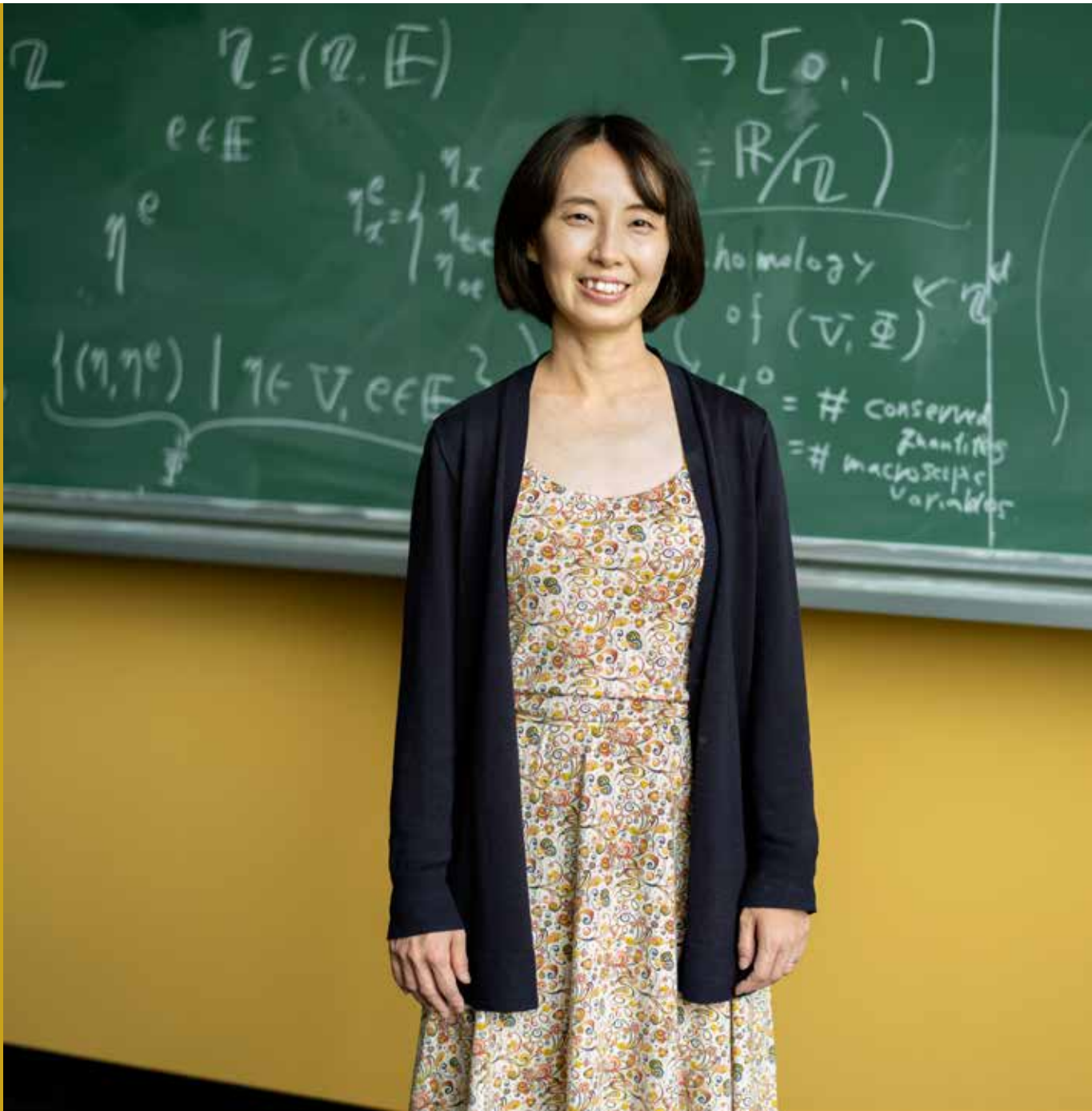


# Makiko Sasada

$$\begin{array}{ccc} \pi_0^N & \xrightarrow{N \rightarrow \infty} & \rho_0(u) du \\ \downarrow & & \downarrow \\ \pi_t^N & \xrightarrow{N \rightarrow \infty} & \rho(t,u) du \end{array}$$

Makiko Sasada grew up in Tokyo. In 2011, she defended her doctoral thesis at the University of Tokyo under the supervision of Tadahisa Funaki. In the same year, she was appointed assistant professor at Keio University and became senior assistant professor in 2014. Since 2015, she has served as associate professor at the University of Tokyo. She was awarded the Brilliant Female Researchers Award (2021), the JSPS Ikushi Prize (2011), and the MSJ Takebe Katahiro Prize from the Mathematical Society of Japan (2010).

