The California Tech

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Mark Wise, Longtime Caltech Physicist and Beloved Teacher, Dies at 72

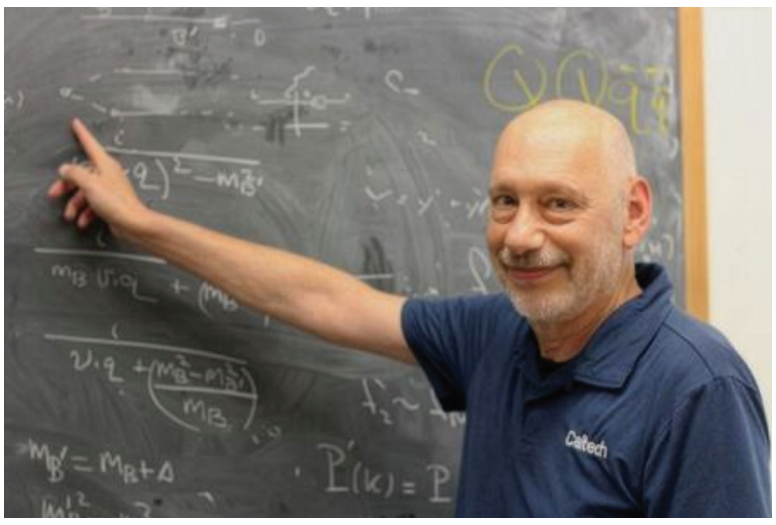
Damian R. Wilson
The Inside World

Mark B. Wise, Caltech's John A. McCone Professor of High Energy Physics and a leading theoretical particle physicist, died July 10 at age 72.

Wise spent more than four decades at Caltech, where his work helped shape modern particle physics and where generations of students knew him as an unusually approachable professor with a dry sense of humor. His most celebrated scientific contribution was the development, with physicist Nathan Isgur, of heavy quark effective theory, which simplified calculations involving heavy quarks and remains widely used in the study of the strong nuclear force.

Earlier in his career, while a junior fellow at Harvard, Wise worked with John Preskill and Frank Wilczek to propose that axions, hypothetical particles introduced for other reasons in particle physics, could make up dark matter. The idea has become increasingly influential as experiments continue to search for axions. Wise also made significant contributions across particle physics and cosmology.

Born in Montreal in 1953, Wise described himself as a poor student early in life. In a 2021 oral history interview, he recalled becoming interested in science only after beginning to read science and science fiction in ninth grade, and credited several high school teachers with encouraging that interest. He later earned bachelor's and master's degrees from the University of Toronto and a PhD from Stanford in 1980.



Mark at the blackboard. (Credit: Clara Murgui)

Wise joined the Caltech faculty in 1982 and became a full professor three years later. Colleagues remembered both his scientific range and his unusually deep knowledge of developments throughout the field. David Politzer, the Richard Chace Tolman Professor of Theoretical Physics, recalled that Wise remained current on new papers and experiments throughout his career and combined that breadth with a rare ability to identify important problems.

Students also knew Wise for the humor he brought to the classroom. His remarks inspired the student-run account @MarkWiseSays, created in 2010 to record memorable lines from his lectures.

"For example, Mark might say: 'If you really get depressed, I recommend diagonalizing a 2×2 matrix.' For physics students, this is both funny and sage advice," shared John Preskill, Richard P. Feynman Professor of Theoretical Physics.

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Lost Caltech

Richard Gruner
(BS 1975)
Guest Commentary

Current Caltech undergraduates are talented, accomplished, and frequently dissatisfied. Many leave Caltech less willing to recommend their student experience to others than their peers at MIT and Ivy League schools. Alumni can attest that similar dissatisfaction with the undergraduate student experience was not present in earlier years.

What has been lost?

Certainly, the stresses of Caltech have not changed. Each year, Caltech recruits the best of the best in science, admitting them in extremely small entering classes (the Class of 2029 has only 248 enrolled students) under highly selective admission standards (the enrolled students in the Class of 2029 reflect only 2.2 percent of the 11,285 individuals who applied for admission). Once there, Caltech undergraduates, who were previously at the top of their high school classes, are given curriculums intended to be difficult even for persons with their exceptional abilities. Students find that they are nowhere near the top of their classes (indeed, they will be lucky if they are near the top of any one course). Learning and new skills follow from determining how to approach new analyses and new problems. The pace and content of Caltech undergraduate education are demanding but rewarding. The stresses are large by design.

None of this is new. For many years, Caltech has been admitting and educating students on this model, helping them to build on their entering talents and emerge with extraordinary undergraduate educations in math, science and technology disciplines, educations that have been the launching points for leading careers in academia, industry, and professions such as law and medicine. Through the caring efforts of professors, grad students, and other educators plus a strong and effective ethic of cooperation and mutual support among students, Caltech undergraduates complete a difficult but rewarding educational journey that most later feel was worth the effort. Indeed, the journey may be the ultimate educational experience at Caltech. By learning how to survive and prosper at Caltech, students acquire the discipline, learning approaches, problem solving skills, collaborative behaviors, and dedication needed to study and understand math, science, and technology at the highest levels.

For many of us who passed through the Caltech undergraduate experience in an earlier era (both my wife and I are BS Class of 1975), the years at Caltech are remembered as perhaps the most intense yet most satisfying and rewarding of our lives. Nothing that came after was quite the same. We formed life-long friendships there and undertook activities

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Caltech Alum-Led Nova Cottage Co. Rethinks Affordable Housing Construction

Emily Yu
Feature

California needs more homes than it is building. In 2022, the Statewide Housing Plan from the Department of Housing and Community Development called for 2.5 million homes to be built by 2030 in order to address the housing shortage. For the past three years, an average of 104,085 homes per year were authorized by building permits in the state, one-third of the 312,500 annual pace implied by the target.

At Nova Cottage Co. in Pasadena, CEO Caroline Paules (BS '19, Lloyd) and COO Karin Najarian view part of the housing shortage as an engineering and design problem. The company is developing prefabricated homes designed to expedite construction through less site work and fewer utility connections. "We want to be the easiest to permit, the fastest to install, and the most affordable to own," Paules said.

Nova began at Idealab, the technology incubator founded by Bill Gross (BS '81, Venerable) in 1996. In the intervening 30 years, it has created over 10,000 jobs and 175 companies, more than 50 of which have gone public or been acquired, and its companies have collectively raised more than $4 billion, according to Idealab. Explaining his motivation for starting Nova, Gross said, "I had been interested in the problem of affordable housing for years, and, with Caroline and Karin, I felt I had found the team that could build a company to really address the problem."

Gross knew Paules from Heliogen, another Idealab company, which concentrated sunlight via mirrors to generate high-temperature heat that can replace fossil fuels in energy-intensive industrial processes. Najarian was recruited after Gross read about her work on the Solar Futures House at Woodbury University, which was a finalist in the U.S. Department of Energy's Solar Decathlon, now known as the



Paules and Najarian in front of the model cottage. (Credit: Pasadena Weekly)

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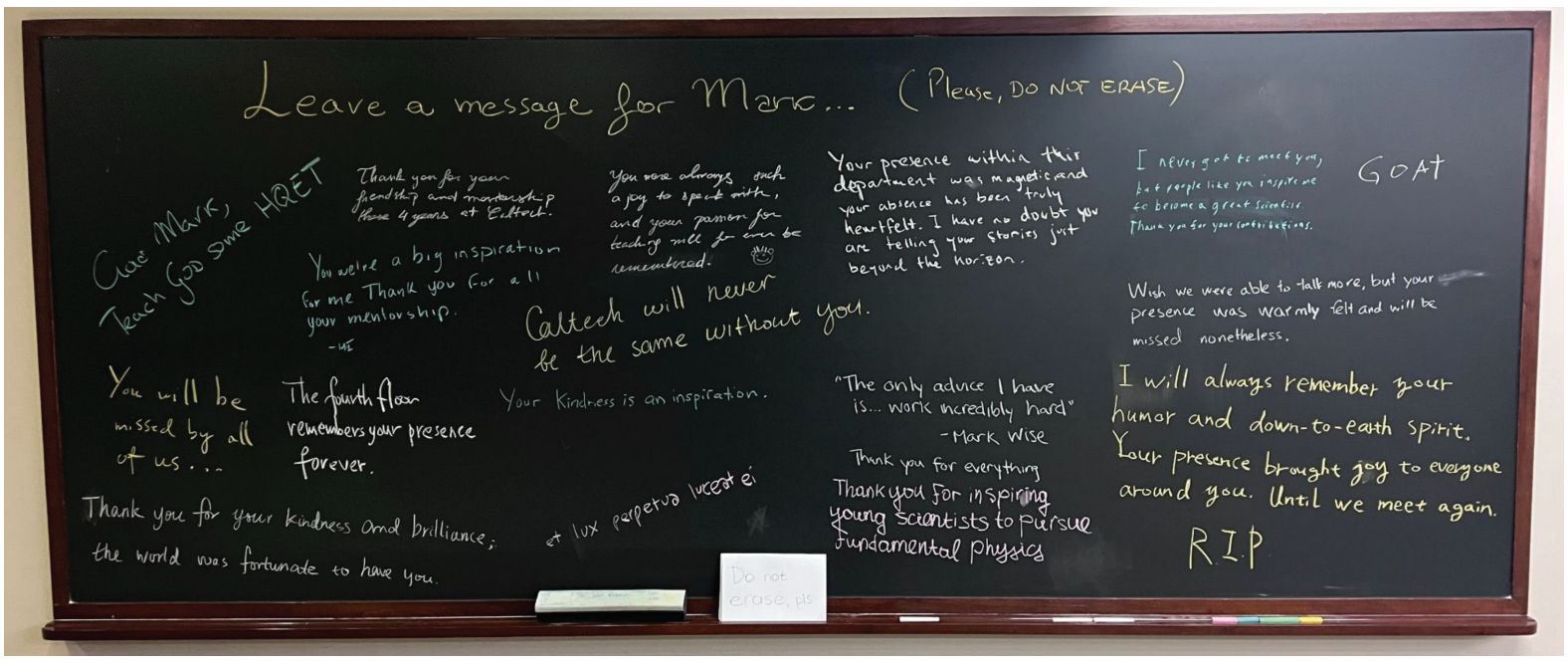
Mark Wise

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"Or he might say, 'This calculation will knock your socks off.' A cliché you might hear from anyone. But who besides Mark would then proceed to remove his shoes, rip off his socks, hurl them at the blackboard, put his shoes back on and resume lecturing?"

Maria Spiropulu, the Shang-Yi Ch'en Professor of Physics, recalled that Wise paid students a quarter for every correct answer in class, an "economy of encouragement" he maintained for years out of his own pocket. Students from Dabney House once honored him with a LEGO figure depicting Wise, coffee mug in hand, lecturing at a blackboard.

That accessibility extended beyond the classroom. Former students and colleagues knew Wise as a giving mentor who took care to give young researchers worthwhile problems and was, Spiropulu recalled, "endlessly generous with his time" throughout his Caltech career. Hirosi Ooguri, the Fred Kavli Professor of Theoretical Physics and Mathematics and the Kent and Joyce Kresa Leadership Division Chair, remembered Mark as "deeply committed to his students and postdoctoral scholars" and as a "kind and generous colleague whose counsel I always valued. I will miss him."



Messages left for Mark on the theory floor of Downs-Lauritsen. (Credit: Damian R. Wilson)

Wise remained closely involved in the life of the Institute, serving for 16 years as principal investigator of Caltech's high-energy physics program and sitting on the Department of Energy's 2013 P5 panel, which helped set national priorities for particle physics.

"Mark was a titan of theoretical physics whose towering achievements were matched only by his unbounded humility, kindness, and generosity to all," said Clifford Cheung, current McCone Professor of Theoretical Physics and director of the Leinweber Forum for Theoretical Physics. "He nurtured generations of scientists who would go on to shape our field."

Wise was elected to the National Academy of Sciences and the American Academy of Arts and Sciences and received the American Physical Society's J. J. Sakurai Prize for Theoretical Physics in 2001.

He is survived by his wife, Jackie; his sons Barry and Jonathan and their wives, Marissa and Diana; his grandchildren Leo, Alex, and Jacob; his sister, Jenna Hofbauer; and his brother, Mitchell Wise.

Nova Cottage

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BuildingsNEXT™ Student Design Competition.

In her architecture education, Najarian learned about innovations and pilot projects in prefabricated housing, but noticed that no one has been able to scale it. Paules approached construction through her knowledge of mass manufacturing from working at Heliogen, and noted the basic method of building a house has changed little over the past century. Her observation is consistent with broader measures of the industry. Last year, Federal Reserve researchers found that construction was the only major U.S. industry with negative average productivity growth since 1987.

Much of the work in home construction takes place in succession, with different crews needed for excavation, concrete, framing, roofing, plumbing, electrical work, insulation, and finishes. "Everything is sequential," Paules said. "You do step one, and then two, and then three, and if you get stuck on step three, you can't do step four." In 2020, a National Association of Home Builders survey found that the average builder used 24 subcontractors on a single-family home and subcontracted 84% of construction costs.

