QnAs with Joanne Chory

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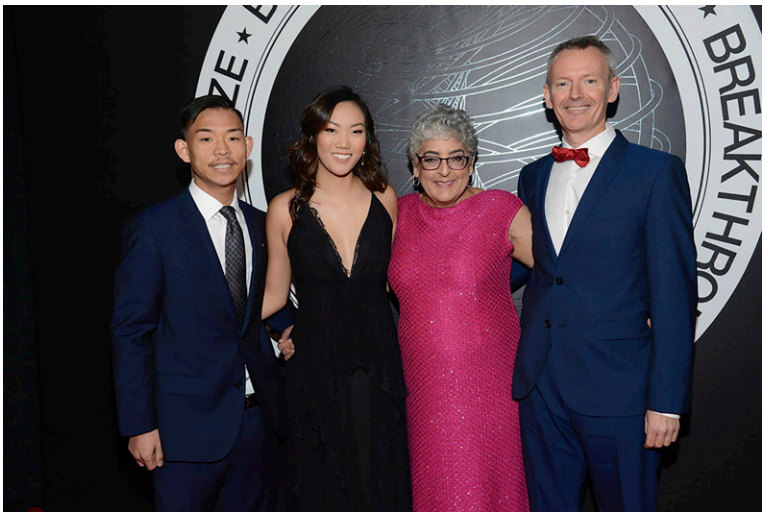
Few plant biologists would imagine the honor of a walk down a glitzy red carpet. However, that is where Joanne Chory, a member of the National Academy of Sciences and a professor at the Salk Institute for Biological Studies in La Jolla, California, found herself in December 2017. She, along with 11 others, had been awarded the Breakthrough Prize, a $3 million award that recognizes extraordinary achievements in the fields of fundamental physics, life sciences, and mathematics. The prize is awarded at a televised ceremony in Mountain View, California. Chory recently spoke to PNAS about the prize, her experience attending the ceremony, and how she, as a laureate, can influence the next generation of Breakthrough Prize winners.

PNAS: How did you hear that you had been awarded the Breakthrough Prize?

Chory: I was sitting here in my office on a Friday morning when Gary Ruvkun [a molecular biologist at Massachusetts General Hospital] phoned. He's on the prize committee, and he's someone I know well, so he probably volunteered to make the call.



Joanne Chory (third from left) with her family. Image courtesy of Joanne Chory.

I was excited about it because in general the Breakthrough Prizes have gone to people who work in neurosciences or biomedical sciences. As a geneticist who studies plants, my work is far from human disease, but it is relevant for the planet. I was happy for my community because winning the prize put plants in the limelight for a short while.

PNAS: Can you tell me about the work for which you were awarded the prize?

Chory: I work on this plant called *Arabidopsis thaliana*. It's not a very significant plant, but it has a number of properties that make it useful to geneticists. It's small and can be grown indoors. You don't have to have access to a farm. It has a rapid life cycle and a small genome. It has small seeds, which is advantageous to people like me who grow tens of thousands of seedlings on plates to find mutants that don't respond properly to their light environment. That's the basis for the last 30 years of work in my laboratory, really: How do plants adapt to changes in their light environment? They are rooted in the ground often in a less-than-optimal light environment. We've studied plants growing in the light versus the dark and plants growing in the shade of another plant. There is competition for light. It's a complicated set of receptors that receive all of the light in the environment and connect to regulatory pathways that control whether a plant grows or not.

PNAS: How did your work advance the field of plant genetics?

Chory: One of my laboratory's most significant contributions is defining the mechanisms of signaling from plant steroid hormones called brassinosteroids. While training students and postdocs to run their own laboratories, we uncovered most of the components of the signal transduction pathway from the cell surface receptor to changes of gene expression in the nucleus. Plants recognize steroids using a unique receptor with no counterpart in the animal world, yet every single flowering plant seems to have at least one such receptor. We can manipulate the amount or activity of this receptor to make a plant of almost any size.

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PNAS: How is your work on *Arabidopsis* significant for the planet?

Chory: I can give you one example. The accumulation of greenhouse gases, such as carbon dioxide, in the Earth's atmosphere has thrown the Earth's carbon cycle out of equilibrium. This has caused the Earth's surface to warm. Our studies on shade avoidance in *Arabidopsis* were driven by our desire to define the pathways that govern how plants grow in the shade. It turns out that plants use almost the exact mechanism to grow when they find themselves in warmer temperatures. This allowed us to devise strategies to help plants adapt to rising temperatures caused by global warming. In doing so, we hope that we can maintain [the] yield of our most important crops.

PNAS: Can you describe the experience of attending the award ceremony?

Chory: Have you ever seen the Academy Awards? It looked a lot like that. First, we were brought there in a limousine and we walked the red carpet. Then we had dinner with some pretty famous people: celebrities, but also people big in the academic world, like heads of institutions. And young entrepreneurs were everywhere. My kids were also there. They were really proud of me, even gushing.

PNAS: Why is the Breakthrough Prize good for science?

Chory: The Breakthrough Prize shows science in a positive light. The ceremony, which is very well done, tells millions of people in an accessible way of some of the biggest recent discoveries in science. It shows that you can think of scientists as both glamorous and rigorous. In addition, they have distinguished it from other prizes by presenting at least one award each year to a graduating high school student.

PNAS: As a laureate, you are involved in selecting future awardees. What kind of scientist do you think is deserving of a Breakthrough Prize?

Chory: There are a lot of great scientists out there to nominate for prizes like this. One thing that needs to be pushed with our committee is to increase diversity among the recipients in gender, color, and field of study. People who work between disciplines are really interesting. They're doing something new. I'm going to look for people like that as well.