- Research topics:
- Probability theory
  - Mathematical physics



Onna-Okinawa, Japan, 2023



**Could you please introduce yourself in a few words and tell us when you chose to do mathematics?**

My name is Makiko Sasada. I work at the University of Tokyo as an associate professor, in the areas of probability theory and statistical mechanics. I've also recently been collaborating with those in other areas, like algebra, geometry, integrable systems, and physics. I live in Tokyo and have two children, an eight-year old son and a two-year old daughter.

When I was very small, maybe three or four years old, I liked things like mazes, puzzles, and logic puzzles. Even at that age I liked to think hard about these problems, and I loved the moment when I figured them out. I think at that point I already loved mathematics.

These would be very simple questions about counting, like if there are four trees and they're spaced two meters apart, then what is the distance from the first tree to the last tree? There were also what's called tsurukame-zan, which is a very classic math problem in Japan. Tsuru is a kind of bird with two legs, and kame is turtle. Turtles have four legs. Let's say there are a total of 10 birds and turtles combined, and between them, they have a total of 24 legs. How many birds are there, and how many turtles?

My parents would ask me these kinds of questions when I was very small, around elementary school age, and I would come up with good strategies for solving them. I found it very, very interesting.

After that, I started KUMON, which is an after-school education program where they give you problems to do and things to study that go beyond your grade level. If you're good at a subject, you can go higher and higher up, so when I was in elementary school, I was already studying some junior-high level subjects. They just give you the problems and an idea of how to solve them, but you learn and solve them by yourself. This made me like mathematics more and more, and made me want to learn more and more, to the point where I was solving second-order quadratic equations before I was 10 or so.

