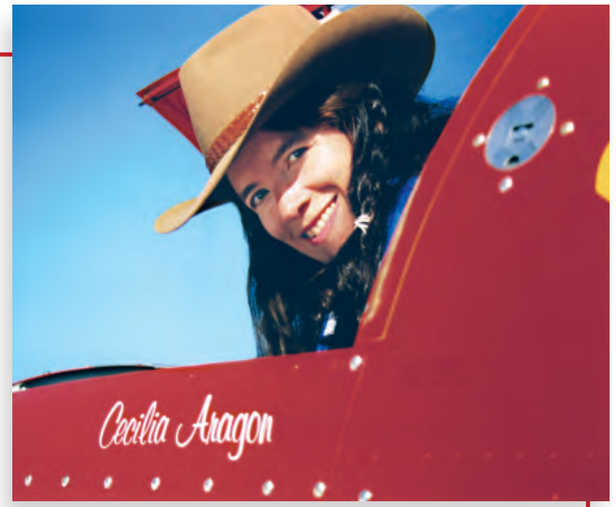


by Judy Hill

First Flight

A Caltech alumna overcomes her fears and takes to the skies.

She is a pilot and a professor. She is a computer scientist and an aerobatic expert. In fact, she is the first Latina to secure a place on the United States' World Aerobatic Championship team. Cecilia Rodriguez Aragon (BS '82) has jumped out of airplanes; performed loops, spins, and rolls at air shows; worked as a test pilot; and contributed to the design of experimental airplanes.

Currently a professor in the College of Engineering at the University of Washington, Aragon has worked with Nobel laureates and taught astronauts to fly. President Obama recognized her work with a prestigious Presidential Early Career Award for Scientists and Engineers.

For the first three decades of her life, however, Aragon says she was beset by fear and anxiety.

Growing up in Indiana as the daughter of immigrants, she recalls becoming accustomed to strangers thinking less of her and always feeling as if she were "on the outside." Becoming a Caltech undergraduate, she says, felt like coming home.

"It had never occurred to me that there were so many other people who would accept me for my love of math and science," she notes. "It didn't matter that I was Hispanic, female ... all those things that had been strikes against me were like nothing. What mattered in terms of belonging was your knowledge and your ability, not your skin color or gender. Caltech opened my eyes to the idea that being a part of a community was possible. It was pure joy. It was liberating. For me, it meant if I worked hard and studied I could become a member of a community."

But once she entered UC Berkeley's computer science PhD program—as she recounts in her unpublished memoir *Flying Free: How I Used Math to Overcome Fear and Achieve My Wildest Dreams*—Aragon again felt like an imposter, and the "terrified child" woke up once more.

> In 1985, I was twenty-five years old and scared of elevators. My graduate school administrator once found me crying in the ninth-floor women's restroom, after I'd climbed eight flights of stairs, too frightened to jump past the elevator doors. My fears immobilized me even in situations that didn't seem to bother anyone else. My muscles stiffened whenever I climbed a ladder, shook hands with a stranger, or talked on the telephone. This physical reaction bewildered me, but I had no idea how to avoid it. It seemed that whenever I had to perform, my brain circuits got jammed by fear, and I froze. I was afraid to study for exams, scared to imagine writing a thesis, terrified that people would find out the truth: I was a Failure with a capital 'F.' Overcoming my fears seemed impossible.

When Aragon was hired as a software developer at Digital Equipment Corporation's research lab in Palo Alto in 1985, she had recently dropped out of graduate school, having convinced herself she could never complete the required dissertation.

One day, her new colleague, Carlos, a private pilot, invited her to go flying. "I froze," writes Aragon, "and once again the circuits of my brain jammed with fear." Still, she realized she was being offered a valuable opportunity to face her fears, take a risk, and break out of what had become an increasingly narrow and fettered life. She said yes.

Aragon recalls that first heady small-plane flight above the waters of San Francisco Bay.

