

TECH



*Caltech
Alumni
Magazine
Spring
2023*

THE RIGHT FIT

Sizing up outdoor apparel

GROUNDBREAKERS

Reflections from Caltech's
pioneering women

KITCHEN AID

Inside the robotic restaurant revolution

THE FLAVOR FANATIC

How Harold McGee
makes scents of the world

2023

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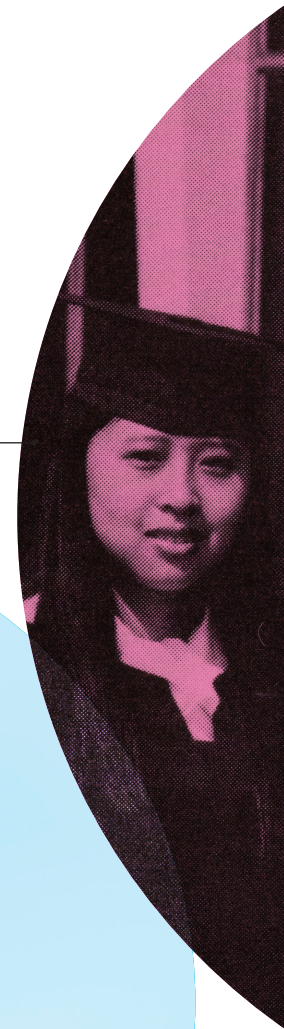
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"Each place has its own flavor, and the flavor of the world isn't restricted to food. It's all around you all the time—as you're walking down the street and you get a whiff of a tree, or somebody cooking, or the exhaust from a clothes dryer."

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Caltech Alumni Portal

Connect, engage, and grow with Caltech Alumni



With more than 25,000 Caltech alumni around the world, Techers are making a positive impact through science! Find out where your fellow alumni live on the **Caltech Alumni Portal**.

portal.alumni.caltech.edu

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MITCH TOBIAS

When Mitch Tobias isn't thoroughly enjoying the company of various Caltech alums, he's shooting campaigns and projects for Logitech, Uber Eats, eBay, Burst Oralcare, Cisco, Allstate Insurance, McDonald's and Peet's Coffee. He specializes in vividly fun, stylized lifestyle photographs of humans. Tobias also has another dimension: He's a music composer/songwriter — writing for all manner of media. He's also co-founder of the Exotica-Rock band, "APE." Look them up!

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COVER: Raquel Vélez, BS (BS '07)
Photograph by Mitch Tobias

TRANSMISSION

From the Board Chair of the Caltech Alumni Association



JENNIFER LEE, PhD (PhD '10)
Board Chair,
Caltech Alumni Association

There is no denying that the past few years have presented new and difficult challenges for all of us. Our kids will carry school memories vastly different from ours. We've missed so many family gatherings and milestones. Our workplaces likely will never return to pre-pandemic "normal." Most of us are still mourning losses, even as we embrace the differences the rapid changes have left.

Over my first six months as Chair of the CAA Board of Directors, I have become acutely aware of both the challenges and the opportunities as they apply to our community of 25,500 Techers. As an organization, and as individual Caltech alumni, we understand that the future looks a little different from what we had expected.

As Caltech alumni, we also are trained to see things from a different perspective. We know that our world, our work, even our personal lives, they all are in a constant state of change, and we adapt our thinking as data change and provide new information. Balance is not a passive act, it requires constant adjusting as circumstances change. Just think of how Caltech has adapted and changed since its founding in 1891.

The CAA Board of Directors and staff are excited for the future. Our mission to grow and support alumni relationships is clear. We seek ways to encourage a community that cultivates creativity, satisfies curiosity, and promotes well-being. Even during the worst of the pandemic, we found ways to encourage community using new tools, all while safeguarding our health. Elements of our programs and traditions will change for this new world, just as they evolved previously.

For 2023, the CAA Board and staff are planning for new, timely, and valuable programming, ensuring new ways to deliver on our commitments. The pandemic showed us a clearer picture of the global Caltech community we serve. (See pages 30-31 for more

Techer data.) It's a big challenge for our volunteers and a small-but-mighty professional staff of nine. So the CAA Board has approved an unprecedented investment of financial resources in FY23 to create and support the infrastructure needed for piloting new alumni programs and experiences in targeted regions throughout the U.S. and the world.

To achieve our goals, we need you to join this partnership. If you see a CAA event on the horizon, plan to attend—you never know who you might meet and what you might learn. Among CAA's new initiatives for alumni to engage and volunteer is Dinner Is Served, slated for the summer of 2023. Its success will depend upon alumni like you to host and enjoy dinners all over the world, held in the homes of Techers.

Most of us are not on Caltech's campus anymore, but our Caltech experience continues. We each bring a bit of Caltech to all of the communities in which we live, work, and play. I look forward to seeing you at our CAA events this year and hearing from you; my email is caaboardchair@alumni.caltech.edu.

A handwritten signature in black ink, appearing to read 'J Lee'.

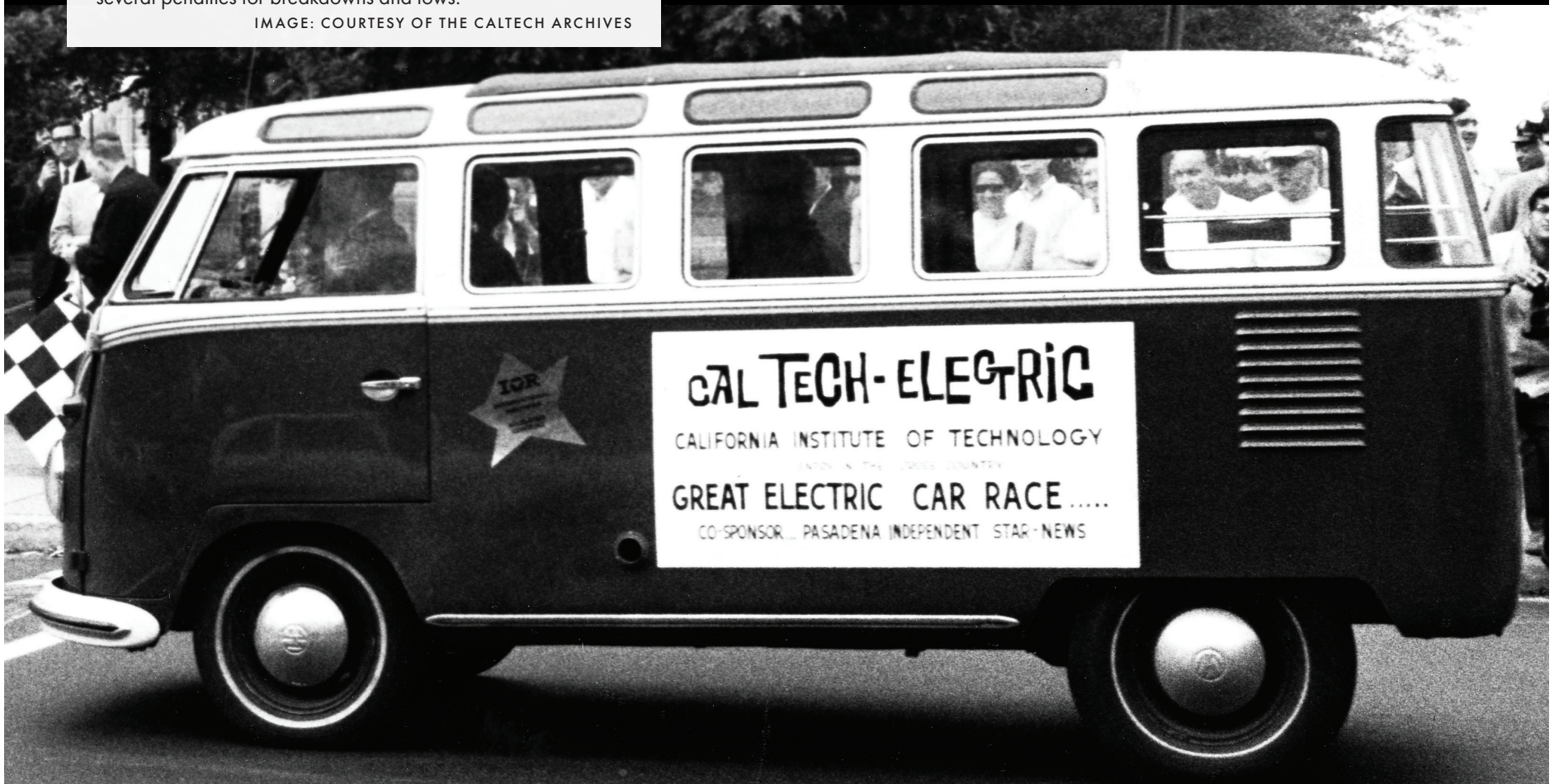
JENNIFER LEE, PhD (PhD '10)
Board Chair, Caltech Alumni Association

SHOCKING UPSET

In 1968, Wally Rippel, BS (BS '68) and his Caltech team challenged MIT students to a cross-country race of electric cars. Rippel's personally modified Volkswagen bus was the scrappy underdog, its floor covered with 20 lead-cobalt batteries, while MIT's fancier Chevy Corvair, donated by General Motors, used a set of \$20,000 nickel-cadmium batteries. The teams set off from Pasadena and Cambridge, respectively, with 54 charging stations set up along the route. MIT's car crossed the finish line first, but Rippel's bus was declared the winner after MIT suffered several penalties for breakdowns and tows.