The Nova team also noticed the challenge of utilities integration in small-home construction when looking into Los Angeles' interim shelter villages, which serve as transitional housing for people experiencing homelessness. The cost of the shelters themselves are a small fraction of the overall construction costs, which include hundreds of thousands of dollars for infrastructure such as electrical, water, and sewer lines, as well as the foundation, grading/paving, and landscaping.



Paules working in Michael Hoffman's lab in 2018. (Credit: Caltech)

Nova's goal is to complete construction more efficiently with their Cozy Cottages, aiming to lower upfront construction costs and ongoing utility expenses while making both more predictable. The company currently estimates that a studio will cost between $125,000 to $175,000, including pre-engineering, materials, installation labor, the foundation, with placeholders for utilities and permitting fees. Nova is working toward a cottage costing less than $100,000 and installation in a day. "We really want to make houses like cars and every other product that you see that's mass manufactured," Najarian said.

A house has site-specific conditions, such as soil and weather, which Nova accounts for while keeping the structure itself consistent. For instance, the foundation consists of commercially available ground screws. Using the manufacturer's tested load tables, how much compression, uplift, and lateral force a screw can resist is specified for different soil conditions. Then, the number and size of screws is determined for a cottage foundation. The plates on the screws distribute the load, while a precast concrete pad provides additional distribution. Nova may eventually design and test its own screws. Because the pad is precast and the screws are drilled directly into the ground, this process avoids on-site concrete formwork, rebar, and curing time, which can take weeks.

The structural calculations brought Paules back to Caltech's mechanical engineering curriculum. "It's actually a lot of stuff that we learned in ME12," she said. "It's a lot of trusses. Definitely a lot of free-body calculations."

Above the foundation, the shell of a cottage uses structural insulated panels (SIPs) that are composed of a foam core in between panels of wood. The wood carries tension and compression while the foam keeps them separated and transfers shear. SIPs are therefore able to provide structure as well as insulation, reducing the number of separate tasks needed to build a shell.

Nova's planned production system would complete more work in a factory. Wall panels would combine the structure and insulation with interior and exterior finishes, wiring, and other components, while the kitchen and bathroom would arrive as complete modules. On-site work would then be reduced to fitting and sealing the pieces. The company's goal of installing a cottage in one day refers to this planned production system. Its Pasadena model cottage has so far shown that a studio can be assembled in less than two months.

Inside the 300-square-foot studio model are a full kitchen and bathroom, and pieces designed to serve more than one purpose. For example, a counter-height shelving unit separates the kitchen from the living area, while providing storage on both sides. The bathroom includes a 36-inch shower, toilet, vanity, medicine cabinet, and a window.

Windows on opposing walls provide cross-ventilation. Clerestory windows near the roof bring more light into the room and allow warm air to escape. The high ceiling also makes the studio feel larger. Nova's second design is a 450-square-foot one-bedroom cottage with an additional sleeping loft. The company



Paules installing a ground screws for the model home foundation. (Credit: Nova Cottage Co.)

built the model home first to show that the square footage still provides a practical living space.

Utilities are another major aspect of construction where Nova aims to reduce costs. Their proposed system, the Nova Grid, would connect multiple cottages to a central hub that contains solar panels, batteries, water-treatment equipment, and a control system that tracks water and power use to balance resources among the cottages and identify potential maintenance issues. The goal is for a group of cottages to function off-grid for as long as two weeks.

Within this shared system, potable water, greywater, and blackwater are managed separately. Rainwater and condensate collected from air-conditioning could be filtered for potable use, with delivered water supplementing the supply when necessary. Greywater, such as water from sinks and showers, could be recycled for non-drinkable uses, while blackwater, or sewage, would pass through an electrochemical wastewater reactor (ECR).

The ECR is directly related to Paules's undergraduate research at Caltech. During her 2018 Summer Undergraduate Research Fellowship in Professor Michael Hoffmann's lab, she worked on an automated toilet designed for places without conventional wastewater infrastructure. The toilet used an electrochemical reactor to treat waste so that water could be reused for flushing or irrigation. Paules helped integrate sensors that could detect leaks, track reservoir levels, predict pump damage, and verify that the reactor's electrodes were working. In the Nova Grid, an electrochemical reactor would treat blackwater on site, removing the need to build a new gravity sewer connection.

To allow several homes to share a Grid, Nova plans to place its cottages in small communities similar to the arrangement of bungalow courts, a form of small housing development that originated in Pasadena. Several homes are placed around a common garden or walkway. The design relies on California's small-lot subdivision and accesso-

Nova Cottage

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ry dwelling unit (ADU) laws. A property with eight homes could be achieved by dividing one property into four lots, then having a primary cottage and an ADU on each. Current law can streamline the division of a qualifying site into as many as 10 lots and 10 homes, with the precise permitted number depending on the property.

Najarian said the style of Nova's cottages and the bungalow-court arrangement, which provides open green space, also alleviate concerns people may have about aesthetics regarding additional affordable housing. Paules noted that the attention to aesthetics was a different way of thinking than she was accustomed to from previous engineering jobs, as housing also has social and political interfaces.

On September 29, the building permit for the first customer cottage was issued for the backyard of an Eaton fire property where a garage was lost. The cottage was reviewed as both a fire rebuild and an ADU. Nova expects construction to begin this fall.

Gross hopes the Nova system can eventually be used elsewhere in the world to make housing more affordable. "The chance to make an impact right here in this community is great," Gross said. "Hopefully, we could perfect this here and export it to a lot of other places as well."



Structural insulated panels. (Credit: Nova Cottage Co.)

Welcome Back! From Caltech Dining Services & Housing

Miguel Campos
News

Hello everyone from Housing and Dining Services!

As we kick off a brand new academic year, we want to take a moment to welcome you all back to campus. We are incredibly excited to see familiar faces and can't wait to get to know all the new students joining our community this fall.

World Cup Food Fest

We hope everyone enjoyed last Friday's (Oct. 2) Food Fest! It was fantastic seeing the community come together to enjoy our World Cup finalist and champion-themed foods, as well as the special late night snacks.

Exciting Pop Ups

We have so many fun pop up events planned for this year. Please keep a lookout on dining's Instagram for regular updates on when and where these will occur so you don't miss out on any of the surprises we have in store.

Sustainability on the Menu

We want to formally announce our partnership with Klimato! You may have already noticed the new emission letter grades on menu items (A-E) in Browne Dining Hall. This is a way for us to keep track of our carbon emissions and understand how food selection impacts our environment. Organized in proud collaboration with the Caltech Graduate Student Council (GSC) and Plant-Based Caltech (PB Caltech), we hope this framework provides an easy way to measure which foods have a larger carbon footprint during your day-to-day meals. We will continue to build on this partnership as we strive to make positive changes and have a better environmental impact in all that Dining Services does.

Connect With Us!

Thank you all for making this community so vibrant. It is our absolute pleasure serving you, and we look forward to an amazing year ahead. We wish everyone a fun, successful, and safe fall term!

Dining Questions:
Email: dine@caltech.edu
Webpage: dining.caltech.edu

Housing Questions:
Email: housing@caltech.edu
Webpage:
housing.caltech.edu



World Cup Themed Food Fest Fall 2026 (Credit: Miguel Campos)

Young Ventures Adds Caltech to Its Scouting Network

Camilla Fezzi
The Outside World

Editor's note: Camilla is a co-founder of Young Ventures and serves as its Caltech partner.

Young Ventures is a venture capital platform run by students at nine universities. It launched publicly on September 1 with Caltech as one of its partner schools. The others are Stanford, Harvard, NYU, Cambridge, Oxford, LSE, ETH Zurich and Bocconi. Davide Franchini founded the platform, and each campus has one student partner.

The idea is to find university spin-offs earlier than most investors do. Research-based startups often come to venture firms' attention only after they incorporate, pitch or get press coverage. By then, valuations have often gone up. Young Ventures thinks its campus partners can spot these projects sooner because they work alongside the researchers building them. A student in a department may hear about a promising project months before it becomes a company. The platform also takes direct applications and referrals from the funds it works with.

According to Young Ventures, its team reviews more than 500 projects a year across the nine campuses. It invests about €100,000 per company on average, usually alongside one of the 25 established funds it co-invests with. About 60% of its capital goes to Europe, 35% to the United States and the rest to Asia. Its sectors include deep tech, biotechnology, environmental technology, advanced materials and digital technology.

At Caltech, the platform expects to hear from students and researchers at an early stage. That could be a SURF project that has grown beyond its original scope, a graduate student thinking about a spin-out or a postdoc interested in commercializing their work.

The platform's first investment is Cortirio, which makes a wearable headset that images the brain using functional near-infrared spectroscopy, a portable alternative to fMRI. The device is meant to detect traumatic brain injury in under two minutes without a CT scanner or a hospital visit. Five more portfolio companies are listed on the Young Ventures website as upcoming.

Caltech undergraduates, graduate students and postdocs working on projects with commercial potential can contact the platform. It prefers to talk with founders before they incorporate, and having a company already is not required. More information is at youngventures.vc. The Caltech partner can be reached through Fleming House or at camilla@youngventures.vc.

Young Ventures logo. (Credit: Camilla Fezzi)

We're Bringing Back the Quail!

Tech Staff
Humor

A SATIRE advice column about alive, ahaha, and everything in between! Brought to you by the one and only California Tech. See below for wisdom (?) from Quails past and scan the QR code to submit your own questions for future issues!

How do Question the Quail articles get written?

WATER!!!! LOTS OF WATER!!! THAT IS THE ONLY WAY TO WRITE QUAIL ARTICLES SINCE IT IS VERY HOT IN PASADENA!!!!

Why does everyone keep talking about lululemon?

It seems like there is a very specific instance in which Caltech students were offered free lululemon products. Please ask upperclassmen about this incredible anecdote...

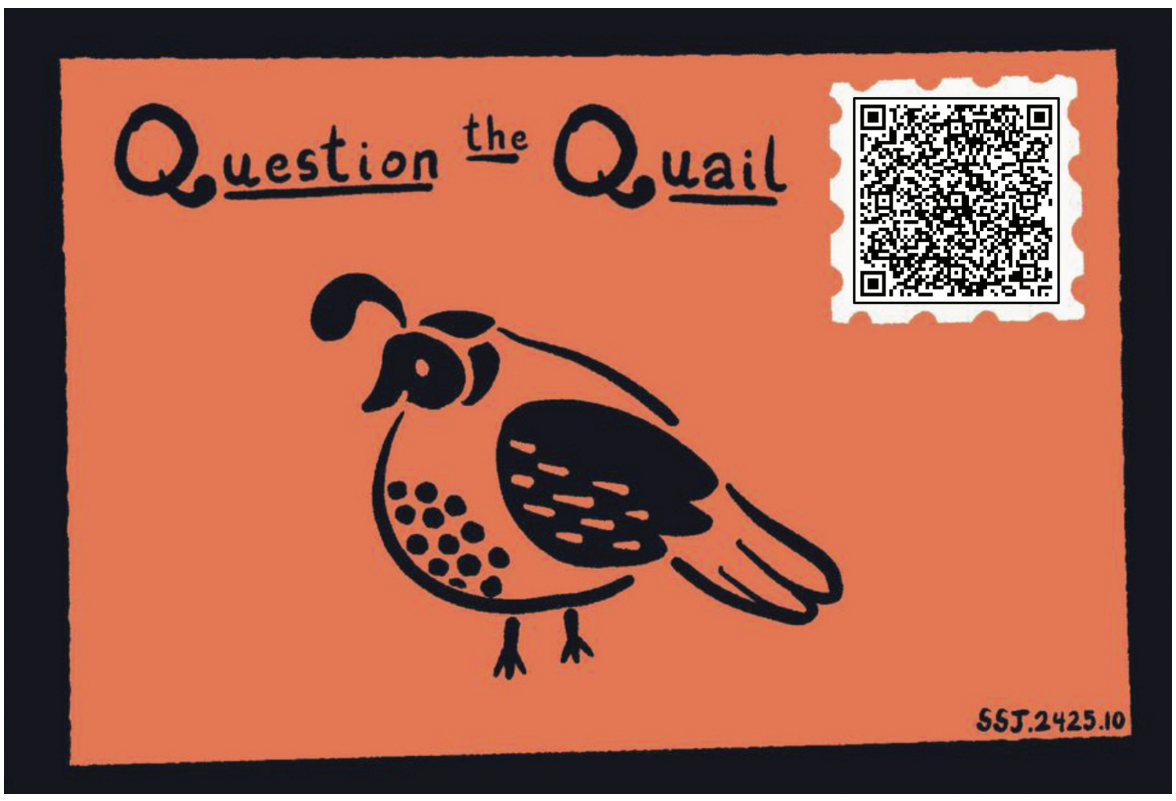
I'm a grad student looking for club funding. How do I go about applying for money? – Madeline Hatter

Simple! Just follow this 4-step plan:

1. Create a crap club that sounds interesting but niche enough to discourage participation, allowing you to retain more funds.
2. Propose the most costly items related to your club idea, requesting all of them, and I mean ALL OF THEM!
3. Send in a request to the treasurer of the Associated Students of Caltech (ASCIT, the undergraduate student government), to steal all the money from undergrads to use for your tons of unnecessary equipment and your dumb club that you were planning to embezzle money from anyways.
4. Embezzle

what do i do if my phd thesis sinks in a submarine – Dillard Dopamine

So, imagine this: my PhD thesis takes an unexpected plunge in a submarine, right? Classic Tuesday. Now, when I spill the beans to Caltech about the whole ordeal, I'm thinking of spinning it like my advisor got a little too peckish, you know, like they devoured my hard work. Picture this - a dash of humor, a sprinkle of charm, and a plea for a "pity PhD" because, come on, who else can claim their advisor snacked on their thesis? It's not every day you survive a submarine mishap and a thesis-eating mentor, right? I'm hoping they'll see the humor and toss an honorary degree my way. Fingers crossed, and let's hope they've got a sense of humor down at Caltech!