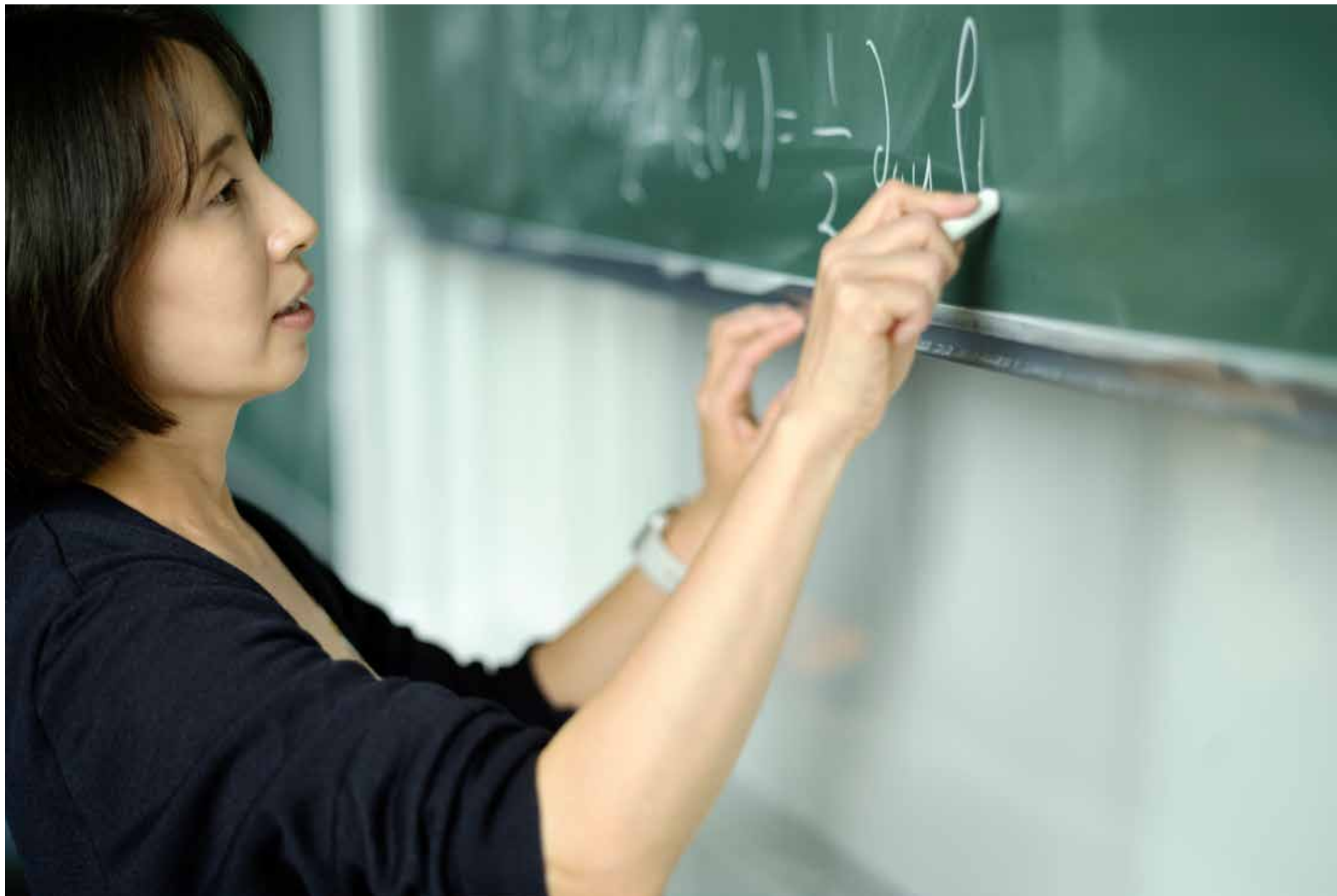
In junior high and high school, I went to a girls' school, and I really liked it there. But I didn't have many friends who liked math, so I didn't do as much math during that time. The teachers weren't as invested in teaching math either, though there was one exception. During that time, I spent more time playing music, which I also love. I played guitar and piano, performed in a play, and was also in a band, with electric guitars and drums, with my friends. After entering the University of

Tokyo, I found that there were many people who liked math, which was amazing. I finally had friends who liked math and physics, which was fun. I was thinking I would go into either math or physics, but I found experimental physics wasn't for me. I found it difficult, and I also didn't like estimating error from things like temperature, wind, slope ... It all felt too vague to me. I wanted to do something more rigorous, more clear, and so I decided to go into math.

**Were you encouraged by your family, friends, or other people around you?**

My mother encouraged me a lot. She's actually a translator of English and Japanese, and sometimes French. She didn't study science when she was in university, but she told me that if she were born in my time, maybe 30 years later, she would have studied science or mathematics. In my mother's time, many Japanese women thought women were not suited for science, so she said she was just following what everyone thought. But she was very encouraging, especially since she knew that I loved mathematics ever since I was small. She bought me interesting books on mathematics, educational computer games on logic and puzzles. When I was in junior high or high school, she even took me to a math talk by university professors.

My father is actually a physicist. He didn't comment much in terms of my career, but he also didn't discourage me. I think he wanted me to choose for myself. He didn't tell me to study physics or mathematics, but after entering university, he discussed physics and mathematics with me, which was very nice. Overall, my parents were both very, very encouraging. Teachers, not so much. But I did like one math teacher I had in high school. She was very kind, and told me I should do mathematics, and that I was very good at it. But she did also say that mathematics was very tough. Overall I would say I had an encouraging, supportive environment, but sometimes my friends would comment, for example, "You really want to do mathematics? Really?" And in junior high or perhaps high school, I tried out an afterschool education program where they teach university-level mathematics to junior high school students who are interested. But there were only boys in the program, and I didn't feel very comfortable there. I wanted to study mathematics, but I didn't like the atmosphere. I was often the only girl, although sometimes there



were a few others. Yet I didn't get very many opportunities to communicate with the other girls. I actually went and tried out two different afterschool programs. One had a female teacher and wasn't so bad. But the other one, the teacher would sometimes crack jokes with the boys that made me feel kind of uncomfortable, jokes about certain topics or idols on TV ... In that sense, I'm not sure the environment I was in was all that nice.

