Speech

In Honouring the Masao Horiba Award Winners — HORIBA Radio Laboratory and My Voyage to the United States —

Masao Horiba

HORIBA Radio Laboratory

In 1945, Japan was defeated in the Pacific War. I believe the biggest reason Japan accepted the Potsdam Declaration was the nuclear bomb. The fact that mankind became aware of the might of nuclear energy, the most crucial form of energy available to us, in the form of a bomb, was very though-provoking. Today, the question of owning a nuclear bomb or not remains a heavily politicized issue relating to the nation's sense of identity and its status as an independent state.

I was in my second year of university when Japan lost the war. I am still uncertain as to whether the choices I made at the time were correct. Science had always been my favourite subject, and by the time I entered middle school I wanted to be a mathematician or an astronomer. But in high school, after taking classes from a physics teacher specializing in nuclear science, my interest changed from astronomy, a discipline that covers something very large, to nuclear science, a discipline that deals with the smallest of things. I entered the Department of Physics at Kyoto University in hopes of studying under Bunsaku Arakatsu, a nuclear physicist I held in highest esteem.

However, as a result of Japan's defeat in the war, the U.S. military banned research in nuclear physics, and all research facilities and equipment relating to nuclear physics were either destroyed or shut down. As there was nothing to do at the laboratory, I rented a house and set up a private laboratory to continue with my research. This became the HORIBA Radio Laboratory.

My research involved the study of measuring instruments for counting pulse numbers. After many twists and turns, I managed to develop a vacuum tube counter capable of measuring pulse numbers exceeding 100 megabytes. As the output of this counter was a binary system, my research also involved the high-speed conversion from binary to a decimal system.

However, running a research laboratory was difficult for a careless person like me, and after exhausting the money given to me by my father, I was forced to raise my own funds. When I came across a stash of storage batteries and selenium rectifiers produced by a major company called Nihon Denchi for wartime use, I immediately approached them to ask if I could have them. They said yes, so I did so immediately.

Back then we used to experience power outages regularly, almost every night, due to an extreme shortage of electricity. So I developed back-up storage batteries using the batteries and selenium rectifiers I had brought back. When I put them on the market it became a runaway success, the best-selling product of HORIBA. In the morning when I looked out of the window, I would see a long line in front of the laboratory. However, since these batteries required manpower to manufacture, production was halted once we had enough funds.

However, without a source of income it did not take long before I ran out of funds. I next turned to painkillers Phenacetin[*1]. These were used by injured soldiers during the war, and as with the storage batteries, there were surplus supplies at pharmaceutical companies with the end of the war.
I did not know much about chemistry, but after consulting with a chemistry professor in Kyoto University, I managed to convert them into dulcin[*2] in a process that included concentrating the substance prior to hydrolysis. Unlike saccharin, dulcin had a mild sweetness, and this became another huge hit. For a while, I managed to get by from the profits, but there was a limit to the raw materials.

I was very busy with fund-raising, and where actual research was concerned, I was making little progress in the area of electronics without quality electronic components, or more precisely, without quality electrolytic capacitors at my disposal. I lacked the documents to build my own electronic components; I asked manufacturers whether I could visit, but was denied for confidentiality reasons.

At the time I used to enjoy visiting the American Culture Center[*3] near Sanjo Karasuma, where new publications from the United States were put on display. Many of the publications were in the field of humanities, but they also displayed a substantial number of natural science books. One day, I came across a book entitled “Electric Capacitors” and I borrowed it immediately. The book contained various data concerning electrolytic capacitors as well as manufacturing process. Although this process was old, I threw myself into building one, and through refinement, succeeded in creating a prototype. With this prototype in hand, we went around looking for companies needing capacitors, mass produced the capacitors and used parts of the products for ourselves. The prototype was received very well, and Matsushita, Sharp, Toshiba, Mitsubishi Electric and other companies suggested buying everything we produced. However, since this was a prototype, we asked the companies to finance a loan to start a manufacturing plant, but none said yes. It was then that an individual, what we would today

call a venture capitalist, took a look at our prototype and agreed to finance a loan unconditionally, and so we were able to start. However, as a result of the outbreak of Korean War in 1950 and inflation, we had to abandon the building of our plant.

