No Girls Need Apply

Sometimes in science it can help not to know too much. If you knew eminent scientists had worked on a research problem before—with only limited success—you might justifiably shy away from working on that problem. And that was just what physicist Fumiko Yonezawa didn't know about amorphous materials, better known as glasses.

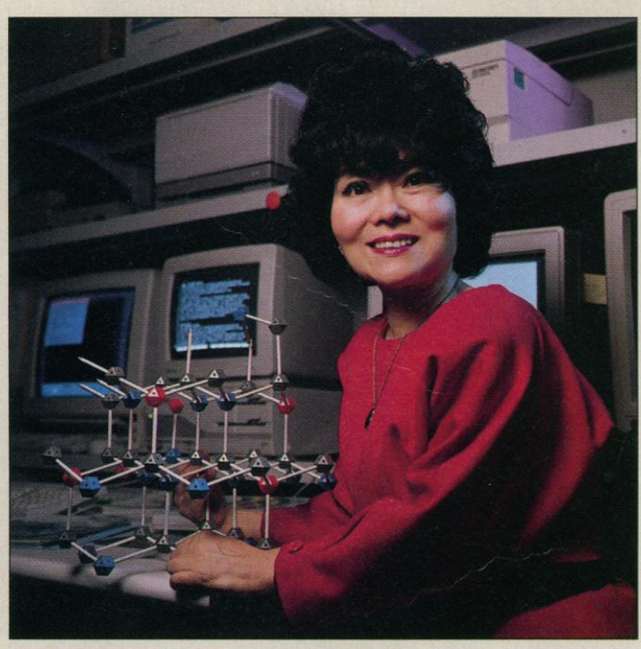
When Yonezawa was a graduate student at Kyoto University, a professor gave her an obscure problem about the statistical theory of random systems. "There were only five papers [on the subject] before that and they had been written by famous people. But I didn't know how famous. So I read them very critically, and I found out what we could do to develop the theory further." The result: a groundbreaking approach called coherent potential approximation, or CPA. That method formed part of her doctoral thesis in 1966 and is now fundamental to the theoretical understanding of the atomic structure of glasses.

Today, Yonezawa is an internationally known researcher who directs a large lab on the Yokomana campus of Keio University. A 10-person team in her lab is pushing beyond the earlier findings to expand the boundaries of computational physics. That team wants to understand, on the atomic level, how liquids become crystals or amorphous solids. "You take elemental atoms, put them in a box, apply pressure, heat, and see what happens," she says, adding laughingly, "It's not easy."

But, then, Yonezawa didn't make it to where she is by the easy route, though she concedes that being a woman has sometimes actually helped. Her work on CPA, begun in graduate school at Kyoto University, came to full fruition in 1967-68, when Yonezawa was at Kyoto University's Research Institute for Fundamental Physics. At the time, CPA was also being developed independently by male researchers at Bell Labs in the United States, as well as in Canada. Among such high-level competitors, Yonezawa stood out. "I think I was lucky to be a woman," she says. "At international conferences there were many papers. When [the physicists in attendance] remembered that a paper was presented by a little Japanese girl, they remembered the work as well."

Yet even Yonezawa, an upbeat person who does not like to dwell on the negative, acknowledges there are major difficulties involved in being a woman in Japanese science. Just as her career was taking off, in 1966, she had a daughter; two more soon followed. "I worked very hard. I had to bring them to nursery school; I had to do the shopping; I had to cook. My husband didn't help me in any way at all. He is a typical Japanese husband," she says. Furthermore, she says, one reason she stayed in academics is that the doors to industry were slammed in her face. Despite being consistently at the top of her university class, "when we tried to find jobs in companies, they all said, 'Only boys, no girls wanted.' Until then I didn't realize I was a girl."

After that kind of reception, she returned to the academic world, spending a few years at Yeshiva University and City College of New York, an experience she says honed her competitive skills in the high-pressure world of American physics. Then she returned to Japan and in 1981 was named professor at Keio University's new department of physics. A share of an unusually large grant of $5 million over 4 years from the Ministry of Education, Science, and Culture powers her lab's work. Recently, as an outgrowth of her interest in computational physics, she has become interested in neural networks.



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Model career. Physicist Fumiko Yonezawa uses computational models to study how solids form at the atomic level.

For her success, Yonezawa gives much credit to her mother, who was forbidden to attend university by her father but began teaching Yonezawa geometry when she was still in kindergarten. And she thinks parents generally hold the key to the cultural barriers that exist for women in science in Japan. "Parents say girls are not good at mathematics, and they don't want to spend a lot of money educating their girls in science. I think girls are conditioned since they are very young. Generation after generation has been conditioned like that. It will take generations to correct that."

–Toomas Koppel

brought up on 'man-the-tool-maker' and this just took it apart. Everyone knew that things would never be the same again."

Still, primatology was a bastion of male domination—and Goodall came under attack. The ruling animal behaviorists expected the animals to be numbered and placed in general categories, such as "the male" and "the female." Goodall chose to recognize chimpanzees as individuals instead. "I named the animals and used words like 'individual,' 'emotion,' and 'personality,'" she recalls. That was the key to her method: Goodall watched as life histories unfolded, believing that these lives—rather than theories or experiments—held the key to social structure. "Letting nature, including the animal, go its own way, I think is more female—at least in our society," notes Jolly. "It requires a certain kind of patience to put up with something you can't control."

The leading lights of the field considered this tendency unscientific and sentimental. Like Fossey and Galdikas later, Goodall met with hostility from other researchers. The Trimates "all labored at times under a silent ostracism," says Geza Teleki, a primatologist and the chairman of the Washington D.C.-based Committee for the Care and Conservation of Chimpanzees. "And other times it came right out into the open. There were some meetings where scientists really laid into them in a nasty way, insinuating that what they were doing was not appropriate science."