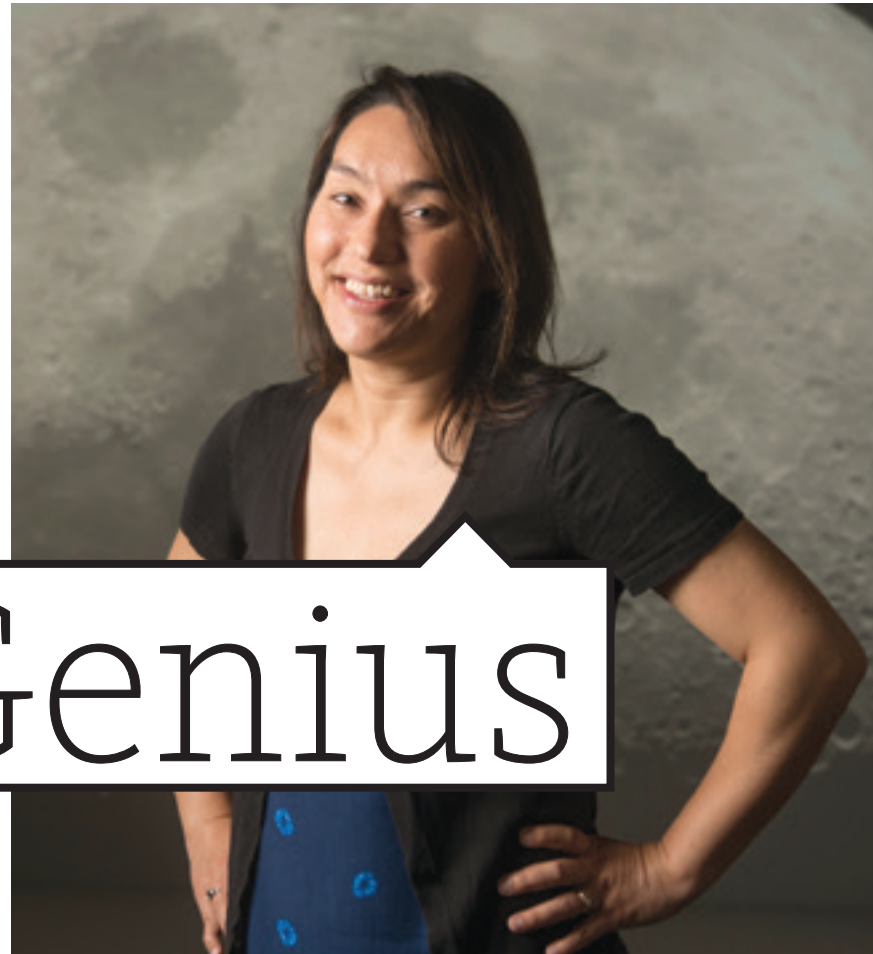
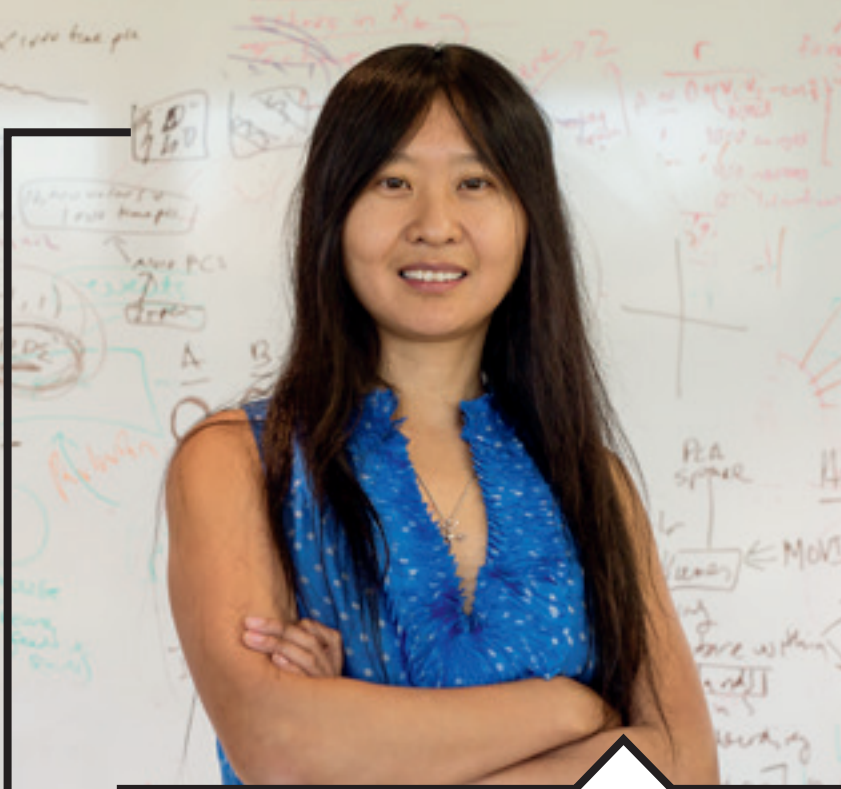


