

# TECH



---

*Caltech  
Alumni  
Magazine  
2021*



## BACK TO THE FUTURE

Nationally and Locally,  
Steve Mayo Leads

## FUELING RESEARCH

Last Call for Ernie's AI Fresco

## MEMORY BANK

Niv Karthikeyan Changes Course

# 2021

## TABLE OF CONTENTS

"The overarching goal of the Vaccine Planning Working Group is to ensure that Caltech is fully prepared to receive, store, and administer vaccines to our community."

PAGE 6

"We are all trying to make tomorrow better but are taking different paths to get there"

PAGE 10

## 05 TRANSFORMING

### 06 | BACK TO THE FUTURE

How Steve Mayo (PhD '87) transformed biology, Caltech, and served the country

### 10 | MEMORY BANK

The Chang Prize gives graduating Techers the freedom to explore new paths, and Nivetha Karthikeyan (BS '20) is making the most of it

## 15 PIONEERING

### 16 | DISTINGUISHED ALUMNI

Meet the 2020 Distinguished Alumni Award recipients

### 22 | COMMERCIAL FLIGHT

Robert Behnken (MS '93, PhD '97) returned to space with the historic SpaceX's Dragon Crew



Photo: Stephanie Diani





## 25 ENRICHING

### 26 | **FUELING RESEARCH**

For 34 years, Ernie Mercado brought the Techer community together with good food, low prices, and a winning personality; can you master Ernie's Recipe Challenge?

### 29 | **IN HIS WHEELHOUSE**

The night John Glenn made Henry Baer (BS '18) a *Jeopardy!* champ

### 30 | **THE CHIMES OF BOLLYWOOD**

How Iram Parveen Balil, MFA (BS '04) uses her science education to create compelling feature films

### 32 | **SCHEMA**

### 33 | **THE STACK**

### 34 | **ANNUAL LETTER**

### 36 | **IN MEMORIAM**



"Someday, when things get back to normal, we'll get together and drink some tequila."

PAGE 26

# CONTRIBUTORS



## MARISA DEMERS

Marisa Demers is a freelance writer who got her start covering wildfires and breaking news for newspapers. She also worked for Caltech and was most recently an assistant director for the Caltech Associates. A San Gabriel Valley native, she has enjoyed following Caltech's scientific breakthroughs and student pranks over the years. You can read more of her writing on [widestletter.com](http://widestletter.com) and follow her on Twitter @WidestLetter.



## STEPHANIE DIANI

Stephanie Diani is a New York-based photographer who makes portraits of A-list celebrities and others for a cool group of discerning editors, art buyers, and creative directors. She uses cinematic light and shadow to capture the subtle nuances of her subjects in moments of contemplation, humor, or playfulness. She is self-taught, has been an independent photography professional for 20 years, and still gets giddy about a great shoot.



## WAYNE LEWIS

Wayne Lewis has been a postal worker, security guard, bass player, executive secretary, music critic, beard model, and standup comedian. Today, he writes and consults for a range of organizations that make the world a better place, including the best academic institutions in the Los Angeles area. Born in Jamaica and raised on the East Coast, Lewis lives in a suburban neighborhood of Los Angeles with his wonderful wife and two cats named after action movie heroes from the '80s.



## LEAH LEE

Leah Lee takes a simple approach to producing portrait and lifestyle photographs, utilizing beautiful light, colorful settings, and the energy of her subjects. An Orange County native, Lee earned a fine arts degree at Humboldt State University. She has shot for *The Wall Street Journal*, *Cure Magazine*, *Essence*, CBS, Thrive Causemetics, Glenfiddich, German National Tourist Board, and more. Lee recently moved to Oceanside, Calif., with her husband, two daughters, and her Australian Shepherd.

# TECHER

*Caltech Alumni Magazine* 2021

Publisher: RALPH E. AMOS, MPA, CALTECH ALUMNI ASSOCIATION

Editor: MARK A. DAVIS, CALTECH ALUMNI ASSOCIATION

Contributing Writers: MARISA DEMERS, WAYNE LEWIS, WYNA LIU, EDUARDO SANTIAGO

Copy Editor: BULLETPROOF

Photography: STEPHANIE DIANI, LEAH LEE

Illustration: CRAIGIO HOPSON, MARIO WAGNER

Art Director: SUSAN LANDESMANN, LANDESMANN DESIGN

Design Assistant: TRACY CREAMER, DESIGN BY TRACY

Editorial Assistance and Data Services: ZACHARY KELCH, SHERRY WINN

### CALTECH ALUMNI ASSOCIATION BOARD OF DIRECTORS (2020-21)

SATOSHI OHTAKE, PHD (BS '00, RUDDOCK HOUSE): President

KEITH KARASEK, PHD (BS '74, LLOYD HOUSE): Vice President, Leadership

JEANNE HARTSHORN, MBA (BS '11, LLOYD HOUSE): Vice President, Finance

CHRISTIE CANARIA, PHD (PHD '08): Vice President, Governance

JENNIFER BLANK, PHD (PHD '93)

CHRIS BRYANT, MBA (BS '95, RUDDOCK HOUSE)

ANTHONY CHONG, BS (BS '10, RUDDOCK HOUSE)

NICK HUTZLER, PHD (BS '07, RICKETTS HOUSE)

TARA GOMEZ-HAMPTON, PHD (PHD '11)

JENNIFER LEE, PHD (PHD '10)

DAN LIEBLING, MS (BS '02, LLOYD HOUSE)

ALEX LOCKWOOD, PHD (PHD '14)

KEVIN NOERTKER, BS (BS '09, LLOYD HOUSE)

CAROL NOTTENBURG, JD & PHD (BS '74, FLEMING HOUSE)

ALICE TANG, MS (BS '79, FLEMING HOUSE)

### CALTECH ALUMNI RELATIONS

RALPH E. AMOS, MPA: Assistant Vice President for Alumni Relations & Executive Director, Caltech Alumni Association

MARK A. DAVIS, BS: Director, Alumni Content and Value Delivery

MARGOT CLIFFORD, BA: Manager, Student and Recent Alumni Programs

BRIAN SMITH, BFA: Associate Director, Alumni Digital Integration & Strategy

SHERRY WINN, BA: Membership Coordinator



# TRANSMISSION

*From the President of the Caltech Alumni Association*

## A TRANSFORMATIVE MOMENT

Looking back on a year of social unrest, manifesting climate change, and a pandemic, it could be easy to see the many problems we face as overwhelming. The antidote is to see how the need to evolve brings about transformation. It may be a cliché, but it is also true that when a caterpillar wakes to find itself locked in a cocoon, it feels trapped. Once it figures a way out, it discovers it can fly.

2020 was a year in which the needs of “the moment” may have caught up to at least some of what science has been offering for years. Global society is more aware—suddenly and acutely—of the advantages that science and technology have been developing and innovating. For a long time now, a much larger percentage of our economy has been capable of working from home. Once the emergency aspect of the pandemic subsides, we will be left with the fact that the telecommute has been normalized and the evolution of the workplace has taken a sudden leap forward. This brings a range of positive ramifications for the environment, the physical and mental health of workers, and much more. Similarly, after years of perseverance in research, mRNA technology has arrived with a long list of practical applications, and a future of unprecedented medical achievements has been fast-tracked.

The implications of that kind of change carry across all fields and all institutions. We are seeing it play out now in our Caltech Alumni Association, where the moment has also brought new leadership and new realizations about our mission and our capabilities.

By fostering community, we can help you find the best outlets for your talents and the best people to share yourself with as you live, work, and play. We are here to help you leverage who you have become as a graduate of this unique institution, so that you are living your best life. In this way, our work becomes as important as it is practical.

As an example, in 2020, the number of Techer alumni participating in Seminar Day exploded from a one-time low of 450 to 2,500, 60% of whom had never participated before. Where regional events traditionally bring 50 to 60 people, a recent webinar featuring Charlie Munger drew 2,900. Why? Because the needs of this moment made the creation of better virtual spaces and experiences necessary. We delivered and you responded with unprecedented participation in live events.

As our community grows stronger, the mission of the Alumni Association becomes more important. The fact that Caltech alumni work at the forefront of this global transformative moment adds extra meaning—or us—to our purpose, our dedication to the success and well-being of every member.

As you work to advance humanity, we work to support and advance you.

Yours in this transformative moment,






**SATOSHI OHTAKE, PhD (BS '00)**  
*President, Caltech Alumni Association*



**SATOSHI OHTAKE, PhD (BS '00)**  
*President, Caltech Alumni Association*

CONNECT WITH THE CAA AND  
YOUR FELLOW TEACHERS

 [facebook.com/caltechalumni](https://facebook.com/caltechalumni)  
 [@caltechalumni](https://www.instagram.com/caltechalumni)  
 [@caltechalumni](https://twitter.com/caltechalumni)  
[#CaltechAlumni](https://twitter.com/caltechalumni)

# Caltech

When all of life's boxes are checked \_\_\_\_\_

breakthrough

THE CALTECH CAMPAIGN



## It Makes Good Science

Make the strategic decision to invest in Caltech

**Contact the Caltech  
Office of Gift Planning:**

*Phone: (626) 395-2927*

*Email: [giftplanning@caltech.edu](mailto:giftplanning@caltech.edu)*

**Life Income Gifts • Retirement Assets • Bequests • Donor and Adviser Resources**





# TRANSFORMING

## Attention to Detail

Using folded DNA to precisely place glowing molecules within microscopic light resonators, researchers at Caltech have created one of the world's smallest reproductions of Vincent van Gogh's *The Starry Night*, containing 65,536 pixels and only the width of a dime across. DNA origami, developed in 2006 by Caltech's Paul Rothemund, PhD (BS '94), is a technique that allows researchers to fold a long strand of DNA into any desired shape. The process has the potential to influence a variety of applications, from drug delivery to the construction of nanoscale computers.

IMAGE: ASHWIN GOPINATH



[ *Transforming* ]







# BACK TO THE FUTURE

STEPHEN MAYO REFLECTS ON HIS UNIQUE  
PERSPECTIVE AS A CALTECH ALUMNUS SERVING  
HIS ALMA MATER AS AN ADMINISTRATOR, AND  
RETURNING TO HIS RESEARCH PROGRAM.

BY WAYNE LEWIS • PHOTOGRAPHY BY LEAH LEE

*“The overarching goal of the Vaccine Planning Working Group is to ensure that Caltech is fully prepared to receive, store, and administer vaccines to our community.”*

Few Techers have contributed to the Institute from as many angles as **Stephen Mayo (PhD '87)**, Caltech's Bren Professor of Biology and Chemistry. He has been a student, postdoctoral fellow, faculty member, graduate-option executive officer, vice provost, and division chair. Along the way, he helped to define new areas of biological discovery, developed technology for human health, and served his country as an Obama administration appointee to the National Science Board. We talked to Mayo about a turbulent 2020, career highlights, and his unique view as both a graduate and professional leader at Caltech.