Lost Caltech

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that are among our most meaningful life memories. It was a highly positive time all things considered.

Since then, however, undergraduate dissatisfaction has grown. Many recent students have left Caltech with poor memories of their student days. Among Caltech students graduating between 2005 and 2020, only 35 percent indicated in a survey that they were very satisfied with their undergraduate education, while 54 percent of similar students at MIT and Ivy League schools indicated they were very satisfied. Only 28 percent of the same Caltech undergraduates indicated they definitely would recommend that a high school student attend Caltech while 64-67 percent of MIT and Ivy League students said they definitely would make such a recommendation. Clearly, Caltech can do better in creating positive student experiences that graduates will recommend at levels similar to students at peer schools such as MIT and Ivy League universities. The survey results are described in the Caltech Co-Curricular Group (C3) Final Report (April 2022).

These are not the only signs of discontent. Articles in the California Tech newspaper have recounted repeated incidents in which student initiatives aimed at organizing social events for students or other student-initiated projects have been frustrated by refusals of the administration to support them or by threats to impose exorbitant costs on the students or house organizations in the case of modest damage. Similar comments (many of them from student leaders such as ASCIT officers and house presidents) have been received by alumni when they go on campus and talk to present students. It is a frustrating and socially isolating time for current Caltech undergraduates in which student community-building activities and support for student life outside the classrooms seem to have diminished in scope and quality from prior eras.

What is missing in today's student experience?

Interestingly, alumni can provide much of the answer. The stresses at Caltech have not changed materially in the last 50 years. Classes are tough, time is short, and this is not going to change because Caltech cannot provide the top-quality science education it is known for without these pressuring features. But the undergraduate student experience is arguably weaker than 50 years ago. We who saw the student support then and the lesser actions now can see the difference. We can identify what has been lost.

To put it simply, the Caltech undergraduate experience is not positive enough outside of the classroom.

This commentary identifies some of the lost elements in the Caltech undergraduate experience that were positive in an earlier era and that are missing today. They are presented with the hope that the account will help the present administration to make improvements. These were all workable measures at Caltech in earlier eras with substantial impacts on the quality of student life outside of the classroom. The addition of these or close equivalents would go a long way toward improving the present undergraduate student experience and ensuring that this experience is as rich, supportive, and satisfying for undergraduates as student life 50 years ago.



Richard Gruner. Caltech, BS 1975; former Co-Editor-in-Chief, The California Tech*; former Professor of Law and Director of the Center for Intellectual Property at the John Marshall Law School in Chicago.* (Credit: USC Gould)

I. Frosh Camp

The gap begins with the absence of Frosh Camp. This event was conducted as new undergraduates first arrived in Southern California and involved several days off campus on the beach or in the woods. Frosh Camp started the Caltech undergraduate experience with a community-welcoming and building event. It demonstrated that Caltech was a special community and that new undergraduates were important members of that community.

Frosh Camp taught by example the supportive and informal nature of undergraduate life at Caltech. The event mixed all entering freshmen and women, some undergraduates (primarily student leaders and other representatives of the breadth of student life at Caltech) and a substantial number of Caltech faculty. The aim was discussing student life and the broader Caltech community (as well as having some shared fun). The more mechanical steps of describing campus features and resource availability would be accomplished later on campus via orientation events and processes.

Frosh Camp was held in a setting that was not only away from campus, but fun itself. A relaxed and interesting setting detached from Caltech served to isolate students and faculty in an enjoyable way from perceived pressures on campus. Over the years, a number of locations served as Frosh Camp settings. In the 1970s, Frosh Camp took over a YMCA camp on Catalina Island. Later, a camp in the mountains near Crestline, California, was used. More recently, students and faculty went to Ventura County. The following description of the version of Frosh Camp held in 2017 highlights the community building importance of this type of event:

> "This year, Caltech's freshman orientation took place on September 18 and 19 in Ventura, California. Over the two days, students from the class of 2021 attended talks about the Honor Code and academics, met deans and resident associates, and participated in elective activities such as a boat design contest and a geology hike.
>
> Paul Asimow (MS '93, PhD '97), the Eleanor and John R. McMillan Professor of Geology and Geochemistry, has led the annual geology hike for 10 years, with increasing attendance each year. With panoramic views of the Channel Islands, the Ventura River Valley, and the Santa Clara River Valley — weather almost always permitting — the 1.5-mile trail is located in the hills above Ventura and passes through fossil-rich rocks and landforms testifying to the extremely rapid uplift of those hills and the nearly-as-rapid resulting erosion."

Professor Asimow's presence at Frosh Camp and his leadership of activities stressing both science and recreation were typical although the specific faculty members in attendance varied year to year. Frosh Camp illustrated the Caltech community at its best: informal, relatively hierarchy free, extremely sharp, and active.

One could meet the most remarkable people at Frosh Camp. Richard Murray, Class of 1985 and later a Caltech Professor and winner of the Richard P. Feynman Prize for Excellence in Teaching at Caltech, recounted his first, highly informal contact with Nobel Prize winner Feynman at Frosh Camp on Catalina Island in the early 1980s:

> "I was sitting down, looking across a field, and a professor sat down next to me and started talking about some shells he had found while he was swimming. Lo and behold, it was Richard Feynman – although I was an engineering student and not in physics, and I'm not sure I knew who he was at the time. That willingness to talk to a student typified his approach to teaching."

Not a bad introduction to Caltech.

Frosh Camp established firmly that freshmen were part of the Caltech community. From day one, it was communicated – from the existence of Frosh Camp, the involvement of many faculty in the Camp, and the comments of both faculty and students at the Camp – that Caltech valued community over all else and that freshmen were part of this rare community. Essential features of student life – including the norms of cooperation and collaboration and the benefits of operating under the honor system in which students are honor bound not to take unfair advantage of other members of the community – were communicated to freshmen from day one. The availability of help from fellow upperclassmen (and the fact that pretty much every student would need help at some point) was made clear in the first discussions. Support was a pervasive theme. New undergraduates met, in the faculty members and students at the Camp, some of the people who would be immediately available sources of support when new students returned to campus.

Perhaps most importantly, new undergraduates met each other at Frosh Camp with time to just talk and hang out, discovering (perhaps with some surprise) that their classmates were much like themselves – precocious, brilliant students, often shy, and frequently a little (or even a lot) socially backward. The undergraduates had never known many (if any) persons like themselves; now they were surrounded by a group of peers, which provided some inspiration and comfort.



Professor Asimow talks to students from atop a stump during the 2017 Frosh Camp geology hike. (Credit: Caltech)



Coffeehouse. (Credit: The Big T, 1970)

Frosh Camp was regularly undertaken in stunning settings such as Catalina Island or the San Bernardino Mountains where participants could engage in enjoyable joint activities and build shared memories. Later, on campus, these shared experiences would promote continued interactions among new frosh, with resulting benefits in support and further enjoyable activities. Frosh Camp is now gone with the loss of these sorts of community benefits.

II. The Student Run Coffee House

In the 1970s, Caltech had a student run Coffee House, located in a Caltech-owned house on San Pasqual street (when it was a continuous street). Later a similar facility operated in the basement of the old student houses. The purpose was to serve Caltech students (mostly undergraduates) in a friendly, personalized environment. The features of that environment (the menu, the music, the physical elements like pinball machines and other aspects of the setting) were all curated by students. It was open late (because that was when Caltech students needed a break from long homework sets) and was a short but meaningful walk from the student dorms (with the result that a Coffee House run forced students to get out of their rooms and have a brief interlude of physical activity amidst long homework sessions). The Coffee House also provided a limited amount of student employment, aiding the tight budgets of a number of undergrads.

Walks to and from the Coffee House were often group affairs organized off the cuff, adding social benefits to the individual relaxation provided by the Coffee House. People who ate at Coffee House have pleasant memories of milkshakes, burgers grilled to order, loud music, and lots of pinball. It was fun and easily available every night.

Today, there is no student-curated equivalent. A professionally run café reopens in the evenings in a period it calls "Coffee House", but this is a pale substitute for the student-created, student-focused Coffee House of an earlier period. Simply having a place to have coffee is not the same as having a place run by peers for peers. Where are the student-selected decorations, music, and menu items? And where are the pinball equivalents? Relief should be there every night into the night. The student run Coffee House provided this; today there is only a student support gap in the evening hours.

III. Robust Interhouse Dance Constructions and Themed Events

The term "Interhouse Dance" was a misnomer 50 years ago. The dance aspects had largely fallen away and the building of decorations and the holding of parties dominated by the decorations were the essence of Interhouse. The event might have better been called "House Engineering and Fantasy Night" as most houses focused on either major constructions or other theme events with plays and costumed activities. Dancing, if it occurred at all, was minimal. For reasons of changed scheduling and diminished projects, some of the community building opportunities of Interhouse seem to have been lost.

A single night was selected for Interhouse Dance 50 years ago in the middle of the fall quarter. This served two purposes. First, having the event on a single night allowed all house members to cruise around and see what other houses had done. Second, by holding the event relatively early in the fall quarter, the construction of Interhouse projects or the development of elaborate themed events became important bonding processes. New frosh (who generally knew few upperclass persons upon arriving in their houses) were encouraged to come out of their rooms and join in the major house projects. By the end of the projects at the Interhouse Dance, the frosh knew many of the upperclass house members and vice versa. They had all worked on joint efforts and could share pride in the major projects they completed as house communities.

Today, Interhouse events are spread throughout the year, with each house having its event on a different day. Constructions are optional. For the houses that have their events after the fall quarter, this timing loses the community building advantages of quickly bringing new students into house activities via participation in group projects leading up to a fall Interhouse event. By winter and spring terms, students will already have felt the isolating and often crushing effects of extreme workloads and finals. The best community building opportunities will be lost in houses that must defer their Interhouse events past the fall quarter.

The diminished scope of decoration and theme projects also seems to be a loss. The scope of community building opportunities revolving around Interhouse 50 years ago is reflected in the ambitious features of the house projects involved (and, hence, the magnitude of the group efforts that students organized and executed within the houses to carry out these projects). To give an idea of the scope of constructions undertaken in just one house 50 years ago, the following were Interhouse projects completed in Page House between 1971 and 1974 (students in other houses worked on their own competing projects):

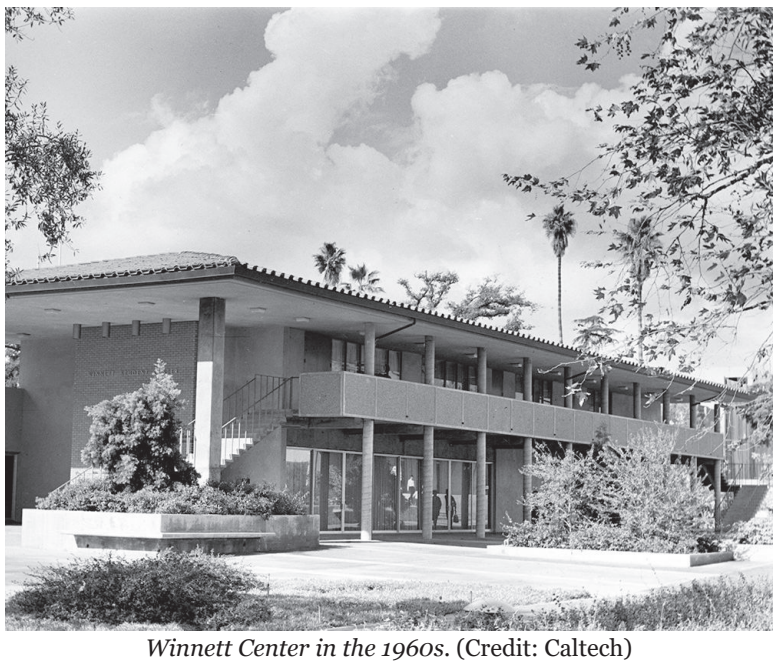
1) The Page House Railroad – The main downstairs hallway in the dorm was transformed into a railroad by laying down a track using small conduit pipe as rails. Cars riding on the rails were mounted with little red wagon wheels with the rubber portions stripped off (leaving behind a metal hub with a "C" shaped profile that fit on the track). The wheels were swapped out like racing tires as the bearings in each wheel hub wore out after a certain number of hallway transits. The engineering triumph in the railroad design was the motivation mechanism – this was a rider powered railroad! Riders added energy to the system by climbing stairs to a relatively high point in the lobby near the beginning of the hallway. There they were loaded into seats on a car. Once loaded, the rail car was released down an immediate slope which brought it to sufficient speed to send it rolling down the length of the track where it was caught at the end of the hallway on a spring. The riders got off and the stretched spring had sufficient power to send the now lighter car all the way back down the track to the beginning of the ride (or thereabouts). A brilliant physics demonstration that even worked!