IMAGE: COURTESY OF THE CALTECH ARCHIVES

TRANSFORMING



[Transforming]

BY WAYNE LEWIS • ILLUSTRATION BY MARIAN F. MORATINOS

electric avenues

With Brian Sisk, PhD (PhD '04) helming
battery design, Rivian is taking the electric
revolution off-road



“Trucks need electrification the most ... It made no sense that electrification started with egg-shaped vehicles that were already the most efficient. You’re pushing diminishing returns that way, whereas if you electrify a truck, that will make a meaningful impact.”

WHEN THE ELECTRIC-VEHICLE company Rivian Automotive first reached out to him in 2019, **Brian Sisk, PhD (PhD ‘04)** was used to fielding recruiting calls from startups. With EV technology taking off, his expertise in battery engineering and his leadership experience in the field were in high demand.

Sisk was also used to turning down those invitations. Summoning the healthy skepticism so often seen in Techers, he would always find a flaw in the initial pitch.

But Rivian was different. “It was the first time I couldn’t tear apart the business case within the first five minutes,” Sisk says. “It surprised me. With some due diligence, I saw a company that wanted to get a product to market, with a good investor group, backing, and leadership. Ultimately, I couldn’t find the

hole in their argument, so I was like, ‘I guess I have to join.’”

As senior director of energy storage systems, Sisk leads a Rivian team informally known as the “Battery Pack,” responsible for everything from system architecture and component design to testing and validation for the power sources behind the company’s trucks and SUVs. According to the latest public data, Rivian is working to fulfill over 200,000 orders, 100,000 of them for fleet delivery vehicles; already, more than 1,000 Rivian vans are making deliveries for Amazon. These automobiles have drawn plaudits—including *MotorTrend* naming Rivian’s R1T pickup 2022 Truck of the Year—but, as Sisk says, “that’s not why we do what we do. We do it so we can contribute to the transformation of transportation and help fight climate change.”

On a mission

The big picture informs Rivian’s very intention of electrifying off-road vehicles and fleet transport. Although those are classes of automobile that have come to the EV market later in the game, Sisk believes that the priorities should have been flipped from the start.

“Trucks need electrification the most,” he says. “It made no sense that electrification started with egg-shaped vehicles that were already the most efficient. You’re pushing diminishing returns that way, whereas if you electrify a truck, that will make a meaningful impact.”

Indeed, the larger mission supersedes business as usual from his point of view. Asked about what sets Rivian’s technology apart from competitors, he offers a gentle objection to the premise: “I don’t look at this industry as a zero-sum game. We’re really about defeating climate change more than we are about defeating any other car company.

“We can’t tackle that problem all by ourselves,” Sisk continues. “So we welcome other participants in the market, because we’re all pushing for the same goal. If we can push separately and make progress, then we all win. The climate wins. The world wins.”

Guided by data

Rivian’s success to date is the story of a serendipitous meeting of makers and market. Sisk speaks of Rivian with pride, first for the people he works with—on his team and across the company—and then for what they’ve accomplished together. The task of making high-performing, heavy-duty automobiles powered by battery is no small challenge. He and his colleagues have met it, producing along the way a vehicle that “shows the world a new way to build a pickup and new



Brian Sisk, PhD (PhD '04)

ways to think about truck design, engineering, and use case,” according to *MotorTrend*.

Sisk reserves some credit for Rivian’s customers. “We’ve done really creative things to pack as much energy as we can into a relatively small volume while still requiring it to do all the wild, adventurous things Rivian drivers do,” he says. “That can mean everything from water fording to rock crawling. What our customers want to do is a big part of what makes our technology exceptional.”

Part of the remit for the Battery Pack team is to turn data into useful insight that can help optimize battery performance and longevity.

“We have the ability to use data to help us understand how our battery is functioning,” Sisk says. “That makes our next products better, and even allows us to improve productivity in the field.”

Changing the world can be fun

During his doctoral studies, Sisk worked in the research group of Nate Lewis, PhD, the George L. Argyros Professor of Chemistry at Caltech. Sisk looks back with gratitude at both the team Lewis assembled and the atmosphere in which they worked.

“He built a culture that I absolutely treasured,” Sisk says. “Every day, I would wake up excited to take that next step in an experiment. I’d say that my time at Caltech was among the happiest of my life, for the combination of the people, the culture, and the science.”

Straight out of school, he worked in defense intelligence for about six years, then switched tracks to work in energy storage, first at Johnson Controls and then at A123 Systems, where he was vice president of product development. Today, he is one of almost 20 Techers working at Rivian.

That the company would draw so many from a small university doesn’t surprise Steven Low, PhD, Caltech’s Frank J. Gilloon Professor of Computing and Mathematical Sciences and Electrical Engineering. “Our students are very entrepreneurial,” he says. “Additionally, a lot of young people are enthusiastic about the energy transition. Rivian has a reputation for being cutting-edge and innovative, so there’s a natural fit.”

Sisk sees a lot of similarities between the cultures at Caltech and Rivian, especially their commitment to teamwork and their ambition. “What meant the most to me about my time at the Institute was how easy it was to collaborate with world-class people,” he says. “I could feel the welcoming, collaborative environment from the first day I set foot on campus.

“Rivian has a lot of the same qualities—people wanting to join together to solve major problems, such as climate change, but also wanting to do something truly awesome.” ■

“We have the ability to use data to help us understand how our battery is functioning. That makes our next products better, and even allows us to improve productivity in the field.”

THE RIGHT FIT

INTERVIEW BY MAUREEN HARMON

PHOTOGRAPH BY MITCH TOBIAS

Raquel Vélez, BS (BS '07) didn't grow up with an appreciation for the great outdoors. "My family is from Puerto Rico," says Vélez, "and the idea of voluntarily sleeping on the ground outside in the cold was not my parents' definition of success." Even so, she fell in love with skiing as an adult living in California. But when she visited her local retailer to buy ski pants, she was disappointed—nothing fit her body. "You don't feel like you're a part of the community if you can't wear the

clothing," she says. Having made her own jeans in the past, she opted to make her own ski pants—and by 2019, she launched her outdoor apparel company, Alpine Parrot, geared toward bigger bodies.

Techer talked to Vélez, who has a background in mechanical engineering, about her pivot from tech to fashion, the stereotypes that affect the apparel industry, and how sustainability is still possible in a world of fast fashion.

Why do you think the outdoor apparel industry has been so slow to adopt new sizes?

Raquel Vélez: I'll give you a couple of facts. Fact number one: 68 percent of American women wear sizes 14 and up. Fact number two: Less than 20 percent of outdoor apparel is made in plus sizes. It really comes down to fat phobia. There's this total misconception that people in bigger bodies don't engage in physical activities; or that if you have more weight on your body, it would

be too hard to go outside; or that bigger-bodied people are lazy, so they have no desire to go outside. Not true. Then there's the really awful argument of, well, maybe you should exercise more so you wouldn't be fat. Except, what are you supposed to wear to exercise?



“Fact number one: 68 percent of American women wear sizes 14 and up. Fact number two: Less than 20 percent of outdoor apparel is made in plus sizes. It really comes down to fat phobia.”

You had carved out a successful career as a mechanical engineer in tech. What led you to fashion?