---

**Last year was a time of transition for you, completing a 10-year tenure as chair of the Division of Biology and Biological Engineering (BBE). Then a global pandemic changed everything. What was your 2020 like?**

It was certainly a challenging time. In my final months as BBE chair, I oversaw the shutdown of more than 50 labs when local restrictions were imposed, while also addressing the need to keep essential work, such as COVID-19 research, moving forward. After restrictions eased, I helped to ensure that labs reopened in a manner consistent with our COVID-19 protocols, including significantly reduced density of researchers in our buildings.

In my own research, we pivoted our efforts in antibody engineering to COVID-19, working with [Caltech biologist] Pamela Bjorkman [PhD] and Protabit, a Caltech spinout I cofounded a number of years ago. The basic idea is to use computational design to enhance the neutralization potency of anti-SARS-CoV-2 antibodies isolated from recovered COVID-19 patients. With success, we could provide passive immunization at low doses, potentially with an EpiPen-like autoinjector in an outpatient setting.

We're making progress but still have a way to go. We've been fortunate to receive generous support from senior trustee Charlie Trimble [BS '63, MS '64].

**The Institute tapped you for its COVID-19 vaccine group. Broadly speaking, what are the group's approaches and goals?**

The overarching goal of the Vaccine Planning Working Group is to ensure that Caltech is fully prepared to receive, store, and administer vaccine to our community. As the only faculty member on the committee, my primary role is providing advice on technical issues. There are lots of logistical challenges, such as coordinating with public health authorities, developing vaccination priority lists, and addressing the cold storage challenge.

**Over the course of 16 years, you served Caltech in a number of leadership positions. Speaking as an alumnus and scientist, what are some of your personal highlights?**

I was vice provost during the Great Recession, and we engaged in an assertive technology licensing project that involved filing lawsuits against well-known companies infringing on Caltech/JPL patents covering CMOS [complementary metal-oxide-semiconductor] imaging. We grossed over \$100 million in settlements right when the revenue was really useful.

From my time as division chair, I'm really proud of integrating bioengineering into the division and helping to establish the Chen Institute for Neuroscience, the Chen Neuroscience Research Building, and the Merkin Institute for Translational Research.



What I'm most proud of, though, is hiring an amazing group of faculty and helping junior faculty develop into tenured professors with field-leading research programs. At the end of the day, Caltech's success boils down to having the best and the brightest for everything we do. The Institute's tradition of hiring great faculty is our seed corn for the future.

**Having been involved with Caltech in so many capacities, what would you like your fellow alumni to know about how the Institute works?**

I think the Institute works at every level—education, research, administration—to break down obstacles that hold back progress. Caltech's approach to solving hard problems—an unabashed dose of barrierless, interdisciplinary science and engineering—is what brought me here as a graduate student and brought me back as a faculty member.

As part of the administration, I tried to maintain, and hopefully enhance, the idea that no problem is too hard for Caltech.

**Your own work has bridged fundamental science to entrepreneurial pursuits translating your discoveries. Can you talk about the importance of connecting the two?**

I've had several opportunities to translate my work into the real world through Caltech spinouts, as both a graduate student and a faculty member. Doing things that have an impact on real people has always been important to me. I'm happy to say that technology from one of my companies is now in two FDA-approved drugs in clinical use.

Caltech is set up nicely to encourage translational work. After all, our mission statement includes working to "benefit society." In some sense, translation is part of our DNA.

**Your early work broke new ground in computational protein design when many thought your goals were all but impossible. What kept you motivated?**

One part of the answer is that we didn't know enough to believe what we were doing was impossible. Sometimes ignorance is bliss.

The other part is that we were having lots of fun making incremental progress, and we just ignored the naysayers. I had lots of internal moral support from Caltech and super enthusiastic, talented graduate students and postdocs. Of course, competition from other labs working in the same area provided its own flavor of motivation.

**What future direction in your field are you most excited about?**

Developing computational approaches to directly design enzymes remains a significant unsolved problem, because of the need to include both



dynamics and quantum mechanics in the calculations. We've done some work with a static snapshot of the calculated transition state of the desired reaction. This works somewhat, but the enzymes aren't nearly as good as naturally occurring ones. To successfully design enzymes from scratch, it will likely take new scientific insight and technological breakthroughs.

**What notable changes have you seen at Caltech since your time as a student?**

The increase in buildings on campus, including the new Chen Neuroscience Research Building, which is located where I used to park my car. As a graduate student in the late 1980s, I remember looking out the window of Noyes into the giant hole that became the Beckman Institute. Construction has really taken off since then.

**What is your wish for the future of Caltech?**

My first wish for Caltech, and the rest of the world, is to get back to pre-COVID-19 levels of activity. The social justice movement really blossomed as the pandemic took hold. I certainly hope that we don't go backward on this, and that Caltech can advance on issues of diversity, equity, and inclusion in a way that maintains and even expands excellence with the same level of commitment and enthusiasm that it has shown for areas of historic success. ■

*"Caltech is set up nicely to encourage translational work. After all, our mission statement includes working to 'benefit society.' In some sense, translation is part of our DNA."*

[ *Transforming* ]





# MEMORY BANK

## MEMORY BANK

## MEMORY BANK

### THE MILTON AND ROSALIND CHANG CAREER EXPLORATION PRIZE EMPOWERS ALUMNA TO BRING TALES OF SOCIAL JUSTICE BACK TO THE COLLECTIVE CONSCIOUSNESS

BY MARISA DEMERS • PHOTOGRAPHY BY STEPHANIE DIANI

**N**IVETHA KARTHIKEYAN'S (BS '20) time at Caltech was spent following her passions in computer science, social justice, history, and archival research. In the summer of 2020, as a newly minted college graduate entering a strange world of a global pandemic and street demonstrations, Karthikeyan had to make her first career move. Each interest represented a wildly different path.

As the 2021 recipient of the Milton and Rosalind Chang Career Exploration Prize, Karthikeyan now has the luxury to experiment with different interests while performing original

research. Her project, "Intersections: Building Solidarity Through Community Archives," will share accounts of forgotten activism among Caltech students and South Asian Americans. It also will broadly examine how different racial groups throughout history have joined together to support each other and enact change. Thanks to the Chang Prize, which awards up to \$65,000 to each recipient, Karthikeyan has the freedom to focus solely on the project for a year, untethered to the priorities of an employer or the demands of graduate school studies.

[ *Transforming* ]

"THE CHANG PRIZE HAS  
ALREADY CHANGED MY PATH  
IN LIFE, AND IT IS NOT LOST ON  
ME THAT THIS IS AN INCREDIBLE  
AND RARE OPPORTUNITY."

"The Chang Prize has already changed my path in life, and it is not lost on me that this is an incredible and rare opportunity," says Karthikeyan, who now lives in New Jersey. "'Intersections' existed only as a beautiful dream in my mind. I'm thrilled to take pieces of inspiration that I got from my historical research and share them with the rest of the world."

### FREEDOM TO EXPLORE

**Established in 2017**, the Chang Prize taps into our secret thoughts and ambitions by asking: If money were not an issue, what would you do to make the world better? If you could delay taking on a 9-to-5 job, what other interests would you pursue?

The Chang Prize turns those answers into reality.

The award was conceived of and supported by Caltech senior trustee and 2002 Distinguished Alumnus Milton Chang (PhD '69) and his wife, Rosalind. Semi-retired and living in Northern California, Chang devotes his time to mentoring entrepreneurs. Yet, he remembers feeling disengaged in the early years of his career working in the aerospace industry.

"I struggled because I was not relating to my work," Chang says. "I believe in self-actualization, and that we have talents that need to be shared with humankind. Yet I had not found my calling in life."

Two years after graduation, Caltech classmate John Matthews (MS '63, PhD '67) invited Chang to join his new company, Newport Corporation. Chang jumped at the chance. There, he could apply his technical knowledge of lasers but also explore business strategy, marketing, and sales. Chang discovered he had a talent for taking companies at their earliest stages and guiding them to success. Over time, he honed this skill and became an accomplished entrepreneur and angel investor who engineered six initial public offerings and seven acquisitions.

"How many of us actually know the optimal career for ourselves?" Chang asks. "Taking the time to test out new fields and explore different talents can be helpful. To do that, you need resources, and I know how tough the world can be."

## ACTS OF SOLIDARITY

**Karthikeyan's "Intersections"** was born out of her senior history thesis dedicated to South Asian immigration and technical labor. Her search for primary sources led her to the South Asian American Digital Archive. SAADA and other community archives enable people, bound together by a culture, identity, or social movement, to preserve and share their history outside of mainstream institutions.

As she pored through oral histories, personal letters, and newspaper clippings, Karthikeyan was intrigued by the vignettes of transracial solidarity she came across, which had been left out of the national conversation on race and anti-Blackness. As a South Asian immigrant searching for ways to meaningfully contribute to the Black Lives Matter movement, she found that her discovery offered some clarity.

"I used to think that the past had to be horrible and worse for racial equality," says Karthikeyan, who began volunteering with SAADA this year as a special projects assistant. "But then I came across examples of people, just ordinary people, coming together to subvert racism, and it gave me so much hope."

"That is the power of archival research. It can connect this moment to whole other worlds of being that existed before we were here."

"THAT IS THE POWER OF ARCHIVAL  
RESEARCH. IT CAN CONNECT THIS  
MOMENT TO WHOLE OTHER WORLDS  
OF BEING THAT EXISTED BEFORE WE  
WERE HERE."

Now, she wants to broaden the story Caltech shares of itself with the world. Karthikeyan is interviewing a handful of alumni involved in social and anti-war movements to explore how community and solidarity have been embodied at Caltech since the 1960s. Their stories will be published by the Caltech Archives, whose oral history collection includes Nobel laureates and Institute presidents.

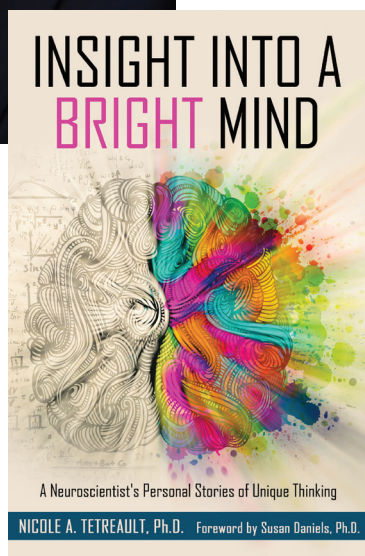
As she embarked on her own social justice journey in her sophomore year, Karthikeyan says she would have enjoyed learning about Caltech's history of activism and meeting with alumni who were leading the way. The oral histories, coupled with an intergenerational panel discussion she is organizing, will make it easier for future students to know they are part of a larger legacy at Caltech. She credits the Chang Prize for making it possible.

"We are all trying to make tomorrow better but are taking different paths to get there," Karthikeyan says. "I feel so lucky to have the opportunity to branch out and be the recipient of so much generosity." ■





In her new book, 2019 Chang Prize recipient Nicole Tetreault (PhD '13) shares stories of people with intense and creative minds



## Neuro-Uniqueness

*Every person has a different brain signature. Nicole Tetreault (PhD '13) is helping misunderstood communities embrace their neurodiversity.* BY MARISA DEMERS

**The brain's activity**, with its vast network of connections and neural patterns, is unique to each person. There are 7.8 billion people sharing space in the world but processing and learning about it differently. Helping others understand this diversity has been Tetreault's professional calling.

