

## Book Review

*Les Neuf Chapitres: le classique mathématique de la Chine ancienne et ses commentaires. Edition critique bilingue traduite, présentée et annotée par Karine Chemla et Guo Shuchun. Glossaire des termes mathématiques chinois anciens par Karine Chemla, calligraphies originales de Toshiko Yasumoto. Préface de Geoffrey Lloyd.*

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Those who have been following Karine Chemla's numerous publications on the *Nine Chapters* were aware that she was working on a translation of the *Jiuzhang suanshu*, or the *Nine Chapters of Mathematical Procedures* (called *Nine Chapters* in the following), and that a book was forthcoming. But probably few foresaw such a masterpiece. This work of scholarship, which does justice and honor to a major classic of Chinese Mathematics, is a significant event in the field of history of science.

This imposing volume of more than 1000 pages is the product of more than twenty years collaboration between two renowned experts on ancient Chinese mathematics, Karine Chemla, Centre National des recherches scientifiques in France, and Guo Shuchun, Academy of Science of China (IHNS). This book is an unusual enterprise, which gathers the best of western and Chinese expertise.

The volume consists of three parts. An introductory section, consisting of four chapters: a) a general overview of the *Nine Chapters* and its commentaries (Chemla), b) a history of the text (Guo), c) a discussion of former critical editions and studies of the *Nine Chapters* (Guo), and d) comments on the language of the text and the problems of translation (Chemla).

The basic text of the *Nine Chapters* was probably compiled at the beginning of the Christian era and was commented on by two mathematicians, Liu Hui, and Li Chunfeng, in the 3rd and 7th centuries respectively. Their commentaries were incorporated into the classic and studied along with the basic text by succeeding mathematicians. Considering its long-lasting influence and its rich content, this classic, which is translated here along with the commentaries, appears to have been the most important work of the Chinese mathematical tradition.

The second part of the book, in nine chapters, is devoted to the edition and translation of the text. Each chapter begins with a detailed introduction by one of

the authors, describing the format of the chapter, the structure of the problems and of the algorithms, the order in which the problems appear, and the explanations found in the commentaries. The translation is furnished with numerous endnotes. The introductory remarks and the footnotes are an indispensable complement to reading the translation.

The third part contains a glossary of more than 140 pages listing all the mathematical terms used in the text and commentaries. This glossary, which is Chemla's achievement, is a very useful tool. Under each entry, one finds all the occurrences and meanings of the term in the text and the commentaries. Through this glossary, one realizes the wide usage a mathematical term can have, as well as the rigor with which each of them is selected. This glossary is in itself a masterpiece. No doubt, it will be intensively used in the future by scholars of the history of Chinese mathematics. The third and last part of the volume ends with a bibliography of books and articles in Chinese, Japanese and Western languages. Before going into specific aspects of this work, I would like to stress once more the significance of this book which no historian engaged in the history of Chinese mathematics can ignore.

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#### *The material aspect of the book*

Even in its external features, this book is exemplary: every page is dense, nonetheless always pleasant to read; the parts written in Chinese and in French are strictly differentiated, probably in order not to disturb the non-sinologist. Both the layout and typography have been carefully designed. The Chinese characters in the glossary are beautifully hand-written. The graphics are exemplary. The volume contains all the information which a reference book should have: introductory notes, historical comments, methodological warnings, critical apparatus, the original text with accompanying translation, indexes, and a glossary, which helps the specialist as well as the neophyte find his way through the book and study each item thoroughly. This volume attains a rare achievement of academic professionalism. The editor, who plays an important part in the success of this enterprise, must be congratulated.

#### *The authors' style*

The content of the book is as carefully thought as its outward appearance. There are few books that are based on so many years of reflection. Hence, this book probably supercedes all former translations of the *Nine Chapters* (Japanese, Russian, and English). Even if some of Chemla's choices can be criticized, she cannot be reproached for carelessness. The terminology of the translation is based on a thorough study of the entire text so that the expression for each mathematical concept is informed by the context of the whole of the *Nine Chapters*. Karine Chemla

has especially worked on Liu Hui's commentaries, which she considers a significant tool for understanding ancient mathematical practices. In the general introduction, she outlines the theoretical reflection she elaborated from these commentaries and points to the aid they provide to the understanding of the basic text. One thesis she defends is that some commentaries provide "demonstrations" of the correctness of the algorithms given in the text. Considering the highly sophisticate character of her argument, the neophyte who has never read the Nine Chapters, would better begin by reading through the Chinese classic.

Guo Shuchun has also achieved a remarkable work. He gives us a critical edition of the text that rests on knowledge accumulated during the past twenty years by Chinese researchers. He definitely closes the epoch in which a historian could freely "correct" an ancient text in order to restore its "coherence". Although very conventional, the historical and philological comments contained in Guo's introduction are indispensable to understand the significance of this classic throughout its history. Guo's introduction brings us back to concrete preoccupations such as the question of the transmission of the different extent versions, or the work done on it by later mathematicians. It constitutes a useful complement to Chemla's highly abstract considerations.

Specialists will probably note that there are more than stylistic differences between the authors - they have divergent views of the classic. I do not view this as a problem. The reader should be made aware that the Chinese text is ancient and partially corrupted, that many passages are problematic and have not yet found a definite explanation.

### *The translation*

The neophyte who first encounters Chinese Mathematics through the translation of the *Nine Chapters* should be warned that this "translation" is almost a reconstruction, in the sense that the part played by the translator is far more important here than is generally the case. Karine Chemla not only proposes interpretations to difficult passages, she has also worked hard to develop a style that renders as faithfully as possible the form and the spirit of the original text. In doing so, she also paid attention to the readability of the translation. This was a difficult challenge. We can only regret that the French translation cannot be read through without using permanently the critical apparatus. This is not the case for the Chinese text. But we have to recognize that this is a very reliable, coherent translation, which has the merit of being based on clear principles.