RV: What started as a plan to make my own jeans because I couldn’t find any that fit, eventually led me to pattern-making courses. The final project in one of the classes was to design an eight-piece line. So I presented a plus-size, women’s skiwear line.

My teacher pulled me aside and said, “You need to do this. There are a lot of people just like you, and you are your own customer. You understand their needs better than anybody else.” She told me I had an opportunity to really change an industry. That sat with me for a few months until I finally made the leap from tech to fashion.

How did your engineering background come into play?

RV: I often will tell people that I got my degree in mechanical engineering from Caltech, then went on to be a robotics engineer, then a software engineer, and now I’m an apparel engineer.

In all seriousness, the process of patternmaking is simply mechanical engineering, but with fabric instead of metal. I use my engineering background constantly, both in the literal development of our products, as well as in the general day-to-day running of my company—the engineering way of thinking is the only way I know to build a company that will scale over time.

Where did the name Alpine Parrot come from?

RV: There is one species of alpine parrot in the world. It’s called the kea and it lives in the Southern Alps of New Zealand. When you think about parrots, you think of colorful birds that hang out on the beach and dance and sing. But the alpine parrot lives in the mountains. It plays in the snow. It’s super smart, really friendly, but it has this basic olive-green exterior. Yet when it flies, it has these beautiful rainbow underwings that take your breath away. When I think about the people that I serve, particularly people of size and people of color—people like myself—there are all of these stereotypes that have been put on us about the outdoors. But the reality is, when we’re in our element, just like the alpine parrot, we shine.

How are you tackling sustainability issues in an apparel industry that is notorious for waste?

RV: There is a lot of very intentional design in our products. We want to make sure we are making the most useful products for our customers, and we want those products to last as long as possible. For example, the fabric in our Ponderosa pants is stretchy because bodies are constantly changing. But it’s also breathable, quick-drying, and abrasion-resistant. The abrasion resistance is important, not just when you’re hiking—the inner thigh is the first area where pants start to fall apart for bigger-bodied folks.

There are products out there that will have three or four different fabrics in the same garment. All of our products use the same fabric throughout the garment, so we can get as much use out of every roll of fabric as possible.

To minimize environmental effects of shipping, we use a lot of the same items across our products. So the buttons on our flannel shirts are the same buttons on our pants. The dyes for our products are Bluesign approved, which means that an independent third party has confirmed that these dyes are not toxic. And every single person who is involved in making our products is being paid a living wage and working under good conditions.

What’s on the horizon for Alpine Parrot?

RV: Alpine Parrot has had slow and steady growth. We spent a lot of time doing fit testing to make sure that people really felt confident in our clothing. We’ve got shorts and hoodies on the horizon. We’ve got rain jackets. My goal is to have everything that you would find in any outdoor apparel store. I want to make sure that every single bigger-bodied human who loves to engage in the outdoors has what they need to be safe and comfortable. It’s really basic. People ask, “What novel invention do you have?” And I say, “Nothing. I just make clothes that fit.” ■

PIONEERING

SOLVING THE EQUATION

Lorraine Lois Foster (PhD '64) demonstrates her skill at dissecting mathematical matrices—the topic of her dissertation, which secured her place as the first woman ever to earn a PhD in Mathematics from Caltech. Foster was born in Culver City, California, in 1938 and received her undergraduate physics degree from Occidental College in 1960. After graduating from Caltech, she became a faculty member at California State University, Northridge, working in Number Theory and Mathematical Symmetry, and ended her career at CSUN as Professor Emerita of Mathematics.

IMAGE: THE LOS ANGELES TIMES PHOTOGRAPHIC COLLECTION, UCLA LIBRARY DIGITAL COLLECTIONS

[*Pioneering*]



MINT GREEN


HOW ETHAN FREY IS USING
CRYPTOCURRENCY TO ADDRESS
CLIMATE CHANGE



ETHAN FREY (BS '99) didn't find cryptocurrency—it found him. He was at a political conference in Berlin in 2014, and the only guy in the room wearing a suit approached him with a radical idea about a new kind of currency that was community-controlled and governed by rules favoring productive members of the community rather than just the powerful. "That sounds great," Frey told him, "but the banks will never buy it." No, the man in the suit said: "With blockchain, you can make your own money, with its own rules." Frey imagined the possibilities: an unhackable, equitable economic system. The kind of system that might, for instance, only loan money to businesses that were certified green.

BY DAN MORRELL

ILLUSTRATION BY
L.J. DAVIDS



The idea was perfectly suited to Frey's background. Raised in Oakland as the son of a computer programmer, he was interested in tech early, writing code on a Commodore 64 as a child and eventually studying computer science at Caltech. "That's where I really learned hardcore programming—and the theory that I still use today," says Frey. He spent his early career in software and later moved into web development, with a years-long detour into organic farming. In the eight years since meeting with the man in the suit, Frey has become a leader in the crypto space, launching several popular new crypto projects and appearing at industry conferences and on podcasts.

The combination of sustainability and technology is at the heart of Frey's new venture, Wynd, a cryptocurrency with an environmental mission. In this conversation with *Techer*, Frey talks about how his project works, the kinds of big ideas he hopes to support, and what a wider revolution will require.

How did you come up with the idea for Wynd? And how exactly does it work?

Ethan Frey: Wynd is a result of trying to find an idea to support the environment that was most likely to work and that also had the shortest path from idea to action to impact. So we built a blockchain-based currency exchange that sends 25 percent of all transaction fees to a transparent environmental impact fund. The more people that trade our tokens, the more money that goes to environmental efforts.

The fees are only about 0.1 percent of the transactions, so they are small amounts. But if you're eventually getting millions or tens of millions of transactions a day, that 0.1 percent can add up.

To launch the project, we gave out a bunch of free tokens and then created a governance system that allows users to vote on changes to the system. Right now, Wynd users are essentially debating how to debate, but when they get to start choosing the environmental project grants and addressing other really hard questions, it will be really interesting to watch.

What are some of the ideas that you would love to see Wynd move forward?

EF: We want to give money to projects that are moonshots. One of the projects we're looking at is called the Weather Makers, and their big plan is to regreen the Sinai Peninsula. The Sinai is a total desert between Egypt and Israel, but in pre-Egyptian times, it was actually a forested area with pastures and they could harvest there. Then agriculture basically decimated it about 4,000 years ago.

So the Weather Makers are talking about seeding ecosystems in the desert that are based on saltwater, growing them out, and making them sustainable. We already have this problem around the world of expanding deserts, and people are even trying to build walls of trees to stop [those deserts] growing. But if we can regreen deserts, that's a whole new solution. And I'd like to direct some money to help push that project along.

You have said that bear markets are the best time to build. Can you talk to me about the current state of crypto as you see it and why you think it's true that bear markets are the best time to build?

EF: At some point in the bull markets, it's speculation upon speculation: The price is going up and people buy in trying to make a quick buck. When it collapses, all the "quick money" people leave, but the people that really believe in it for the long term avoid a lot of that noise. And when it's down, it's a lot quieter and people can focus on asking, "Okay, what do you want to be two or three years from now?" I want to build long and steady, stable growth.

"I have a son and I want him to have a decent planet to live on when he's older. So this is about me saying, 'Hey, I have this cool tech talent and I want to do something to actually impact the future.'"

The cryptocurrency world still feels a bit insular. How do you make these revolutionary ideas more widespread?