The 2019 corecipient of the Milton and Rosalind Chang Career Exploration Prize, Tetreault knows what it is like to be on the edge of a diverse spectrum. She is gifted and has a learning disorder. Taking into account other neurotypes such as dyslexia and autism, Tetreault estimates that 1 in 5 children in the classroom is neurodiverse.

Her book, *Insight into a Bright Mind* (Gifted Unlimited, LCC, 2020), weaves personal stories with neuroscience to empower readers to look holistically at intense and creative minds.

"You have a right to be here in the form that you are in," Tetreault says. "The more you become acquainted with how you process sensory, emotional, and physical information the better."

As Tetreault immersed herself into neurodiversity research, she saw a need for other communities to understand their own uniqueness.

*"The more you become acquainted with how you process sensory, emotional, and physical information, the better."*

With support from the Chang Prize, Tetreault created Beyond the Cell, a nonprofit that teaches incarcerated women about the brain and how environmental factors can alter its activity. The Centers for Disease Control and Prevention estimates that anywhere from 25% to 87% of inmates have suffered a traumatic brain injury.

"That is just the physical trauma we are learning about. We are not even talking about the emotional, psychological, and behavioral issues women are experiencing," says Tetreault, who blends meditation and creative writing into her program. "With greater awareness, they can make better choices when they are faced with reliving their trauma."

COVID-19 prevented Tetreault from offering Beyond the Cell in prisons, but she is piloting her program with experts and refining her curriculum. She is also pitching a book about criminal justice reform through a neuroscience lens.

"I saw the need to deconstruct and help with the language, services, and advocacy of this issue," Tetreault says. "The Chang Prize gave me an ounce of hope that I could do something a little bit different."



# PIONEERING

## The Artistry of Medicine

For Sumana Mahata (BS '17), there is an invaluable connection between her life as a UC San Diego medical student and her passion for design. "I am finding myself asked to step up to being an artist in medicine. It's a path that I didn't really know existed until I started walking along it myself," Mahata says. "I enjoy portraying STEM disciplines as beautiful and informative, inspiring newcomers and encouraging those already STEM-ing every day... It's quite powerful, honestly."

PORTRAIT OF DR. ANTHONY FAUCI  
BY SUMANA MAHATA



[ *Pioneering* ]







# THE 2020 DISTINGUISHED ALUMNI AWARDS

**Caltech recognizes four graduates who have become respected leaders in fields ranging from mathematics to artificial intelligence.**

First presented in 1966, the annual awards recognize a particular achievement of extraordinary value, a series of such achievements, or a career of extraordinary accomplishment.

WORDS BY WAYNE LEWIS • ILLUSTRATIONS BY MARIO WAGNER





There was that first eureka moment. Mathematician **Ian Agol**, PhD had arrived at the key idea for solving the virtual Haken conjecture, a problem that kept rearing its head in his work. Thinking back to that day in 2011, in a hotel in Brisbane, Australia, he reaches for a phrase that also conjures rock-climbing, a pastime he picked up as a Caltech undergraduate.

"Any given route, there's a hardest move or sequence of

moves, and that's called the crux," Agol says. "For me, this was the crux of the problem. I got really excited."

His trajectory since has been from one eureka moment to the next, as he and his colleagues settled some of the most difficult open questions in his field.

The UC Berkeley professor is considered a top mind in the study of shapes called three-manifolds. He is lauded as having fulfilled the vision of his legendary mentor, William Thurston, in reconciling geometry and topology, a more abstract area concerning certain fundamental properties of shapes that remain the same no matter how the shapes are twisted or pulled. Two more of Agol's celebrated results

# IAN AGOL

(BS '92, MATHEMATICS)

*Simons Chair and Professor of Mathematics,  
University of California, Berkeley*

For his significant contributions to low dimensional topology and geometric group theory, such as proving the virtual Haken conjecture, Marden's Tameness conjecture, and other theorems that provide an understanding of the coverings of three-dimensional manifolds.

answered inquiries first opened by Thurston.

Agol's accomplishments have been well recognized, including with membership in the National Academy of Sciences and with the 2016 Breakthrough Prize in Mathematics. With no false modesty, he credits his predecessors, colleagues, and collaborators.

"Any time you have a success, you're building on the work of many others," he says.

That feeling of intellectual community harkens back to his studies at Caltech, when fellow travelers in the math option so often turned to each other for help.

"Part of the great thing about being there was having such a good cohort of people to talk to, and be challenged by, and learn from," Agol says.

From nightly dinners at

Blacker House to excelling in intramural ultimate Frisbee, those days among his extraordinary and offbeat classmates remain fond memories for Agol. Even his struggles helped set his path, as when Professor Michael Aschbacher (BS '66) would encourage him to redo the parts he got wrong in his homework sets.

"That was very valuable to me in learning how to do problems and learn from my mistakes," Agol says.

As he takes on the next unsolved challenge, and the one after that, Agol himself is somewhat surprised by the legacy he has carved into the annals of mathematics.

"I never felt like a genius," he says. "Maybe I overshot my expectations to some extent."



# FEI-FEI LI

(MS '02, PHD '05, ELECTRICAL ENGINEERING)

*Sequoia Professor of Computer Science, Stanford University*

*Denning Co-Director, Stanford Institute for Human-Centered Artificial Intelligence*

*Cofounder and Board Chair, AI4ALL*

For her leadership in the fields of computer vision, machine learning, and artificial intelligence, as well as her advocacy for diversity and inclusion in AI and STEM fields, Li's interdisciplinary influence connecting neuroscience and machine learning has made her a leading voice in applications of AI to improve healthcare.

When **Fei-Fei Li** was a Princeton undergraduate plotting her future in computer vision research, she had plenty of options for graduate school. The lure of Caltech, ultimately, came down to the Institute's easy interdisciplinarity—and its people.

"I chose Caltech because of my co-advisers Pietro Perona, an AI professor, and Christof Koch, a neuroscientist," she says. "I had the rare opportunity to work at the intersection of cognitive neuroscience and computer science. That was very enticing for me."

Her efforts as a scientist at Stanford have pushed the field of artificial intelligence forward. Li's signature contribution is ImageNet, a massive database she launched in 2009 with millions of labeled images. The repository constitutes a major

resource behind the ever-expanding capabilities of computers to discern what they "see."

"I was very interested in cracking the Holy Grail problem of computer vision, which is object recognition," Li says. "Looking back, I'm pleased to see that so many people have found ImageNet helpful, including researchers in my own lab."

She remembers her time at Caltech as filled with invigorating conversations with her fellow trainees and her mentors, whom she describes as "wonderful scientists full of imagination and very fun personalities." Sample topics included Bayesian statistical models for object recognition, the abstract art of Mondrian, and the origin of Nutella.

"I have such fond memories of the intellectual energy and the people," she says. "The labs

were simple spaces, but I had the chance to be with scientists from around the world. It was always full of ideas and discussions and energy."

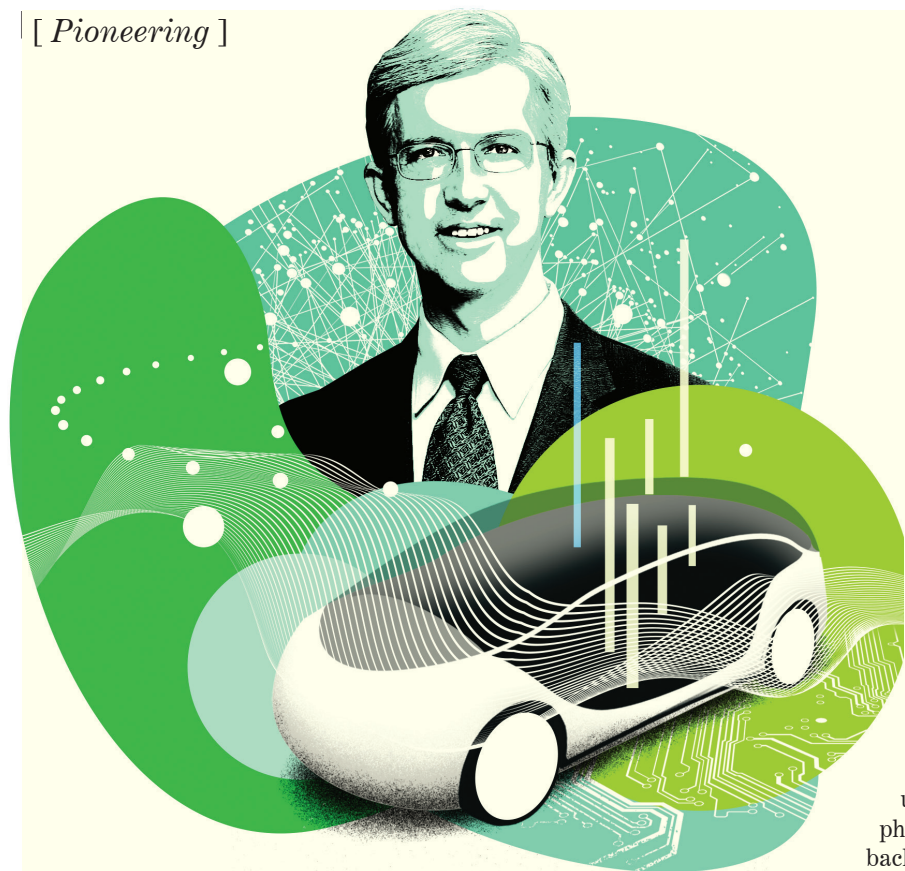
These days, Li's investigations explore how computer systems can be deployed to reduce medical errors. At the same time, she's using her platform as a leading voice in AI research for good.

The educational nonprofit she co-founded, AI4ALL, works to increase diversity in the field. And the Stanford Institute for Human-Centered AI, an interdisciplinary research hub she co-founded in 2019, engages the social sciences and humanities to ensure that people remain at the center of the conversation about AI.

"AI has the potential to radically transform every industry and every society," Li says.



"As a first-generation AI researcher, it's simultaneously a privilege and a responsibility to help guide AI technology and application to benefit all humans' lives, not just a privileged few."



**D**an O'Dowd doesn't move fast and break things. He knows there's a place for that in the computing world—but not in his personal mission.

"What I do is make computers safe for humanity," he says.

So far so good on that front. The company he founded in 1982 and still leads, Green Hills Software, ensures the safety and security of crucial systems across a staggering breadth of applications—military, indus-

trial, and everyday. For instance, anyone who's flown in an airplane in recent years has benefited, unaware, from a philosophy that dates back to his days as a Caltech undergraduate, when he started documenting every bug in his code and its fix.

"My focus, really since graduating, is how to write software that never fails and can't be hacked," O'Dowd says. "It's about taking care—real care—thinking about it, analyzing, writing down what you're doing, and verifying that you're doing it right."

He has been working in a space where doing it right is nonnegotiable—at the heart of

systems that simply must not fail—for decades. It's a charge that's growing more important than ever as internet-connected smart houses, cars, and electrical grids move from conceptual to commonplace.

Starting in the late 1990s, Boeing has relied on software from O'Dowd's company to run its B1-B Lancer intercontinental nuclear bomber. Since then, the security of the Green Hills INTEGRITY operating system has met the highest standards of the Federal Aviation Administration as well as those of the National Security Agency and the National Institute of Standards and Technology. The latter is a certification no other company has accomplished.

