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"Sekiko Yoshida: Abacus "Software" in the Early U.S. Space Program

In 1958, the first U.S. satellite, Explorer 1, was launched into orbit. Its most consequential scientific achievement was James Van Allen's cosmic ray experiment leading to the discovery of vast radiation belts above the Earth. But Van Allen's team of physicists found their efforts at further data analysis stymied by a lack of computational power and their incomplete understanding of the new phenomena encountered by the satellite. Satellites offered a brand-new vantage point to understand space; but also necessitated new techniques to grapple with the data they acquired.

This paper explores the submerged contributions of geophysicist Sekiko Yoshida, a Japanese scientist in the early U.S. space program who worked at the University of Iowa. Her analysis of the cosmic ray data collected by Explorer provided the scientific underpinning for the discovery of the radiation belts. Wielding techniques that were typically used by Japanese cosmic ray physicists in this period, Yoshida was able to determine the complex motion of radiation particles in orbit around the Earth and to compute cosmic ray values recorded onto miles of paper tape. She performed these calculations on a Japanese abacus. Yoshida's experience as an expatriate woman is an example of the intersectionality of gender, race, and national identity in the history of computing. It also demonstrates the use of an Asian computing system in making a quintessentially "American" scientific accomplishment during the Cold War.