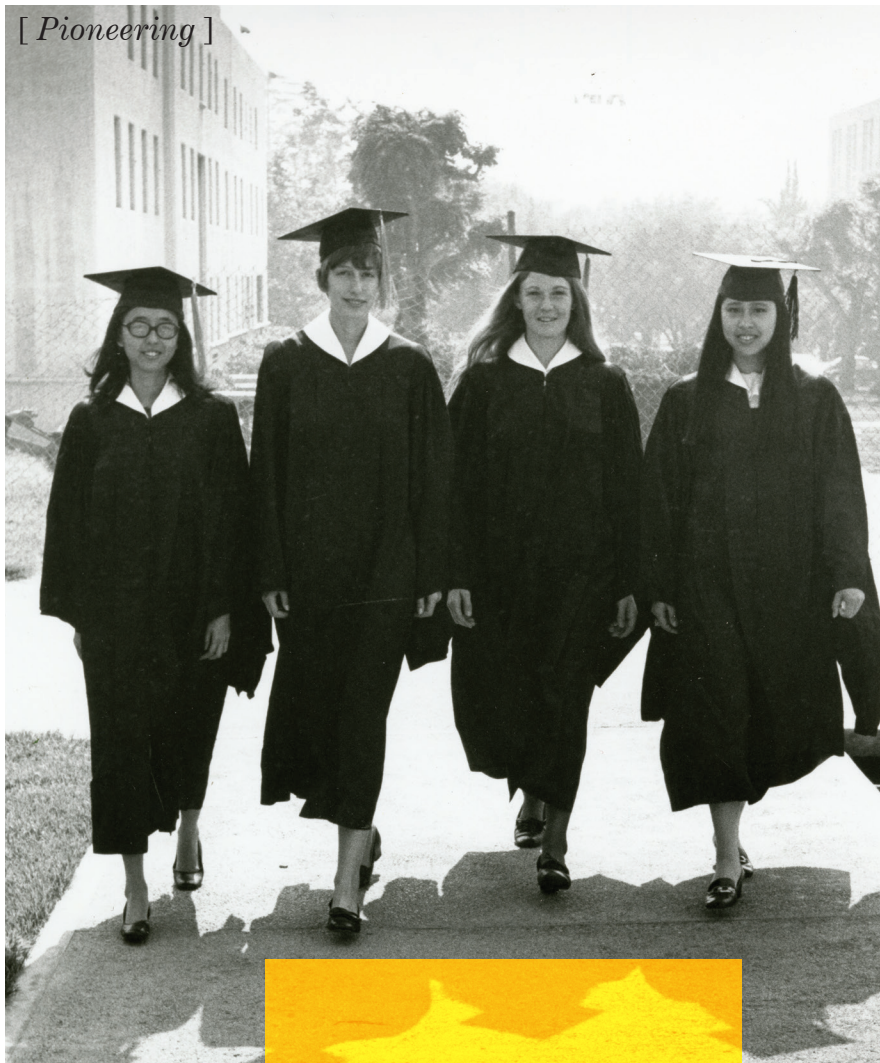
EF: Yes, there's still a very small population involved in the crypto space. To make it a real revolution, it has to get out of the crypto world. So you can build new models like Wynd with experimental people—the crypto types who will take the risks—and then once it's really stable, you can start expanding. Maybe you can get UNESCO or the World Wildlife Fund involved by saying, hey, we have a functioning program that works on a small scale, and it's not some Ponzi scheme—I can actually explain why it works.

At the end of the day, if we make something that works in our world, and say, the World Bank copies it, and does the exact same thing, it's a success. I don't need to make money off it. It's not about me making a fortune. Expanding the idea is really the essential part.

I have a son and I want him to have a decent planet to live on when he's older. So this is about me saying, "Hey, I have this cool tech talent and I want to do something to actually impact the future." That's meaningful. So I'm passionate about sharing that vision and hope more people join in it. ■



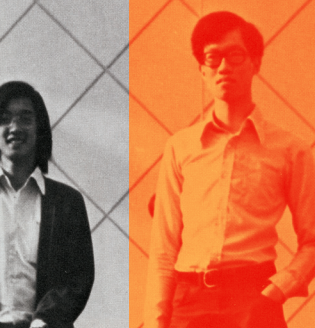
[*Pioneering*]



STEPHANIE CHARLES

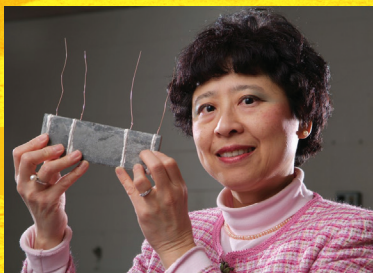


SHARON LONG



DEBORAH CHUNG





GROUNDBREAKERS

BY MARISA DEMERS

ON THE 50TH ANNIVERSARY OF THEIR GRADUATION,
THE FIRST WOMEN TO EARN BACHELOR'S DEGREES
AT CALTECH REFLECT ON THE EXPERIENCE

FOR DECADES, some of the brightest minds at Caltech debated the merits of educating women at the Institute. Could they handle the rigor? Would they contribute to their fields or stay home and raise a family? Would coeducation become a failed experiment?

In spring 1973, four young women walked across the commencement stage prepared to make their marks on the world in science, engineering, at home, and anywhere else they wanted.

STEPHANIE CHARLES, MS (BS '73) graduated with honors. Future engineer. **SHARON LONG, PHD (BS '73)** graduated with honors. Future biochemist and professor. **DEBORAH CHUNG, PHD (BS '73, MS '73)** graduated with honors. Future engineer and professor. **FLORA WU, MD (BS '73)** graduated with honors. Future physician.

All were transfer students and made history as the first women to earn undergraduate degrees from Caltech. On the 50th anniversary of their graduation, three of these alumnae, Charles, Chung, and Long, spoke to *Techer* about their experiences as Caltech pioneers. (Flora Wu could not be reached for an interview.)

ON DECIDING TO APPLY

CHUNG: I went to King's College, which was one of the top secondary schools for math and science in Hong Kong. When I was accepted to Wellesley College, my parents and I were very proud. It is an excellent school but none of us knew what a liberal arts education meant! In my first year, I was already taking senior-level mathematics courses. I felt like there was not a whole lot left for me to learn. I went crying to my foreign student adviser, and she helped me transfer. I don't remember how many schools I applied to, but Caltech was always top in my mind.

CHARLES: My dad was in the missile business and dealt with scientists and engineers, which were careers I was interested in. He was very influential in my life and suggested I focus on three schools: Caltech, MIT, and Harvey Mudd College. In 1969, we visited all three. Caltech was truly my first choice from the beginning, but they said they were not accepting women that year, and to try again next year. When they admitted me in 1970, it was a no-brainer that I would attend.

LONG: From the time I was in high school, I had already identified biochemistry as something I wanted to study. I liked Caltech because it offered a broad education in biology, chemistry, and biochemistry. The year I was a freshman, Caltech was not open to women, and I went to Harvey Mudd College instead. At that time, it was just a fact of life that there were both all-men's and all-women's institutions. I did not think of my situation through a larger lens of what it said about society.

STEPHANIE CHARLES

"I was on the board of the Caltech Alumni Association for eight years and went to just about every graduation during that time. I remember thinking that I would have to count the number of women to verify if they were still a minority."

ON BEING THE ONLY ONE IN CLASS

CHUNG: My high school was actually a boys' school that accepted some girls in the later grades, so I was used to that environment. Obviously, I am all for women getting opportunities, but at that time, I just wanted to learn and do my best. I transferred to Caltech in 1971 and earned my bachelor's and master's in two years. My focus was on my studies.

The students at Caltech were pretty open, and I do not remember the boys saying anything negative to me. I am sure I would have ignored them if they did. Whatever other people might have thought of me was their problem, not mine.

I lived in Lloyd House. [Female-only corridors were established in some of the houses.] They did some crazy things like throw mud at each other. That craziness was a bit too much for me but it helped us all become a closely-knit group. My experience in the house was like brothers and sisters hanging together, doing crazy things and studying together.

CHARLES: In 1970, Sharon and I were the only female sophomores. In most of my physics classes, I was the only woman. I never had anyone be negative to me. Yes, women were a tiny minority at the time, but we were getting good grades.

If I were inclined to be sensitive, the one thing that could have been taken negatively was when a physics teaching assistant got drunk and expressed relief that the "distraction" of having women on campus had not dragged down the guys' grades. But I laughed it off because it was a skeptical comment about the men, not the women.

LONG: Being such a tiny minority at Caltech was informative because whatever metric you picked—How smart are you? How tall are you? How ambitious are you? How insecure are you?—I was in the middle of the distribution. There were men who were smart and not as smart. There were men who were confident and shouldn't have been, and men who were not confident and should have been. It helped me see that the traits of being smart, ambitious, or insecure have nothing to do with your sex or gender. Because of that experience at Caltech, I didn't feel intimidated or out of place in later education and work situations.

DEBORAH CHUNG

"For many of the professors, this was the first time they had women in the classroom. It was important for everyone to see that we behaved like any other student."

ON SETTING THE TONE

CHUNG: Going co-ed was a new experience for both teachers and students. For many of the professors, this was the first time they had women in the classroom. It was important for everyone to see that we behaved like any other student.

