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also known as **Aida Ammei**

(*b*. Yamagata, Japan, 10 February 1747; *d*. Edo [now Tokyo], Japan, 26 October 1817)

mathematics.

Aida studied mathematics under Yasuyuki Okazaki in Yamagata when he was fifteen. When he was twenty-two, he went to Edo, determined to become the best mathematician in Japan, and worked as a field supervisor of engineering, river improvement, and irrigation under the Edo shogunate. His coworkers in the civil service included Teirei Kamiya, who was one of the ablest disciples of the famous mathematician Sadasuke Fujita. Aida wanted to become Fujita's pupil, and asked Kamiya for an introduction. Fujita did not receive Aida as a pupil, however, perhaps because of a falling-out occasioned by Fujita's pointing out mistakes in the problems inscribed on a tablet donated to a temple by Aida (these tablets, called *sangaku*, were hung on the walls of shrines and temples by recognized mathematicians as votive offerings—they further served as an exhibition of scholarship and as a supplement to textbooks). Aida then devoted his efforts to composing and publishing his *Kaisei sampo* (1781), in which he criticized and revised Fujita's highly regarded *Seiyo sampo* of 1781. Kamiya accordingly lost face, because he had introduced aida to Fujita who then was insulted by him; he retaliated by publicly pointing out the faults in Aida's book. Kamiya's criticism of Aida initiated a series of polemics that, conducted in private correspondence and in more than ten published mathematical works, lasted for the next twenty years.

In this dispute Naonobu Ajima, who was a friend of Fujita, sided with Kamiya. Ajima and Fujita had both been pupils of Nushizumi Yamaji, a master of the Seki school, and the private feud was thus transformed into a rivalry between the Seki school of mathematicians and the Saijyo school established by Aida. The Seki school was the most popular of the many schools of mathematics in Japan. Yoriyuki Arima (1714–1783), Lord of Kurume, was one of its leaders and was the first to publish its secret theories of algebra. Arima personifies the anomaly of a member of a hereditary warrior class drawn, in a time of enforced peace, to mathematics of the mostly highly abstract and purely aesthetic sort; he, too, had been a pupil of Yamaji, and he took Fujita under his protection and assisted him in the publication of *Seiyo sampo*. (Arima's own *Shuki sampo* was as popular in its time as Fujita's work, and Aida drew heavily upon both books.)

In 1788 Aida published *Sampo tensei shinan*, a collection of conventional geometry problems which were, however, presented in a new and simplified symbolic notation. The same year saw the coronation of a new shogun, and Aida was released from his post to face the social and cultural dislocation of the masterless samurai. He then decided that it was heaven's will that he concentrate on mathematics; he would live on his savings and devote himself to the perfection of his studies. He also took pupils, including many from the northeastern provinces; these returned to teach in their native regions, where Aida is still revered as a master of mathematics.

In *Sampo tensei shinan*, Aida compiled the geometry problems presented in Arima's *Shuki sampo* and Fujita's *Seiyo sampo and Shinpeki sampo*, These were largely the problems of *yo jutsu*, the inscribing in circles or triangles of other circles, a mainstay of traditional Japanese mathematics. In his book, Aida also showed how to develop formulas for ellipses, spheres, circles, regular polygons, and so on, and explained the use of algebraical expressions and the construction of equations.

Aida was well acquainted with the mathematical literature of his time, and edited several other books. In the course of his research he developed a table of logarithms, transmitted from China, that differed substantially from that of Ajima, being calculated to the base of two.

Aida also worked in number theory and gave an explanation of approximate fractions by developing a continued fraction (a simplification of the methods of Seki and Takebe). And, by expanding $x_1^2 + x_2^2 + x_3^2 + \ldots x_n^2 = y^2$, he obtained the integral solutions of $x_1^2 + k_2x_2^2 + \ldots + k_nx_n^2 = y^2$.

Aida was hard-working and strong-willed and produced as many as fifty to sixty works a year. Nearly 2,000 works survived him, including many on nonmathematical subjects. He was a distinguished teacher of traditional mathematics and a successful popularizer of that discipline.

Kazuo Shimodaira