2) The Sewers of Paris – This involved placing reinforcements and water seals in the lower portions of all the doorways in the downstairs hallway, lining the hallway with a waterproof liner, and flooding the hallway to a two-foot depth. A catwalk built above the flooded portion allowed guests to walk down a sewer tunnel along the length of the hallway. Grey and decayed wall decorations along with some fake cobwebs lined the hallway to make it look appropriately gross and disgusting. Fortunately, at least for the persons living in the dorm rooms adjacent to the flooded hallway, realism ended there – rats and stench were not part of the sewer simulation.

3) Transporter to Star Trek – This project turned on the heat shrinking features of large sheets of mylar plastic and the optical effects that persons could create over entire rooms by taking mylar coated with reflective aluminum, mounting it to large frames, and heat shrinking it to produce entire mirrored walls. The Star Trek inspired project started with a "transporter room" in which guests entered a room, lights flashed and went out, and when the lights came back on the room was a different shape. This was a low-tech effect based on pure people power – the apparent change in rooms and location was achieved by parties behind the scenes moving the walls of the transporter room at the appropriate moment. From this transporter, guests moved down a long hallway (the same one formerly containing the railroad and sewer) along a mirrored path. Shrink-wrapped aluminized mylar walls mounted down the length of the hallway created a corridor with a funhouse set of mirrored reflections. At the other end was a recreation of the full Star Trek Enterprise Bridge with appropriate visual displays, control panels, and blinking lights.

4) The Disco – Once again, the optical effects of shrink-wrapped mylar provided inspiration. The construction project aimed at creating a disco parlor with actual dancing. Mirrored walls were again created with heat-shrunk aluminized mylar (probably using an excess supply of mylar left over from the year before). These surrounded a disco dance floor with a mirrored disco ball suspended from the ceiling that completed the lighting effects as colored lights reflected off the ball and the mirrored walls.

These efforts illustrate the types of student-generated, science-infused projects the minds of Caltech undergraduates create when unleashed (and given a bit of project money to work with and a bit of forgiveness as to damage done). It takes student-generated projects like these to distract and engage Caltech-level students. With this engagement, communities are formed and students gain distraction from the otherwise crushing pace of academic work. This is well-recognized autonomy. Yet similar projects seem unlikely to proceed today. The need for pre-approvals is likely to deter thinking big about Interhouse Dance decorations, particularly where the parties with approval powers do not share the cleverness and scientific bent of Caltech students but do have strong interests in risk avoidance and minor damage prevention.



Winnett Center in the 1960s. (Credit: Caltech)

IV. Student Services in Winnett

The now destroyed Winnett building was the source of many student activities and supports which were not fully restored in student-proximate forms when the substitute Houseman building was completed. Winnett was located a short walk from students in all seven houses. The services it provided were immediately available to undergraduates. These included:

A. The Personal Touch: Flora and her Friday donuts

Presently, many undergraduates are distressed about their student lives – in some cases because of actions taken by the Caltech administration – yet feel that they do not know who to talk to or how to complain. This lack of an outlet becomes its own further source of stress – a pressure cooker without an escape valve is inherently dangerous.

In an earlier era, Caltech had a simple solution. It institutionalized listening. It provided a human face as an entry point to student support. With approximately 250 entering freshmen and women entering each year and a total of only about 1000 undergraduates on campus at any given time, Caltech can afford to give personal attention to support of each undergraduate. At one time, this personal touch was provided by one-on-one contacts with a friendly staff member named Flora prominently housed in Winnett within steps of the student dorms. Flora supplied the personal touch to student support and she was armed with donuts.

Flora was an administrator (with a title related to student life) who provided an ever-present ear to students in trouble or who just wanted to talk. She offered some practical advice and was particularly popular on Friday mornings when she dispensed free donuts from her office. The lure of the donuts ensured that she saw many students at least once a week and could engage in friendly conversation with help given if needed. It probably added to her popularity that she had once been married to a member of the Grateful Dead (Tom Constanten). She was a caring individual who was always interested in undergraduates and was an ongoing and immediately available source of compassion. She provided a human entry point for student services, steps away from where students lived.

B. Events in Winnett Lounge

A substantial sized lounge in Winnett hosted (at Caltech's expense) an ongoing series of free events ranging from comedy to serious public affairs. A representative comedy event is reflected in the following announcement from 2009:

> "The Caltech Comedy club is presenting Saturday Night Stand-Up Comedy, featuring some of LA's best emerging and established comics. This free show will feature comics from Comedy Central, the Improv, the Laugh Factory, and more."

Winnett Lounge also hosted diverse speakers addressing more serious matters. Martin Luther King Jr. visited the campus in 1958 and met with students in Winnett Lounge. Roy Wilkins spoke there in 1964. In one year alone, speakers in Winnett included Ken Kesey (noted author), Dick Tuck (political prankster), Linus Pauling (two-time Nobel Prize winner and former Caltech faculty member) and Zhores Medvedev (world famous Russian political dissident and scientist). Ray Bradbury, Leonard Nimoy, and Chappy James (the first African-American USAF General) gave informal lectures for students there. Mason Williams played his hit "Classical Gas" and Virgil Fox, organ virtuoso, gave a concert in Winnett Lounge. Nobel Prize winner Richard Feynman dropped by on a series of Wednesday afternoons and told stories of his time at Los Alamos.

There were many more similar events and insights from extremely talented and engaging outsiders. Sessions provided in Winnett Lounge were all aimed at students, made available near where they lived and for free. There does not appear to be any substitute speaker or artist series presently aimed at students, with the associated loss of both entertaining diversion and broadening cultural experiences.

C. Caltech Y

The Caltech Y has been a major force in shaping the non-academic features of undergraduate life at Caltech for many years. Up until the loss of Winnett, the Caltech Y offices were located in Winnett, steps away from the students they served. Now they are relegated to a Caltech-owned house on the periphery of campus. Still a major force in undergraduate life, the Caltech Y is nonetheless hindered by its lack of proximity to undergraduates who can no longer drop in for a few minutes (all that many have free amidst crushing academic schedules) for informal Caltech Y activities and conversations.

D. Student Publications

Winnett also included the offices of The California Tech newspaper, the Big T yearbook, and other student publications, along with a darkroom that supported the photographic activities of those publications. Proximity to the student houses meant that students were easily able to participate in campus news reporting supplemented with many student-generated photos of events. The presence of the paper in immediately available offices helped make the paper an active student voice amidst the student population, providing student curated information on student affairs, student government activities, related Caltech administration activities, and entertainment options both on campus and off.



Martin Luther King Jr., pictured (center left) with a group of students in Winnett Lounge in 1958. (Credit: Caltech Archives)

V. Nearby Entertainment on Campus

A. Student-Focused Performances on the Olive Walk

Every year professional entertainers performed on the Olive Walk (in a space near Winnett) to provide distraction for students and other members of the Caltech community. These events were organized by the Master of Student Houses (MOSH), a faculty member with responsibility for the quality of life in the student houses. The level of entertainment booked and paid for by Caltech for the distraction of students was topflight. For example, on one occasion 50 years ago, the San Francisco Mime Troupe (a nationally recognized political satire act) provided hilarious spoofs of current politics and social life. A local troop of belly dancers was such a hit they were invited back several times, with one of their performances highlighted by the presence of a camel ridden by the then MOSH David Smith. Needless to say, these events were distracting – they were aimed at undergraduate students in particular.

At present, there is no MOSH (perhaps reflecting a diminished faculty interest and involvement in student life outside the classroom). Hence, it is not clear who would organize the equivalent of these memorable entertainment events.

B. Other Caltech Sponsored Events

Caltech was a lively source of cultural events in the past. One of the highlights of 50 years ago illustrates the exceptional persons brought to campus in that era. In 1974, Caltech hosted an extraordinary gathering of science fiction writers at a conference open to students, with attendees including Robert Heinlein, Poul Anderson, Robert Silverberg, Larry Niven, Harry Harrison, Randall Garrett, and Jerry Pournelle (Caltech Professor John Pierce presided).

C. World Class Entertainment at Beckman Auditorium

For many years, Beckman Auditorium (Beckman) on the Caltech campus regularly hosted many leading artists and lecturers. Artists appearing at Beckman ranged from Marcel Marceau to PDQ Bach (Peter Schickele) to the Mod-

Lost Caltech

continued from page 5

ern Jazz Quartet to the Vienna Boys' Choir. Beckman hosted lectures by such luminaries as David Hockney, Frank Gehry, Tom Stoppard, Oliver Stone, Michael Crichton, Herman Wouk, and Beverly Sills. Beckman was the centerpiece of entertainment and culture at Caltech. An outside observer once described Beckman Auditorium as "a vibrant cultural hub. ... [I]t hosts a diverse array of events including performing arts, lectures, films, and classes throughout the academic year."

Caltech once recognized that the programs at Beckman were a significant source of positive student experiences. Some years ago, a video describing student culture at Caltech pointed to events at Beckman as significant highlights of student life. The student narrator mentioned recent programs that included a lecture by James Cameron on the science behind the movie Avatar, a talk by Stephen Hawking on black holes, and two different sessions of TED talks.

Caltech turned away from providing a season of diverse performances at Beckman Auditorium in the early 2000s, limiting use of Beckman to Caltech events, internal academic programming, student-led productions, and public science outreach initiatives. A series of chamber music concerts appears to be the only outside entertainment booked there now. Broader entertainment seems to be gone to the detriment of undergraduates and the entire Caltech community.

Updating for the Needs of Today

The accounts here focus on features of the Caltech student environment of 50 years ago that were meaningful then but appear to be missing now. These stand out to persons who had positive student experiences in an earlier time as features that aided those experiences and which might also benefit students now.

Of course, times and student needs change. New needs of students may suggest the desirability of student life features beyond those described here as beneficial 50 years ago. The only way for the administration to identify the specific student life features and administrative supports that will produce more positive student experiences is by listening to present undergraduates. The fact that the administration does not seem to be actively investigating the concerns of present students in searching for sources of continuing undergraduate discontent and seeking additional changes to produce more positive student experiences suggests that student discontent is likely to continue.

Discontent continues to be expressed when alumni speak to students today. More troublingly, students do not have a sense that things are changing for the better or that the administration is even interested in these problems. Worst of all, some students express concerns that they do not even know how or to whom they should voice their distress about undergraduate life and the limitations that certain administration figures are placing on student-initiated activities. If students' present concerns remain unheard, it seems highly unlikely that the administration will understand the concerns and take accurately targeted steps to make improvements. If one does not hear about and understand a problem, it is unlikely that one can take effective measures to fix it.

In sum, two types of administrative action would help counteract recent student dissatisfaction with the Caltech undergraduate experience. First, changes to restore the types of student life features described here would be useful improvements. Their past success in supporting positive student experiences and undergraduate satisfaction at Caltech indicates their potential for making improvements in the present environment. Second, the administration needs to listen more – that is, pay additional attention to the detailed concerns of present undergraduates – and adopt thoughtful and rapid measures to respond to those concerns. Such listening, analysis, and thoughtful responses would be useful ways to construct changes tailored to today's students and to make sure that the changes are effective in improving present weaknesses in the Caltech student experience.



Richard Gruner in THE BIG T, 1975

Trading Fall Term for a Magical Term Abroad in Denmark

FASA Office
The Outside World

Arabella Camunez arrived in Denmark ready for a different style of learning. She also found a welcoming community, an abundance of castles and winter days with only a few hours of daylight.

Arabella, a member of Caltech's Class of 2027 studying chemical engineering, spent fall 2025 at the Technical University of Denmark, known as DTU, through Caltech's Copenhagen Scholars Program.

"I have really enjoyed my time at the Danish Technical University," Arabella wrote. "Both the international students I have met and the Danish students and locals I've met have been very friendly and welcoming."

A different classroom

One of the biggest adjustments was the difference between DTU's semester system and Caltech's quarter system. At DTU, Arabella said, courses meet once a week for four-hour blocks, usually divided between lecture and problem-solving or practice time. Her classes also relied heavily on group projects and final exams rather than regular assignments.

"All my classes involved a couple of big group projects and a final, and that was everything we had to submit," she wrote. "The lack of regular assignments to turn in meant you needed intrinsic motivation to study and stay on top of everything."

Arabella also noted that many professors have an open-door policy for students seeking help. "There is basically an open-door policy with a lot of professors about asking questions and getting help, but it can be somewhat intimidating," she wrote. "I only used that policy when I was in a group with Danish students who knew how to take advantage of it."

The semester itself took some getting used to. "The semester system feels significantly longer than the quarter system I have grown accustomed to, so about 12 weeks into the semester it did begin feeling very long," she wrote. "However, we did get a week-long fall break in October!"

Finding community

Outside the classroom, Arabella found community through her orientation group, campus clubs and a church she began attending. At the beginning of the term, exchange students are assigned to "buddy groups" for orientation week. Arabella said her group quickly became close.

"I got really lucky and my group got on fantastically and many of us stayed friends throughout the entire semester," she wrote.