CHARLES: I was very rarely treated differently from other students. Only one instance comes to mind. In my first year, I took karate from Tsutomu Ohshima, who was the man that brought shotokan karate to Israel, France, and the United States. [He also founded the Caltech Karate Club in 1957.] He was just an extraordinary man, but I don't think he ever taught women before. There were maybe three or four other women who were in the class with me.

One time early on, he had told everyone to do knuckle pushups, and I remember him looking at us girls. He waited for some time and said, "OK, girls can do pushups on their palms." Karate is just as much about developing the mind as it is about developing strength, so all of us said no. He never again tried to separate us.

LONG: When female undergraduates arrived on campus, there were already women who had more senior roles, such as grad students and teaching assistants. It gave me a sense of continuity in the scientific community. I remember the Caltech Y organized some talks by women who were outstanding established scientists, including Dr. Chien-Shiung Wu [a physicist who worked on the Manhattan Project], and that was a great gift. It was helpful to see women who really loved science and who stuck with it.

“When female undergraduates arrived on campus, there were already women who had more senior roles, such as grad students and teaching assistants. It gave me a sense of continuity in the scientific community.”

ON GRADUATING

CHUNG: Graduation was the first time that Caltech really took notice of this moment. They photographed Sharon, Stephanie, Flora, and me in our caps and gowns, and I remember it being on the cover of E&S magazine [now Caltech Magazine]. I think we made the local newspaper, too. But before then, I never had a feeling of being different, which was good, actually. But at graduation, I realized that, wow, this is different.

CHARLES: I remember [Nobel laureate and Caltech professor Richard] Feynman walking up to me and saying “You’re the first,” which was related to the fact that Charles comes earlier in the alphabet than Chung or Long or Wu. The professor who handed me my diploma on stage made that comment, too. A great deal has been made of my being the first. I have an assortment of friends who will loudly announce this at gatherings. I do not make a big deal out of it, but it’s amusing since it has more to do with alphabetical order and Caltech being slow to admit women than with anything I actually did.

I was on the board of the Caltech Alumni Association for eight years and went to just about every graduation during that time. I remember thinking that I would have to count the number of women to verify if they were still a minority. Now everyone expects to see a lot of women on campus, and that is a welcome change.

EPILOGUE

After graduation, Charles moved to Northern California to earn a master’s in electrical engineering at Stanford University. She remained in Silicon Valley and worked as an engineer in the telecommunications industry for nearly 30 years. Since retiring, Charles has been an American Red Cross volunteer leader, who ensures that people displaced by fires, floods, or other natural disasters have access to shelter and food.

Chung also attended graduate school. She received a doctorate in materials science at MIT, and has been a professor of mechanical and aerospace engineering at the University at Buffalo, The State University of New York, since 1986. Recognized as a leading scientist in her field, Chung is ranked 10th among all living materials researchers in the world, according to a 2022 study based on publications and citations. She also created smart concrete, which contains carbon fiber that renders with self-sensing abilities to the concrete. With Chung’s invention, engineers using an electrical probe can detect stresses, deformations, or damage in concrete before they become visible.

Currently a professor at Stanford University, the 1992 MacArthur Fellow seeks to understand how symbiotic bacteria interact with their plant hosts. Her work established that bacteria and plants recognize and control each other by exchange of chemical signals. She is an elected member of the National Academy of Sciences and has received other recognitions. ■

PAPER TRAILS

For Robert Lang, PhD (BS '82, PhD '86), the principles of mathematics and engineering have proven essential to his standing as one of the world's leading masters of origami. Lang's origami has yielded useful applications in industrial design—from airbags to expandable space telescopes—while awing viewers with its astonishing realism. This grizzly bear is made from a single sheet of handmade paper called "O'Malley Crackle," which Lang says "is one of my favorite papers for wet-folding—the technique used here—and I think its texture perfectly suits the subject." Caltech recognized Lang in 2009 with a Distinguished Alumni Award.

IMAGE: COURTESY OF ROBERT J. LANG

ENRICHING



[*Enriching*]

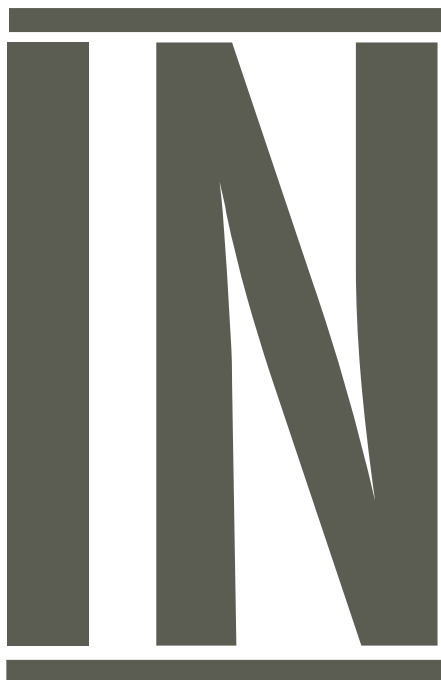




BY MARISA DEMERS • PHOTOGRAPHY BY AMANDA FRIEDMAN

KITCHEN AID

Americans love eating out. They spend more money at their coffee shops, cafés, and chain restaurants than at their local grocery stores. Yet this boon, which began in 2016 and tapered for a few months in 2020, has not made owners or workers significantly richer. The restaurant industry has slim profit margins that average between three and five percent, according to the National Restaurant Association. And today, a labor shortage, inflation, and soaring food prices are eating into those modest gains.



IN A SECTOR eager to cut costs, RYAN SINNET, PHD (BS '07) has developed a solution. As cofounder and chief research officer at Miso Robotics in Pasadena, Sinnet sees the untapped potential of a human-robot workforce.

"When you take a deep look at the industry, it is hard to see how it can be sustainable," Sinnet says. "Then you look at all the interesting ways robots are being deployed in other fields and you wonder why restaurants are being left behind."

Since its inception in 2016, Miso Robotics' offerings have been increasing

kitchen productivity and reducing food waste, all with minimal human intervention. Its flagship series, known as Flippy, features robotic arms that flip burgers, fry chicken wings and french fries, and cook and season tortilla chips. Newer models include Sippy, an automated soda fountain, and CookRight Coffee, which monitors an urn for coffee temperature and levels.

Sinnet is involved in all aspects of his company's inventions. Together, Sinnet and Miso Robotics have been awarded eight patents, and their latest version of Flippy was named to *Time* magazine's "Best Inventions of 2022" list. The industry has also responded to Miso Robotics' vision of the modern fast-food kitchen: The startup has raised more than \$70 million in crowdfunding and has clients such as Panera Bread, Chipotle, and Jack in the Box.

"YOU LOOK AT ALL THE INTERESTING WAYS ROBOTS ARE BEING DEPLOYED IN OTHER FIELDS AND YOU WONDER WHY RESTAURANTS ARE BEING LEFT BEHIND."

"I WANTED TO BUILD STUFF"

SINNET DEVELOPED an interest in computers early on. At 5 years old, he grabbed his father's BASIC learning manual and taught himself the programming language. As a teenager, he had a side gig as a web developer for a few startups. At Caltech, Sinnet was exhilarated to find others who enjoyed science and technology as much as he did, but he also struggled with the demanding course load, an experience he likened to "taking a pounding against the shoreline." To relax, he headed to the Caltech gym. Sinnet joined the men's basketball team and played pickup games with other students and alumni, including DAVID ZITO, BS (BS '97). He also spent time in the weight room and befriended Aaron Ames, a postdoctoral scholar who wanted to advance the field of robotics. They both shared an interest in control

theory, which in robotics means moving from point A to point B as efficiently as possible. When Ames accepted a faculty position at Texas A&M University, he invited Sinnet to join his research group. Ames returned to Caltech in 2017 as the Bren Professor of Mechanical and Civil Engineering and Control and Dynamical Systems.

From 2008 to 2015, Sinnet helped Ames engineer a human-like gait for robots. As exciting as it was to push the boundaries of robotics, Sinnet wanted to work on projects that could be quickly translated outside of the lab. After completing his doctorate, he returned to Los Angeles and developed software and artificial intelligence tools to help create a sustainable, solar-powered farm. Then, Sinnet heard from Zito, who had become the founding chief executive officer of Miso Robotics. He had already recruited ROB ANDERSON, BS (BS '16) and invited Sinnet to meet the other cofounders.

