Toshihide MASKAWA

Dr. Maskawa was born 1940 in Nagoya, Japan. He graduated from Nagoya University in 1962 and received a Ph.D. in Physics from the same university in 1967 supervised by Professor Shoichi Sakata. He spent three years at Nagoya University as an assistant professor, then moved to Kyoto University where he had a fateful encounter with Makoto Kobayashi, a corecipient of the Nobel Prize in Physics in 2008. Since then, he has also showed enthusiasm for social activities and nowadays is also famous as an anti-war activist. In 1997, he became a professor at the Yukawa Institute for Theoretical Physics at Kyoto University and held a directorship at the institute. After 2003, he moved to Kyoto Sangyo University as a full professor and established the Maskawa Institute for Science and Culture. He has been a university professor at Nagoya University since 2009, as well as a director at the Kobayashi-Maskawa Institute for the Origin of Particles and the Universe, Nagoya University. Since 2010, he has been a member of the Japan Academy.
He won the Nishina Memorial Award in 1979, followed by the J.J. Sakurai prize and the Japan Academy Prize in 1985. In 2008, he was awarded the Nobel Prize in Physics "for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature."

SCIENCE & PEACE

—— You are an enthusiastic peace activist. Why?

MASKAWA: I cooperate with people who defend Article 9 of the Japanese Constitution. My peace activism began around 1964, when I got involved in movements opposing nuclear submarines calling at Japanese ports and the construction of nuclear power plants. In those days, I used to go around meeting small groups of mothers here and there. I used to be active at Nagoya University, too. When I moved to Kyoto University, Kansai Electric was planning to build a nuclear power plant in a small village on the Sea of Japan coast. The village was divided into two camps, for and against the project, fighting each other. I was commissioned to study and write a report on what would happen to the local river if cooling water was taken from there for the reactor. It was a well-paid job, but I used to work, and still work, without remuneration whenever I can be useful and provide the kind of knowledge that people need.

—— So you continued your peace activism at Kyoto University. That was the same period as your theoretical work with Dr. Makoto Kobayashi, with whom you shared the Nobel Prize.

MASKAWA: Yes. In those days, I was the Secretary of the Faculty Union. Kobayashi used to come to the University at around ten in the morning, and we would talk for about two hours and break for lunch. After lunch, Kobayashi went back to his office, and I ran around on campus carrying out my union activities. When I went home—and that was just after my second son's birth—I would ask my wife how my young family had spent the day and then went straight to work on my research from nine to one in the morning. My life was like this in those days. I was busy and was working efficiently. I didn't waste any time watching TV. After dinner, I immediately started work. Sometimes I worked for four hours from nine.
The broken symmetry (CP violation) on which we worked was first detected experimentally in 1964 by James Watson Cronin and others. I brought this news to my laboratory. It was during my first year or so in the doctoral course. I felt that something strange was going on but couldn't figure it out even if I tried hard to understand. So I assumed that it was not the right moment and that we weren't ready to tackle this mystery yet. I wanted a theory that would enable us to calculate. I kept it in the back of my mind. In 1967, Steven Weinberg presented his unification theory, but calculation was still impossible. In 1971, the Dutch genius Gerardus 't Hooft drew a formula with symbols. This made me think that it was now time to discuss the broken symmetry. In April that year, Makoto Kobayashi had come to Kyoto University, and when the dust had settled somewhat, we started working together on or around May 10. We completed the theory near the end of June. It took about fifty days. We had taken up the CP violation early and had been checking since 1964 to decide if it was time to tackle this question.

Even after we wrote our paper, it drew nobody's attention because it was written by young researchers in an unknown town in East Asia. Three years later, Nicola Cabibbo took up the same subject, without knowing about our work. In the "normal" course of events, the Italian becomes famous first, and somebody points to a similar work by some Japanese, allowing us to catch up with the rest of the world. This didn't happen, thanks to Prof. Yoichi Iwasaki, who later served as President of the University of Tsukuba. In those days, Prof. Iwasaki was at Kyoto and took notice of our work before moving to Tsukuba. He told Dr. Hirotaka Sugawara, Chief of the Physics Division at the High Energy Accelerator Research Organization, about our paper, and they decided to call someone in the United States to do a bit of PR for us, since they found our paper interesting. In fact, Dr. Sugawara himself expanded our paper a little for publication. So we owe our success to the two of them.

