Nobel Voices Video History Project, 2000-2001

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Interviewer: Neil Hollander
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HOLLANDER:

Okay, Doctor, if you would be so kind as to introduce yourself.

TING:

I'm Samuel Ting, a professor of physics from MIT.

HOLLANDER:

What branch of physics really are you in?

TING:

In the past, I was doing elementary particle physics, experimental physics, and now I'm gradually doing some experiments in space.

HOLLANDER:

Experiments in space?

TING:

Yes, experiments in space, yes.

HOLLANDER:

What kind of space?

TING:

Oh, no.

HOLLANDER:

Oh, that kind of space.

TING:

On the International Space Station, which is an effort by the European Space Agency, by NASA, by the Japanese, and by the Russians to build a place where people can live and work in space for an extended period of time. There there are experiments by me.

HOLLANDER:

Exactly what are you doing with the Space Station?

TING:

You know the Space Station now has been built. It has a dimension of 100 meter by 80 meter, weighs about 420 tons. In there, there are six astronauts live there permanently. Because it is so large, it provides very good infrastructure, power supply, support the weight, to do fairly precise experiments which normally cannot be done in space until now. The experiment I want to do is to look, two things. One, is the universe made out of antimatter? And the second is, what is dark matter?

Well, let me explain. We know the universe is expanding all the time. Everybody know the universe, the stars and galaxies move away from each other. Move away from each other means tomorrow is larger than today. That's what it means, moving away. And that also means yesterday is smaller than today. Last year the universe is smaller than this year. So you trace it back and you find out from the speed of expansion or contraction back in time, you find out the universe has lived for 15 billion years, and 15 billion years ago it must have come from a point, and that's why people think the universe comes from a Big Bang.

Before the Big Bang, there's nothing, so after the Big Bang there must be equal amount of matter and antimatter to balance it out. So the question then is, where is the universe made out of antimatter after 15 billion years. And so that is one experiment I'm doing. That, you have to look for negatively charged nuclei. Most of the nuclei are positive charged. The anti-nuclei means they are negatively charged, and therefore you need a magnet to trace positive going one way, negative in the magnetic field going opposite way. So we have a super-connecting magnet, a detector, used with [unclear] accelerators to measure, to identify the particles on the Space Station.

HOLLANDER:

Doctor, to change a little bit, what brought you to physics? How did you become a physicist?

TING:

I started—I was born in the United States in 1936. My parents were studying at University of Michigan, so I was born there at University of Michigan Hospital. At that time, it was just the beginning of World War II. My parents, they are Chinese, so they wanted to go back to China to help China. So I was only a few months old; I have nothing to say.

So they took me back to China, and at that time, because of the wartime conditions, I really didn't go to school until I was twelve. In 1948, I went to Taiwan, and then I began to go to school. In the beginning it was really quite difficult to go to school at age twelve.

Then I went to the University of Michigan because I was born there and a citizen by birth, so it's easy to go to University to Michigan. But first, I want to study engineering. After a few months, I realized I could not understand engineering drawings, whether looking from top, looking from sides, I could not figure this out. So I thought, gee, this will not be good for me. Then, on the other hand, I found out physics and mathematics was easy for me. And that's how I gradually switched to physics.

HOLLANDER:

Going back a bit, it must have been very difficult as a child of twelve to sort of enter school and be placed with other kids who had had, what, eight years of schooling.

TING:

Yes, yes, yes.

HOLLANDER:

But you caught up rather quickly.

TING:

Yes, I guess so. I guess so.

HOLLANDER:

The schooling was in Chinese?

TING:

Yes, it was in Chinese, yes, in Taiwan, in Taiwan.

HOLLANDER:

You had a lot of characters to remember.

TING:

Yes, yes. Well, let's say, both, at when I was twelve when I went to begin my education, or when I was twenty when I went to University of Michigan, that's where I entered into college, both are really quite difficult. Because when I went to Michigan, I didn't know any English.

HOLLANDER:

Really?

TING:

So it was somewhat difficult.

HOLLANDER:

How long did it take you to learn English?

TING:

I don't know, but I did manage, though, to finish all my education rather quickly at Michigan. I remember when I first went there, I would go to a class. I would sit there. I don't understand anything. But soon I found out on Saturdays, there was university football, you know, this American football. That is something I can understand. So I decided, gee, I'm not going to miss that. So most Saturdays, I go to football. But after a few months, I managed to catch it up in school.

HOLLANDER:

What oriented you towards theoretical physics?

TING:

No, I didn't do theoretical physics. I found out mathematics and physics was quite easy for me. So when I went to graduate school, of course, like all the students with good grades, you want to do theoretical physics. Then one day I had a conversation with Uhlenbeck, that's the gentleman who in 1920s discovered the electron spin. He was the best physicist at Michigan. So I said, "I will study with him." He was very delighted.

After a few months, he took me to tea in his office, and he sort of murmured to himself. He said, "Well, if I were to do my life again, I would want to be an experimental

physicist than a theoretical physicist." I was very surprised, because here is one of the great physicists in the world.

So I asked him why. He said, "Well, an average experimentalist is very useful. An average theorist is not." It was a conversation of five minutes, and I immediately said goodbye and I left. That's how I become an experimentalist.

HOLLANDER:

What did you win the Nobel Prize for?

TING:

I win the Nobel Prize for the discovery of a new form of matter, and that work was done from 1972 to '74. I got a Nobel Prize in '76.