"There is no way I could have mapped this future," Sinnet says. "Aaron wanted to make walking robots, and I was not sure what I wanted to do, but I knew I wanted to build stuff. By being open to opportunities and building my knowledge, I found that when I finally stumbled onto my career path, I was prepared."

“DON’T TAKE AWAY MY ROBOT”

MISO ROBOTICS started as an unproven idea. John Miller, chairman and chief executive officer of the parent company of fast-food chain CaliBurger, and venture capitalist Buck Jordan wanted to bring innovation into the kitchen. They looked to Sinnet, Zito, and Anderson to engineer a product.

Thrilled at the prospect of devising a disruptive technology, Sinnet discovered that the artificial intelligence technologies he learned in Ames’ lab—computer vision, machine learning, and forecasting—could be adapted for restaurant robots. He needed patience, a willingness to understand the industry, and some Caltech ingenuity. “We brought in Techers as employees and interns when we were starting from zero,” Sinnet says. “They brought so much creativity early

on. I don’t think we could have gotten where we are today without all their help.”

The first iteration of Flippy debuted at CaliBurger in 2018, less than a mile from the Caltech campus. Part worker and part spectacle, Flippy cooked patties from a demo kitchen designed to attract customer interest. The robot used computer vision to identify food, a thermal camera to track the temperature of the patties, and control theory to pick up a spatula, flip the burgers, and clean the grill. The newer version of Flippy, which is configured for frying food, builds on these technologies to cook several types of food at once and to forecast customer demand.

Sinnet spent considerable time at CaliBurger, searching



for ways to improve Flippy’s operations and functionality. In the process, he befriended the CaliBurger staff and saw them grow fond of Flippy. They gave it their own nickname and one joked with Sinnet, “Don’t take away my robot.” No one expressed concern about robots taking their jobs, Sinnet says.

He attributes this harmony to two factors. First, robots cannot compete with human

workers—at least not yet.

“A human can learn and perform hundreds of tasks in a day,” Sinnet says. “It takes comparatively longer to teach a robot to do just one.”

Second, restaurant workers have enough to do. As employers searched to fill open positions, Miso Robotics test sites increased kitchen productivity by 30%, according to the startup. Staff has more time to

engage in tasks that are more meaningful to humans, such as interacting with customers, Sinnet says. “My work has always been about using technology to advance human welfare. Let’s solve the easy and mundane problems and then focus on the harder ones that we are passionate about.” ■

Harold McGee on how to make scents of our world

The Flavor Fanatic

By Zach Kelch • Photograph by Gabriela Hasbun

“**W**hat is it about food that makes it so appealing? We need to eat, we need to fuel ourselves, but why is it delicious?” **Harold McGee, BS (BS ’73)** began asking himself these questions in the 1970s as an undergraduate at Caltech while taking part in what Blacker House called its “Posh Dinner Parties.”

“We would get dressed up in jacket and tie and would commandeer the kitchens at the Athenaeum and wheel things back and forth through the steam tunnels,” he recalls. “We would come up with menus and wines and have, for that age, really nice meals.”

These friendly group discussions around the dinner table, critiquing the food in front of them, planted a seed of interest for McGee. And over the next five decades, his interest blossomed into an impassioned exploration of the science of food, leading to his most recent book, *Nose Dive: A Field Guide to the World’s Smells* (Penguin-Random House, paperback, 2022).

In the book, 2010 Distinguished Alumni Award recipient McGee takes readers on a sensory adventure, sniffing through the matter we breathe in—the good and the not so good—to form a comprehensive understanding of the “flavor” of the world

around us. And although the book focuses on a more universal understanding of smell, McGee was originally inspired by his love for food. “When I was in school, we didn’t really know that much about what it is in food and drink that stimulates our senses, or how it is that our senses process that information,” McGee remembers.

“Smell is a sense that allows us to evaluate our local environments but also what’s in our mouths and going into our digestive systems. That crossover really fascinated me and that ended up taking me down the path,” he continues.

His first book, *On Food and Cooking*,

became a kitchen and classroom classic after its debut in 1984, and was dubbed a “minor masterpiece” by *Time* magazine for building a revolutionary bridge between the technical science of food and the joyful habits of cooking.

McGee intended to follow up the second, 2004 edition of *On Food and Cooking* with a similarly food-focused guide to flavor, but as he began his research, he became intrigued with how food aromas echo smells in the rest of the world. “I thought I was going to write about food and drink,” he says. “I already knew them pretty well. But then to learn about perfume, and astrochemistry, and

“Each place has its own flavor, and the flavor of the world isn’t restricted to food. It’s all around you all the time—as you’re walking down the street and you get a whiff of a tree, or somebody cooking, or the exhaust from a clothes dryer ... There’s a lot going on around us all the time, and it can be fun to pay attention to it every once in a while and realize what it’s coming from.”

confined animal feeding operations... I didn’t know anything about that stuff, so I had to really learn from the ground up in a bunch of fields that were new to me, which was both the challenge but also the fun.”

Nose Dive offers readers a guide to the smells of the universe, beginning with the Big Bang, and reveals one of McGee’s personal rules to remember: from food to environment, always stop and enjoy the simple scents of every day.

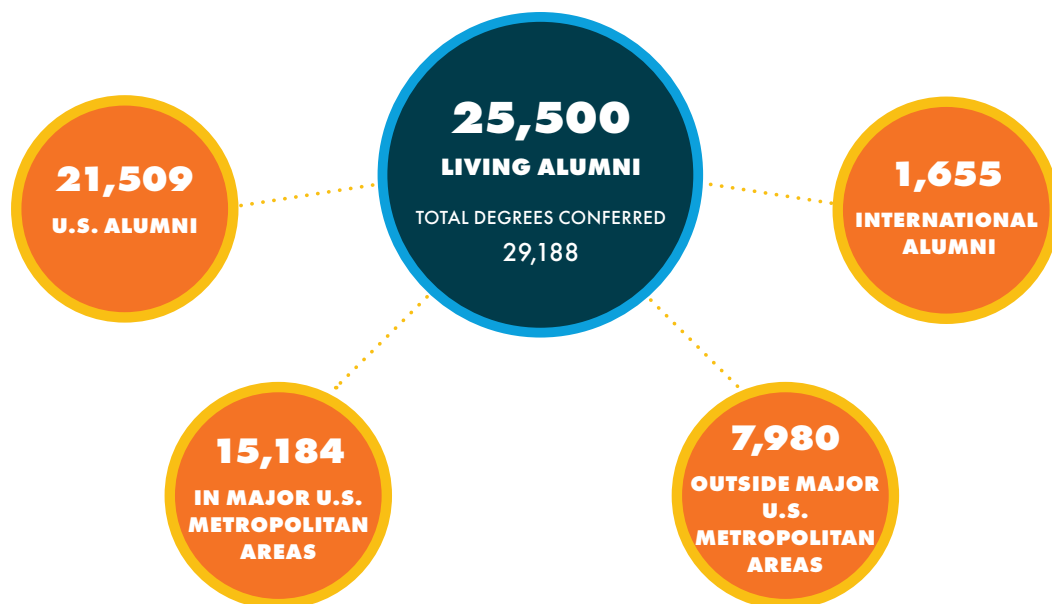
“Each place has its own flavor, and the flavor of the world isn’t restricted to food. It’s all around you all the

time—as you’re walking down the street and you get a whiff of a tree, or somebody cooking, or the exhaust from a clothes dryer,” he says. “There’s a lot going on around us all the time, and it can be fun to pay attention to it every once in a while and realize what it’s coming from.” ■



CALTECH ALUMNI BY THE NUMBERS

THE CALTECH ALUMNI ASSOCIATION (CAA) WAS FOUNDED IN 1920. Today, CAA serves a growing community of 25,500 Caltech alumni around the world, including some of the brightest minds in science, engineering, and business. Despite the many unprecedented challenges, which began in late 2019 with the COVID-19 global pandemic, CAA continues to provide programming, support, resources, and connection opportunities for Techers.



