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Scholars' recreation of two traditions of mathematical commentaries in late eighteenth-century China

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Abstract

This paper aims to shed light on two different mathematical practices in late eighteenth-century China. For this purpose, we analyze two solutions to the "three problems of the eastward motion of fixed stars" (恒星東行三題) that were given separately by Jiang Sheng (江聲) and Li Rui (李鋭), who were both Qian-Jia scholars in the same region of eastern China. By comparing their modes of problem-solving, of reasoning and of computation, we suggest that the mathematical practices they employed represent the recreation of two traditions of mathematical commentaries by Qian-Jia scholars.
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摘要

本文分析了乾嘉學者江聲和李鋭對 "恒星東行三題" 的解答, 揭示其兩種不同的數學實作。 通过比較其解題, 推理和計算模式, 本文認爲他們的數學實作代表了乾嘉學者對古代兩種不同的數學注疏傳統的再創造。
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1. Introduction

By analyzing and comparing different square root extraction computations in commentaries on Confucian classics and in commentaries on mathematical canons, Zhu Yiwen has shown that there were two different mathematical cultures in seventh-century China.[1] In this paper, I will continue the investigation of different mathematical practices in late eighteenth-century China, and deepen the analysis of connections between these practices and the different mathematical cultures that Zhu has shown.

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[1] (Y. Zhu, 2016).

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From the middle of the eighteenth century onwards, during the Qianlong (1736–1795) and Jiaqing (1796–1820) eras of the mid-Qing dynasty, scholars from the Qian-Jia school were involved in a movement of evidential research. The evidential research (kaozheng 考證) emphasized the concrete evidences obtained by critical approaches for their investigation of the Confucian canons. For example, the ancient commentaries by the Confucian scholars in the Eastern Han dynasty (25–220) received an adequate attention, and therefore, the scholarship of evidential research was also called "Han learning". Among the critical approaches the Qian-Jia scholars shared was their mathematical approach.[2] This paper will focus in particular on two eighteenth-century Qian-Jia scholars: Jiang Sheng (江聲 1721–1799) and Li Rui (李鋭 1768–1817).

Qian-Jia scholars had a wide range of academic interests: a special field was using mathematical method to solve problems in the Confucian canons. Dating the texts in the Confucian canons was another issues they were concerned with. In some cases the reasoning in dating texts involves computations that refer to knowledge of both mathematics and astral science, which Qian-Jia scholars would deem to be persuasive evidence according to their spirit of evidential research. Among the various ways of dating texts, reasoning based on mathematical methods is an essential part of their argument. The documents on which this current article focuses present precisely the reasoning that both Jiang and Li developed in relation to the problem of the mathematical dating of parts of a Confucian text.

The mathematics that could be used in this context were a subject of contention. Western mathematical knowledge and practice, with some kindred astral sciences, had been introduced and translated into Chinese from the early seventeenth century onwards. Some Qian-Jia scholars believed that this knowledge from the West was more advanced and could be made good use of in the evidential research they were undertaking. This was the case for Jiang Sheng who believed in the accuracy of Western astronomical values, which were used in his critical study on a particular Confucian canon (see below). But because of the exotic and novel features of Western mathematical knowledge, some scholars were diffident towards the use of foreign knowledge for this purpose. For instance, another scholar Sun Xingyan (孫星衍 1753–1818), also a friend of Jiang Sheng, believed that commenting on the classic by simultaneously using the ancient small seal script and the new Western astral sciences would seem to cause a contradiction.[3]

However, the point we focus on in this article is not which data were used in the context of solving the problems; the purpose is to show that Jiang Sheng and Li Rui used two completely different mathematical practices in their solutions, and that these practices are each rooted in different traditions, and that both practices are different from the then newly-introduced Western mathematical practices.

The first mathematical practice we shall look at is that used by Jiang Sheng in an article he wrote in 1795, entitled *Discourse on the* [*eastward motion of*] *Fixed Stars* (*Hengxing Shuo* 恒星説, hereafter *HXS*). Jiang Sheng, also known as Genting (艮庭), was based in Yuanhe (元和), Jiangsu (江蘇) province (now Suzhou city), which was an important centre for Qian-Jia scholars and for evidential research.[4] Jiang was proficient in the critical approaches for investigating Confucian classics. His most elaborative result is the critical edition of the *Book of Documents* (*Shangshu* 尚書) which relied on his collection of ancient

[2] In the 1920s, Liang Qichao was one of the first scholars to explain the academic spirit of the Qian-Jia scholars. See Liang (1998) and Liang (2004).

[3] Sun sent a letter to Jiang, saying: "When you are criticizing the canon, your character form following that in the *Explaining depictions of reality* [*and analyzing graphs of words*] (*Shuowen jiezi* 説文解字) is too ancient, and the interpretation of astronomy by using Western means is close to the present day. I am afraid of causing contradiction." "君繩經, 字以《説文》既太古, 釋天文以西法又近今, 恐致鑿枘" (Sun Xingyan, *Sun Yuanru xiansheng quanji*, 554).

[4] Jiang Sheng was one of the disciples of Hui Dong (惠棟, 1697–1758), a master from the Qian-Jia school and another Suzhou native. See Hiromu Momose's (百瀬弘) biography (Momose, 1970). For the earlier biography of Jiang Sheng, see Sun Xingyan's *Biography of Jiang Sheng*, in his *Drafts of Works from the Mansion in Pingjin* (*Pingjin Guan wengao* 平津館文稿) in Sun (1995–2002, 553–554), and Jiang Fan's *Biography of Master Jiang Genting* (Jiang F., 1998, 42–46).

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