Maggie Tse will never forget the most exciting experience she has had in science, in part because it literally occurred on a dark and stormy night and was interrupted by a fire alarm.

Tse, a graduate student in physics, works on increasing the sensitivity of the Laser Interferometer Gravitational-Wave Observatory (LIGO). The observatory’s 2015 detection of gravitational waves made international headlines and led to a 2017 Nobel Prize for Rainer Weiss, MIT professor emeritus of physics, and two colleagues.

Key to Tse’s work is a hardware upgrade that reduces the quantum noise in LIGO through the introduction of a “squeezer,” or squeezed vacuum source. The aim is to make LIGO twice as sensitive, capable of capturing gravitational waves from much deeper in space. And that, in turn, will allow further exploration of the universe.

For the last several months, Tse has been based at the LIGO facility in Livingston, Louisiana, where she has been installing and testing a squeezed vacuum source. Her advisor on the work is Matthew Evans, associate professor of physics. Both Tse and Evans are affiliated with the MIT Kavli Institute for Astrophysics and Space Research.

Tse doesn’t know yet what she’ll do after earning her PhD, which she expects to receive in May 2019. However, she’s passionate about sharing science with a broader audience. As a result, she says, “No matter where I end up, I’ll never stop teaching and explaining why science is so cool.”

**physics@mit**: Please tell us more about the most exciting experience you’ve had in science.

**Maggie Tse**: In February we measured some squeezing for the first time. We had the full interferometer operational and measured the sensitivity curve of LIGO in that state. Then we turned on the squeezer and watched that curve go down. It was surreal because it was the first time we saw that the squeezer and the interferometer could play well together.

That night was crazy because just when we’d turned on the squeezer, around 1:00 a.m., the fire alarm went off. There were thunderstorms that night and they tripped the fire alarm. We all had to leave and go stand in the rain—the moment when we were pretty sure that we were squeezing.

We came back after the fire alarm and got everything set up again. That was when we measured squeezing for the first time. We had the noise curve of LIGO plotted on this huge TV screen and we watched as we moved it around. We could make it go up, we made it go down. Squeezing was doing what it was supposed to do.

**physics@mit**: You consider outreach to be an important part of your work. Can you give some examples?
Maggie Tse: Three years ago I proposed that the LIGO collaboration do an Ask Me Anything (AMA) on Reddit, the open forum-style discussion web site. We had a variety of formal outreach programs, but going on Reddit was a little scary to a lot of people in the collaboration. I think they felt it was some sort of Wild West. I had to convince LIGO leadership that this was okay, and that we could reach an important demographic. Reddit is used by many 20-something-year-olds.

I organized our first AMA, where we introduced LIGO to the world of Reddit, and very soon after that we made our first detection of gravitational waves. We did another AMA for that.

People were really excited about LIGO. Our first AMA had 21,000 page views; 18,000 of those were from unique IP addresses. The thread itself had 557 comments, including questions from the public and answers from the 19 LIGO people who participated.

For that first AMA we had originally planned on answering questions for an hour. But the questions kept coming, so we continued for two more.

physics@mit: Describe the people who’ve influenced you over the course of your education.

Maggie Tse: The first person I really remember is my high school physics teacher, Mr. Frankel. It was obvious that he was having fun teaching physics. That overall vibe has carried with me in terms of how I communicate physics now—making sure that the passion comes through.

Another person who was important was my undergraduate advisor at Columbia University, Professor Szabolcs Marka. The first summer I worked with him he asked me to go to the Hanford, Washington LIGO site for two weeks. I didn’t have a specific project or assignment; Szabi simply wanted me to learn about the people and the place.

That was terrifying because I’m a pretty shy person. The idea of going to a lab with no purpose and having to ask around, “Hey, can I help you with something?” was alarming. Szabi recognized that. He told me that this wasn’t the time to be shy, and that I should push through it and meet people because that is how you learn new things.

Those two weeks led to an invitation to come back to Hanford the following summer, and that’s when I met Matt Evans. He was working on an early prototype of the squeezer and mentioned that squeezing might need graduate students in the future. At that point I was only a sophomore in college, so grad school was really far away. But two years later when I did apply to schools, I reached out to Matt. And that’s how I became involved with LIGO.