—— Do you think that your social activism has had an impact on your scientific work?

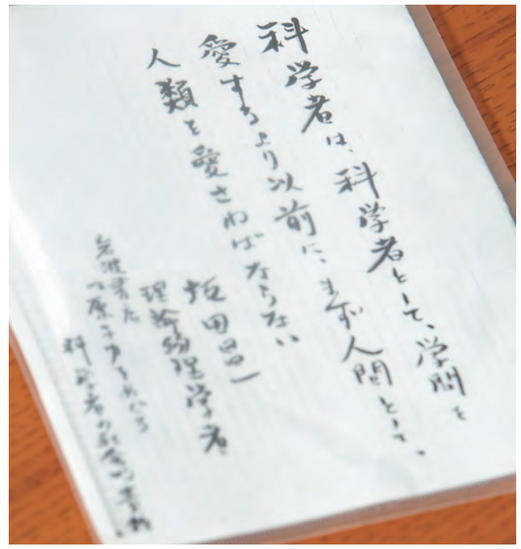
MASKAWA: It would be exaggerating if I said that my social activism and scientific work were mutually beneficial, but it doesn't mean that you can't do both. In Dr. Shoichi Sakata's laboratory, it was said that you were not a full-fledged scientist if you couldn't play more than one role. So I was always doing something besides my research. You can always find time to pursue two different things that interest you. If you have only one thing to do, you tend to slack off, but if you have two or more, you try to be efficient.

—— What was Dr. Sakata like?

MASKAWA: He never told us what to do. His students watched him work, and we learned that there was such a way to do such and such. In my office, I have a sheet of paper on the wall on which he wrote, "A scientist must love humanity as a human before he loves science as a scientist." He wrote this in 1969, when he was discharged after having been hospitalized for some time. I admire him for the strength of this message. I can't make such a statement. I have to add something like "... I think. Don't you?" at the end to attenuate the intensity. But he asserted himself.

Dr. Sakata took great interest in the laboratory's administration. Once I went to see him to report a decision made by the Graduate School's organization. After that, I left the room but noticed that I had forgotten something. Since I already knew that he was in, I only knocked and opened the door before I was told to come in. There, I saw him mopping the floor, stained with my footprints. He hadn't kept me from coming in the first time because of my muddy shoes. He thought that would have embarrassed me and discouraged me from casually dropping in to speak with him. I still recall the image of Dr. Sakata mopping the floor.

Toward the end of World War II, Dr. Sakata was already totally convinced that Japan would lose, so his focus was already on how the laboratory should be run after the war. In those days, a professor held a chair. In 1946, this system was changed when the University was reorganized. He said that all members of a laboratory were equal once they had begun research. In the new laboratory system, you were admitted into a laboratory as an autonomous researcher after publishing a paper or so. All members of a laboratory were equal, and anything was accepted with regard to the laboratory if it had been decided by vote.



A handwritten quote from Dr. Sakata.

—— Dr. Sakata had thought about the new system while the laboratory was evacuated to the countryside during the war and came back with the idea after the war. Was he involved in the war as a scientist?

MASKAWA: Dr. Sakata? No. Dr. Shin-ichiro Tomonaga (Nobel Prize in Physics in 1965) seems to have been mobilized to take part in a project to develop electromagnetic weapons. I have read the papers Dr. Tomonaga wrote at that time. I have the impression that he nicely managed to avoid getting involved. He did write papers, but none of his research would be applicable to any war purpose. But I'm sure there were scientists who collaborated because doing research was interesting. They developed steel materials, which must have been used to build the battleships Yamato and Musashi, and they didn't care what purposes their research achievements served. Some thought that it was none of their business.

—— Science can be used to serve both peace and war.