**Did you come across obstacles in pursuing your career as a mathematician?**

Yes, I think there were many. When I was a third- and fourth-year student at the University of Tokyo, I was the only female student in my program. At the University of Tokyo, you're not divided into mathematics or physics for your first and second year. It was fine during that time because my class had 15 students, and three were female. But after choosing mathematics, which was more precisely around the latter half of the second year and the third and fourth year, I was the only female student in the math department, out of a total of 45 students. I couldn't make any good friends in the department, and felt a bit isolated. Of course, I had some friends that I could talk to and discuss things with, but I didn't do any

seminars with others. There was a good side to this though, because it allowed me to concentrate on mathematics. I really studied a lot during those years. After entering the Master course, I was still the only female student. But there were new students who came in from other universities and some of them were very friendly, so I was able to make some very good friends. I really enjoyed my time in my Master's program. When I started my PhD again, most of the people around me weren't there anymore, and again I felt somewhat isolated. The atmosphere there was very competitive, as you can imagine, and some older PhD students – maybe post-docs – told me mathematics was too tough for me as a woman, recommending that I should not do it. They were struggling to find positions, and putting so much pressure on themselves. They told me that I'd have to be really strong to withstand it. And I remember thinking, "I don't think I have that kind of strength," but I went on anyway. I was actually very lucky in terms of getting my first position. Just after I finished my PhD, I got a tenured position at Keio University. It was an assistant professor position, but tenured. I was very, very lucky. So that was nice, but I did

experience some problems with a male researcher. My time at Keio University was overall very good, but ... There was a male researcher in the same area that I would meet sometimes at workshops and so on, who was very friendly at first. He was around the same age as me, a colleague of mine. But at some point he asked me to go to dinner with him, and when I said no, he started spreading negative rumors about me. His attitude changed so dramatically. This actually has gone on for 15 or so years. It started maybe when I was 24, and has basically continued since then. He often talks negatively about me in front of, for example, my students. My students were shocked about this, and it has continued until quite recently. I didn't say anything to anyone about it, so I suppose the others just thought that we didn't like each other. But the truth is a bit different. Recently, I told two very senior people in our area about it, because I felt that he saying things to my students was going too far, and that I needed to do something. I talked to a senior professor, who spoke to him directly and told him to stop. This was maybe two or three years ago. I don't really know what happened after, but I was hoping it would finally stop. He wouldn't say these things in





front of me – only to other people. So sometimes I would learn from others what he had been saying, when they would ask me about something he said, and if it was true. My students would sometimes even ask me if I was okay, how I could stand it, and so on. And based on what I've heard from them, he is still saying things about me. He also made many comments

not only about me, but also about other female mathematicians. For instance, saying that a female mathematician isn't very good, and that she only got her position because she is a woman. So some people understand what he's like. But he's still been promoted very well, which is ... not good.

**In retrospect, are you happy to have chosen mathematics or do you have some regrets?**

**What are for you the joys of mathematics? What are for you the hardships of mathematics?**

I really enjoy mathematics and life as a mathematician, so I have no regrets. It's perfect. The obstacle I discussed before

felt like such a big thing at the start of my career, but over the course of the 15 years, it's been a very minor thing. I don't care very much about it.

I really enjoy mathematics because it gives me the opportunity to travel a lot all over the world, and to meet so many nice people. I didn't expect that I would be able to travel all over the world in my life. I love people, I love mathematics, and I love traveling. I have a lot of freedom. I can do mathematics at home, at a café, or even in my bed or in the bath. Compared to others working in companies, I am able to spend a lot of time with my children. I get more time with my children, with my family, and I also enjoy teaching. My work is really very nice.

My husband also has a PhD, but he works in a bank as a quantitative analyst, so in financial mathematics. Yet we did write a paper together. As a quantitative analyst, he also works a bit like a mathematician. He's allowed to work at home about half the time, and we share the household chores almost evenly. He does all of the cooking, for instance. Every day, not just the weekends. I'm in charge of dropping our daughter off at nursery school, and he's in charge of picking her up, and so on. I think our situation is better than the average Japanese family.

In terms of hardships, I think we've all had the experience where you think you have solved a problem, and the next day you find there's a problem with it, and then you think you've solved it again! And you find another problem with it, and it's like a roller coaster. This does happen to me as well, but not as much recently.