A club fair during the first week introduced students to a wide range of organizations, including sports teams, performance groups, affinity groups and other activities. Arabella also made friends through the DTU choir, which provided opportunities to perform around Copenhagen. The choir sang at the Copenhagen Half-Marathon and the Carlsberg Christmas Tree Lighting.

"I met some of my closest friends in the DTU choir," she wrote.

Exploring Denmark and beyond

Arabella also took advantage of opportunities to explore Denmark and nearby Sweden. DTU is located in Lyngby, about 40 minutes from central Copenhagen by public transit. "Denmark's public transportation system made it possible to travel widely. There is a very thorough public transit system which made it possible to get just about everywhere," she said.

In September, she took advantage of K7 Week, an event offering people under 26 free or reduced admission to museums and performances. She visited about eight museums and attended an opera during the week.

She also visited Dyrehaven, a park near campus known for its deer, and traveled to several castles. Her favorites were Frederiksborg Castle in Hillerød and Kronborg Castle in Helsingør, the setting of Shakespeare's "Hamlet." Both castles are less than an hour from Copenhagen by train. "I also love castles so I went to as many as I could," she wrote.

Arabella also took day trips to Odense, the hometown of fairy-tale author Hans Christian Andersen, and Lund, Sweden.

Adjusting to winter

The Danish winter brought another adjustment. Around November and especially into December, Arabella said, the days became increasingly short, with only about seven to eight hours of daylight. "Take Vitamin D! I am not exaggerating," she wrote.

As the days grew darker, Christmas markets began appearing throughout the city. "Finally, towards the end of the semester when it starts getting dark early, the Christmas markets start popping up which are delightful," she wrote.

Despite the challenges of the semester, Arabella said the experience was one she would recommend to other Caltech students. "I had a wonderful time during my experience in Denmark and would highly recommend studying abroad at DTU," she wrote. "Just bring a lot more layers than you need in SoCal."

Interested in Studying Abroad?

Students interested in an adventure at DTU or any of the Caltech Study Abroad Programs can find information through Caltech's Fellowships Advising and Study Abroad Office at fasa.caltech.edu/.

The FASA Office is putting on a general info session "Welcome to Study Abroad" on Wednesday, October 7th at 12pm in 153 Noyes. More info is on our office events page fasa.caltech.edu/events or reach out at FASAoffice@caltech.edu. We are also on Instagram at instagram.com/fasa.caltech/.

All photos provided by Arabella Camunez.



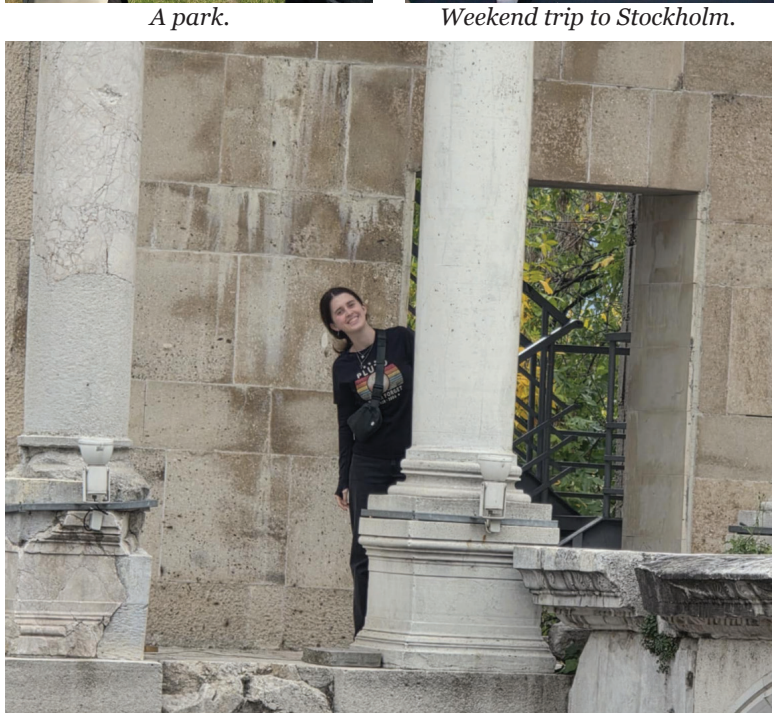
Appreciating the museums in Copenhagen.



A park.



Weekend trip to Stockholm.



Trip to Bulgaria during fall break.

Five Days on the Roof of Africa — Part I

A budget adventurer, four rowdy lads from Leeds, and one relentless case of gas on the Machame Route

Robert Otieno
The Outside World

There is something out there, and something in here. More often than not, I go looking for what's out there to forget what's happening in here. Sometimes it's simpler than that. Just a burning curiosity about what lies beyond in me: the landscapes, the people, the perspectives, the challenges. This summer, I got the chance to visit the Roof of Africa.

The trip was mostly born of a need to do something hard. There were other reasons too, but that was the big one. I'd meant to scale it the winter before, but electoral tensions in Tanzania plus the blame some were placing on Kenyans for stoking them made the timing feel unsafe. Delta Airlines cancelling my flight home didn't help either. So this summer, I asked myself: why not? I was already in Kenya for research, and Tanzania was just four hours away by road. The country had cooled off since the winter's unrest, and, as if the universe wanted me to go, I discovered there was an East African citizen discount on the trekking fees. That settled it. I was locking in.

My original plan was the Lemosho route, which reviews promised would mean better acclimatization and better views. But my study-abroad schedule only gave me six days at the mountain, so I switched to the six-day Machame route instead. That switch came with its own demands: a baseline level of fitness, and some bouldering experience, since parts of the route involve genuine scrambling over rock, to name just a couple. It also meant trading solitude for company: Lemosho is typically just the tourist, the guide, and the porters, whereas Machame meant joining a group.

Honestly, going it alone with a Tanzanian guide and porters wouldn't have fazed me. Tanzanians speak Swahili, and so do I, so I wouldn't have felt entirely like a stranger even in unfamiliar terrain. Instead, I ended up with a rowdy crew of lads from Leeds, UK, whose delightfully eccentric personalities would reveal themselves fully over the five days that followed.

DAY 1
"PPPPRRRR! Sorry, Roberto. Hakuna Matata, Right?"
Altitude gain: 1,195m

Save for the small matter of the coach losing my bag at the border, I woke up feeling great and ready for the day ahead. The first few hours of the morning went to renting gear, which stung a little. Most of my hiking kit, personal effects, and clothes were in that lost bag. Would flying directly into Kilimanjaro Airport have spared me this? Probably. But the money I saved by not flying bought me freedom to shape the rest of the trip on my own terms: tipping the guides and porters generously, and, once I'd summited Uhuru Peak, driving back into Kenya to see Kilimanjaro from the other side of the border, just a three-hour drive away. Maybe one day I'll travel like a rich tourist. For now, I'm a budget adventurer, and I'll take it.

After renting a summit jacket and pants, extra hiking trousers, and thermal compression shirts, I met my guides for a pre-trek briefing. Danny, the assistant guide, walked me through a detailed day-by-day breakdown of the route. Lazaro, the lead guide, checked over my gear, and off we went to collect my fellow trekkers. I had no idea who they'd be and, honestly, didn't care to guess. The sting of losing my bag was still fresh, and the anxiety of what I was about to put my body through over the next five days had already taken hold.

Then the lads climbed in: Josh, Liam, Shane, and Tim. All four had tattoos of some kind, and the running theme was an undying love for Leeds United. Josh had Marcelo Bielsa — the legendary coach who dragged Leeds back into the Premier League — inked on his calf. Shane and Tim both wore the club badge, Tim's on his arm and Shane's on his shoulder. I never spotted Liam's, but he made up for it by wearing enough Leeds United kit for the both of them.

They were an easy, sociable bunch on the drive to Machame Gate. At one point, Mount Kilimanjaro appeared, peeking through the clouds, and a silence settled over the van. Everyone, I think, quietly grasping the size of what lay ahead. At the gate, we ate our packed lunches quickly while our bags were weighed and permits processed, and at 12:41 p.m. we set off, trekking from Machame Gate toward Machame Camp.

Since Shane, Liam, Tim, and Josh were old friends, I hung back rather than wedge myself into banter I probably lacked the context for. I just chipped in when prompted, and was oddly satisfied that my accent held its own against theirs. The trek itself was moderate, and if there was one struggle everyone shared, it was the chill rolling off the misty montane forest. Beyond that, the struggles were personal. I couldn't tell you what anyone else was quietly battling, but mine had a name: Shane's outrageously public farts. Stationed at the back of the group, I was directly in the blast radius.

He'd fart, then turn around with a grin on his face.

The sheer consistency of it made me curse whatever he'd eaten, that day or several days before. Tim, Josh, and Liam sensed my disgust, and maybe feeling some secondhand responsibility as Shane's mates apologized too, though only after laughing at my misfortune of standing in the line of fire. For the second half of the trek I kept switching positions, governed by one rule: **do not walk behind Shane.**

The saving grace through all of this was the fresh, crisp breeze rolling through the forest. Shane's farts, prolific as they were, stood no chance against it. Swallowed up so fast they became, remarkably, a non-issue. So thank you, mountain forest. Thank you, mountain breeze.

We reached Machame Camp at 5:23 p.m., ready for a well-earned rest and a hot meal. Kilimanjaro itself stayed hidden behind the clouds and mist, but my porter (who, by pure coincidence, was also called Robert) promised a decent view at dusk. The last battle of the day was simply generating enough warmth to fall asleep; I remember wondering if thermal pants might have saved me. Still, we were cut off from the world. No service. No tarmac. No delivery. From here to the summit, all I had to depend on were my bones, muscles, blood, grit, and the mercies of the Lord. I will sleep well tonight, I told myself. And it would be a legendary night.

DAY 2
Songs Of Kilimanjaro
Altitude gain: 845m

I'm honestly still surprised I slept at all. Between the shivering, my fingers clutched between my thighs for warmth, and the sheer exhaustion of the day before, my body simply gave in inside the sleeping bag. And I survived.

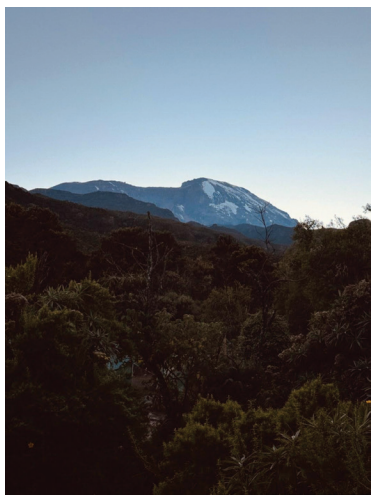
That small triumph didn't last long. The moment the waiter unzipped my tent to serve coffee, the illusion of warmth evaporated. Cold air rushed in, and whatever heat I'd built up overnight vanished with it. I gulped the coffee down and zipped the tent shut again to salvage what little was left. You lose some to win some, I suppose.

After a quick breakfast, we pushed on toward Shira Camp. The trek matched the day before in difficulty though the terrain had changed: mud gave way to rock, the mist and drizzle to sunshine and a light breeze, and the tall camphor trees, once wrapped in lush trailing vines, dropped behind us. What remained was wildflowers, low shrubs, and giant heathers, all flexing their upper bodies as though they'd forgotten to exercise the lower half.

The trek lasted around four and a half hours. I still can't figure out whether other groups were unusually slow or ours was just unusually fast. Either way, we made it in time for a quick lunch of spaghetti and minced meat before an afternoon acclimatization hike, gaining roughly 150 metres. The hike wound down with a round of the famous Kilimanjaro trek songs. Some I already knew, the rest I'd picked up from YouTube.

There's a lot packed into these three songs. "Hakuna Matata," as far as I know, is originally Kenyan; written and performed by Kenyan artists; but this wasn't the moment to argue for credits. If a song can unite two countries and sell East African tourism in the same breath, that's a win worth celebrating. Besides, with zero phone service, some good-natured banter was exactly what the group needed, and the other two songs delivered just as much of it as the first.

All in all, a good day: Shane farted less, the mountain was finally showing itself, and the cold hadn't yet caught up with us. At least, not as I write this.



View of Kilimanjaro from Machame Camp at dusk. (Credit: Robert Otieno)



Team photo after singing at Shira Cave Camp. (Credit: Robert Otieno)

Hakuna Matata
Best known from the version popularized as "Jambo Bwana" by the Kenyan band Them Mushrooms. It has become something of an unofficial anthem on Kilimanjaro treks, sung by guides and porters as a chant of encouragement rather than a formal performance.

