

## Toshiko Yuasa (1909-80): The First Japanese Woman Physicist and Her Followers in Japan

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*Eri Yagi (left) and Hisako Matsuda near the Institute de Physique Nucleaire, Orsay, France, Summer.*

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Toshiko Yuasa was the first Japanese woman physicist, and has been an influential role model among Japanese women physicists similar to that of Madam Marie Curie [1]. Yuasa was born in downtown Tokyo on the 11th of December in 1909, and died in Paris on the 1st of February in 1980 (at the age of 70). Her mother was from a famous old traditional literary family while her father was an engineer, educated at the University of Tokyo, and worked at the Japanese governmental Patent Office. Toshiko had 3 elder sisters and 3 brothers (2 elder and one younger). After graduating from the Girls' High School, which was attached to the Tokyo Higher Normal School for

Women, presently Ochanomizu University (for women), she entered the Normal High School, Department of Science, where she majored in physics. Toshiko was well talented both in science and literature because of her family background. At that time the Tokyo Higher Normal School for Women was one of the only two national schools where women could learn a higher level of natural science than at most senior high schools as well as the Nara Higher Normal School for Women. Toshiko's reason to major in physics was due to the influence of her father, based on her desire to understand the interesting structure of natural phenomena [2, 3, 4].

After graduating from the Tokyo Normal High School for Women, Toshiko entered Tokyo Bunrika University (presently Tsukuba University), Department of Physics in 1931, and graduated in 1934. Tokyo Bunrika University was the only university, located in the Kanto era (including Tokyo) among five universities all over Japan which accepted women students before World War II. From about 1934 Toshiko Yuasa started to do research in atomic and molecular spectroscopy and published her first paper. Having been strongly inspired by a series of papers on the discovery of artificial radioactivity by the Joliot Curie couple; Irene Curie (1897-1956) and Jean Frederic Joliot (1900-1958) at the Radium Institute, Paris, Yuasa decided to go to France to find better research conditions since the conditions for experimental physics were not satisfactory for her as an associate professor at the Tokyo Normal High School for Women. In 1939 Yuasa passed the examination given by the French government and went to Paris in 1940 although World War II just had started in Europe. Despite various difficulties, caused

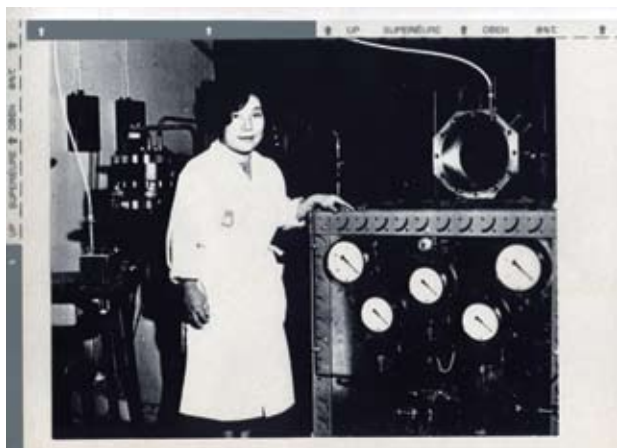
by the war, Yuasa carried on her studies under Professor Frederic Joliot at the College de France and received a French degree in physics for her work on the beta-ray spectra from the artificial radioactive nucleus in 1943 (when she was 33 years old) [5].

In 1944 through the success of the Normandy Landing, Dr. Yuasa had to leave from Paris to Berlin, Germany in August where she continued her research and developed an original instrument, called a double focusing beta spectrometer at a laboratory in Berlin University. In 1945 Dr. Yuasa was ordered to return to Japan through Siberia by the Soviet officials. She arrived in her home country, Japan with the double focusing beta spectrometer (which was carried on her back during the trip) at the end of June just one and a half months before August 15th, the day when Japan surrendered in World War II [6].