> We taxied out. Carlos gave me a thumbs up, and I nodded weakly. He advanced the throttle, the engine roared, and we accelerated along the runway. Beyond the metal cowling, a view of the wide world opened out in front of me. Then the plane lifted its nose, and we were airborne.
>
> There was nothing to do but hold on.
>
> The earth dropped away from us.
>
> We were flying.
>
> And my heart lifted.
>
> Then I remembered: As a child, my single greatest wish was to be able to fly. Not in a plane, but to levitate into the air the way fantastical creatures in books did, to play hide and seek among the branches of trees and rise above the ground, to be free of my ordinary life crowded with scary things and intimidating people.
>
> Carlos pointed the plane toward the Golden Gate Bridge, a shimmering arc across the sea and sky. I wanted to laugh. I smiled so hard the muscles of my face ached.

There is a principle in mathematics called mathematical induction, a two-step concept that says if a property or theory can be shown to be true for one natural number (n) and then shown to be true for n+1, it will be true for all natural numbers. Aragon says that, for her, touching down from that first flight animated that idea.

"I realized I could apply it to my own life," she says. "The first time I faced my fear it was terrifying and made my heart pound, but after I got through it once, I knew I could do it again. And again. It was completely astonishing and magical to me."

> Flying became my art, my science, and my passion. In a span of just six years, I taught myself to overcome my self-doubt,

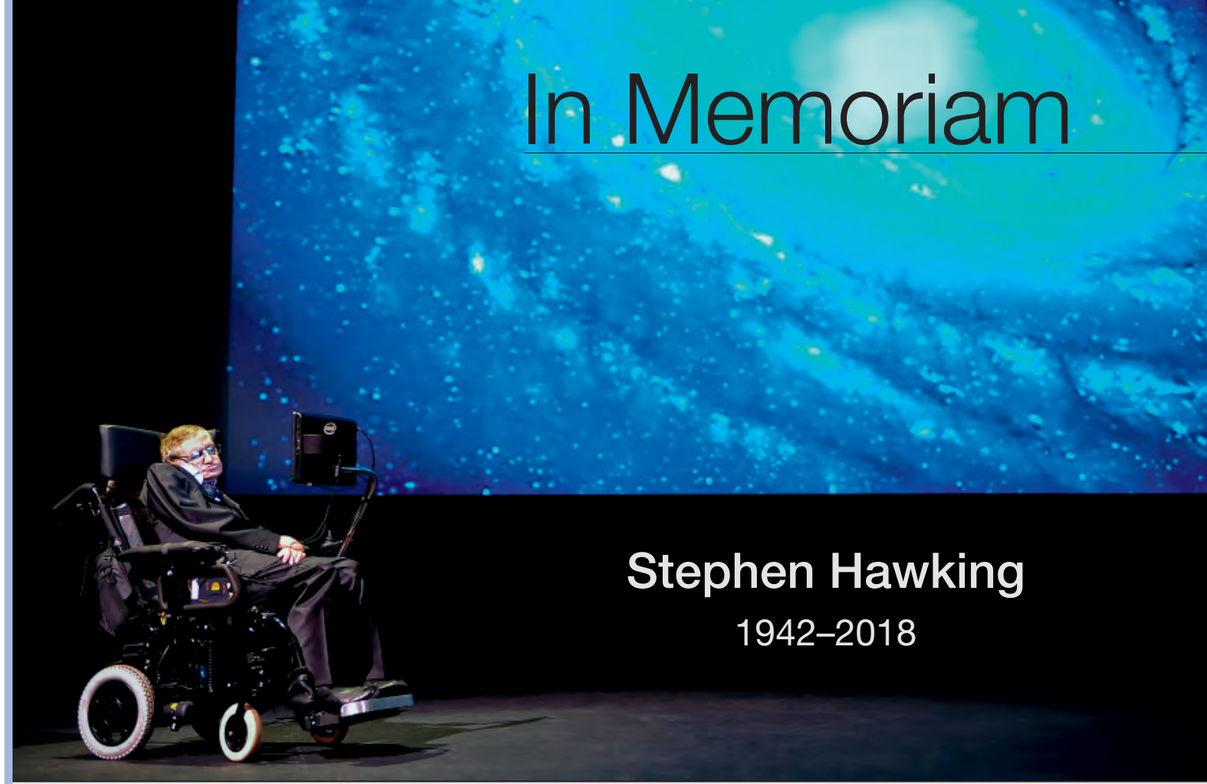
shyness, and deep-seated fear of heights to become one of the best aerobatic pilots in the world.