HOLLANDER:

What kind of matter is that?

TING:

Now, before my experiment, most of the matters, nearly all the matters in the universe we know of, the nucleis, the elementary particles, can be considered as from combination of three type of cores. They have a certain pattern, their weight, and lifetime, how long they live. There's a pattern.

In 1976, I discovered a new particle which I called the J particle, and it was discovered same time as the Stanford people, what they called the side [?] particle. There the particle is very heavy. It is about three times heavier than most of the other particles. Most usual, it has a very long lifetime. Its lifetime is about 10,000 times longer than the rest of the particles. After this discovery, a family of particles with similar behavior was discovered.

Now, you imagine on Earth, most of the people live less than 100 years. But suppose you suddenly find a village, everybody lives 10,000 years or 100,000 years. These people must have some different properties, and that property means we now know it's a new type of core, so-called time core. It is for this work that Mr. Richter and myself was awarded a Nobel Prize.

HOLLANDER:

Without getting too obtuse or difficult, how did you discover the presence of this particle?

TING:
Before that, I had worked for many, many years in [unclear] Hamburg, and there we were using a light ray to hit the nuclei. Then we soon find out, at very high imaging the light ray has a very small chance, but a finite chance, suddenly to change itself to a particle with mass. Now, all this mass has a mass of proton. So I was asking myself, why always this particle always has a mass of proton? Could there be heavier masses? To do that, I did experiment at Brookhaven in United States, used a much higher-energy accelerator and there, indeed, we found this particle.

HOLLANDER:

Using the accelerator.

TING:

Yes, using the accelerator.

HOLLANDER:

Doctor, what do you think the significance is of the Nobel Prize?

TING:

Well, I can only speak for myself. Very often Nobel Prizes was awarded twenty or thirty years after the work. In my case, I don't know why, maybe they are too excited or maybe they made a mistake, they award the Nobel Prize two years after my work. So at that time, I was forty. Then it was quite useful. With the Nobel Prize, it is much easier for me to carry out my experiment. For whatever reason, I don't know, people tends to support you more, gives you more—

HOLLANDER:

It made a big change in your life?

TING:

Not much. To do experiments, it's much easier. People in the government, the U.S. government, tends to support you a little more.

HOLLANDER:

One thing that we've noticed here, here at Lindau, there are something like sixty or more laureates. They're all men. How do you account for that?

TING:

I do not know. For that, you probably will have to ask a sociologist. I do not know.

HOLLANDER:

Do you have any ideas?

TING:

No, I do not have any ideas.

HOLLANDER:

Are there less women in the field?

TING:

Yes, that's correct, yes.

HOLLANDER:

Are the women less aggressive?

TING:

I do not know, because you're now dealing with science and the scheduling of science. I don't know what is the man-to-woman ratio in literature. So this I do not know.

HOLLANDER:

No, only in science.

TING:

Yes.

HOLLANDER:

It's been suggested to us that one of the reasons that there are less women is that men are naturally more aggressive, and to succeed in science you have to be aggressive. Do you think that's true?

TING:

I do not know you would call aggressive. Certainly you must be persistent. You must

believe what you're doing is really the most important thing in your life, at least for me. Nearly all the experiments I've done, at the beginning it was always very difficult. People either say, "Well, this is not worth it," or they say, "You cannot do it. It is so difficult." You only have to, (A), have faith in yourself, and, (B), you really have to be persistent. I don't know you will call this aggressive or not. You certainly have to believe what you're doing.

HOLLANDER:

Have you been wrong before?

TING:

Not yet. But one day may happen. [Laughs]

HOLLANDER:

Doctor, you teach as well?

TING:

Not too much. I'm a professor at MIT, but MIT has been very supportive of me because I work at CERN. I work in space in Johnson Space Center in Houston and Kennedy Space Center in Florida. So it's rather difficult for me to teach. But my collaborators teach for me.

HOLLANDER:

What I wanted to ask you was, if I'm a young person and I come to you and I say, "Doctor, I want to go into science, but I don't know what to do. I don't know where to go. I don't know what to read," [inaudible]?

TING:

That's very difficult to advise. In order to be a scientist, to be a successful scientist, you really have to have 100 percent dedication. You really have to find a subject. You think this is the most important thing in your life. I would advise him, or her, try to find it by whatever means possible. Go to class, talk to Nobel laureates, or read in the library. Try to find a subject you really think is extremely interesting, and for this subject you want to devote your life. That would be my advice.

HOLLANDER:

Doctor, one other question. Do you have any other interests outside of science, literature or something?

TING:

When I was very young, I had a quite good memory, so I could read something and remember. Because of that, when I was in Taiwan I was very interested in Chinese history. Very few people get 100, a perfect score, in Chinese history, but I did because I can remember the happenings. So I still have some interest in history, but now in a very superficial manner.

HOLLANDER:

What phase of Chinese history were you particularly interested in?

TING:

No, just the so-called interest because school was very easy. Yes. [Laughs] I think, no, all of them. China has a long history.

HOLLANDER:

I know. That's why I was asking the question, a particular dynasty or [inaudible]?

TING:

No, I'm quite interested in most of history, only on a detached level.

HOLLANDER:

Do you go back to China often?

TING:

Occasionally. Not all the time. Occasionally. Maybe once or twice a year.

HOLLANDER:

I think that's it.

[End of interview]