Dr. Yuasa worked hard to educate and encourage young female students of science as a professor at the Tokyo Normal High School for Women from 1945 to early 1949. These students were deeply inspired by Dr Yuasa's teaching and way of living, and tried to be professional scientists [6]. Among them three women became professors of physics at national universities in Japan. Dr. Yuasa also engaged in the movement for the promotion of the Tokyo Normal High School for Women to become a new women's



*Yuasa herself.*



*Dr. Yuasa with the propane bubble chamber at Orsay around 1960.*

university. Dr. Yuasa, however, could not start her research through the use of her beta spectrometer because the Occupation Forces in Japan prohibited any research in experimental nuclear physics regardless of whether it was pure or applied. So she decided to leave Japan, and asked Professor Frederic Joliot's help for her to go back and continue her research under him at Paris. It was in May, 1949, when Dr. Yuasa returned to France after an approximately two-month voyage from Yokohama port. At that time Japan had not yet established formal diplomatic relations with France. Since then Dr. Yuasa with her Japanese passport stayed in Paris until her death from cancer in 1980.

In order to cover the 5-year absence, Dr. Yuasa eagerly started experimental nuclear research in beta-decay through the use of a Wilson chamber at the college de France in 1949 [7]. Her position was as a researcher affiliated with CNRS (Centre Nationale de la Recherche Scientifique) with leave as professor of Ochanomizu University. Finally, Yuasa decided to stay in France forever for research and resigned from Ochanomizu University in 1955. In the same year, 1955, Dr. Yuasa reported and published with her coworker at Paris the danger of U. S. H-bomb experiments at Bikini Island in the Pacific Ocean in the spring of 1954 [8]. In 1957 she became Maitre de Recherche (chief researcher) at CNRS, and continued her research at l'Institut de Physique Neucleaire de Universite de Paris,

emeritus).

From about 1967 to 1980 Dr. Yuasa worked on the so called "a few nucleon system" which consists of 2 or 3 nucleons. After analyzing theoretical possibilities with those of experimentally detectiveness, she began to develop an effective large liquid scintillation counter and a large plastic scintillation counter for fast neutrons [10]. By the use of these instruments, Dr. Yuasa carried on experiments, e.g. the deuteron  $^2\text{H}$  and  $^3\text{He}$  breakups by the proton beams from 156 MeV synchrocyclotron [11]. However, it was not so easy to unify theory and experiments. The Japan-French research cooperation project of a few nucleon system, proposed by Dr. Yuasa in 1978, was finally approved just on the day of her death at Becquere Hospital at Paris on the 1st of February in 1980. A paper of the project, directed by Dr. Helene Langevin-Joliot (a daughter of Irene & Joliot Curie) was published in 1985 after Dr Yuasa's death [12]. Dr. Yuasa published 100 academic papers during her whole life, most of which were well evaluated with her high level of experimental abilities (the list of Dr. Yuasa's papers was published in our first Catalog in 1993 with reviews by Professor Miwae Yamazaki, one of Dr. Yuasa's former students [2]). She often participated in international conferences, such as Amsterdam in 1952 and 1957, Oxford in 1954, 1964 and 1966, Geneve in 1955, Paris in 1958 and 1964, London in 1959, Strasbourg, in 1961, Gatoulinbourg

Orsay, where the former institute moved between 1957 and 1959. Here Dr. Yuasa expanded her research to nuclear reactions for carbon  $^{12}\text{C}$  through the use of proton beams produced from a newly built Orsay's synchrocyclotron [9]. Dr. Yuasa continued her research activity after her retirement in 1975 (at the age of 65) as Maitre de Recherche Hon-orarie (chief researcher

in 1964 and 1966, Tokyo in 1967, Los Angeles in 1972, Quebec in 1974, Dehli in 1975 as an invited speaker, Amsterdam in 1976 as an invited speaker, Tokyo in 1977 as an invited speaker. In addition to her academic writings, Dr. Yuasa wrote a number of books and essays in Japanese to introduce French science and culture. She, as a person, played a role as a private ambassador of science between Japan and France. For Dr. Yuasa's above mentioned scientific achievements and remarkable contributions for the promotion of cultural exchanges between Japan and France, the Japanese government awarded her the Medal with the Purple Ribbon (Shiju-Hoshyo) in 1976 [2, 3, 5].