KISWAHILI (AS SUNG)	ENGLISH TRANSLATION
Jambo, jambo bwana! *Habari gani?* *Nzuri sana*	*Hello, hello, sir!* *How are you?* *Very well*
Wageni wakaribishwa *Kilimanjaro* *Hakuna matata*	*Visitors, you are welcome* *Kilimanjaro* *No worries*
Tembea polepole *Hakuna matata*	*Walk slowly, slowly* *No worries*
Machame tutapita *Hakuna matata*	*We will pass through Machame* *No worries*
Lava tutapita *Hakuna matata*	*We will pass through Lava (Tower)* *No worries*
Mawenzi tutapita *Hakuna matata*	*We will pass through Mawenzi* *No worries*
Uhuru tutakwea *Hakuna matata*	*We will climb to Uhuru* *No worries*

Kilimanjaro

KISWAHILI (AS SUNG)	ENGLISH TRANSLATION
Kilimanjaro! Kilimanjaro! *Kilimanjaro! Mlima mrefu sana!*	*Kilimanjaro! Kilimanjaro!* *Kilimanjaro! Such an incredibly tall mountain!*
Na Mawenzi! Na Mawenzi! *Na Mawenzi! Mlima mrefu sana!*	*And Mawenzi! And Mawenzi!* *And Mawenzi! Such an incredibly tall mountain!*
Ewe nyoka! Ewe nyoka! *Ewe nyoka! Mbona wanizunguka!* *Wanizunguka! Wanizunguka!* *Wanizunguka! Wataka nila nyama!*	*You snake, you snake!* *You snake, why do you circle me!* *You're circling me! You're circling me!* *You're circling me. You want to eat my flesh!*

Ooh Chura
Chura means "frog." This is a cheeky, teasing call-and-response typical of camp songs on the mountain, where guides and porters swap in the name of a trekker for comic effect.

KISWAHILI (AS SUNG)	ENGLISH TRANSLATION
Oooh Chura *Anaruka bila boxer* *Ukimwona* *Anainama! Anainuka!* *Anaona haya huyo!*	*Oh, Frog!* *He jumps without his boxers* *If you spot him* *He squats! Up he pops!* *Look at him, all shy!*
Oooh Oti *Anaruka bila boxer* *Ukimwona* *Anainama! Anainuka!* *Anaona haya huyo!*	*Oh, Oti!* *He jumps without his boxers* *If you spot him* *He squats! Up he pops!* *Look at him, all shy!*

Editor's Note: We want to hear your perspective!

We strive to represent every voice in the Caltech Community with fairness, accuracy, and impartiality in our news reporting. If you think we missed something, or just want to share your thoughts about a topic we've reported on, I encourage you to submit a Letter to the Editor!

Send submissions or contact the *Tech* editorial team at

tech@caltech.edu

Submissions are due at 12 p.m. on the Saturday before each biweekly Tuesday publication.

Where to Point the Telescope

AI, Mathematical Judgment, and M_{23}

Shaowu Zhang
News

The inverse Galois problem asks whether every finite group occurs as the Galois group of some finite Galois extension of $\mathbb{Q}$. The program to realize the sporadic finite simple groups as Galois groups over $\mathbb{Q}$ began in 1984. Over the following years, every case except M_{23} was solved, leaving M_{23} as the last open case for nearly four decades. Our recent preprint, joint with Xiaoyu Huang, Blake Jackson, Kyu-Hwan Lee, Bjorn Poonen, and Rachel Pries, resolves this final case and completes the program.

Since posting the paper, many people have asked how we used AI and what led us to consider the triple

(2A, 23A, 23B).

The following post is adapted from my answer to these questions on Zulip. By sharing what I learned from this fruitful collaboration, I hope to give a clearer picture of how we worked with AI in practice and to help others develop their own ways of AI-collaboration.

How the five cases emerged

We started with four-tuples. Building on earlier work, we extended the existing computations and developed a fairly complete picture of the possible genus-zero braid orbits. Häfner's Theorem 5.1 led us from these four-tuples to the following five generating triples:

(2A, 23A, 23B),
(2A, 14A, 14B), (2A, 15A, 15B),
(2A, 11A, 11B), (2A, 8A, 8A).

Each of these gives rise to a length-two, genus-zero braid orbit for the corresponding four-tuple.

The case (2A, 8A, 8A) was the easiest to compute because its associated quotient curves have genus 0. We could handle it directly with BelyiDB. In this case, however, the Galois action on the resulting covers was transitive, so there was no fixed point of the kind we needed.

The case (2A, 23A, 23B) was different. Its associated curves are non-hyperelliptic curves of genus 4. BelyiDB gave us the numerical data, but not the exact defining equations, so we had to recover those equations ourselves.

Changing coordinates

Our first attempt used triangle-group coordinates directly. We tried 40, 60, and then 90 digits of precision. Even at 90 digits, and with height bounds approaching 10^{36}, we could not recognize the coefficients. The AI systems suggested pushing the precision higher. At that point, however, our computational resources were already limited, so we stopped and asked whether the real problem was our choice of coordinates.

We then realized that coordinates defined using the Belyi map are equivariant under the Galois action. This removes the $O(\varepsilon^2)$ ambiguity coming from the original coordinates. With the new coordinates, 40 digits were enough to recognize the quadratic equation P, and its coefficients had heights below 10^3. This was far below the height bounds approaching 10^{36} that we had already tried. At this point, (2A, 23A, 23B) clearly stood out among the five candidates.

We still had to recover the cubic equation Q. The reliable digits left after recognizing P were not enough to recognize Q directly. The initial AI suggestion was again to increase the precision. Instead, we developed a separate reduction algorithm and recovered Q from the same 40-digit data. The equations P and Q define the image of the genus-4 curve X under its canonical embedding into P^3.

Some of the most important decisions were clearly mathematical judgments made by the human collaborators. These included deciding what to compute, stopping an increasingly expensive calculation, changing the strategies, interpreting the numerical evidence, and deciding where to direct our limited resources.

The role of AI

Our multi-agent AI workflows helped us generate and test code, analyze data, work with existing packages, organize large computations, and monitor and recover from failures. This saved us a great deal of time. But the overall strategy, and the decisions to redirect it when something was not working, came from the human collaborators.

We also tried more autonomous approaches at the beginning of the project. Within our limited AI-usage budget, these attempts did not make meaningful progress and did not give us much guidance about what to try next. The workflow that eventually succeeded was not end-to-end AI autonomy. It was a tightly controlled collaboration in which AI made the computational work much faster, while the human collaborators continued to choose and revise the mathematical direction.

For a sense of the computational scale, the 60-digit computation of orbit 7 took approximately 1.71 CPU-hours. All the computations that followed were completed within one day and used fewer than 12 CPU-hours in total. These included recognizing and analyzing the coefficients of the quadratic equation P and the cubic equation Q, computing the Belyi map, carrying out the descent to $\mathbb{Q}$, and constructing a polynomial

$$F(T, V) \in \mathbb{Z}[T, V]$$

whose splitting field over $\mathbb{Q}$ (T) has Galois group M_{23}. We then specialized T to a rational value and used the PARI/GP routines polredabs and polredbest to obtain a lower-height degree-23 polynomial

$$f(x) \in \mathbb{Z}[x].$$

The final mathematical claims were verified rigorously in Magma and PARI/GP without AI. No text in the manuscript was written by AI, although we did use multiple AI agents for internal checking and proofreading.

What I learned

The main lesson for me is that more computing power alone would not have solved the problem. I find it analogous to deep-space observation: AI gave us a powerful and precise telescope, but the team's mathematical knowledge told us where to point it when further magnification would not help. Once we chose the right object and the right coordinates, the relevant structure became visible.

The result grew out of many fruitful mathematical discussions and our exploration of human-AI collaboration. I hope this account inspires others as they develop their own approaches to collaborating with AI. For readers who would like to see what ultimately came into view, the full mathematical details are available on arXiv.

Feynman's Lecture Notes, Pauling's Polypeptide Chain Models Among Items Auctioned at Sotheby's

Emily Yu
Culture

The personal belongings of Caltech professors past, including Richard Feynman, Linus Pauling, and Clair Patterson, went on the auction block, among other scientifically historic items. This summer, as part of its Geek Week, Sotheby's hosted a History of Science & Technology auction at its New York headquarters on the Upper East Side of Manhattan, which featured several items that were once housed in Pasadena.

Lots spanned over two centuries and numerous fields in science and technology. Items provided by the Feynman family comprised 10 of the 55 lots in the auction's catalogue. Eight of those 10 contained letters. The contents offered a glimpse into Feynman's personal life, including one to his mother discussing pine needle tea as scurvy treatment and another describing his work schedule at Princeton. A letter to his sister, Joan, from the early 1940s, detailed his high school academic advice, telling her not to take a solid geometry course as he only learned 5 useful equations and "didn't even learn how to spell pyramid," and to take trigonometry or advanced algebra instead.

Fast forwarding a couple of decades after the letters, the auction sold xeroxed lecture notes from Feynman's famous 1962-63 course on gravitation at Caltech, along with the original transcriptions of lectures 12-16 by Fernando Morinigo and Bill Wagner, who had transcribed all of the course's 27 lectures given in East Bridge. The transcriptions for the first 11 lectures became a textbook after Feynman edited those transcriptions. Lectures 12-16 were added in 1971 in a third revision of the lectures. The lot sold for $23,040.

In the catalogue note for the lecture transcriptions, Sotheby's stated that "despite the disclaimer that Feynman had not checked the lectures, NOTATIONS IN FEYNMAN'S HAND can be found" on lectures 12 and 14, providing "a behind-the-scenes glimpse into the extensive labor that went into producing the *Feynman Lectures on Gravitation*."

Just north of East Bridge, on the other side of Caltech Hall, an item from the Gates and Crellin Laboratories of Chemistry fetched just over $5,000. Lot 28 of the auction consisted of a pair of polypeptide chain models from Linus Pauling and Robert Corey's laboratory, with parts custom made from the Caltech chemistry machine shop. Pauling and Corey's finding that peptide groups are planar due to partial double-bond character allowed them to propose the beta-sheet structure and, with Herman Branson, the alpha-helix in 1951, laying the foundation for modern structural biology. The models were offered by the estate of Richard E. Dickerson, a pioneer in structural biology who worked at Caltech before moving to UCLA.

The auction also included material from Clair Patterson's laboratory in North Mudd. Patterson used measurements of lead isotopes in meteorites to establish an age of about 4.55 billion years for Earth. The lead contamination he encountered in that work led him to investigate industrial lead pollution and campaign against the use of lead in products such as gasoline. Lot 32, consigned by his family, sold for $76,800. It included the 24-karat gold J. Lawrence Smith Medal awarded to him by the National Academy of Sciences in 1973 for his work determining the age of Earth and the solar system, along with one of his Canyon Diablo meteorite samples. A bronze replica of the medal and four photographs documenting his career were also included.

Lots 53-55, the final three lots, were works by neuroscientist and artist Greg Dunn in collaboration with applied physicist Brian Edwards. Many on campus may recognize "Self Reflected," an edition of which is displayed in the lobby of the Chen Neuroscience Research Building. The 23-karat gold microetching depicts neural activity through patterns of reflected light. "I hope this artwork serves as a daily reminder of the audaciousness of our attempts to tackle some of the most difficult and compelling scientific questions of our time," said Dunn in 2021 in Caltech Magazine. The edition offered at Sotheby's measured just over eight feet tall and 10 feet 7 inches wide, and weighed about 300 pounds. With an estimate of $800,000 to $1.2 million, it went unsold. Two smaller microetchings, "Brain Machine Interface," which explores the possibilities and risks of technology connecting brains and machines, and "Chaotic Connectome," depicting neural circuitry, sold for $38,400 each.

In total, the auction brought in $2.3 million across 50 sold lots, including Sotheby's premiums. Early personal computers and their documentation were also sold. The Apple IIc and Apple Macintosh Plus Systems, in their original boxes, had estimates under $10,000; the systems sold for $35,840 and $44,800, respectively. A disbound Apple-1 Operation Manual, with penciled notes and faint stains, sold for $7,680.

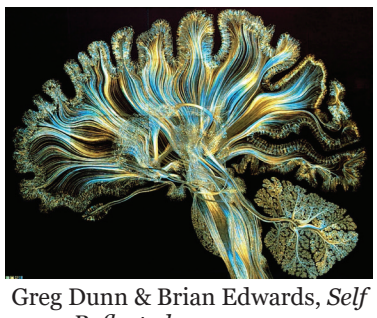
Lecture notes, molecular models, and personal computers are familiar parts of everyday teaching and research. The historical significance of materials now sitting in campus offices and laboratories may become clear decades from now.



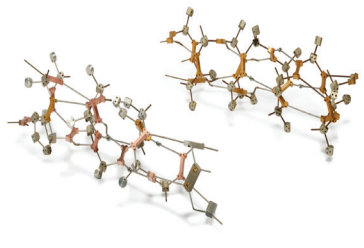
Feynman's Lectures on Gravitation 1-16, including the original transcriptions of lectures 12-16 by Morinigo and Wagner.
(Credit: Sotheby's)



Patterson's J. Lawrence Smith Medal, Canyon Diablo meteorite sample, bronze replica medal, and archival photographs.
(Credit: Sotheby's)



Greg Dunn & Brian Edwards, *Self Reflected,* 2019-2022.
(Credit: Sotheby's)



Polypeptide chain models from the lab of Pauling and Corey.
(Credit: Sotheby's)

This Week in *Tech* History

October 2, 2006

Prank o' the Week

Ruddock House Borrowed Speed Bumps from Holliston

BY: SONIA TIKOO

In the wee hours of the morning on September 21, a small fellowship of Rudds and a Mole performed a remarkable magic trick: they made the Holliston speed bumps disappear.

A few hours later, Ruddock House discovered that the floor of Alley 1 had suddenly been tiled yellow and black, finally providing a "safe" surface for students to walk on.

