WHERE NO OTHER DARED TO GO

KONO YASUI 1880 - 1971
JAPAN'S FIRST WOMAN DOCTOR OF SCIENCE

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Kono Yasui was born to the owner of a shipping business in the town of Sanbonmatsu in Kagawa Prefecture --the first daughter among nine children. Raised by well-read parents in the free and progressive atmosphere of a port town, Kono was a lively girl who loved her studies. About the time she graduated from lower elementary school and entered higher elementary schoo1 (this was before there were public secondary schools for girls in the provinces), her father had her read *Encouragement of Learning*, a highly influential book by the famous Meiji-era(1868-1912)thinker and educator Yukichi Fukuzawa, who founded Keio University. She was also fascinated by histories of ancient Japan and China. Continuing her studies at Kagawa Prefectura1 Normal School, she excelled in every subject, but she loved mathematics and science above a11. In 1898, at the age of 18, she entered the Women's Higher Norma1 Schoo1 (now Ochanomizu University) in Tokyo as a science major.

No Leeches, Please

Graduating in 1902, Yasui began teaching at a girls' higher school in Gifu Prefecture. Three years later, she was selected as the first student to enroll in the new research department at the Women's Higher Normal School. At the recommendation of zoology Professor Tomotaro Iwakawa, she began a study of the carp's Weberian apparatus (a group of small connected bones that transmit sound), and in 1906 she published her findings in the Japanese *Journal of Zoology*. This was the first scholarly paper ever published by a Japanese woman scientist.

Completing the program in 1907, Yasui was hired as an associate professor at the same school. When Professor Iwakawa suggested around this time that she begin a study of the embryology of the leech, Yasui replied that she hated leeches and declined. Instead, she wanted to try applying the methods of embryology to plant development. Yasui embarked on her own independent research into plant cytology (the study of cells) and embryology, and in 1909, the Japanese *Journal of Botany* published the results of her research on the prothallium (the gametophyte that grows from the spore)of the aquatic fern *Salvinia Natans*. The paper caught the attention of Professor Kiichi Miyake of the Tokyo Imperial University Faculty of Agriculture, and Yasui was given the opportunity to study plant cytology under his guidance (though not as a university student).She continued her studies, sometimes borrowing Professor Miyake's microtome to cut thin sections of tissue to view under a microscope, and sometimes devising her own instruments, such as an apparatus for automatically recording the amount of

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moisture that evaporates from a plant. In 1911, with Professor Miyake's recommendation, she was able to publish her research papercOn the Life History of *Salvinia Natans*" in the British journa1 *Annals of Botany*. This carefully researched paper, containing 119 precise microscopic drawings, was the first scholarly treatise by a Japanese woman ever published in a foreign professional journa1.

Overcoming Discrimination

Yasui's career spanned the late Meiji, Taisho(1912-26), and early Showa (1926-89) eras — a time when women were severely oppressed and were a11 but barred from pursuing scholarly studies. With the universities still closed to women, Yasui had no choice but to blaze her own trai1. While she was still teaching at the girls' higher school in Gifu, she was recommended by her former physics professor at the Women's Higher Norma1 School to write a physics textbook for use at girls' higher schools. She did so, but in the end, the Ministry of Education refused to approve the book on the grounds that it could not possibly have been written by a woman. There were also scientists who protested the publication of a woman's study in a scientific journa1.

When Yasui, now teaching at Tokyo Women's Higher Norma1 Schoo1 (as it had been renamed), submitted a request to study overseas, the Ministry of Education initially rejected it on the grounds that a woman was unlikely to achieve anything worthwhile in the field of science. With the assistance of Professor Kenjiro Fujii of the Tokyo Imperia1 University Faculty of Science —a noted specialist in plant cytology and genetics—she finally received approval three years later, but only on the condition that she add" research in home economics" to the purpose of her overseas study.

In 1914, Yasui's plans to study in the united States and Germany were finalized, and she traveled to America to do research at the university of Chicago, where she completed a study on the evolution of trees in the persimmon family. Her plans to travel to Germany, however, had to be called off when World War l broke out. Instead she began a study of plant tissue under Harvard University Professor Edward C. Jeffrey, who had developed a ground-breaking method for cutting very thin slices from hard materials, such as coal and oak, to observe under a microscope. when Professor Jeffrey suggested that Yasui do research on Japanese coal using the new technique, she immediately had some coal sent from Japan and got to work.

