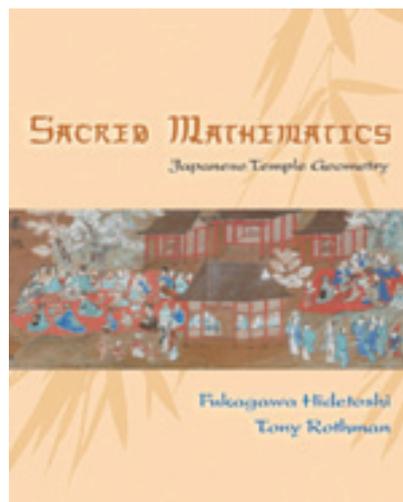


Secular Mathematics in Sacred Precincts

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Sacred Mathematics: Japanese Temple Geometry

Fukagawa Hidetoshi and Tony Rothman
Princeton University Press, 2008, 392 pp
ISBN: 9780691127453

Imagine this.... The Muromachi period in Japan (1338–1573) was a period of cultural development (the Noh plays, the tea ceremony...), and extensive trade with Southeast Asia. Apocryphal though it might be, the story goes that one could hardly find in all of Japan, a person capable of carrying out the art of division! This period was followed by confrontations of the daimyos (warlords) culminating in the battle of Sekigahara (1600), which saw the establishment of the Tokugawa Shogunate. The famous daimyo, Toyotomi Hideyoshi (1537–1598) had already begun to develop a serious mistrust of the Christian (mainly Portuguese) missionaries. The Tokugawa Shogun, Ieyasu followed up on Hideyoshi’s resolve, and in 1614 outlawed the practice of Christianity. From then, until the forceful opening up of Japan by Commodore Perry in the middle of the nineteenth century, Japan followed the policy of “Sakoku” or a “closed country”. In the three millennia when the Tokugawa shogunate held sway, there was a period of relative peace and a renaissance,

referred to as *Genroku*. It was also in the mid-to-late seventeenth century that mathematics flourished — the main arenas being temple shrines, the subjects largely being restricted to geometry and the participants being a cross-section of the general population!

What survives today as a striking testimony to this are the “Sangaku”, which are wooden tablets painted with geometrical figures and were then displayed in Shinto shrines and Buddhist temples. Each tablet encapsulates a theorem or a problem in geometry. These were posed as challenges to experts, and the participants in this unique form of mathematical challenge, saw this whole exercise partly as dedication to Divinity, for helping them to see the path to solutions and progress in their mathematical knowledge. Though there are parallels to the mathematical exchanges in Europe at around the same period (remember Fermat and his letters...), there are key differences. For one, these challenges and their solutions were played out across Japan in various temples and shrines. Second, the participants seem to have constituted larger sections of the general public — there are lovely woodblock images of people (including women and children) huddled together (Plate 4: Sangaku of the Sozume shrine). Importantly, there is also the aesthetic aspect — the Sangaku tablets are beautiful, typifying many attributes of Japanese art.

The book *Sacred Mathematics: Japanese Temple Geometry* is a delightful book which is aimed at both mathematics experts and the non-experts. The authors Fukagawa and Rothman have strived hard to balance the task of delving in detail at some of the Sangaku problems along with complete solutions, while simultaneously keeping the text accessible to an interested reader. Fukagawa, a tireless devotee of the Sangaku has spent his life studying them, recording them, and writing about them. Rothman, a theoretical cosmologist, was fascinated when he first saw Fukagawa’s book with Dan Pedoe on Sangaku and saw the value in bringing this beautiful and rich part of traditional



Sangaku from the Sozume shrine

Japanese mathematics to a broader international audience. The two of them never met but collaborated extensively by way of e-mail exchanges and letters to bring out this delightful book. What makes this whole endeavour even more remarkable is the absence of a common conversational language between them — Rothman does not speak Japanese and Fukagawa is not conversationally fluent in English.

The book is a fascinating source of nuggets from a bygone era — by way of Japanese history, art and mathematics. It has endless possibilities for a curious and interested mind, both that of students and teachers. What role does culture play in shaping mathematical thought? In what ways did the Sakoku contribute to this blossoming of high level geometry with the interesting component of secular public participation within sacred spaces? The book deals also with other fascinating stories related to Sangaku, for instance the travel diaries of a Sangaku enthusiast and itinerant mathematician, Yamaguchi Kanzan, during 1817–1828. His diary entries provide a charming view of the mores and feelings that mathematics evoked at that time among the public, both ordinary and the

“intellectual” class. Needless to say, an added bonus are the visual images of the Sangaku and other related Japanese prints, etc., which are a virtual visual treat. The book is already making waves in the west, especially amongst educators who see the possibility of adding other interesting dimensions to classroom teaching by choosing problems and discussing them, etc. While the strength of Japanese mathematics in the 20th century and at present is well-known, this book offers more than a glimpse of a little known part of mathematics in the Japanese past. It is a book that is bound to delight and fascinate a broad section of interested readers.



Yamaguchi Kanzan Diary 6. Takeda's Maximum Problem

Professors Fukagawa and Rothman have kindly agreed to an e-interview which appears along with this article. I would like to sincerely thank Florian Sprung for help with translation and coordinating the interview with Fukagawa.