Expert opinion from Caltech's newest MacArthur Fellows



Ask a Genius



Every year, the John D. and Catherine T. MacArthur Foundation awards unrestricted fellowships, so-called Genius Grants, to individuals who show extraordinary originality and dedication in their creative pursuits. The 2018 class of fellows includes two Caltech alumnae, **Doris Tsao** (BS '96) and **Sarah Stewart** (PhD '02).

Doris Tsao, Caltech professor of biology, T&C Chen Center for Systems Neuroscience Leadership Chair and Director, and Howard Hughes Medical Institute Investigator, was recognized for her work studying the neural mechanisms underlying primate vision. In 2017, Tsao and her team discovered the system the brain uses to recognize facial identity.

Sarah Stewart, a professor in the Department of Earth and Planetary Sciences at the University of California, Davis, won the award for her work exploring how celestial collisions give rise to planets and their natural satellites, such as the earth and moon.

Recently, *Caltech* magazine asked members of the community what questions they had for the pair. Tsao (above left) and Stewart were kind enough to take some time away from their award-winning research to give us their answers.

Q + A

How has your experience at Caltech inspired your success?

Sarah Stewart: A wise faculty member told me that it is better to be right than to be first. I learned that I didn't have to play the game of rushing my work out the door and that in the end it would be better if I thought deeply about problems.

What was the most important lesson you learned at Caltech?

Doris Tsao: There are no boundaries between fields: nature is a beautiful whole structure that we need to study from many angles. The Caltech Core Curriculum instilled that idea in me. It's why I protested when the proposal was made to abolish the two-year physics requirement for undergrads on the grounds that "quantum mechanics is not relevant for biology majors." My own research on the biology of vision is inspired by insight into dynamical systems and representations of symmetry that come from math and physics.

SS: I learned about imposter syndrome during my first year at Caltech... from a flyer on the wall in my building. I had never heard this term before, so I looked it up. The realization that EVERYONE felt this way was a huge factor in my self-confidence in graduate school.

How do you hope your research will impact the world?

DT: Many of us have a sense of being trapped within ourselves, and we alleviate it in different ways: by making friends or going for a walk outside. For me, understanding the brain and how it generates all of our perceptions, thoughts, and actions will be the greatest liberation.

SS: I want to nurture and expand the public's appreciation of the wonders of nature. I like to point out that nature has a bigger imagination than we do, which is why we always find something unexpected when we do something new, such as sending spacecraft to a new planet or developing new telescopes. My work on the origin of the moon led to the discovery of a completely new type of planetary object: a huge, vaporized body that we named a synestia.

How will receiving this fellowship enhance your research?

SS: I don't know yet! I have not decided what to do with it, and I am going to take my time to consider different options.

DT: The MacArthur is the anesthetic for the last 10 grant rejections I got (and the next 10 that I will get), and a wonderful surprise.

