



**Kimiko Bowman**

# Never Say Never

Bowman Helps Provide Formula for Approximating the  
Distribution of Maximum Likelihood Estimators

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She could have been a horticulturist. She had, after all, thought it would be exciting to create new plants. But Kimiko Bowman, better known by her byline as K. O. Bowman, chose to be a statistician and help develop a formula for approximating the distribution of maximum likelihood estimators.

It was by chance, really, that Bowman chose statistics. Some might even say statistics chose her. She began her college education majoring in home economics at Radford College. "I wanted to make sure I would graduate, and I thought home economics would be relatively easy," said Bowman. "In my second year, the president of the college called me into his office and advised me to change my major to the science field. He thought my future would be much better in science. I [had] liked mathematics ever since I was a small child, so I immediately changed my major to math and chemistry."



Kimiko Bowman, who became a U.S. citizen in 1958, was the first 'foreigner' to receive a doctorate from the University of Tokyo.



At Virginia Tech, Kimiko Bowman worked with L. R. Shenton, her thesis advisor, to provide a formula for approximating the distribution of maximum likelihood estimators.

About a year later, Bowman graduated with a bachelor's degree and won a National Institutes of Health fellowship in mathematical statistics from Virginia Tech that sealed her interest in the statistics profession. Three years after that, she had in hand a master's degree and PhD in statistics. She completed her education with a doctorate in mathematical engineering from Tokyo University, but it was during her time at Virginia Tech that her research really took hold.

Bowman met L. R. Shenton, her thesis advisor, at Virginia Tech and—for the next 45 years—worked with him to provide a formula for approximating the distribution of maximum likelihood estimators. They succeeded by developing formulae for skewness and kurtosis statistics of maximum likelihood estimators with respect to sample size and by developing an approximation formula for the percentage points of Pearson distributions. By combining the two results, Bowman and Shenton were able to approximate the distribution of maximum likelihood estimators.

Another important accomplishment was successfully implementing a divergent series algorithm for large computers. "In sampling, statistics series like this often occur, and the algorithm for the coefficients is extremely complicated and reaches four-dimensional

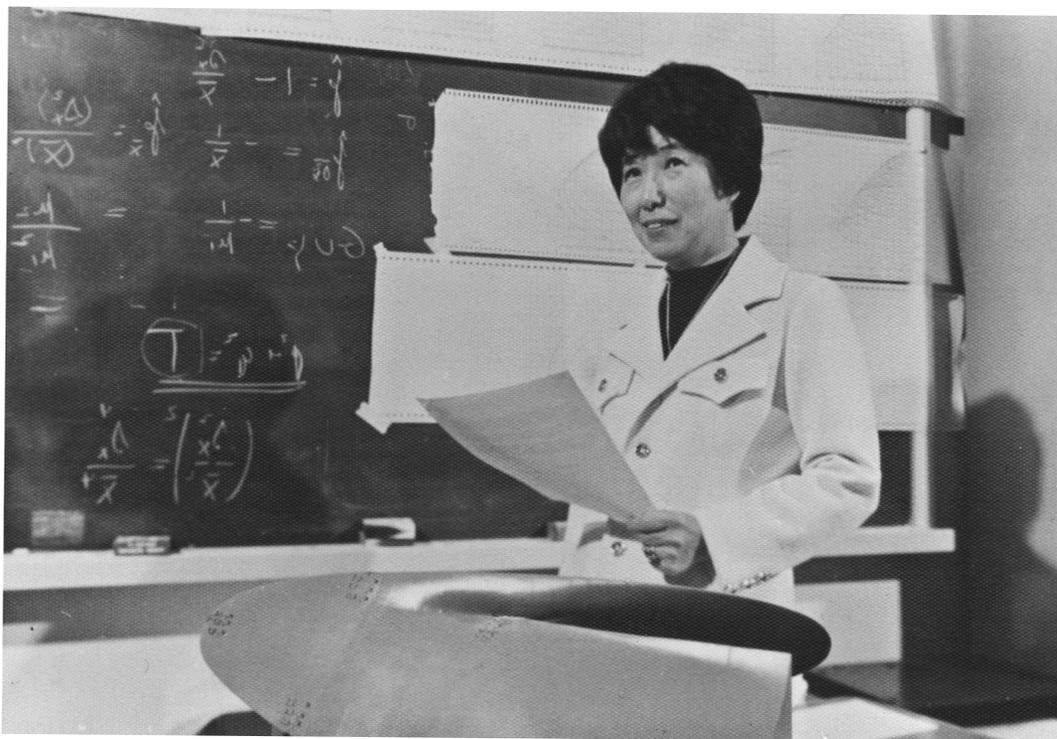
space," said Shenton. Bowman not only implemented the algorithm, but "it works, thanks to Dr. Bowman," said Shenton.