When you're a student, you tend to only be thinking about one or two problems, so you can really focus on your work. You spend so much time focusing on the problem, more and more time, without even sleeping. But for good or for bad, I haven't had much time to concentrate like that ever since I had my children. I feel it's good for my mental health. Recently, just having time to think is a joy for me. But I remember being a student and thinking so hard about a problem for a week, two weeks, or even a month, just constantly thinking about it and not being able to come up with an answer or even a good idea. That was tough.

**What would you recommend a young woman in your country wanting to start a career in mathematics?**

I would first tell her that mathematics is very interesting, and that if she likes it, it's worth doing, and that she should try. You can change your career at any time if you change your mind,

so just go ahead and try first. I think mathematics is rather fundamental in that the ideas or ways of thinking in mathematics could be useful in any line of work. So I would recommend she continue with it until she feels that she doesn't like it. Then she can go into a different area or career, but I really recommend that she keep going until then. Just continuing is what is really important.

**Could you describe your field of mathematics in simple words?**

I want to understand the macroscopic world and microscopic world, and how they are related. We know that heat diffuses, so that when you mix hot water and cold water, they will come to a temperature about midway between the two temperatures. If you put different types of gas into a box, they'll mix, and this happens because of small atoms and molecules moving around inside of the box. But we don't usually see or feel these things. So why do these things happen? Why does heat diffuse? Why does ice melt? We can answer these types of questions with mathematics, which I think is amazing.

This applies not just to physical phenomena but economic phenomena, even the diffusion of infectious disease or even rumors. The relationship between the macroscopic and microscopic worlds can be seen

in traffic jams, animal behavior, and so much more. There are many universal structures in the world, and mathematical models can be used to understand them. That's the really exciting part of my field of mathematics. One model can explain so many things.

We also want to see whether different models have some sort of universal structure themselves. So we compare models, see what is similar and what is different, and the reasons behind these similarities and differences. That is a next-step question, and a more universal thing that I also want to understand.

**You were involved in showing an exhibition on women in mathematics in Japan, and you told me before the interview about how it had influenced a person in your life. Could you talk a bit about that?**

I was involved in the touring exhibition for the "Women of Mathematics Throughout Europe," specifically the expanded version of the exhibition with Japanese portraits in addition to the European portraits. It was held at the annual meeting of the Mathematical Society of Japan in March 2019 and at the EU Delegation of Japan in October the same year. For the October one, we prepared a Japanese translation.

What happened was that I had asked one of my colleague's secretaries to do the Japanese translation, because we thought it would be good for the Japanese audience. Later, she told me the content of the interviews had been so inspiring for her, that she felt encouraged and empowered. And a bit after that, she said she wanted to change careers. She was a secretary at Keio University, but she wanted to start working in web media. And she ended up becoming ... I'm not completely sure, but a writer, or perhaps a translator, and now works at a web media company, sharing news about Japan and about the world for Japanese audiences. She seems so happy, and said that the experience of translating those interviews had a major impact on her.

The whole exhibition was very nice. There was a big ceremony for the opening of the exhibition at the EU Delegation in 2019. I unfortunately couldn't make it because I was in New York for a research visit, but we invited many people. The EU ambassador gave a speech, and Professor Bourguignon, president of the European Research Council, was there as well. The president of the Mathematical Society of Japan also gave a speech. It was a very large event. We also invited many female mathematicians in Japan, and I think that was really the first

time that female mathematicians in Japan had an opportunity to come together like that. There were smaller groups of female mathematicians, for instance those in number theory, but there were no such associations or organizations nationally. And we had such a great time.

This also helped with networking. I of course wrote many emails to invite female mathematicians to the event, though I wouldn't be there myself, and got to know many new people through that process. I felt after the event that the network of female mathematicians in Japan has gotten stronger, and that we communicate more frequently. Last year, we had the first "Women in Mathematics" conference in Japan, and we're having another one soon, although this one won't be in Japan. We also have set up monthly online lunch meetings for women in mathematics in Japan.

We had prepared a report showing statistics on the gender circumstances in mathematics in Japan, and the report was quite shocking for many people. The initiatives I mentioned and many others were mostly set up after that.