The story begins by the removal of carpeting in the North Houses, Ruddock, Lloyd, and Page for the installation of new floor covering. This stripping left the Houses looking relatively unpleasant—some prefer the term "disgusting" in situations like this. This went on for a couple days, until selected Rudds said enough was enough. Therefore, upon receiving permission from Assistant Vice-President of Student Affairs Tom Mannion, a bunch of students set out to fix the problem by taking care of another thing they found relatively unpleasant—the speed bumps.

Beginning at three in the morning on the 21st, approximately five Ruddock House members began removing the speed bumps utilizing ratchet wrenches and good 'ol elbow grease. Of course, as every Techer knows, for every reaction, there is an equal and opposite reaction. The outcry was immediate. Almost every passerby from Security to Caltech staff, to the Pasadena City Police stopped by to express their sentiments, whether they be admiration of student ingenuity, safety concerns, or in some cases, outright anger.



Photo by Sonia Tikoo

(All Rudds, from left to right) Mike Kocurek (Sr.), Michael Kolodrubetz (Sr.), Tom Mainero (Jr.), and Kevin Hartman (So.) frantically ratcheting off the speed bump bolts in the middle of the night/wee hours of the morning.



Photo by Sonia Tikoo

Kevin Hartman (So.) lying on the speed bumps in Alley 1 in Ruddock at the completion of the prank.

Especially unhappy with the night's events were Caltech's maintenance workers, who had worked very hard, for long hours, to install the speed bumps in the first place. Additional issues of safety were raised; that is why the speed bumps are there in the first place.

Sophomore Kevin Hartman, who spearheaded the prank effort and dealt with all the repercussions himself, commented Sept. 23. "A couple days ago I decided to remove the speed bumps on Holliston with the help of various Rudds and a mole or two. My pride makes me want to say that the seven hours and much hassle I went through to pull off this prank were worth it. Rationally I admit that it was kind of a stupid idea. And it is a stupid idea that has come back to bite me in the ass."

The speed bumps were re-installed by Ruddock House early last week.

October 7, 2002

Photo of the Week



E. Adams/*The California Tech*

Students and prefrosh in Blacker enjoy dinner Friday evening. Desserts were thrown to the students from the roof or occasionally splattered on the bricks. One dessert landed on the treehouse roof, but was rescued. The tables were cleared away quickly after dinner for "shopping-basket runs."

Meet Women

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Food! *Fame*

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Rehearsals:
Monday 7:30-9:30 pm
Wednesday 5-6 pm w/ **Women's** Glee Club

See Director Don Caldwell **today** 4-6 in SAC 3 or
Come to Rehearsal at 7:15 in Beckman Auditorium Basement

Fantastic First-Years and Where to Find Them

Jieyu Zheng
Opinion

After five years of volunteering under different acronyms, I officially became by far the oldest orientation leader in fall 2026. I enjoy the festive (and freebie-loaded) orientation weeks, but more importantly, the bright-eyed and bushy-tailed new students rejuvenate my excitement about a place that feels a bit too familiar.

The yearly revitalization of our campus matters for both first-years and old-timers. For new students, it is the season to find their footing by declaring majors or joining labs. For us semi-permanent beings embodying the spirit of Caltech, it is a time to recruit new blood and pass on our knowledge and traditions. Welcoming first-years takes the whole community, so this guide is for the new students and an invitation for everyone else to show up for them.

Look for what you love, not who loves you

All of us landed here on the strength of external feedback: shiny résumés, perfect scores, and nods from a scrutinizing committee. Approval still matters, but a sustainable career has little to do with where you get the loudest applause.

The direction you choose should come from an internal drive. When you go through sleepless nights loaded with existential crises, it is your love for what you do that propels you, not the thumbs-up from your professors. When you work on a long-term research project, it is the enjoyment of the day-to-day work that keeps you alive, not the acceptance letter from Nature after ten years of revisions.

If you listen to external feedback instead, you may have to learn the hard way. In college, I aimed for an A+ in every subject (as I suspect many Caltech students do), and I swam in praise like a child in a sea of candy. This landed me a neuroscience research internship at a top university, but during that critical summer, I found myself crying over petri dishes, lost about why I was even there. I eventually wandered off to a master's program and spent extra years figuring out what I actually wanted, which cost me dearly, both emotionally and financially.

So how do you listen to your heart amid all the outside noise? Here are some questions to ask yourself. Do you enjoy reading the textbooks for a subject, or do you fall asleep so fast that the pages serve as melatonin? Do you enjoy conversations with a professor and feel inspired by their research ambitions, or do you sweat through your shirt under their intense gaze? Do you like the actual day-to-day work of your project, or do you just want to grit your teeth until you get the degree?

Old-timers can help newcomers find their compass. Here is my own little practice. When recruiting students for research, I don't open by telling them what I work on. Instead, I ask them which questions in the field excite them. Résumés matter, but I care more about how their experiences shaped their interests and thinking, rather than about the specific problems they solved. In the end, I always stress that it's a mutual selection process: they should choose the opportunities they like most, not whoever wants them most as labor. In short, present yourself as a potential match so new students can figure out whether they love what you do. You want future colleagues who truly fit your lab, not someone who produces but secretly dreads your presence.

Keep your vision mid-range

Counterintuitively, the practical way to find what you love is to set a mid-range goal. That quantitatively means looking one to two years ahead, not a single term or half a decade.

Too short a timescale makes you lose sight of the big picture and long-term opportunities. Maxing out your scores looks good on the term report, but it's a marginal gain at a high cost, especially if you give up time to branch out socially (more on this in the next section) or for healthy hobbies. All-nighters on a short-term research project like a rotation will impress your temporary boss, but that productivity can eat into the time you need to find your own research niche. After all, your PhD requires a new thesis topic that nobody else has worked on. Treat bad grades and negative feedback as guardrails for your mid-range trajectory, not as the ultimate thing to optimize.

On the other hand, too long a timescale is not a good guide either. In your first year, even thinking about graduation plans is looking too far ahead. First, a distant goal lacks the reward reinforcement that keeps you going. I'd often advise undergrads and first-year grad students against setting a faculty position as their target. In this era, that goal involves almost endless training followed by extremely fierce competition. Even as a student nearing the end of my youth and about to start a postdoc, I still can't see the end of the tunnel. If you define success by a ten-year goal, you'll become a blindfolded donkey at the mill. I wrote about this sparse-reward problem more extensively in my previous column about grad school.

Second, things change so fast nowadays that it's hard to predict what will be obsolete in four years. I spent most of my PhD learning to code, but in the past few months, Claude has taken over most of that work. When I started my PhD, nobody, not even people in machine learning, expected how much LLMs would transform the job market.

It is completely fine to lose interest in what you love now over the next couple of years, and you should embrace that change with grace. Even PhD students who feel they have committed an infinite amount of time to Caltech should know that this program is not for everyone. Quite a few faces you see at orientation karaoke will drop out for startups or fail their candidacy exams. I encourage our community to talk about leaving and changing course as valid outcomes – a sign that your value lies elsewhere, not a sign of failure.

Precisely for that reason, you should maintain the flexibility to pivot by looking one year ahead. For example, plan for courses that will be useful for this year, and apply for summer internships to try out different things. Many summer programs start recruiting now: the application deadline for Summer Undergraduate Research Fellowships (SURF) is in early February, so start looking for interesting labs now. Graduate students should get to know specialists across campus, who can become collaborators or members of a strong thesis committee.

Old-timers should also set mid-range expectations. Difficult assignments help differentiate grades, but you don't want your students wailing at 2 a.m. over your p-sets and outsourcing them to AI chatbots, in which case you end up training better models rather than better students. Likewise, don't expect your research interns to churn out data; they are here to learn, not to produce.

Work on your connections like watering your plants

Remember, too, that you can't run this one-to-two-year experiment alone. Many people will help you along your journey at Caltech. I know many of us are introverts, so this isn't advice to become a socialite, but to build a safety net that holds through thick and thin.

Caltech is proud of its low student-to-faculty ratio and small campus where everyone knows everyone, and all of us should make use of that. These close bonds mean lifelong friendships with your dorm neighbors, mentorship from an advisor who reads your manuscript carefully instead of feeding it to Claude, and labmates who tease you like siblings and hang out after work. I firmly believe this is why we still go to school, even in an age when information is everywhere. Information is cheap now; only deep connections teach you the rigor of scholarship and the creativity that bubbles up over a coffee chat.

Making new connections matters to both newcomers and old-timers. Meeting people in other disciplines can inspire your own studies. One of my term papers wouldn't have been possible without help from an applied physics Discord channel I joined in my first year. Further, for those of us who have been here a long time, friends come and go in generations, and many have already left, so new faces keep our circles alive.

How do you build these connections? Because many of us are introverts, it's all the more important to make a conscious effort, like watering your plants at regular intervals. Ask for help before you think you desperately need it. You might find a solution much sooner, and the other person may already have been working on the same problem. Caltech also offers plenty of resources. The Caltech alumni network, for example, is powerful and eager to help, and Career Achievement, Leadership, and Exploration (CALE) offers invaluable career advice through alumni sessions year-round. Many clubs and student organizations also offer community, support, and chances to explore.

Some connections come from surprising places. Make friends with the cafeteria staff; they'll likely outlast you here. Don't underestimate the power of their small greetings: waiting in line for food becomes much more fun and heartwarming when you know the people serving it. Tiny moments of joy might not stick in your memory, but they lift your mood without you noticing. For more on maintaining your mental health, see here.

Old-timers should offer help proactively. Don't assume first-years will ask for help when they need it. For one, they are surrounded by unfamiliar faces, and striking up a conversation can be hard. And this isn't just service: a newcomer's fresh perspective might make you rethink how you communicate your own research, a skill many of us could improve.

Summary

The first year is always challenging, but with effort from the whole community, it can be fantastic. Newcomers, be open-minded and immerse yourselves in this place. Old-timers, it is our job to make their new home enjoyable.



A first-year Western Gull trying to crack a conundrum – a pacific purple sea urchin. (Credit: Jieyu Zheng)

Caltech Wildlife: The Predators

Jieyu Zheng
The Inside World

Strictly speaking, predators are animals that eat other animals, so a large proportion of our campus species qualify, including the undergrads ordering beef pho, the squirrels eating baby hummingbirds, and the occasionally cannibalistic turtles. While you are still blinking in disbelief and digesting that info, I am going to limit this column to a few obvious predators: those deemed dangerous by the consensus of two security forces – Caltech Security and the natural security league of American crows. Consider it a cool and rare chance to see predators up close in an urban habitat like Caltech. Observe with caution, using this wildlife guide below.

The birds of prey on campus are elegant predators at the top of the food chain. While there are no known nesting spots for them at Caltech, the pine trees and building ledges have served as great watchtowers for territory supervision. Contrary to the stereotypical image of outstretched talons, they spend most of their time quietly perched on a branch, scanning the distance. They can be surprisingly easy to miss unless their tranquility is actively disturbed. A shortcut for spotting hawks is to follow the dive-bombing mockingbirds or a gang of anxiously calling crows. They will lead you to the hawk they are harassing.

Several raptor species visit our campus. The red-tailed hawk, the most widespread hawk in North America, comes in many color variations. Juveniles, for example, don't have red tails yet and can be an ID challenge for beginner birders. Slightly smaller are red-shouldered hawks, known for their repeated calls that set them apart from the single screams of red-tails. Once, I followed that distinctive call and found a red-shoulder at Red Door Cafe, but before I could admire the beautiful bird of prey, a crow gangster swooped in and chased it away. Cooper's hawks are also very common in urban Southern California. Since they are smaller still and roughly crow-sized, I've occasionally mistaken a Cooper's for a stout band-tailed pigeon, exactly what Cooper's hawks like to eat.

Theoretically, we have great horned owls in Pasadena, and indeed, we have an owl – drum rolls – statue on campus too. A fake owl sits atop the Beckman Institute, overlooking the Gene Pool. Rumor has it that it's there to deter sparrows from nesting. Unfortunately, it remains my only owl sighting at Caltech.

Another neighborhood celebrity is the coyote, a canine somewhere between a fox and a wolf in size. Coyotes usually live in small family groups of two or three. Their midnight howling is eerily wolf-like and can give you goosebumps, creating a Halloween-worthy illusion that there are a dozen of them around.

You might have noticed the coyote warning signs around campus. Follow their advice and do not approach or feed coyotes, and report sightings to Caltech Security (I'd love to hear about them too, if you wish). Although coyotes usually shy away from humans, attacks have been recorded in Southern California, with victims including toddlers and small dogs. If you can't avoid a coyote, don't run away; instead, use a somewhat counterintuitive tactic. Remember that you are a predator too, and predators size each other up. Make yourself big and loud and hold your ground, and the coyote will usually show you due deference. Bare your teeth if you want, but just don't turn it into a selfie smile.

The matriarch coyote was very active around campus back in 2024, and I was lucky enough to photograph her on Wilson Ave. That set of photos

Predators

continued from page 5

was an instant hit during that era of frequent coyote sightings and won me my initial fame as a wildlife photographer. Unfortunately, I haven't seen her or her family on campus since mid 2025, and my friends' anecdotes about them have also grown sparse. This is likely a result of controlled trimming on campus: the lower parts of the bushes were cut back so that coyotes would be less willing to hide in them. I am in favor of a safer campus, but I also miss the days when they ran around purposefully, sending alarmed squirrels scrambling up the tree trunks.