Into the Coal Pits

Returning to Japan in 1916, Yasui realized that Tokyo Women's Higher Norma1 School had neither the funds nor the facilities she needed to continue her study of Japanese coal. Fortunately, Professor Fujii spoke with the administrators of Tokyo Women's Higher Norma1 Schoo1, and special arrangements were made for Yasui. While remaining on the staff of Tokyo Women's Higher Normal School, she was permitted to do research at Tokyo Imperia1

University while working part-time there supervising student experiments in genetics. This research arrangement continued after Yasui was appointed a full professor at Tokyo Women's Higher Norma1 School in 1919. Each day, as soon as she had finished teaching and meeting with students, she would head for the university and stay there until late at night conducting research. In addition, she traveled all about the country collecting samples of coal, from the Yubari coal mines on the northern island of Hokkaido to the Miike and Takashima mines on the southern island of Kyushu. In order to collect samples, she would have herself lowered 30 meters or more into a coal pit on a woven rope basket used for hauling up coa1. 1t was dirty and dangerous work of the type most researchers avoided, and even Yasui's mother, who generally encouraged her daughter in her studies, begged her to stop.

Over a period of 10 years, Yasui used her uniquely precise methods of observation to reveal the changes that occurred in plant tissue —and particularly in the cell membrane—during the carbonization process that turns plant matter into coa1. She also classified numerous plant fossils, in the process discovering at least six ancient species (which as a result include *Yasui* in their scientific names). Through her research, she was able to disprove the accepted explanation regarding the carbonization process —that it was the work of microbes—and propose a new theory: that in the course of geological upheavals, plants became sediment that underwent gradual carbonization through the physico-chemical action of the matter above and below it. This excellent study was a first for Japan, in terms of both methods and results, and Yasui's paper "A Botanica1 Study of Japanese Coal" earned her the degree of doctor of science from Tokyo Imperia1 University in 1927.

Courage, Rigor, Humility

The debut of Japan's first woman doctor of science was celebrated in newspapers and magazines as an epoch-making event, and the news brought joy and hope to women around the country. Accepting the honor with an air of embarrassment, Yasui spoke as follows. "Blessed by the understanding of those around me and with nothing to encumber me, I have simply plodded along a path of my own choosing. I do not seek fame, nor do I desire high status, but will be content to know that my work lives on after me." These humble words, coming from a woman who conquered huge obstacles by sheer force of will and passion for knowledge, reveal Yasui's sterling character.

In 1929, the journal *Cytologia* (Cytology) was launched, with Fujii as editor in chief. Yasui first served as business manager and accountant and later worked on both editing and production, thus helping to spread news of Japanese scholarship around the world.

At the same time that she was carrying out important research at Tokyo Imperial University, Yasui was doing significant work on plant cytology at Tokyo Women's Higher Normal School, studying the cell structure —including the contents of the cell and the formation of the membrane —in a variety of plants, such as spiderwort (*Tradescantia reflexa*) and the

castor bean plant (*Ricinus communis*). Next she expanded into the fields of cytogenetics and comparative embryology, using 15 plant species including a number belonging to the poppy family, and ultimately used her findings to tackle plant phylogeny, or the evolution of plant "families." Looking back over her career, Yasui once said, "In the end, I think, my whole life's work has been the study of phylogeny. Yasui published 95 research papers during the course of her career, the last appearing in 1957, when she was 77 years old. Biology professor Torao Otsuki of Ochanomizu University, who knew Yasui well, said that "in terms of both the quality and quantity of her achievements, she belongs in the top tier of world scholars among women scholars, she is equaled by few in the world. "

As a teacher, Yasui firmly maintained high standards at all times and made it clear that she would not allow her female students to make excuses for themselves. Outside of the lab or classroom, however, she was kind and generous to her juniors and students alike. In short, she was a strict teacher but a warm human being. In connection with the educational reforms carried out after the end of World War II, Yasui campaigned actively along with several colleagues for the establishment of a national women's university devoted to specialized study and research, and in 1949 her efforts bore fruit when Tokyo Women's Higher Norma1 School became Ochanomizu University. Yasui became a professor at the new university and devoted herself to nurturing a new generation of scientists.

Kono Yasui lived for many years with her sister Masa, who was younger by 20 years. Masa, a painter in the Japanese style (Nihonga), took care of household duties for Kono. Thus, even after Yasui retired and was made professor emeritus in 1952, she was able to spend her days from dawn to dusk carrying out research and editing the journa1 *Cytologia*. In 1962, however, she was confined to bed. According to those who called on her, she invariably had an English-language newspaper and the latest scholarly journals at her bedside. She enjoyed listening to conversation and always showed the greatest care and taste in the traditional tea utensils and sweets she used to entertain her visitors. Summing up her life, Yasui said simply, " It was a joy because I loved doing research." Kono Yasui died in 1971, at the age of 91. She remains to this day a shining beacon for women scientists to follow.

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