The kernel of all this, O'Dowd's interest in computing, first sprouted during his Caltech days.

"Computers are cool because they're mathematical by nature and you can use them to make things happen," he says. "Caltech is where I got into computers and decided that's what I wanted to do—understand and write software."

His passion for protection also arises from an instinct familiar to many a Techer: Do something no one else has done.

"Making unhackable systems was an unsolved problem 25 years ago," he says. "Nobody had ever seriously taken on that challenge. I had enough of an idea how to do it, but it was not the way other people do things."

# DANIEL D. O'DOWD

(BS '76, ENGINEERING & APPLIED SCIENCE)

*Founder and CEO, Green Hills Software, Inc.*

For his entrepreneurial leadership and transformative contributions to the development and commercialization of fail-safe embedded safety and security software for high-risk, high-value applications, including commercial and military avionics, self-driving cars, and remotely controlled medical equipment.



# CHARLES T. MUNGER

(CERTIFICATE '44, CEILING AND VISIBILITY UNLIMITED)

*Vice Chairman, Berkshire Hathaway, Inc.*

For his accomplished career as an investor, businessman, and attorney. He is partner and vice chairman of Berkshire Hathaway, chairman of the Daily Journal Corporation, a director of Costco Wholesale Corporation, and former chairman of Wesco Financial Corporation.

**C**harlie Munger, JD considers himself to have been “an accidental Caltech student.”

The circumstances that led him from Omaha, Nebraska, to campus in fall 1943 were indeed atypical: he came to study meteorology through the U.S. Army Air Corps. Nonetheless, his interactions with Caltech professor Homer Joe Stewart [PhD '40] echoed through Munger's life decades later as he ascended to the firmament of business success. He also strongly identifies with the Institute's basic ethos.

“My life has been dedicated rather intensely to rationality, and that's a very Caltech value,” he says. “It works pretty well, even when things don't look like Caltech.”

Munger describes his military service—forecasting flight conditions so that pilots could land safely at distant airfields—

as “unromantic.” But he credits the physics he learned at the Institute, in part, with preparing him for law school, noting that a background in math or physics is (counterintuitively to some) a consistent predictor of success in legal studies.

The career he built afterward brought him to the forefront of the business world, first as a founder in 1965 of the prominent law firm Munger, Tolles & Olson and later as vice chairman of investment giant Berkshire Hathaway, a title he retains to this day. Along the way, he picked up a reputation as public sage (and wag), thanks to the gathering of his words of wisdom into *Poor Charlie's Almanack* in 2005 by friend and Caltech trustee Peter Kaufman, MBA.

“That damn book made me famous,” says Munger, a Pasadena resident. “I don't mind

being as well known as I am, but I don't want to be better known.”

Reflecting on his uncommon experience at Caltech, he emphasizes the influence of Stewart, an aeronautical engineer with whom he studied thermodynamics.

“He taught me a valuable lesson—that I should not try to make my living competing with people like Homer Joe Stewart,” Munger quips. “It was a wonderful lesson because all my life I've competed with klutzes instead.”

Of course, the connection runs deeper than that. Munger remembers Stewart as unfailingly kind to his students, lightning quick at calculation, and

dedicated to finding the right answer.

“Anytime you interface with somebody like that who's really admirable, it enlarges your aspirations and your knowledge,” Munger says. “It warms life. The world is better when it contains a Homer Joe Stewart.”

Sometimes, it seems, you can connect with the most exceptional people, even by accident.





Robert Behnken's service on SpaceX's Crew Dragon is historic

## Commercial Flight: Behnken's Historic Return to Space

A fresh chapter in American aerospace began on May 30, 2020, with the launch of SpaceX's Crew Dragon, the first U.S. commercial spacecraft to bring astronauts to orbit. Aboard were NASA astronauts Robert Behnken (MS '93, PhD '97) and Douglas Hurley, BSE. The test flight also marked the first spacecraft launched from the U.S. since the end of the shuttle program in 2011.

The history-making journey was Behnken's third mission to the International Space Station. He was glad to be taking off from the familiar Launch Complex 39A at NASA's Kennedy Space Center once again.

"The biggest accomplishment was to return that launch capability to Florida," says Behnken, a colonel in the Air Force and former chief of NASA's Astronaut Office. "There was also quite a bit of excitement associated with the

commercial partnership between NASA and SpaceX. They definitely ran with a lot of opportunities for innovation."

The Crew Dragon craft was dubbed "Endeavour" by Behnken and Hurley in honor of the shuttle that first brought each of them to space. From the ISS, Behnken completed four spacewalks to conduct improvements to the station's power system. He also recorded a message from orbit that was played at Caltech's 2020 virtual convocation ceremony. He and Hurley would return to Earth on August 2, splashing down in the Gulf of Mexico.

Behnken notes that the intellectual versatility he honed at Caltech helped him work across disciplines with SpaceX teams as they tackled the many challenges that come with spaceflight. His fond feelings for the Institute have only grown in the years since graduation.

*Behnken notes that the intellectual versatility he honed at Caltech helped him work across disciplines with SpaceX teams as they tackled the many challenges that come with spaceflight.*

"Caltech has always been a special place for me to look back on," he says. "Students should cherish the time they have at Caltech, and the alumni should cherish each other. It's a unique community, and there aren't that many of us in the grand scheme of things." — Wayne Lewis





Andrea Ghez's research brings into question some established theories

## Ghez Becomes Latest Techer Nobel Laureate

On October 6, 2020, Andrea Ghez (PhD '92) was named one of four recipients of the Nobel Prize for Physics. Ghez, the Lauren B. Leichtman and Arthur E. Levine Professor of Astrophysics at UCLA, was recognized for her discovery of a supermassive black hole at the center of the Milky Way.

Ghez's research includes studying more than 3,000 stars that orbit the supermassive black hole, leading to her renowned study questioning Einstein's theory of relativity, which was published in July 2019 by *Science* magazine.

She shares half of the Nobel Prize with Reinhard Genzel of UC Berkeley and the Max Planck Institute for Extraterrestrial Physics. Together, they are praised "for the discovery of a supermassive compact object at the center of our galaxy."

Even after this incredible accomplishment, Ghez is set on further discovery. "Our understanding of how the universe works is still so incomplete," she says. "The Nobel Prize is fabulous, but we still have a lot to learn."

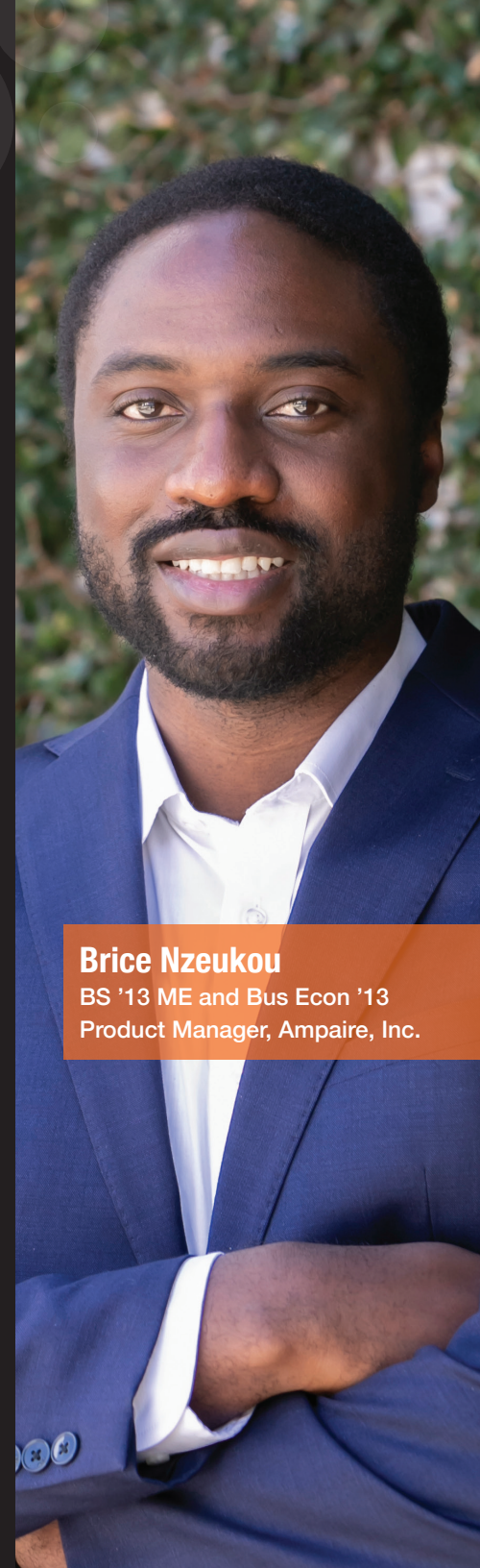
*"Our understanding of how the universe works is still so incomplete. The Nobel Prize is fabulous, but we still have a lot to learn."*

# EACH ONE TEACH ONE

Join the Caltech  
Black Alumni Council Today

[portal.alumni.caltech.edu/](https://portal.alumni.caltech.edu/)

Caltech | Alumni



**Brice Nzeukou**

BS '13 ME and Bus Econ '13  
Product Manager, Ampaire, Inc.

# CALTECH ALUMNI

## ORAL HISTORY PROJECT

**Every Techer has a story, and we'd really like to hear yours.**

SINCE 1897, Caltech has been producing the best-trained people in the world.

You are one of those people, and your story is valuable. What brought you to Caltech? Who were your friends, and what was life like on campus?

What made you persevere to the end? What are you up to today?

We've recorded the stories of more than 1,400 Techers in their own voices. It's been illuminating, fun, maybe a little therapeutic, and we believe it's been important.

This is the history of Caltech alumni, told by you. All the files are going online, available for other Techers to hear. Many will be spotlighted in upcoming podcasts, in special *Techer* magazine features, and in a beautiful book available to you for your shelves and coffee tables. Plus, it will be the perfect set piece to spice up your Zoom background.

### HOW DO WE DO IT?

A team dedicated to Caltech alumni is ready to answer your call, ask you a few questions, and record your story. No preparation needed, just reach out.

**Please call 877-254-7514 between  
5:00 AM and 7:00 PM (PT).**

**"My Mom bet  
me I couldn't  
get in to Caltech."**



Evan Tsang (BS '99)

### WHAT HAPPENED TO EVAN TSANG?

*"...(The application) just had a blank page, and they were, like, 'Do whatever you want on this.' So I drew a timeline of my life in the shape of a smiley face, because, well, I've got nothing to lose, I'm never going to get into this place."*

Since you already saw his grad year, you know he got in.

**That's Evan's story.**

**Now we'd really like to hear yours.**

**Call us soon!**

**Caltech**

**Alumni**



An aerial photograph of Jezero Crater on Mars. The crater is a large, roughly circular depression in the reddish-brown Martian soil. In the center of the crater is a large, dark blue lake. Several channels of water, appearing as lighter blue lines, flow into the lake from the surrounding landscape. The terrain around the lake is rugged and rocky, with various ridges and valleys. The overall color palette is dominated by shades of brown, tan, and blue.