After the death of Dr. Yuasa, her belongings at her own apartment, 23-25, Rue de L'Estrapade, 5<sup>e</sup> in Paris were sent back to Japan according to her will. Luckily, these 87 carton boxes were deposited through the support of Ms. Miwae Yamazaki (Professor Emeritus of Saitama University, one of Dr. Yuasa's followers) at the Institute for Women's Studies (presently the Institute for Gender Studies) at Ochanomizu University in Tokyo. The contents of these boxes were classified under the name of Toshiko Yuasa's Archives which are waiting for further international studies from Asia and other parts of the world as well as from Japan and France [13].

Toshiko Yuasa's Prize for young women scientists started since 2002. It is sponsored by Ochanomizu University with the support of the French government to send a young woman to France each year to promote her further studies.

## **SUMMARY AND CONCLUSION**

The family of Yuasa supported her becoming a physicist, whose situation was common for most cases of women scientists in Japan [14]. Dr. Yuasa developed her research abilities in a foreign country, France rather than in Japan. This is also often seen among women physicists in Japan.

Compared to Dr Yuasa's time, a very different situation, namely, the rise of various

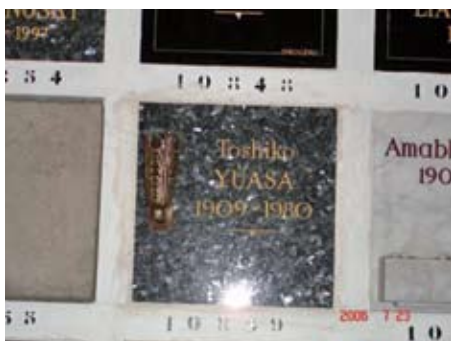
women scientist communities in Japan at a grass-roots level started about 20 years ago. For example, the “Josei Butsuri-gakushya no Kai” (women physicists informal meeting) has been meeting once a year on the occasion of the annual meeting of the Physical Society of Japan. In addition, international networks for women in general, women scientists, and women physicists have been active in the past few years [15]. The Gender Equality Promotion Committee of the Physical Society of Japan was started after the Paris Conference, Women in Physics of 2002 while other academic societies of science also organized similar committees [16]. The joint meeting of these committees was also started in 2002.

In addition, a promising woman physicist, Dr. Atsuko Kondo Ichikawa (1970-), a research assistant at KEK (High Energy Accelerator Research Organization, Tsukuba) who would be a future team leader of experimental nuclear physics, showed up here in Japan. The 9th Morita Prize for promoting young women scientists, sponsored by the JAUW (Japanese Association of University Women) was just awarded to Dr. A. K. Ichikawa for her promising future as a member of K2K (KEK to Kamioka) and T2K (Tokai to Kamioka), a sort of long baseline neutrino experiments [17]. These experiments with over 200 participants from 40 different countries are planned to send intensive artificial muon neutrino beams to the Super Kamiokande detector where oscillation from muon to electron neutrinos would be detected. Although the

final result will appear around 2010, Dr. Ichikawa’s abilities for developing various instruments during preparations were highly evaluated. The situation of the above project in Japan is essentially different in comparison with the project by Dr. Yuasa, which was done under the umbrella of the Curie family at l’Institut de Physique Neucleaire de Universite de Paris in France. This indicates some development of Japan in the field of experimental nuclear physics as well as that of science and technology in general with an economical background. Note that the Kamiokande is known as the place where Professor Masanori Koshiba observed neutrinos from supernova 1987A for which he received the Nobel Prize in physics in 2002.

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Yuasa’s cemetery.