In her translation, special attention has been paid to the mathematical language and particularly to the technical terms. The terms given in the glossary have technical meanings as well as common meanings, used in daily life. That is why the original text can be read easily today, even when we do not immediately perceive

all the mathematical implications. This is the case for terms such as “procedure” (*shu* 術), “faire communiquer” (*tong* 通), “part” (*fen* 分), “modification, transformation” (*dong* 動). One characteristic of Chemla’s translation is that most of the technical terms are translated into a very abstract or artificial language. Hence, in the translation, their technical character is visible at first glance. This explains why the translation is almost unreadable without using the introduction and footnotes. But this is not necessarily a shortcoming. Chemla’s close attention to technical terminology in the text leads her to point to deeper, subtler meanings than previously imagined. The glossary is a repository of her results in this field.

Chemla’s also focuses her attention on the form of the text. The French translation tries to be faithful to the regularities, repetitions and parallelisms which can be noted in the original. She considers that the structure of the text is meaningful and conveys information about the underlying mathematical practice. She gives particular attention to the form of algorithms. One of Chemla’s main achievements in the history of Chinese mathematics is the group of techniques she has developed for comparing and linking different algorithms. This detailed work on algorithms, which she has carried out for many years, has led her to propose that mathematical practices in China were centered around them. She particularly considers that Liu Hui’s commentaries, which sometimes assume a geometrical character, have no other aim than to “demonstrate” the correctness of the algorithms in use. This is one point of view, but we could also consider that these commentaries aim at clarifying the way these algorithms were obtained and understood. For example, the geometrical figures which are described in Liu Hui’s commentary to the root-extraction procedure (p. 323) can be understood as visual aids, which Chinese mathematicians had in mind when working on the algorithm.

When reading Chemla’s French translation, we are struck by its disembodied character and the impossibility of imagining the creative process or the intuition that led to this text. Chemla’s great carefulness is praiseworthy but in her translation she sometimes favors abstract solutions instead of concrete images. Let us take the example of the root-extracting procedure, *kaifang shu* 開方術, which Chemla translates as “procédure d’extraction de la racine carrée” (procedure of square root-extraction) instead of a more faithful “procedure for opening the square”. As explained by Chemla, she preferred the first translation, which sounds more “modern”. In this case, she considered that the mechanism of the algorithm was more important than the name. My opinion is that a more faithful translation would have been helpful. The idea of “opening a square” refers to a standard geometrical decomposition performed on a square, which is mentioned in Liu Hui’s commentaries and is also intensively used in the following periods. Using a more literal translation for the name of the procedure would have helped keep the reader mindful of the original intuition.

Likewise, the term *chu*, translated by “divide” is a key term in Karine Chemla’s

interpretation of the root-extraction procedure. Chemla translates “*kaifang chu* 開方除” with “diviser par extraction de la racine carrée”, that is “divide through the square root-extraction”. This sounds very strange for a reader not accustomed to Chemla’s style. With this translation, she wants to stress that Chinese mathematicians were aware of the analogy between the division algorithm and the root-extraction procedure. This is not wrong but one cannot help but think her translation would have been less strange if *chu* was translated by “eliminate”. As explained in the final glossary, *chu* can also mean “to eliminate, subtract, cut off” and refer to an operation performed on a geometrical figure. It is not impossible to consider this meaning as the primary one. If that was the case, Chemla’s choice to translate *chu* by “divide” instead of “eliminate” introduces an abstract dimension which may not exist in the original and hides the geometrical intuition which underlies algorithm. The analogy which she notes between these algorithms may only be a reflection of the analogy existing between geometrical operations performed on a segment, a square or a cube and consisting in eliminating progressively parts or sections of it. This is an interpretation that must also be argued, but it has the merit of being more intuitive than Chemla’s interpretation.

Lastly, I should point out the only serious shortcoming of this undertaking. It concerns the bibliography, which at first sight seems to be on the same model as the one Joseph Needham compiled in his volume of *Science and Civilisation in China*. Studies are classified according to the language used: western languages for one part, Chinese and Japanese for the other. The first part is due to Karine Chemla and the second to Guo Shuchun. It is the second part, which is questioned here. While the references in the footnotes are all given using Latin characters (such as Guo Shuchun, Li Jimin), they are given in the bibliography only in Chinese with neither transcription nor translation. This option limits the use of the bibliography to Chinese speaking people, which is unfortunate because researchers who do not read Chinese also want to be informed of the publications in China in the field of history of science. Furthermore, in spite of what the title promises, there is almost no study in Japanese mentioned in the bibliography. It only mentions two articles of Mikami Yoshio in Chinese. This shows either a lack of concern or an ignorance of the Japanese literature on ancient Chinese science. Needham’s bibliography in comparison was more complete. Mikami, in the 1930s, is probably one of the first historians to draw attention to Liu Hui’s commentaries and to point to the shortcomings of Dai Zhen’s edition of the *Nine Chapters*. He examined closely Liu Hui’s work on the circle and the sphere. Even though research has advanced since Mikami’s time, such an omission is surprising. Likewise, to say as Guo Shuchun does, that “the clarification of Liu Hui’s commentaries is due to researchers of the last twenty years” is not correct. This is all the more unfortunate since Mikami spared no pains to collaborate with Chinese historians of science. Last of all, let us point out that the names of the few Japanese authors mentioned in the bibliography are read according to Chinese

pronunciation and arranged according to the alphabetical order. For that reason, it is technically impossible to find these references from the names given in Latin characters in the footnotes. If the book is reedited, we wish this shortcoming to be rectified.