# ENRICHING

## A New Mission

On February 18, 2021, NASA's Perseverance rover landed in Jezero Crater on Mars. The team identified Jezero Crater as an ancient lakebed, illustrated here—as it may have been billions of years ago—filled with water. “The crater is one of the most promising places to look for evidence of ancient microbial life and to collect samples for future return to Earth,” says Matt Smith, PhD, systems engineer at NASA's Jet Propulsion Laboratory. The rover is the first mission to collect rock and dust particles from Mars, providing insight to the Red Planet's geology and past climate and opening the door for future human exploration.

IMAGE: NASA/JPL-CALTECH



# FUELING RESEARCH

BY MARISA DEMERS

ILLUSTRATIONS BY CRAIGIO HOPSON

*Ernie Mercado dished out good food at low prices for 34 years at Caltech. Upon his retirement, alumni and students showed their appreciation by raising more than \$35,000 as a final tip.*



**E**Ernie Mercado spent 34 years serving flavorful Mexican street fare to a crew of Caltech customers. Yet the 71-year-old proprietor of Ernie's Al Fresco food truck needed only a day to decide that he wanted a new title: retiree.

Mercado remembers the moment. On October 8, 2020, a little after 1 a.m., he awoke and was filled with certainty that it was time to shutter his business. He drove onto campus later that morning, sad but sure about his decision. Mercado was quiet about his retirement plans until the following Friday morning, when he handed out copies of a farewell letter.

The news spread quickly through texts, messaging apps, and email, and, by lunchtime, a large, socially distanced group had gathered near his truck. The turnout surprised Mercado. Long lines had disappeared when the pandemic forced the Caltech community to learn and work from home or have staggered shifts in the labs.

It is easy to imagine a bigger send-off if the campus had been open, but Mercado has no regrets.

"It was destined to happen this way because it makes saying good-bye less painful," Mercado says. "I saw my daughter in each and every one of the students and I came to love them, too. I will remember their faces, their smiles."

Since his food truck rolled onto campus in 1986, Mercado's business has hit a sweet spot with graduate students and postdoctoral scholars. For less than \$10, a delicious, calorie-dense meal could power young



*Quesadilla con espinaca para el Maestro.” Music to my ears each time I walked up to the truck. You and Lucy and Delma fueled my PhD. Then part of my postdoc. And now in my current job at Caltech. The yummy-ness of the food was only eclipsed by the warmth and kindness of those who made it. You are a gem of Caltech, and will always be fondly remembered (and missed). I wish you the very very best in retirement and in grandparenthood!*

JUSTIN BOIS (PHD '07)

scientists and engineers through their studies and research. Indulging in an oversized Mucho Macho Burrito, a JAWS hamburger, or a potato quesadilla topped with spicy Painful Green salsa was one part of the experience. Customers were loyal to Mercado because they liked him. He greeted them with familial words of affection—*primo* and *mija*. He also shared updates about his daughter Cristina, who was in graduate school, quipped about his love of tequila, and cheered up those who were trying to brush off failed lab experiments.

Postdoctoral scholar Ivo Ros and fellow researchers in the lab of Michael Dickinson, the Esther M. and Abe M. Zarem Professor of Bio-engineering and Aeronautics, were regular customers and considered Mercado a friend. To show their appreciation, Ros created an online fundraising page and lab members shared the link with friends and on social media.

In 19 hours the fundraiser surpassed its \$2,000 target. By December, 725 people had donated \$35,662 and left more than 100 heartfelt comments. Mercado shared the donations with four Ernie's Al Fresco workers, including cook Lucy.

Today, Mercado's life has a different rhythm. He and his wife, Graciela, babysit their first grandchild, who was born in January. The couple also hopes to go on extended vacations to France and Mexico.

Before he boards a plane, Mercado plans to visit Caltech. He will not be in his truck—he already gave it to his brother—but he will be searching for his longtime customers.

“Someday, when things get back to normal, we'll get together and drink some tequila,” he says. ■



*Besides great food, I remember Ernie's great memory and generosity. Forget your wallet? No problem. Ernie would feed you and collect the next time you visited. Thanks for the great food over the years.*

SCOTT CARTER (PHD '99)



*Ernie and his team kept me fed at lunch several days a week throughout graduate school. Ernie's fed me through my early scientific discoveries. I was eating Ernie's when I felt my first earthquake. Veggie burritos, nopales tacos, and the fish burritos were my common orders. I knew it was avocado season, because everything would be twice as filled with avocados. Ernie is a gentleman, who always addresses you like the King of Spain addresses a grandee, "primo (cousin)." I wish him and his team every joy in their future endeavors.*

NICK HEAVENS (MS '07, PHD '10)

*It's extremely comforting to know there is something consistently in your corner during formative but difficult parts of your life. Through your friendly disposition, delicious and affordable food, and generosity of spirit, you gave all of us that, Ernie. Thank you so much for that!*

CHIRAJ DALAL (PHD '10)

*I can't imagine Caltech without Ernie. When I had a long morning of experiments, catching his truck for a late, satisfying lunch was the best. I wish the world had more people as kind and generous as Ernie.*

GREGORY DONALDSON (PHD '18)



## RECIPE CHALLENGE

HOW DOES ERNIE MAKE IT?



### ERNIE'S NOPALES SALAD CHALLENGE

**Techer** asked Ernie to share a favorite recipe as a farewell to Caltech, but naturally Ernie doesn't cook by the book. Besides, he knows how Techers love a challenge, so here it is—the Before and After photos of the Nopales Salad. Study the photos and create your own recipe. Send your recipes and photos of the final feast to [info@alumni.caltech.edu](mailto:info@alumni.caltech.edu). The Techer Taste Kitchen will try them out and report the tastiest and most interesting results.



# In His Wheelhouse

*Henry Baer is a two-time Jeopardy! champ*

**Halfway through his first appearance** on *Jeopardy!*, Henry Baer (BS '18) was in a hole. With a score of \$2,600, he was in third place, \$4,800 behind the leader. But the Double Jeopardy round began with a promising omen for someone who had recently spent four years at Caltech: One of the six categories was “Astronauts.”

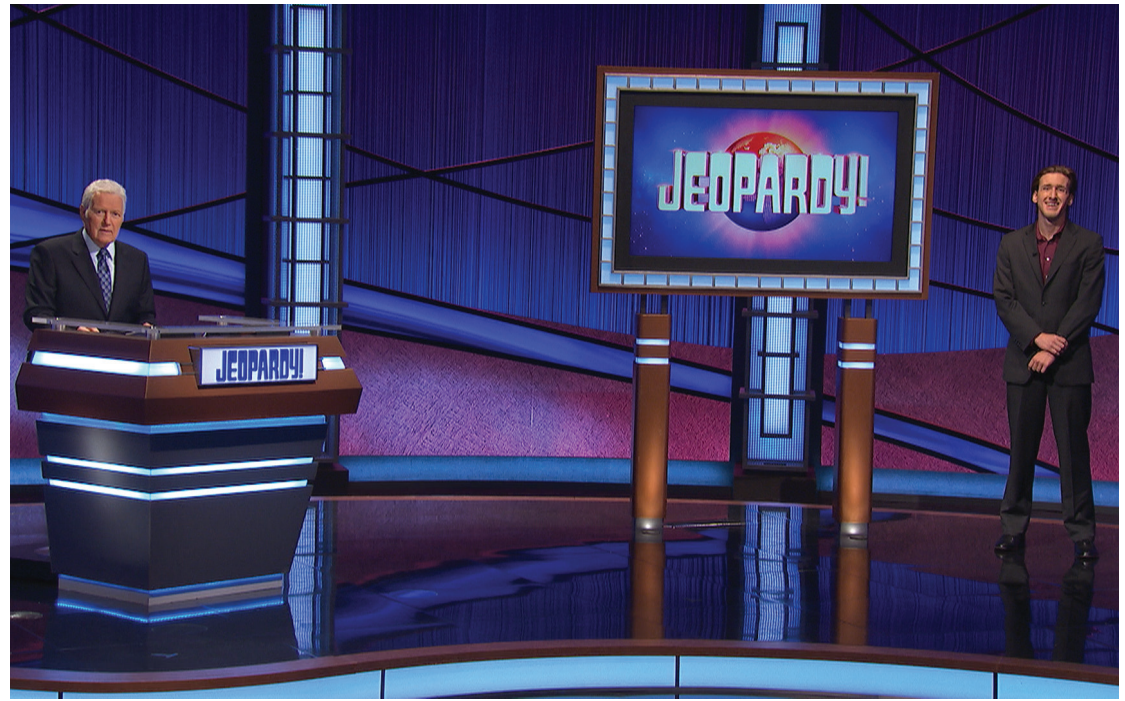
Baer, playing first, went right to the \$1,600 clue in that subject and answered correctly, and then found a “daily double” clue in the same category, allowing him to bet any amount of his earnings so far. He wagered it all, answered correctly (“Who is John Glenn?”), and vaulted into first place.

“The questions didn’t cover anything I learned in a course at Caltech, but being in such close proximity to JPL, I was probably more aware of those facts,” says Baer, who majored in computer science but did take an astrobiology class his senior year. “It was definitely in my wheelhouse, so I was really happy when that category came up.”

The rest of the match, which aired Nov. 23, was a back-and-forth affair between Baer and the returning champ. But Baer came out on top, earning the right to defend his title in the next match. Which he did, handily. His performance so impressed Alex Trebek that the show’s legendary host introduced Baer’s third match this way: “Let me tell you something very simple about our champion, Henry. He’s good. So gear up.”

By the time Baer’s episodes were taped last fall, contestants and viewers knew that Trebek was being treated for cancer. Still, Baer says he was struck by Trebek’s enthusiasm. “That first game was so neck and neck, and he genuinely thought it was one of the more exciting games in recent memory. It was fun to know it wasn’t just another game for him.”

Although Baer’s luck ran out in his third match, he says the experience was especially meaningful because Trebek was still hosting the show; Trebek would pass away in early November, weeks after Baer’s games were recorded.