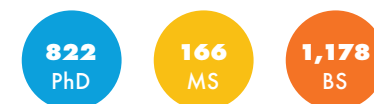
NOTES ABOUT THE DATA:

- Data is current as of January 10, 2023.
- Of Caltech's 25,500 living alumni, the Institute has verified contact information for 24,593 alumni. Numbers included on these pages are subsets of the Contactable Alumni data.
- In/Outside Major US Metropolitan Areas excludes 1,453 alumni contactable via email, but without a current physical address on record.
- Alumni By Degree and Division will vary from total number of alumni due to Techers who have earned multiple degrees at Caltech.
- Currently Caltech data only allows for binary capture of gender, but Caltech is aware of the issue and working on solutions to allow alumni more inclusive, non-binary options in the future.

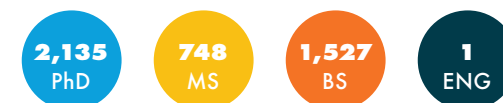
To update your contact information, send email using the subject line "Contact Information Update" to info@alumni.caltech.edu.

ALUMNI BY DIVISION AND DEGREE

BIOLOGY & BIOLOGICAL ENGINEERING



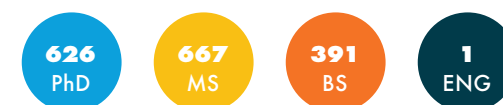
CHEMISTRY & CHEMICAL ENGINEERING



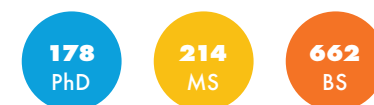
ENGINEERING & APPLIED SCIENCE



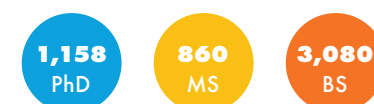
GEOLOGICAL & PLANETARY SCIENCES



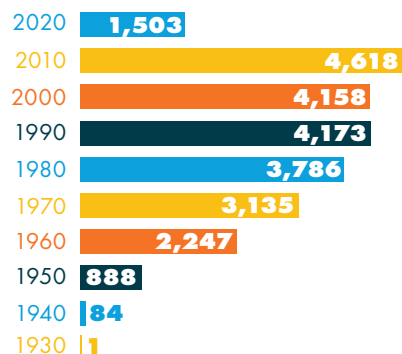
HUMANITIES & SOCIAL SCIENCES



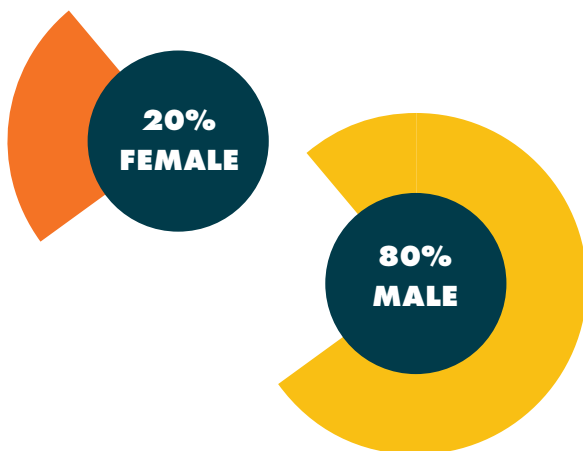
PHYSICS, MATHEMATICS & ASTRONOMY



ALUMNI BY DECADE



ALUMNI BY GENDER



15,846/41%
E-TECHER RECIPIENTS
AND OPEN RATES
(PER ISSUE)

TOP 20 EMPLOYERS OF ALUMNI

- 1 CALIFORNIA INSTITUTE OF TECHNOLOGY
- 2 ALPHABET/GOOGLE, INC.
- 3 JET PROPULSION LABORATORY
- 4 STANFORD UNIVERSITY
- 5 MASSACHUSETTS INSTITUTE OF TECHNOLOGY
- 6 UNIVERSITY OF CALIFORNIA, BERKELEY
- 7 INTEL CORPORATION
- 8 MICROSOFT CORPORATION
- 9 APPLE INC.
- 10 UNIVERSITY OF CALIFORNIA, LOS ANGELES
- 11 THE BOEING COMPANY
- 12 UNIVERSITY OF SOUTHERN CALIFORNIA
- 13 RAYTHEON COMPANY
- 14 HARVARD UNIVERSITY
- 15 META PLATFORMS/FACEBOOK
- 16 UNIVERSITY OF WASHINGTON
- 17 IBM CORPORATION
- 18 UNIVERSITY OF CALIFORNIA, SAN DIEGO
- 19 NORTHROP GRUMMAN CORPORATION
- 20 THE AEROSPACE CORPORATION

UPCOMING CALTECH ALUMNI EVENTS

*Details and additional events to come.
For the most up-to-date information, visit
www.alumni.caltech.edu*

2023

CALTECH IN SILICON VALLEY	MARCH
TECHER TOURS: LEGENDS OF THE NILE	MARCH 28– APRIL 8
CALTECH IN THE DISTRICT OF COLUMBIA	APRIL
SEMINAR DAY (HYBRID)	MAY 13
SENIOR DINNERS (STUDENT EVENT)	MAY 15-17
COMMENCEMENT AND DISTINGUISHED ALUMNI HONORS	JUNE 16
DINNER IS SERVED (AROUND THE WORLD)	JULY 22–23
CALTECH IN SILICON BEACH/WEST LA	AUGUST
CALTECH INTERNATIONAL VOLUNTEER DAY	AUGUST
DISTINGUISHED ALUMNI IN CONVERSATION, WEBINAR	SEPTEMBER
TECHER TOURS: JOURNEY TO SOUTHERN AFRICA	SEPTEMBER 24– OCTOBER 9
ALUMNI WEEKEND AND REUNIONS CELEBRATION	OCTOBER 20-22

2024

TECHER TOURS: TOTAL ECLIPSE WITH DOUG DUNCAN	APRIL 6-9
TECHER TOURS: PARIS & THE AFRICAN AMERICAN EXPERIENCE	MAY 11-19
TECHER TOURS & ASSOCIATES: GALAPAGOS STUDY TOUR	AUGUST– SEPTEMBER

Caltech | Alumni

Journey to Southern Africa

September 24 - October 9, 2023

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FOR A COMPLETE LISTING OF
TECHER ALUMNI TOURS, VISIT
www.alumni.caltech.edu/travel

*“If I have ever seen magic,
it has been in Africa.”*

JOHN HEMINGWAY



SCHEMA

From the President and CEO of the Caltech Alumni Association

As we reflect on CAA's progress and accomplishments over the past few years, a saying comes to mind: "When you see a turtle atop a fence, know it did not get there on its own."

It's no secret that success is never achieved in a vacuum. It takes collaboration, hard work, and a willingness to change to truly have impact. And that's exactly what CAA and its legions of members have been doing for the past 88 years.

Since its official incorporation in 1935, CAA has been working to represent and support Techers everywhere they live, work, and play. But a lot has changed since 1935. And, as the world around us evolves, so too must CAA.

While Techers share the same alma mater, today's 25,500 alumni are diverse, global, and have a wide variety of unique personal, professional, and intellectual needs. As a group, Caltech's alumni are evolving by the day – with today's Techers leading across every industry imaginable from aerospace to designing web3.

When we began working to evolve CAA in 2020, we did so with a mission that still resonates today: Modernize CAA's operations to better serve and support its alumni. This means adapting and leveraging technologies that enable alumni to connect 24/7, wherever in the world they may be. It means reimagining traditions when needed. And above all, it means delivering value through the programs, content, and services that we provide alumni.

CAA has already made considerable progress toward this mission. With the support of members, our Board and staff have worked tirelessly to foster and further alumni connection.

Here are a few recent examples:

- Launched landmark digital events including Virtual Seminar Day
- Introduced CAA's Alumni Portal
- Introduced the e-Techer newsletter
- Convened the Black Alumni Council and laid the foundation for a new Asian alumni constituent group

- Celebrated the return of CAA's Alumni Reunions
- Reintroduced educational Techer Alumni Tours
- Hosted the Annual Meeting of Members as a hybrid in-person and digital event
- Hosted in-person alumni outreach and networking events in Chicago and Seattle

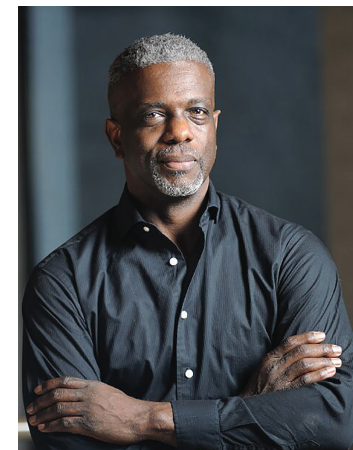
Over the last three years, and throughout the challenges of COVID-19, CAA has worked to become a world-class alumni program that our members deserve and can be proud of. But there is still work to be done.