What are you going to do with the award money? Are there any personal pleasures you're hoping to indulge in?

What do you think of the word "genius" and what it means?

SS: My personal goal is to use the fellowship to do something new that I would not have done otherwise. I want it to be a mix of personal and professional activities. (Yes, taking the family on world travels is on the list.)

DT: I haven't yet calculated if it will cover my one-year-old boys' day-care tuition until they get to elementary school. Maybe there will be a little left over for a nice lunch at Ernie's.

DT: To me, a genius is someone who follows an idea sparked by some light in their own mind, which is not obvious yet to anyone, and might not be even after the first few tries at explanation, because it is still before its time. A genius tends to live in the realm of possibility. They don't care if their fruits can be sold at the market; in fact, they know they can't because no one else can see them. Yet, they persist in applying the full rigors of creative hard work to carry their idea forward to its logical implications. Three examples of genius from my field of neuroscience: Julian Jaynes's neurological-anthropological exploration of the origin of consciousness; Donald Mackay's proposal for how a robot can learn new concepts not programmed by its maker; and Henri Poincaré's analysis of the origin of our subjective notion of space.

SS: Genius is such an intimidating word to me. I very much resonate with the MacArthur Fellowship's emphasis on creativity. I have been thinking a lot about creativity and how to teach students to develop their own creative activities. Creativity can be learned and honed.



As alumnae, what advice would you give to Caltech students today?

When did you know you wanted to be a scientist?

Why does the office printer always get jammed?



DT: Follow your curiosity and be irresponsibly optimistic about the future!

SS: Talk to your professors! They are amazing people. Caltech's faculty are its most valuable resource.

DT: I knew from a very young age. I liked to read biographies, and the most glorious heroes to me were the scientists and composers.

SS: My amazing high school physics teacher, Eric Curry, made me want to study physics in college. He had the magic touch of teaching: clear explanations mixed with sheer fun.

DT: Because people are always making peanut butter and jam sandwiches on it?

SS: Because it knows I need to teach in five minutes.



In Memoriam

Read more about their lives at magazine.caltech.edu/post/in-memoriam



Harold Brown 1927–2019

Harold Brown, who was Caltech president, emeritus; life member of the Caltech Board of Trustees; and former secretary of the U.S. Department of Defense (DOD), passed away on January 4. He was 91 years old. During Brown's presidency (1969–77), he made significant changes to the undergraduate curriculum, developed a campus master plan, and paved the way for women to be admitted to Caltech (in 1970).



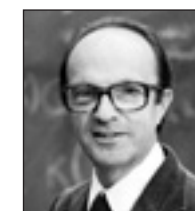
Fiona Cowie 1963–2018

Fiona Cowie, professor of philosophy at Caltech, passed away on December 9 at the age of 55. She joined Caltech in 1992 as an instructor in philosophy and was appointed assistant professor in 1993, associate professor in 1998, and professor in 2010. Cowie's research explored the evolution of the human mind and philosophical questions about language. She was a proponent of the theory that language is not an innate product of the human brain but is instead a technological innovation.



Walter Burke 1922–2018

Walter Burke, longtime president and treasurer of the Sherman Fairchild Foundation and a life member of the Caltech Board of Trustees, passed away on November 1. He was 96 years old. First named to the Caltech Board of Trustees in 1975, Burke was elected a life member in 2009. In 2014, Caltech and the Sherman Fairchild Foundation honored Burke with the creation of the Walter Burke Institute for Theoretical Physics.



Wilhelmus A. J. Luxemburg 1929–2018

Wilhelmus Luxemburg, emeritus professor of mathematics at Caltech, passed away on October 2. Luxemburg joined Caltech in 1958, becoming full professor in 1962, a position he held until 2000. Luxemburg's most notable work was in the theory of Riesz spaces (partially ordered vector spaces where the order structure is a lattice) and infinitesimals (entities too small to be measured).