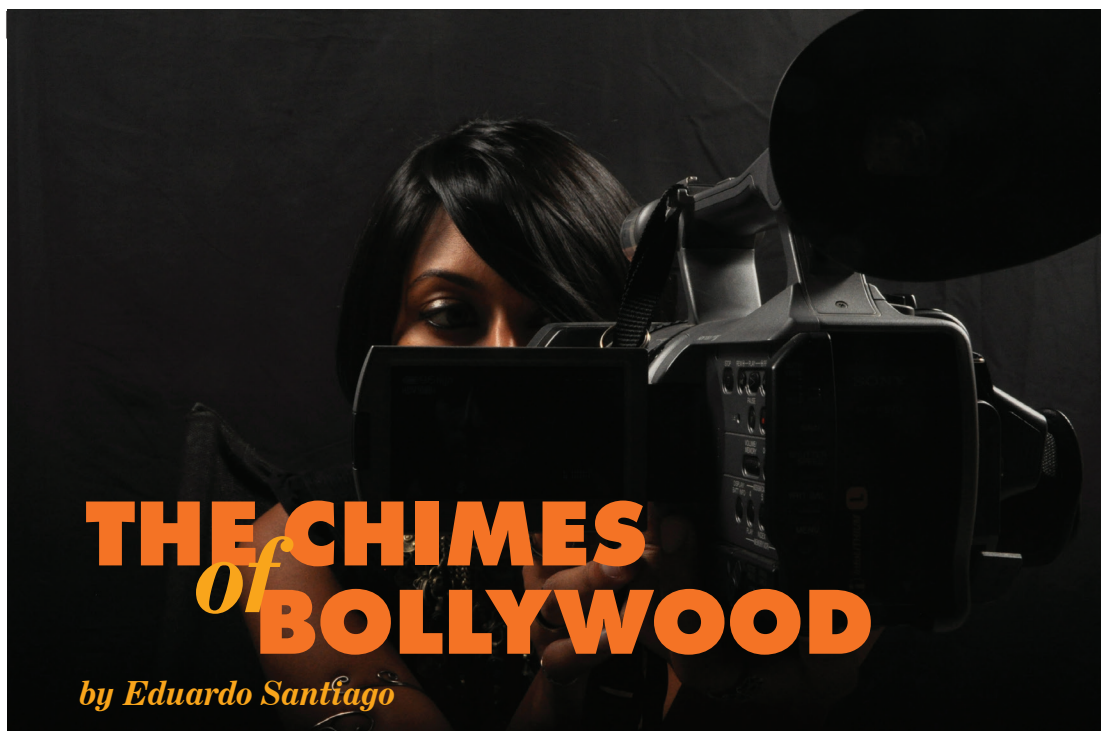


*“I’ve been watching Jeopardy! since I was 5, so Alex Trebek was almost mythological to me ... I really felt lucky that I had the chance to play the games with him hosting, and to talk to him. He was extremely kind.”*

“I’ve been watching *Jeopardy!* since I was 5, so Alex Trebek was almost mythological to me,” Baer says. “I really felt lucky that I had the chance to play the games with him hosting, and to talk to him. He was extremely kind.”

Baer, now the founding engineer at San Francisco-based Merge, a business-to-business software integration platform provider, said proximity to JPL wasn’t the only way in which Caltech helped prepare him for game show success. During his years in Pasadena, he led the Quiz Bowl Club, which he credits for honing his grasp of the kinds of history, geography, and mythology trivia that are *Jeopardy!* staples.

Henry Baer credits astronaut John Glenn for giving him a game-changing Daily Double



Iram Parveen Balil's latest film, *I'll Meet You There*, is now widely available on streaming platforms

**W**HEN SHE WAS A LITTLE GIRL IN PAKISTAN, Iram Parveen Balil, MFA (BS '04) used to crawl in between her parents while they were watching Bollywood movies in bed. She'd pretend to sleep so as not to be sent to her own bed. Eventually, she'd drift to sleep to the sound of passionate dialogue, garish musical numbers, and in the quiet moments, the tinkling sound of chimes. The next day, re-watching the movie with her sister, she could remember all the dialogue.

But it wasn't Bollywood that brought her to Hollywood, it was Caltech. In 2000 she received admission and a generous scholarship. It was a difficult transition for the 17-year-old. Although the focus was environmental science engineering and business management, movies were never far from her mind.

She recalls a favorite professor who taught a senior film class that she wanted to take her first year at Caltech. "He kept saying no," she says, "And I kept going back. I finally convinced him. I got an A in that class. He would roll his eyes when I said, 'I'm going to be a director one day.'" She cringe-laughs at the memory, but she's a director now with three feature film, an assortment of shorts and TV projects on her IMDB page. A fellow



successful screenwriter/director even named a secret agent character after her. Her projects address her many deep concerns: the reality of post-9/11 America, and how it manifested into extremism, racism, and misogyny.

Caltech was enormously significant in helping the filmmaker get her messages to the world.

"What Caltech prepared me to do," she says, "was to learn how to problem-solve and not be scared of new realities. I already had a burgeoning desire for storytelling, but being in an atmosphere where curiosity and imagination and problem-solving were encouraged, where you weren't scared of jumping into things you didn't know... all of that primed me to take the leap I was ultimately set to take."

There are also practical uses to what she learned.

"Being an engineer, I definitely have a very structural mind," she adds. "When I'm talking to my cinematographer I'm very comfortable discussing depth of field, lens choice, all those things, because it's easy. It's physics. But in terms of writing and storytelling, I understand structure. In fact, what's hard for me is dialogue and the nuances of character. As an artist, I'm growing."

Photos by Alia Azamat



*“When I’m talking to my cinematographer I’m very comfortable discussing depth of field, lens choice, all those things, because it’s easy. It’s physics.”*

Her work is evidence that she has grown enough to stand shoulder to shoulder with other acclaimed film artists. Her new feature, *I’ll Meet You There*, a beautifully rendered, multigenerational family drama with a Pakistani-American teenage girl in the lead, was one of 10 chosen from 1,305 submissions for the 2020 South by Southwest’s narrative feature competition, although the coronavirus pandemic forced the cancellation of the in-person portion of entertainment and technology’s hippest festival. The movie recently debuted with great fanfare on streaming apps, where her previous work, including *Josh: Independence Through Unity* (2013), is also available.

It was a hard blow for Bilal, but, ever the scientist, she’s taking a rational approach. “I’m trying to detach myself from both failure and success,” she says

Undeniably, acceptance into the festival and subsequent distribution deals are confirmation that when she answered what she calls “the chimes of Bollywood,” she was saying yes to her destiny.

## Match Madness

On March 20, 2021, Caltech Alumni faced off against MIT graduates for Match Madness, the Institutes’ first ever virtual chess tournament. Alumni competitors, spectators and chess fanatics watched online matches featuring Techers Jones Murphy (MS ’91), Joshua Gutman (BS ’06), Zach Rivkin (BS ’14), and Oscar Mickelin (MS ’16) take on MIT opponents Philip Rosenbach, Vasik Rajlich, Geoffrey Gelman, and Richard Yi.

The competition consisted of two mini-tournaments, one to determine the “champion” of each institute, before culminating in a final Beaver versus Beaver showdown. During the matches, Caltech Chess Club president, Tony Kukavica, joined MIT Chess Club president Tyrone Davis III and member Will Cuzzo to provide entertaining and enlightening color commentary. Virtual audience members used chat for good-natured heckling as well as to reconnect with old friends and competitors.

During the match, former Caltech competitor and Chess National Master, Jones Murphy reconnected with current MIT student, Tyrone Davis III, during the tournament. The two competed in the New York chess scene around the same time while Davis was only a child and proving himself to be one to watch.

“The world of chess has changed dramatically. A kid can mature in chess faster with today’s virtual resources,” Murphy said during the Zoom event. He also discussed being a part of one of the first ever virtual chess tournaments between Caltech, MIT, Harvard and Carnegie Mellon in 1988. Ultimately, Richard Yi of MIT won the tournament in a heated two-game final match with Caltech’s Gutman, running the clock down to the final second and claiming victory.



# SCHEMA

*From the Executive Director of the Caltech Alumni Association*



RALPH E. AMOS  
*Executive Director,  
Caltech Alumni Association*

I have a question for you. How does your degree from Caltech translate into living your best possible life? Not just a job, but the right job? Not just an idea but the relationships to help bring it to life? Not just relationships, but family?

Since our first degrees were earned in 1897, Caltech graduates have served at the leading edge of the most important work in the world. Protecting the planet, curing disease, forwarding science—no one is better prepared for this work than you. But there's more to life than work and more to a school than the value of a degree. What sometimes gets lost in our effort and success is that, ultimately, Caltech stands for work done for humans by humans.

There is a human element to everything. For Techers living anywhere in the world, the place to find the human element is the Caltech Alumni Association. While the students, faculty, and graduates of Caltech focus on making people's lives better in general, Caltech Alumni focuses on you, the 25,000 Caltech graduates living around the planet.

Our values are based on your well-being and success, on helping you not just to do your best work, but to live your best life, fulfilled and happy.

Our job is to foster and celebrate a powerful and vital community.

We are working hard to make it worth your while to join us and make meaningful use of all we offer. Here are three innovations you can explore right now, designed to help you connect—to add to our community and let our community add to you.

**ORAL HISTORY PROJECT. LIFE AFTER OUR DEGREE.** Who are we? What are our stories? From the dark days of our first job search to the greatest triumphs in our fields, we've recorded more than 1,400 personal stories so far and are making them available, archived online, as podcasts, spotlighted in *Techer*, and included in a forthcoming book. We do not stop learning from each other. What's your story?

**BUILDING NEW COMMUNITIES WITHIN OUR LARGER ONE:** Soon, alumni will be invited to join or form constituent groups around

OUR VALUES ARE BASED ON YOUR WELL-BEING AND SUCCESS, ON HELPING YOU NOT JUST TO DO YOUR BEST WORK, BUT TO LIVE YOUR BEST LIFE, FULFILLED AND HAPPY.

the more unique bonds alumni have—ethnicities, gender, advanced degree holders, or professional interest. Do you see yourself in one?

**TECHER ALUMNI PORTAL.** Finding each other has been too difficult for too long. We have created a portal, a skeleton key to connect us all, to make contact easier and communication more practical.

**HUMANITY IS THE THROUGH LINE THAT CONNECTS OUR WORK - AND US—TO THE WORLD.** The Caltech Alumni Association works for you, the humans behind the important and difficult work of science and technology.

Work, play, live well. We all benefit in many ways from the power of community.

I hope you will join in,

A handwritten signature in black ink that reads "Ralph Amos".

*Executive Director, Caltech Alumni Association*



# Dropping Pumpkins

CREATED BY WYNA LIU

Puzzlemaker **Wyna Liu** drew inspiration for this issue's The Stack from Caltech's annual Pumpkin Drop. Since 1972, Caltech students have celebrated Halloween with delightful destruction—smashing liquid-nitrogen-frozen pumpkins from the tallest building on campus at the stroke of midnight. In recent years, the event has attracted large crowds of spectators, who watch safely from a distance, as pumpkin debris explodes into the night of tricks and treats.