While networking and alumni outreach events are an important piece of the puzzle, and as we look forward to more face-to-face interaction this year in alignment with health expert recommendations including our upcoming Seminar Day on May 13 and our upcoming 2023 Alumni Weekend next October, CAA must also support alumni with programs that foster connection, content that inspires change, and services that support Caltech alumni in their personal and professional lives.

With your support, we look forward to doing so and keeping that turtle atop the fence thriving, like our vision for alumni, in 2023.



RALPH E. AMOS
President and CEO of the Caltech Alumni Association



RALPH E. AMOS
*President and CEO of the
Caltech Alumni Association*



initiative
FOR STUDENTS / Caltech

Diverse perspectives and approaches are essential to making powerful breakthroughs. The initiative will ensure that every facet of the Caltech student experience is extraordinary—giving our students the tools to innovate and excel through graduation and beyond.

Learn how you can help us invest in our students:



initiativeforstudents.caltech.edu

IN MEMORIAM

We mourn the loss of the following members of our Caltech alumni community

1946

Donald Furst (BS '46, MS '48)
John Taber (BS '46)
Harry Wolbers (BS '46)

1949

William Rumer (BS '49, MS '50)

1950

Andrew Check (BS '50)
David Warren (EX '50)

1951

Walter Edwards (BS '51)
William Wright (BS '51, PhD '55)

1952

Howard Robbins (PhD '52)

1953

Thomas Talbot (MS '53)

1954

Franklin Dryden (BS '54, MS '57)
Edward Gauss (BS '54)
Claude Hinton (PhD '54)
G. N. Huntley (BS '54, MS '55)
Jerry Mitchell (BS '54)
Gordon Zentner (BS '54)

1955

Juris Hartmanis (PhD '55)
2013 Distinguished Alumni Award

1956

Peter Lauritzen (BS '56)

1957

Gordon Eaton (MS '53, PhD '57)
1995 Distinguished Alumni Award
James Sibley (MS '57)

1958

Richard Ehrhorn (MS '58)
William Helman (BS '58, MS '60)
William Tifft (PhD '58)
Alvin Trivelpiece (MS '55, PhD '58)
1987 Distinguished Alumni Award

1959

William Burnett (MS '59)
Robert Jewett (BS '59)

1961

Samuel Suitt (BS '61)

1962

Randall Griep (BS '62)
Lance Taylor (BS '62)

1964

Alfred Lieberman (MS '59,
PhD '64)

1965

Eugene Nebeker (MS '60,
PhD '65)
Ignacio Rodriguez-Iturbe
(MS '65)

1966

Michael Laughlin (MS '66)
Harvey Shepard (MS '62, PhD '66)

1968

John Lehman (BS '68)

1970

David Schor (BS '70)

1972

Robert Smithson (PhD '72)

1973

Philip Neches (BS '73, MS '77,
PhD '83)

1978

Leland Paul (BS '78)

1990

Kent Budge (PhD '90)

1996

J. D. Yule (PhD '96)

2009

Kris Kazlowski (BS '09)

READ OR SUBMIT OBITUARIES AT

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EDU/IN-MEMORIAM

Horologium Viatorium

Ulrich Schniep of Munich crafted this pocket string sundial with compass, also referred to as a "horologium viatorium" or "Reisesonnenuhr," in the year 1586. Made of gilt brass, this item was a high-end piece for the wealthy, with its intricate ornamentation and calculating power. The tool is adjustable for terrestrial latitudes, 42-52 degrees, and contains an etched reference chart on the back with the latitudes of various cities across Europe.

Schniep was a master of his craft, with clients such as the Duke Albrecht and Emperor Maximilian II. He also served as the time-telling instrument maker to Wilhelm V, Duke of Bavaria (1548-1626). In 1551, Emperor Charles V granted Schniep the honor of his own royal coat of arms. This piece is one of his last works, as he would die in the summer of 1588. Other works of Schniep are in the British Museum and the Harvard Library collections.

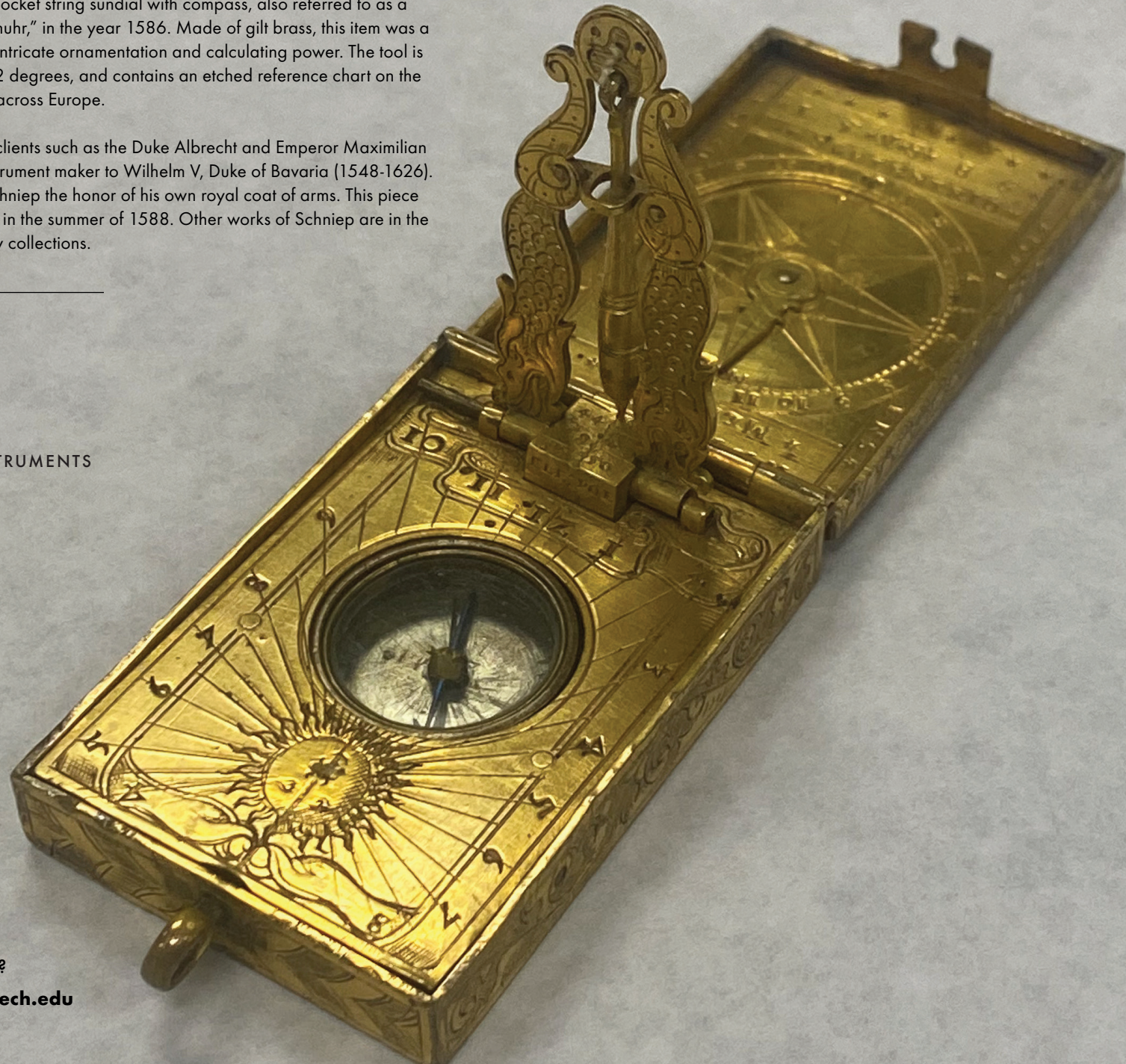
ID #: ST-WA-02

DONOR: EARNEST WATSON

COLLECTION: SCIENTIFIC INSTRUMENTS

MATERIAL: BRASS

Do you know more about this specific instrument, or did you use one like it while you were at Caltech? Share your story with alumni@caltech.edu



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