Bowman's life wasn't all work, however. She also found time to be a strong advocate for those with disabilities. She served on the National Science Foundation Equal Opportunities in Science and Engineering advisory committee and Committee on People with Disabilities. She wrote a report while chairing the latter that resulted in grants being set aside to provide accommodation or special equipment for people with disabilities—which helped promote their participation in science and engineering at NSF.

Bowman also chaired the Statistical Tracking of Employment of People with Disabilities task force for the President's Committee on Employment of People with Disabilities. Her main duty was to monitor the questionnaire for Census 2000 so relevant questions were asked about people with disabilities and accurate results were obtained.

Perhaps her interest in being a champion for people with disabilities stems from the physical hardships she, herself, has overcome. In her youth, Bowman suffered from polio that paralyzed her from the neck down. Doctors told her she would never walk again, but after two years of

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Kimiko Bowman, at Virginia Tech, advised a number of graduate students and published three books and approximately 200 papers.

rehabilitation, she was walking. Gladys Reynolds, a statistician and good friend of Bowman's from her Virginia Tech years, said, "I want to highlight her determination and perseverance. ... In 1980, she was having polio-like symptoms and was diagnosed with Post Polio Syndrome. In spite of this, she has continued to be as active and proliferate as always."

Bowman considers herself a "triple minority," being an Asian and a woman, as well as someone who suffers the effects of polio. "There were many struggles I had to overcome," Bowman said. "However, one must not lose sight of what we want to accomplish. So, I tried not to worry about slights or insignificant things."

Instead, she became one of the first women to be elected Fellow of the American Statistical Association in 1976, worked hard to advance scientific research using statistics, advised a number of graduate students, and published three books and approximately 200 papers. One of those papers, "Tables for Determining Statistical Significance of Mutation Frequencies," coauthored with M. A. Kastenbaum, received a Citation Classic in 1989 for being the fourth most-cited paper in the history of *Mutation Research*, an international journal. Additionally, Bowman is an elected fellow of the American Association for the Advancement of Science (1970), an elected member of the International Statistical Institute (1978), and an elected fellow of the Institute of Mathematical Statistics (1987).

In an effort to do more for minorities in the statistics profession, Bowman also became a contributing editor to the *Current Index to Statistics* in 1977 and continued in this position for more than 10 years. During that time, she translated articles from Japanese journals into English, added keywords and abstracts, and included them in the index. She also was asked to go to Japan as a liaison scientist for the Office of Naval Research. She initially went for three months, but continued to visit throughout her career. In 1987, she was invited to attend the International Statistical Institute meeting in Tokyo and to give a keynote address at the satellite meeting at Mt. Fujiyama. During the meetings, she received an audience with the Crown Prince and Princess of Japan—an unforgettable memory for her.

In 1994, Bowman retired from Oak Ridge National Laboratory as a senior research scientist. Retirement has not slowed her down, however. She continues to be a guest scientist in the Computational Sciences and Engineering Division at Oak Ridge, working on research in distributional properties of estimators and test statistics under non-normal sampling. She also consults with colleagues within Oak Ridge on aspects of statistics such as procedures for validating computer models in economics and stochastic models in epidemiology and biology. In the words of Reynolds, "As a woman, minority, and a person with a disability, she has certainly been an inspiration and mentor to many of us in the scientific community." ■