MASKAWA: Albert Einstein was gravely criticized for his suspected role during the war. Leo Szilard, a Hungarian scientist in exile in the United States, had heard a rumor that the Nazis were amassing uranium in Scandinavia and asked Einstein to talk to the American government about the possible ramifications of Nazi Germany beating the U.S. to make the world's first atomic bomb. So Einstein talked to the U.S. President. He must have been ashamed about this afterwards. When Hideki Yukawa went to the United States after the war, Einstein went to see him to apologize for his role of messenger, shedding tears and saying that his words had led the U.S. government to drop two atomic bombs on Japan. The Russell-Einstein Manifesto, an approximately two-page document that was published later, indicates that if you carefully read between the lines, Einstein was seriously concerned that a third world war would destroy the planet.

—— The starting point of your peace activism is related to nuclear power plants. What do you think of the utilization of nuclear power?

MASKAWA: We witnessed that accident in Fukushima. We know that the danger of nuclear power plants can be lowered if we spend more money. Is it appropriate to commercialize nuclear power at the current level? I don't think that we have arrived at such a technological stage. But fossil fuels will one day be depleted. Then, what should we do? There are moments when natural energy can't be harnessed. Without winds blowing continuously, wind farms can't generate power. Power storage is also difficult. I believe that the biggest mission of scientists today is to develop technologies for low-cost power storage. What is most important is to clearly recognize the energy-related challenges we have to overcome as a society.

—— In Japan, much concern is focused on what to do about the fast breeder reactor (FBR).

MASKAWA: Yes. It's been suggested that it be discontinued because it is not going well. But storing large quantities of plutonium is in itself a problem. With that much plutonium, we can make hundreds of atomic bombs within a year, which might then spread all over the world because they want to export nuclear power generation. In today's politics, nothing true is said. I believe that it is wrong to be allowed to store something that can be easily applied to another purpose. This is, by extension, a question of war and peace.

—— In such a situation, how do you think scientists should be involved in society?

MASKAWA: I take researchers out, even by deceiving them. If there is a peace assembly or some related meeting, I would say to them, "The weather is great; let's go for a walk," and take them to the meeting. They always undergo a change afterwards. They inevitably open their eyes when they contemplate society's actual situation and how it is changing and are forced to think of their children's and grandchildren's future lives.

Science begins with a question. Here are results, but how should you interpret them? Do they suggest Phenomenon X, or am I wrong? I call this a process of negation for affirmation. At the point where you can no longer say "No," you can at last say "Yes." The report on the possible discovery of the top quark was about 200 pages long, to demonstrate that it was NOT an erroneous signal. Without this, the report could have been about four pages long. At first, there were all sorts of contamination caused by false signals, which we had to deny one by one.

—— Finally, what is your message to young researchers? What would you like to tell them?

MASKAWA: I think that you need a sense of longing and adventure to develop as a research scientist. For example, in elementary school, a science teacher may make a digression and says, "A genius scientist called Einstein said that time passes differently for people in different motions." This is something quite unforgettable. Most kids think, "That's ridiculous," and stop there, while some make a mental note of it, plus the fact that no scientists are opposed to this theory. They study more and get closer to Einstein, experiencing feelings of adventure as they approach the object of their longing.

My object of longing was Dr. Sakata. It was in the autumn of my first year of senior high school. In 1955, he presented the Sakata model, the forerunner of the quark model. I read about it in a boxed article in a science magazine or something and felt quite excited to learn that such advanced research was being conducted in my hometown. In those days, senior high school science lessons covered only discoveries made in Europe up to the 19th century, and nothing contemporary. I discovered that something extraordinary was taking place in Nagoya. I felt that I had to be a student of Dr. Sakata.

—— Today, scientists are under pressure to produce results that serve society immediately.

MASKAWA: This is an extremely bad situation for science. We are not allowed to carefully and patiently work on something for a long time because it is intriguing, although the project might fail. Every year you must write annual reports and interim reports and fill out application forms to ask for grants. You spend more time writing interim reports than working on your research. This is an extremely unfortunate situation.

Interview with Prof. Maskawa was done by M. Kawachi (Nagoya IAR), A. Nishizawa (Nagoya IAR) and H. Nakazaki (Chunichi Shimbun Co., Ltd). This interview article was written by H. Nakazaki and translated to English under the responsibility of Nagoya IAR.