## ACROSS

1. With 62-Across, likely solver of this puzzle
8. National Space Society magazine with a Latin name
15. Hardly a wholesome laugh
16. Certain emission from radioactive decay
17. Colloquial
18. Motor grp. freebies
19. Annual campus event that takes place, appropriately, in the fall
21. Large water tow-er
23. Holiday at the end of Ramadan
24. Time release?
27. "Gross!"
28. Wearer of an extra-large belt?
30. Prefix with space
31. Small island
32. Twenty-one places
34. Component of galinstan
35. Unit from the Greek word for "weight"
36. Put words into one's mouth?
38. Tootler
41. Broad valleys
45. Apollo \_\_\_\_
46. Most admired woman from 2018 to 2020, per Gallup polls
47. Sci-fi conveyance that's bigger on the inside than the outside
49. The nosebleed section, for V.I.P.s
50. 19-Across hosts

54. Acquire
56. "There's no basement at the \_\_\_\_" (line from Pee-wee's Big Adventure)
57. One who's tickled red?
60. Suit
61. Gal who acts
62. See 1-Across
63. Feed fodder
64. Verb for 19-Across
65. Blinky things

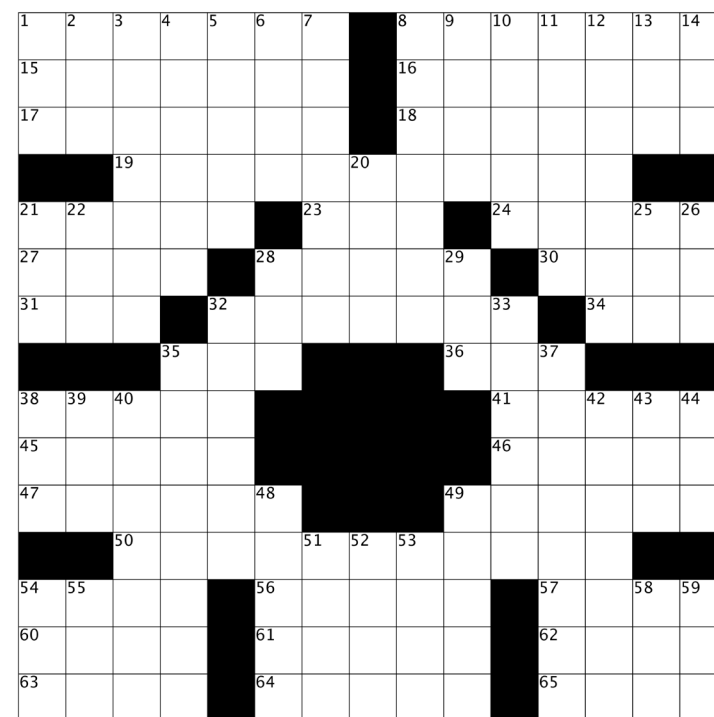
## DOWN

1. Prompt abbreviation?
2. Dazzle
3. It's a sucker for sharks
4. However
5. Instruction on a Wonderland cake
6. IC or Ruffle
7. Ones defined by the hats that they wear?
8. Freedom from inhibitions
9. Out of juice
10. Game company with a logo nicknamed "the Fuji"
11. Savory pastry-like dumpling
12. Drummer's gear
13. Genre for 32-Down
14. Cries of regret
20. Number on some Roman numeral clocks (and a representation of gravity, vis-à-vis the black squares in the center of this grid)
21. *The Office* airer
22. In the style of
25. Ocean State sch.
26. Largest units of time
28. Stick in the water?
29. Show sleepiness
32. First female MC to have two number one hits on the Billboard Hot 100

33. It's a numbers game
35. [Honey, it's right over there!]
37. Fuzzy Arctic cutie
38. Election fig.
39. Kaplan of rock's Yo La Tengo
40. Work allowance
42. Singer inducted into the Grammy Hall of Fame, the Apollo Theater Walk of Fame, and the Hollywood Walk of Fame
43. Moody and brooding music genre
44. Instrument for Ornette Coleman
48. Hiccups
49. Truth, to Shakespeare

51. Ancient country whose capital was Susa
52. When tripled, blah blah blah
53. Med. care choices
54. Thing in a ring, maybe
55. Shredder on stage
58. Joe
59. Meditation sounds

Looking for answers? We all are, of course, but currently we can offer only the puzzle solutions, available at [alumni.caltech.edu/techer/dropping-pumpkins](http://alumni.caltech.edu/techer/dropping-pumpkins)



# ANNUAL LETTER

*From the President of the Caltech Alumni Association*

## DEAR CALTECH ALUMNI,

**On behalf of the Caltech Alumni Association (CAA) Board of Directors**, I am excited to look back on a very challenging year and note how many exciting new or reimagined initiatives CAA has undertaken. In addition to the redesigned magazine you hold in your hands, CAA also launched a fully redesigned website and a community-building Alumni Portal, all in March 2021. Expect to see more in the coming year.

I also write to inform you that the upcoming 2021 Annual Meeting will take place on Thursday, June 17, 2021, 6:00–6:30 PM via Zoom. Watch your email for the Zoom link closer to the meeting.

In addition to the Annual Meeting, I draw your attention to a few further business items. On the next page, you will find a summary of CAA's most recent audited financial statements. At the back of this magazine, you will find Proposed Bylaw Changes, a ballot, which you can fold, seal, and return.

The current bylaws were initially drafted more than 15 years ago. In order to bring the bylaws into line with current best practices and provide a more direct and flexible set of governance rules, a new version of the bylaws is proposed for adoption by the membership. The proposed bylaws contain a number of changes from the current bylaws, including:

- Our members will no longer vote on candidate Directors or amendments of the bylaws. Under the proposed bylaws, candidate Directors are approved by the Board and the amendments to the bylaws must be approved by at least two-thirds of the Board.
- Terms of the Directors will be flexible to allow adjustments on the number of Directors and maintain appropriate rotation. Currently, all terms are set at three years.
- The titles of the Officers and allocation of responsibilities will change. Notably, the Secretary position will transform into the Chair of the Governance Committee, and the role of note-taking will vest in a CAA staff member.

In addition, the CAA Board of Directors has accepted the recommendations of the Nomination Proposal Committee for the candidate officers and directors listed below. Officers and directors will be elected at the Annual Meeting and will begin their terms at the close of the meeting.

Members of the CAA may make additional nominations for directors or officers by petition, signed by at least 50 other members in good standing, provided that the petition is received by the Secretary no later than May 15, 2021. If no additional nominations are received by May 15, the Secretary will cast a unanimous vote of all regular members of the CAA to elect the candidates nominated by the CAA Board.

### **Officer Nominees (1-year term)**

President: **Satoshi Ohtake, PhD (BS '00)**, Missouri

Vice President: **Keith Karasek, PhD (BS '74)**, Massachusetts

Treasurer: **Jennifer Lee (PhD '10)**, Washington

Secretary: **Christie Canaria (PhD '08)**, Maryland

### **Director Nominees (three-year term)**

Iram Parveen Bilal, MFA (BS '04), California

Frederic Caldwell (BS '96), California

Miral E-Kim, PhD (BS '78), California

Jessica Mao (MS '06, PhD '06), Germany

Gerard O'Reilly (PhD '04), Texas

Elizabeth Stameshkin, JD (BS '03), California

We are proud of our Caltech alumni, who prove every day that advancing humanity through education, science, and technology is a team effort. We trust that the community available through CAA makes your goals easier to pursue and more rewarding to reach. Wherever you work, live, or play, CAA wants to ensure that Techers are there with you.

Please feel free to reach out to me at [sohtake@alumni.caltech.edu](mailto:sohtake@alumni.caltech.edu) or to Ralph Amos, CAA Executive Director, at [ramos@caltech.edu](mailto:ramos@caltech.edu)—we welcome your questions and feedback.



**SATOSHI OHTAKE, PhD (BS '00)**

*President, Caltech Alumni Association*



# ANNUAL FINANCIALS

*From the President of the Caltech Alumni Association*

## STATEMENTS OF FINANCIAL POSITION\*

SEPTEMBER 30, 2020 AND 2019

	2020	2019 (As Restated)
<b>ASSETS</b>		
Cash and cash equivalents	\$ 241,438	289,301
Prepaid expenses	4,975	13,049
Caltech pooled investment accounts	7,545,884	7,647,381
Property, equipment and artwork	14,231	21,642
<b>Total Assets</b>	<b>\$ 7,806,528</b>	<b>7,971,373</b>
<b>LIABILITIES AND NET ASSETS</b>		
Accounts payable	\$ 4,272	16,510
Related party payable	4,729	—
Lifetime membership deposit	314,827	314,827
<b>Total Liabilities</b>	<b>323,828</b>	<b>331,337</b>
<b>Net Assets without Donor Restrictions</b>	<b>7,482,700</b>	<b>7,640,036</b>
<b>Total Liabilities and Net Assets</b>	<b>7,806,528</b>	<b>7,971,373</b>

## STATEMENTS OF CASH FLOWS\*

SEPTEMBER 30, 2020 AND 2019

	2020	2019 (As Restated)
<b>CASH FLOWS FROM OPERATING ACTIVITIES</b>		
Cash received from donors	\$ 161,429	136,036
Cash received from service recipients	207,986	232,588
Cash paid to suppliers	(708,920)	(575,727)
Interest and dividends received - other	1,535	2,218
<b>Net Cash Used by Operating Activities</b>	<b>(337,970)</b>	<b>(204,885)</b>
<b>CASH FLOWS FROM INVESTING ACTIVITIES</b>		
Distributions from Caltech pooled investment accounts	290,107	361,060
<b>Net Cash Provided by Investing Activities</b>	<b>290,107</b>	<b>361,060</b>
<b>Net Increase (Decrease) in Cash and Cash Equivalents</b>	<b>(47,863)</b>	<b>156,175</b>
<b>Cash and Cash Equivalents, Beginning of Year</b>	<b>289,301</b>	<b>133,126</b>
<b>Cash and Cash Equivalents, End of Year</b>	<b>\$241,438</b>	<b>\$289,301</b>

\*Unaudited Financial Statement

## STATEMENTS OF ACTIVITIES AND CHANGES IN NET ASSETS\*

SEPTEMBER 30, 2020 AND 2019

	2020	2019 (As Restated)
<b>SUPPORT, REVENUES, AND OTHER INCOME</b>		
Net investment returns - Caltech pooled investment accounts	\$ 188,610	156,660
Reunion/Seminar day	—	150,580
Caltech Support and In-kind contributions	1,210,774	1,142,281
Regional programs	19,376	21,706
Miscellaneous income	—	3,922
<b>Total Support, Revenues, &amp; Other Income</b>	<b>1,420,295</b>	<b>1,477,367</b>
<b>PROGRAM SERVICES EXPENSES</b>		
Communications	127,724	166,023
Class reunions	90,685	115,184
Seminar day	55,912	89,884
Regional programs	22,595	37,017
Membership earned	—	25,040
Professional services and support	10,803	22,524
Student outreach	19,194	20,258
CAA Honorary member dinner	—	11,987
Depreciation	7,411	8,523
Other small programs	2,643	4,731
Play dough	—	2,049
<b>Total Program Services Expenses</b>	<b>336,967</b>	<b>503,220</b>
<b>SUPPORT SERVICES EXPENSES</b>		
Salaries and related benefits	907,774	843,763
Alumni house rental	162,482	162,482
<b>Total Support Services Expenses</b>	<b>1,070,256</b>	<b>1,006,245</b>
<b>Total Program &amp; Support Services Expenses</b>	<b>1,407,223</b>	<b>1,509,465</b>
<b>Management and General Expenses</b>	<b>170,408</b>	<b>72,845</b>
<b>Total Expenses</b>	<b>1,577,631</b>	<b>1,582,310</b>
<b>Change in Net Assets</b>	<b>(157,336)</b>	<b>(104,943)</b>
<b>Net Assets Without Donor Restrictions, Beginning of Year</b>	<b>7,640,036</b>	<b>8,059,806</b>
<b>Prior Period Adjustment</b>	<b>—</b>	<b>(314,827)</b>
<b>Net Assets Without Donor Restrictions, End of Year</b>	<b>\$7,482,700</b>	<b>\$7,640,036</b>



## Connect

Advancing humanity through science and technology is a team effort.