*1: Acetanilide derivative with both analgesic and antipyretic efficacy. It is no longer in use due to its nephrotoxin nature.
*2: Artificial sweetener widely available after the war. It is currently banned.
*3: The Civil Information and Education Section (CIE) established under GHQ/SCAP on September 22, 1945, built 23 CIE libraries around Japan, and made English books and serial periodicals available to the general public. Control was transferred to the U.S. State Department following the inurement of the San Francisco Peace Treaty, and CIE libraries continued as the American Cultural Center in 13 cities. (Source: pp.45-48, "Aim of Establishing the American Cultural Center – Review of Kanawagawa Prefecture Library archives on American Culture Center", Mari Ishihara, a paper published for the 2008 Research Conference of Mita Society for Library and Information Science)

Establishment of HORIBA Ltd.

At the time I was saddled with a debt of 1 million yen, and as my calculations told me I would not be able to repay the sum even after 100 years, I needed to start a new venture to make more money. I decided to commercialize a pH meter used to manufacture electrolyte capacitors, and established HORIBA Ltd. in 1953.

In the same year the Korean War ended, and Japan stepped up the level of rice production, which boosted demand for the fertilizer ammonium sulfate. Ammonium sulfate is produced by injecting ammonia gas into sulfuric acid, and since precise control of pH levels is required in the production process, pH meters became a vital apparatus at chemical factories across Japan. As there were not many good industrial pH meters available at the time, HORIBA's pH meters sold very well and I was able to repay the debt.

To be honest, all these enterprises were done to make money. I would very much have liked to be in a position to receive the Masao Horiba Award. But I continued to run my company without such an opportunity presenting itself, and I finally decided to cut all ties with my nostalgia and carry on as an expert on measurement, which is what I do today.

Voyage to the United States

In those days, everything about Japanese technology was based on American technology, and I very much longed to visit the United States. I tried every possible means to procure a U.S. visa without any success, and so I continued to wait eagerly for the first opportunity that came my way. I most wanted to visit the National Bureau of Standards (NBS).

Japan Productivity Center was sending out study tours to the U.S. (Figure 1). As U.S. was very keen for Japanese industries to develop, they treated

delegates of the Japan Productivity Center extremely favourably, arranging visits to many corporations and institutions. However, delegates were mainly drawn from large corporations and small companies were not afforded the opportunity. So I hatched an ingenious plan. I inflated our capital and employee numbers tenfold by adding zeros to our application form, and I managed to become a part of the delegate. Of the ten or so members, I was the only one from a small company.

Figure 1 The first overseas study tour of top management headed by Taizo Ishizaka, then chairman of Japan Business Federation; September 6, 1955 (Source: Japan Productivity Center website).

So in 1958, I joined the study tour of the U.S. At the time, the exchange rate was 360 yen to a dollar, and our daily allotment was twelve dollars, but half was spent on accommodation so we had to live on the remaining six dollars. A round-trip ticket from Japan to the west coast of the United States, from the west coast to the east coast and back, and from the west coast back to Japan had already been purchased, but I didn't have a good idea as to what it is like to live on six dollars per day in the United States. I had a 90-day visa, and 45 of those days were to be spent on the study tour, so I hoped to travel as I wished during the remaining 45 days.
The study tour went on a tour of various corporations as well as government and university research institutions as planned. The study tour returned to the west coast on the 43rd day and every one of the members except me left the United States.

I had with me 1,000 dollars I had bought on the black market back in Japan. 1,000 dollars back then was the equivalent of 500,000 yen, a capital sum that I had somehow managed to procure. With this money I embarked on my solo-trip. As for my long-held wish to visit the NBS, I had written to them beforehand so I received a warm welcome.

In those days, my research consisted of electrochemical analysis, and so I was interested in the study of standard voltage. The accuracy of conventional cadmium cells at the time was four decimal places and became extremely unstable on the order of 100 mV. I wanted to visit the NBS to see if there were standard cells that were more stable.