But flying, it turned out, was just the beginning.

After my stint on the US Aerobatic Team, I applied the strategies I'd used to teach myself to fly to go after the dreams I'd deferred. In 2003, I went back to complete my PhD in computer science, the program I'd quit because I thought I wasn't smart enough. I worked with astronomers to solve the greatest mysteries of the universe. Then I applied for my dream job, a career I'd all but given up on because the odds against it were so great. I received six offers and landed what seemed to me to be the best job on the planet—Professor in the College of Engineering at the University of Washington.

I've lived the kind of life I never would have dreamed of as a shy awkward child in Indiana, a child no one expected much of. ... [And] I did it through a series of simple and rather ordinary steps, by combining math and logic with passion in an unexpected way.

Cecilia Aragon is the director of the Human-Centered Data Science Lab at the University of Washington. She and her team use both quantitative and qualitative methods to study how people make sense out of very large data sets. She was awarded a 2017–18 Fulbright Fellowship to conduct research in human-centered data science and teach visual analytics in Chile.



In Memoriam

Stephen Hawking

1942–2018

Theoretical physicist Stephen Hawking died on March 14, 2018, at age 76 from complications of amyotrophic lateral sclerosis (ALS). Famous for his mind-bending theories of black holes and his popular book, *A Brief History of Time: From the Big Bang to Black Holes,* Hawking was a frequent visitor to Caltech. He did much of his seminal research on black holes during a yearlong visit to Caltech from 1974–75. Over the next four decades, Hawking, a professor at the University of Cambridge and a Sherman Fairchild Distinguished Scholar at Caltech, returned to the Institute often to conduct research and exchange ideas with faculty, postdoctoral scholars, and graduate students.

"Stephen was not only one of the greatest scientists of our era; he was also a wonderful friend, and an inspiration to me, both personally and scientifically," says Kip S. Thorne (BS '62), Richard P. Feynman Professor of Theoretical Physics, Emeritus. "He lived life to the full. He took me to Antarctica in the depths of the Antarctic winter! His sense of humor was legendary. When he started a sentence, laboriously on his computer, I never knew whether it would end in a deep pearl of wisdom or an off-the-wall joke. His insights into our universe have inspired generations of physicists who follow in his wake, and will continue to inspire for decades to come. I miss him terribly, already."

"Stephen Hawking was one of the world's greatest physicists, and his death is an enormous loss," says Sean Carroll, a colleague of Hawking's and a research professor of physics at Caltech. "He did more to advance our understanding of gravity than anyone since Albert Einstein. Stephen was also an irrepressible character who persevered in the face of overwhelming adversity. He traveled frequently, and could have gone anywhere; we were fortunate that he chose to frequently come to Caltech."

Hawking was known for his scientific wagers, including a bet with Thorne and John P. Preskill, Richard P. Feynman Professor of Theoretical Physics at Caltech, regarding his declaration that information that fell into a black hole would be lost forever. He eventually conceded that he had been wrong.

Preskill recalls, "What I'll remember best about my time with Stephen is that we could make each other laugh. I sensed when we first met that he would enjoy being treated irreverently. So, in the middle of a scientific discussion I could interject, 'And what makes you so sure of that, Mr. Know-It-All?' knowing that Stephen would respond with his eyes twinkling, 'Wanna bet?'"

Read more about Hawking's life at **magazine.caltech.edu/post/in-memoriam**