The Caltech Alumni Portal is your tool for finding your own Techer team that will help you live your best life while making your best contribution to the world.

- Find your alumni friends
- Connect with professional peers
- Form and join communities based on where you live, work and play
- Free to Caltech alumni and easy to join\*

To sign up, visit [portal.alumni.caltech.edu](https://portal.alumni.caltech.edu)

\*Use your LinkedIn profile to pull your professional experience into the platform to create more insightful connections.

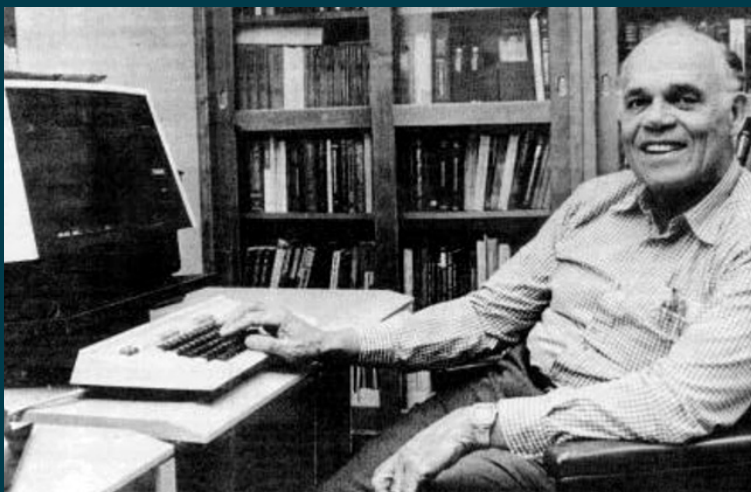
**Caltech** | **Alumni**

# IN MEMORIAM

*We mourn the loss of the following members of our Caltech alumni family*

- 1938**  
Carlton L. Horine (BS '38)
- 1941**  
William L. Deniston (BS '41)  
Paul H. Faust (BS '41)
- 1943**  
George P. Sutton (BS '42, MS '43)
- 1944**  
Walter R. Fillippone (MS '44)  
Eugene W. Peterson (MS '44)
- 1945**  
Fred M. Briggs (BS '45)  
Lawrence G. Hall (BS '45)  
Richard C. Honey, PhD (BS '45)  
Raymond C. Wheeler (BS '45)
- 1946**  
Wilbur A. Ingram (BS '46)
- 1947**  
Henry C. Keck (ENG '47)  
Herbert N. Royden III, PhD (BS '47)  
Richard A. Sutton (BS '43, MS '47)
- 1948**  
Charles E. Auerbach (MS '47, ENG '48)  
Nicholas A. Begovich (BS '43, MS '44, PhD '48)  
Glenn W. Billman (BS '41, MS '42, PhD '48)  
Howard L. Engel, PhD (MS '48)  
Yuan-Cheng Fung (PhD '48, DAA)  
Curtis C. Whittlesey (ENG '48)
- 1949**  
Myrven F. Gift Jr. (BS '49)  
Richard J. Pollak (BS '49)
- 1950**  
J. Milton Andres, PhD (BS '49, MS '50)  
Robert V. Knox (BS '45, MS '50)  
Alvin V. Tollestrup (PhD '50, DAA)
- Richard B. Wright (BS '50)
- 1951**  
Eli Botkin (MS '51)  
Henri A. Dopchie, PhD (MS '51)  
Lawrence D. Dyer, PhD (BS '51)  
Carl-Nils Hildabrand (BS '51)  
Dan B. LeMay (BS '51)  
Donald D. MacDougall (BS '45, BS '50, MS '51)  
Jay A. Montgomery (BS '50, MS '51)  
George M. Sawyer (BS '51)
- 1952**  
Allan J. Acosta (BS '45, MS '49, PhD '52)  
Berni J. Alder (PhD '52)  
Jerry Grey (PhD '52)  
Roy A. Keir (BS '52)  
Dick Quan (MS '52)  
Edward C. Saunders (CERT '44 CAVU, MS '52)
- 1953**  
Charles E. Benjamin (BS '53)  
Andrew C. Boush (BS '53)  
David S. Hogness (BS '49, PhD '53, DAA)
- 1954**  
Clarence R. Allen (MS '51, PhD '54)  
Stephen J. Chamberlin Jr. (MS '54)  
Ronald S. Saliba (BS '54)  
George Wada, PhD (BS '54)
- 1955**  
Ray D. Bowerman (BS '51, MS '52, ENG '55)  
Thomas B. Howes (MS '55)  
George T. James Jr. (ENG '55, MS '55)  
Armin D. Kaiser (PhD '55, DAA)  
Donald B. Roberts, PhD (BS '55)
- George W. Sutton (MS '53, PhD '55)  
George H. Trilling (BS '51, PhD '55)  
Hsun-Tiao Yang (PhD '55)
- 1956**  
John D. Baugher (BS '52, MS '56)  
Eugene H. Dryden (BS '55, MS '56)  
Peter Gottlieb, PhD (BS '56)  
Norman F. Jacobson (BS '50, PhD '56)  
James H. Koontz (BS '56)  
William K. Purves, PhD (BS '56)  
Irving C. Statler (PhD '56)
- 1957**  
William S. McDonald (PhD '57)  
Robert F. Pramann (MS '57)  
William R. Smythe (BS '51, MS '52, PhD '57)
- 1958**  
Dang D. Ang (MS '56, PhD '58)  
Frank J. Berto (MS '58)  
Stephen A. Emanuel (BS '58)  
Roy A. Jensen (BS '57, MS '58)  
Leon M. Keer, PhD (BS '56, MS '58)  
Dennis G. Peters, PhD (BS '58)  
James W. Sedin (PhD '58)  
Wallace W. Short (MS '53, PhD '58)  
Donald J. Taylor, PhD (BS '55, MS '58)
- 1960**  
Bruce R. Doe (PhD '60)  
John G. Price (BS '60)  
B. Alvin Schoomer Jr. (PhD '60)  
William A. Strohl (PhD '60)
- 1961**  
James R. Dodd (PhD '61)  
Bill D. Iwan (BS '57, MS '58, PhD '61)
- James M. Kallis, PhD (MS '61)  
Robert E. Long, PhD (BS '61)  
Roddam Narasimha (PhD '61, DAA)  
Daniel Ross (BS '60, MS '61)
- 1962**  
Charles R. Miller (BS '52, PhD '62)  
William F. Tivol, PhD (BS '62)
- 1963**  
William C. Boyle (PhD '63)  
Susan Y. Wu (PhD '63, DAA)
- 1964**  
Boris Auksmann (MS '58, ENG '59, PhD '64)  
Fred W. Dorr Jr., PhD (BS '64)  
Robert C. Leif (PhD '64)  
Richard A. Scott (PhD '64)
- 1965**  
Charles B. Archambeau (PhD '65)  
David T. Denhardt (PhD '65)  
Kenneth Kunen, PhD (BS '65)  
Jerry C. Peck (BS '57, MS '58, ENG '59, PhD '65)  
Walter A. Specht (BS '57, MS '61, PhD '65)
- 1966**  
James A. Aries (BS '66)  
William D. Harrison (PhD '66)  
Catalin D. Mitescu (PhD '66)
- 1967**  
Alfred J. Bersbach II, PhD (BS '67)  
Alan F. Klein (PhD '67)  
John M. Trischuk (PhD '67)
- 1968**  
Phillip R. Pfaffman (BS '68)
- 1969**  
Jean-Pierre R. Laussade (MS '65, PhD '69)  
Stanley T. Murayama (PhD '69)
- 1970**  
Peter W. Day (PhD '70)  
Daniel F. Higgins (MS '70)  
Edward J. Patula (MS '67, PhD '70)  
James R. Preer (PhD '70)  
John B. Trenholme (BS '61, MS '62, PhD '70)
- 1971**  
Rodney J. Crewther (PhD '71)
- 1973**  
Tyzz D. Lu (PhD '73)  
Henry J. Melosh IV (MS '71, PhD '73)
- 1974**  
Kim C. Border, PhD (BS '74)
- 1977**  
Madeline P. Shinbach (MS '77)
- 1978**  
Thomas R. Holm (MS '72, PhD '78)
- 1981**  
Roger P. Linfield (PhD '81)  
Stuart J. Vincent (BS '81)
- 1985**  
David E. Weisman (EX '85)
- 1986**  
Robert J. Cave (PhD '86)  
Jakob J. van Zyl (MS '83, PhD '86)
- 1990**  
Raymond G. Mayer (MS '90)  
Frederick G. Roeber (BS '90)
- 1994**  
Angela C. Shih (MS '90, PhD '94)
- 1999**  
Adam P. Showman (MS '99, PhD '99)
- 2016**  
Cassidy Yang (BS '16)
- Current Student**  
Sarah Guenov





Stanford University Archives

## From the Archives: Games Face

This summer, the eyes of the world will turn to Japan for a slightly out-of-the-ordinary Olympic Summer Games, offering the perfect opportunity to recall a previous notorious Olympics. After completing two degrees with honors at UCLA, James Ellis LuValle (PhD '40) competed for the U.S. in track at the 1936 Olympics in Berlin, earning a Bronze in the 400-meter event and, along with fellow medalist Jesse Owens, undercutting Adolf Hitler's misguided concepts of German exceptionalism. In 1937, LuValle won his place in Caltech history as the Institute's first Black graduate student, earning a double degree in chemistry and physics working with Linus Pauling. Lu Valle had a lengthy career, mentoring more than 900 students; working at places such as the U.S. Office of Scientific Research and Development, Eastman Kodak Laboratories, Smith-Corona Marchant, and Stanford University, and conducting research that resulted in three U.S. patents. – Based on research by Edray Goins, PhD (BS '94)

Photo, from left: 1936 Olympic competitors in Berlin, Godfrey Brown, Archibald Williams and James Lu Valle

PHOTOGRAPHER: LOTHAR RUEBELT – 1936 VINTAGE PROPERTY OF ULLSTEIN BILD



SEND ALL ADDRESS CHANGES TO:

Caltech Alumni Association  
MC 1-97  
1200 E. California Blvd.  
Pasadena, CA 91125

PHONE: 626.395.6592

EMAIL: [INFO@ALUMNI.CALTECH.EDU](mailto:INFO@ALUMNI.CALTECH.EDU)

# Caltech

## SEMINAR DAY

ALUMNI VIRTUAL EXPERIENCE

SATURDAY • MAY 15 • 2021

**FOR INFORMATION VISIT**  
[alumni.caltech.edu/seminarday](https://alumni.caltech.edu/seminarday)

### THE TRADITION CONTINUES

Join Caltech alumni from all over the world for a live, virtual experience featuring cutting-edge research and the alumni and faculty behind the breakthroughs.

Building on the success of the 2020 online event, Seminar Day will bring together our global community of Techers virtually, putting a fresh, new spin on an 84-year-old tradition.

- Dynamic virtual platform
- Connect with the global Caltech community
- Discuss the topics on the new Caltech Alumni Portal

**Caltech** | **Alumni**

**Satoshi Ohtake, PhD (BS '00)**  
Senior Director, Pfizer  
2021 Seminar Day Session Moderator