I was extremely impressed with what I saw at NBS. They were studying standard cells at accuracies of five to six decimal places. A change of one degree in temperature translates to -40 mV, and the change affects the impurity of materials. The institute was therefore conducting research on standard materials to cope with changes in the composition of electrolyte solutions and electrodes. They were also making a thermostatic bath with gigantic machinery, to achieve stabilization at the level of .005 degrees. So there were three scientists and three lab technicians in a lab that was three times the size of this room, conducting research on standard cells at the accuracies of five to six decimal places.

Although standard cells were based on hydrogen electrodes in U.S. at the time, researchers were set on creating standard materials with a stable pH composition that would replace this highly unstable material. For this purpose, the laboratory had rows instruments to achieve five-nine or six-nine purity for various chemicals. Back then, producing standard water was not

as easy as percolating water through ion-exchange resins; it had to be distilled with a quartz water distiller. But since impurities from the quartz glass were a problem, they put coating on top; such unbelievably painstaking tasks were carried on diligently for days on end.

When I saw these scenes, the penny dropped. Until then, there was a single path in my mind, where science came first, technology was based on this science, and technology evolved into practical use for society. At NBS however, the distinction between science, technology and practical use was completely blurred. Technology served as the stimulus for science and science served as the stimulus for technology. Upon seeing how quickly this process translated into practical results, I felt I had witnessed science and technology in its truest form. Technology and science. I left NBS with a firm conviction that this was the pathway our company must pursue.

With my visa due to expire, I landed in Los Angeles on the 88th day of my visit. I had reserved a seat on a flight back to Haneda Airport on Japan Air Lines, but for some reason was told that the plane was full. I became desperate as I did not wish to be detained for overstaying my 90-day visa period, and was told I could possibly avoid detainment if I flew out to Honolulu on a domestic flight and waited for vacancy on a Japan Airlines flight out of Honolulu. So I took the flight out to Honolulu.

As my plan was to fly back to Japan from Los Angeles, I only had one dollar 50 cents left with me. This was not enough for a night at the hotel, so I watched a Hula dance performance on Waikiki beach (Figure 2) and decided to spend the night there and take the bus to the airport the very next day. I stayed on after the performance, thinking I had enough to get to the airport as the bus fare was 15 cents. Then, a person who looked Japanese came up to me and asked me what I was doing there, so I explained that due to a mix-up I needed to get on board the JAL flight out of the country the following day. This person invited me to his home, provided me dinner and took me to the airport the next day. I have remained on cordial terms with this person ever since.


Figure 2 Waikiki beach during sunset

I thought I would be in good hands once we arrived in Haneda, where there will be people from the company to greet me along with my wife. However, strong westerly winds forced us to make a stopover on Ueki Island instead of Haneda. At one point, we did not know if we could leave the island before the end of the day, but finally the plane took off for Haneda. If we had to spend the night on Ueki Island, I would have needed some money for my dinner, but fortunately we landed in Haneda five hours after take off.

Although I have digressed in my story, I came away from the trip with the conviction that progress in technology and science was impossible without a commitment to basics. And our company has continued to abide by this conviction ever since, that we must commit ourselves to basics, because these basics will survive no matter how much the world changed around us.

I turned 80 in 2004. Also, to commemorate 60 years of HORIBA Ltd., I

established the Masao Horiba Award in hopes of supporting young researchers involved in basic research. The scale of the award is rather modest, but there is also a modest prize attached to it that can be used without restriction for three years. I hope award recipients will make the most of this.

The Masao Horiba Award ceremony is attended by distinguished guests from various locations and disciplines. It is a great honour to be hosting this award in your eminent presence. I would also like to extend my heartfelt gratitude to our awards committee for selecting outstanding researchers.

What will give me greatest pleasure is to see the Masao Horiba Award bring together great minds and become a force, however small, within technological and scientific activities in Japan and ultimately in the world.

Thank you very much for your attention.

(Source: Speeches given at the Masao Horiba Award ceremony on October 17, 2007 and October 14, 2008 at Shibaran Kaikan, Kyoto University)