Snowy egrets are underrated predators that also frequent our campus. They eat almost nothing but other animals: fish, crustaceans, and insects. What attracts them to our campus is the tiny mosquitofish in the ponds, so keep an eye on the bodies of water on campus, including the lily ponds and turtle ponds. Their white plumage might look too obvious, but it is thought to blend in against the bright sky and fool the fish below. They stir the water with their yellow feet (nicknamed "golden slippers"), then aim their long black bills at their targets with precision. Despite their hunting skills, they can become targets of the crow gangsters too, sometimes paying a mafia fee in fish.

True predators hunt discreetly and often alone, but you, as a predator, don't have to – grab a friend and socialize over beef pho instead (served every Tuesday at Browne Dining Hall). Meanwhile, the crows will keep watch for the other predators, so you don't have to stay constantly on guard.



A majestic female coyote reigning over her Caltech territory. All photos by Jieyu Zheng.



An adult red-tailed hawk perching on the roof.



Juvenile red-tailed hawks lack the signature red tails and can be difficult for bird ID.



Red-shouldered hawks are smaller than red-tails, but still ominous to the campus squirrels.



A juvenile Cooper's hawk on a tall pine tree is almost shaped like a pigeon.



Only occasionally sighted, snow egrets are focused hunters at the lily ponds.

Compact Disk — "First Breakfast"

Annie Zhao
Humor



The difference is extremely noticeable.

An Echo of Infinity

Nima Ghaderi
Culture

A parcel miraged at the outpost
of thought,
It yields the phonic of the distant sought.

Like a Lilac-blue cradled in
sound,
A pristine tidbit without a
mound.

A partitioning without a bound,
A gentle note, unchimed, and
round.

A solace in that beckoning,
As you grace it in the now.

A quiet unfurl,
Of you and the last.

The California Tech

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The Return of: **Caltech Missed Connections**

Ever catch someone's eye at Red Door or share a moment at interhouse? **We want to hear your Missed Connections!** That campus crush you've been too scared to speak to or just an intriguing encounter, (anonymously) **share your stories with us**. Your experiences could make our next issue and add a little spark to this wearisome campus. So, spill the details — they might just be reading.

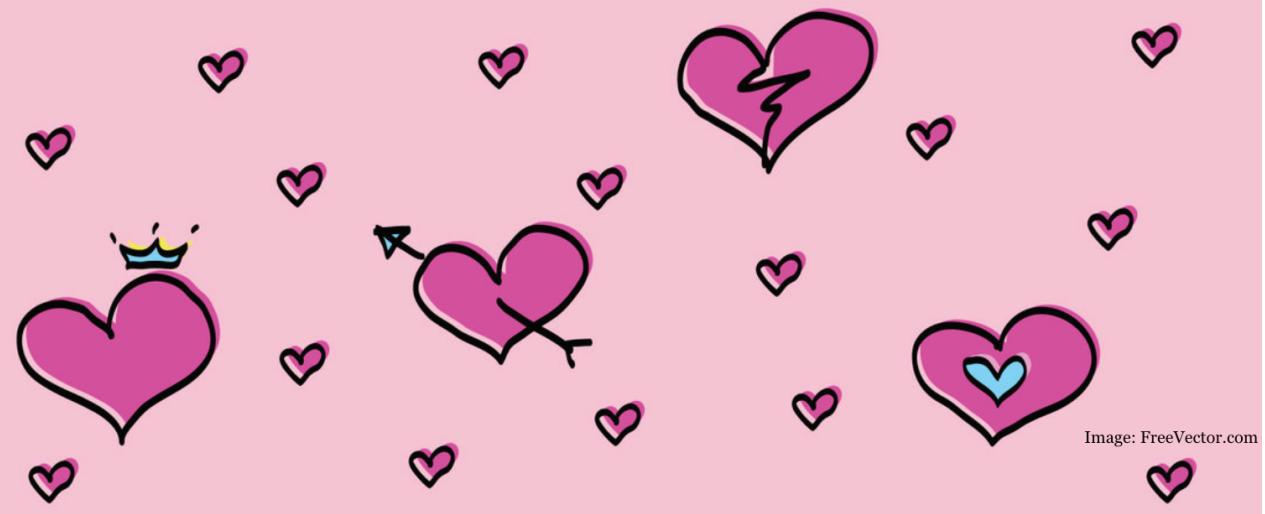


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The California Tech Journalistic Principles

The News-Opinion divide
All articles shall be clearly and explicitly labeled as either News or Opinion/Editorial.
News articles report on topics that have been thoroughly researched by Tech staff writers, and should be impartial to any one point of view. In a News article, the writer shall not insert their own personal feelings on the matter; the purpose is to let the facts speak for themselves. The Tech assumes full responsibility for all content published as News.
In contrast, Opinion articles (including Letters to the Editor) may be written and submitted by anyone on any topic; while the Tech will edit all published Opinions to ensure no wrong or misleading information, we do not otherwise interfere. Again, the role of the Tech here is to help the whole campus communicate their ideas and share their stories, not promote specific ones. Content published as Opinions do not necessarily represent the values of the Tech or our staff.
An exception to this is Editorials, which are written by Tech staff and represent official opinions of the Tech. Any information and sources in Editorials shall be held to the same standard as News reports, but there is no promise or expectation of impartial coverage.

Fair Reporting
All facts of major significance and relevance to an article shall be sought out and included.
If an assertion is made by a source about a specific person or organization, they shall be contacted and given a reasonable amount of time to respond before publication. In other words, no second-hand information or hearsay shall stand on its own.

Quotes and Attribution of Information
Facts and quotes that were not collected directly by Tech reporters shall be attributed. Articles shall clearly differentiate between what a reporter saw and heard first-hand vs. what a reporter obtained from other sources.
Sources' opinions are just that — opinions. Expert opinions are certainly given more weight, as are witness opinions. But whenever possible, the Tech shall report facts, or at least corroborate the opinions. A reporter's observations at a scene are considered facts for the purposes of a story.

Sources
All sources shall be treated with respect and integrity. When speaking with sources, we shall identify ourselves as Tech reporters and clarify why we would like to hold an interview. Sources for the Tech will never be surprised to see their name published.
In published content, we shall put our sources' quotes into context, and — as appropriate — clarify what question was being answered.
We always ask that a source speak with us on the record for the sake of journalistic integrity. We want our audience to receive information that is credible and useful to them. Named sources are more trustworthy than unnamed sources because, by definition, unnamed sources will not publicly stand by their statements.
That being said, we realize that some sources are unwilling to reveal their identities publicly when it could jeopardize their safety or livelihood. Even in those cases, it is essential that the Tech Editor-in-Chief knows the identity of the source in question. Otherwise, there can be no certainty about whether the source and their quotes were falsified.
This also applies for Letters to the Editor and Opinion submissions to the Tech. If the author requests that their piece is published anonymously, they must provide a reason, and we shall consider it in appropriate circumstances. No truly anonymous submissions shall be published. Conversely, no submissions shall be published with the author's name without their consent.
When we choose not to identify a source by their full name, the article shall explain to readers why.

Corrections Policy
We strive for promptness in correcting all errors in all published content. We shall tell readers, as clearly and quickly as possible, what was wrong and what is correct.
Corrections to articles will be immediately updated on the online version of the Tech at tech.caltech.edu. If appropriate, corrections will also be published in the following Tech print issue.

Honor Code Applies
In any remaining absence of clarity, the Honor Code is the guiding principle.

The California Tech

Editor-in-Chief
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Production
Maya Yie
Your Name Here!

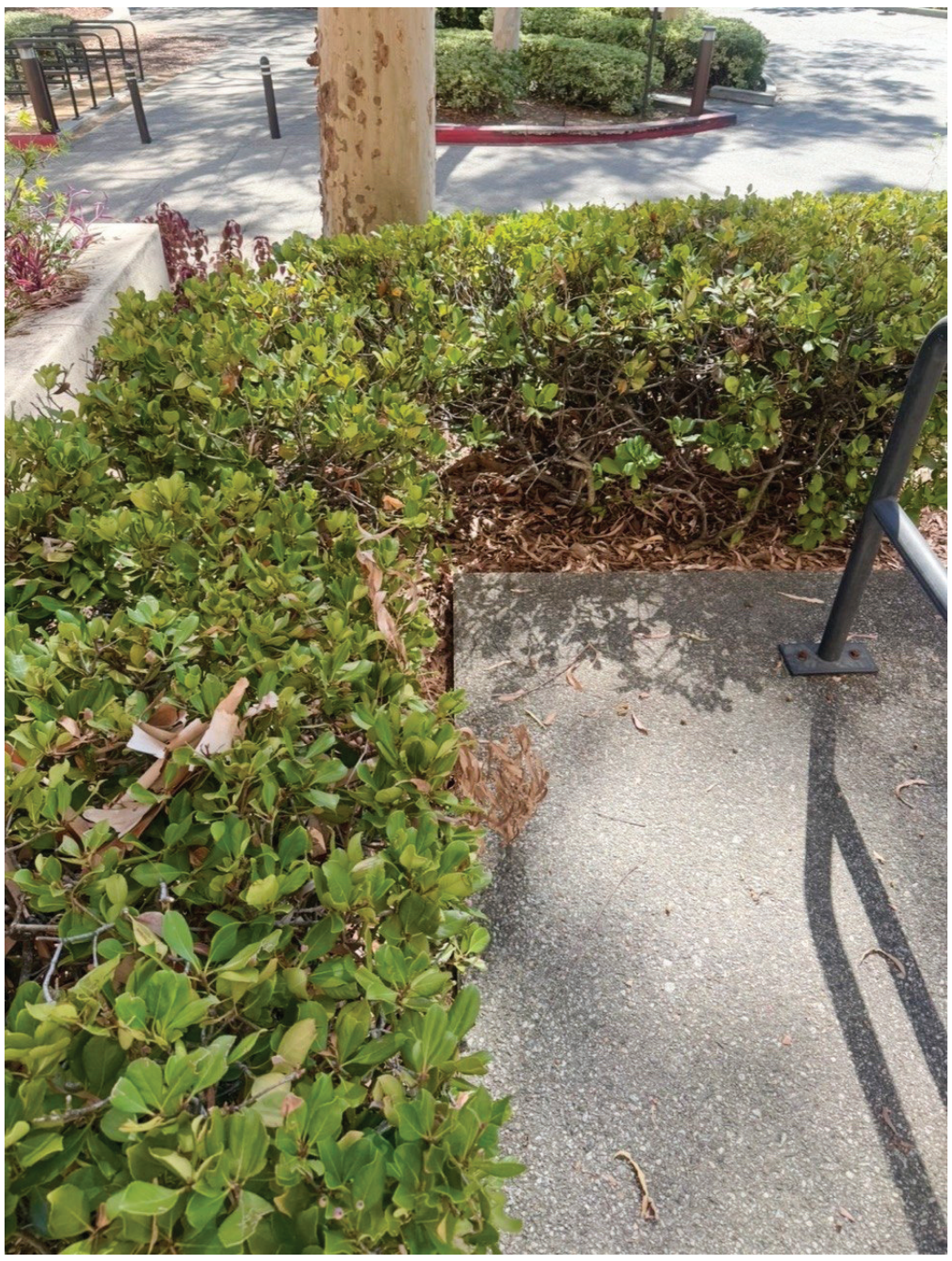
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The California Tech
CalGuesser
#39



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! Gift cards sponsored by CalGuesser Benefactor Kevin Kan (BS '93), but only if you find it before he does!!!**

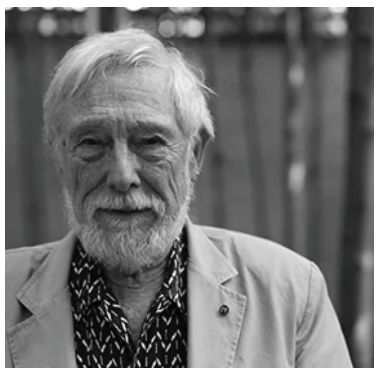
"On campus" is defined as the convex hull of the buildings shown on caltech.edu/map/campus.
The QR code will be hidden somewhere within or immediately around the pictured area.

Tech Editor's Corner

Piute Creek
By Gary Snyder

One granite ridge
A tree, would be enough
Or even a rock, a small creek,
A bark shred in a pool.
Hill beyond hill, folded and twisted
Tough trees crammed
In thin stone fractures
A huge moon on it all, is too much.
The mind wanders. A million
Summers, night air still and the rocks
Warm. Sky over endless mountains.
All the junk that goes with being human
Drops away, hard rock wavers
Even the heavy present seems to fail
This bubble of a heart.
Words and books
Like a small creek off a high ledge
Gone in the dry air.

A clear, attentive mind
Has no meaning but that
Which sees is truly seen.
No one loves rock, yet we are here.
Night chills. A flick
In the moonlight
Slips into Juniper shadow:
Back there unseen
Cold proud eyes
Of Cougar or Coyote
Watch me rise and go.



Gary Snyder, the 1975 Pulitzer Prize for Poetry winner and Professor Emeritus at UC Davis. (Credit: Brian Palmer, poets.org)