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In Memory of Professor Li Jimin (1938-1993)

Algorithms in the mathematical sciences in the ancient world

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Algorithms and proofs in the ancient world

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Mathematical reasoning and computation in the early astral sciences in Chinese

Abstract – The earliest “mathematical classic” handed down through the written tradition, *The Gnomon of the Zhou* (*Zhoubi* 周髀), presents mathematical knowledge related to the astral sciences. The date when the book was completed is still an object of debate. Qian Baocong 錢寶琮 (1963) put forward the hypothesis that the book had been completed in about 100 BCE, whereas Christopher Cullen (1996) suggests it was completed at the beginning of the 1st century CE. On the basis of recent research based on arithmetical terminology, notably the prescription of divisions and the use of the term 除 *chu*, I have suggested that some parts of *The Gnomon of the Zhou* present close relationships with the mathematical manuscripts of the Western Han period excavated in recent decades. This seems to support Qian Baocong’s view. I have also suggested that the same features (the use of the term *chu*) seem to show that other parts are of later composition. Noteworthy is the fact that these parts are almost exactly those the 3rd century commentator Zhao Shuang 趙爽 on *The Gnomon of the Zhou* pointed out as additions to the “original text.” (For a more precise description, see Chemla, “Shedding some light on a possible origin of the concept of fraction in China. Division as a link between the newly discovered manuscripts and *The Gnomon of the Zhou* [dynasty]”, *Sudhoffs Archiv*, 97 (2), 2013, p. 174-198. The text is online at <https://halshs.archives-ouvertes.fr/halshs-01138465>.) This could be coherent with the hypothesis Cullen put forward, except for the fact that the parts that seem to him to have been the last to be added differ from those pointed out by Zhao Shuang.

As Qu Anjing 曲安京 (2002, p. 24) and Cheng Zhenyi 程貞一 & Wen Renjun 聞人軍 (2013, p. 153-156) both emphasized, the last section of *The Gnomon of the Zhou* is one of the parts that according to Zhao Shuang did not belong to the original text of the classic (even though there is disagreement on the exact part of the text to which Zhao Shuang refers here). Like Qu Anjing, I think that Zhao Shuang refers here to the whole final part of the book. This section answers a question about the *reason why* some numerical values for some astronomical data are what they are. In Zhao Shuang’s view, this text reflects an exchange between a master and a student. At least, this possibly indicates that in Zhao Shuang’s time, a learning of the astral sciences could take this shape. In my talk, I will observe the interplay between reasoning and computation to which this section testifies, both in the main text and in the commentary Zhao Shuang composed on it. My aim is, more generally, to draw conclusions on that interplay in the context of astral sciences in early China as attested to by *The Gnomon of the Zhou* and its commentaries.