

Review

SaKHYa, *Gaṇitasārakaumudī: The Moonlight of the Essence of Mathematics by Ṭhakkura Pherū* (Manohar, 2009, ISBN 978-81-70304-809-8, 278pp., Rs. 995)

This is a reliable study on *Gaṇitasārakaumudī* (hereafter *GSK*), a book of Traditional Indian Mathematics written in early 14th century by Ṭhakkura Pherū. SaKHYa is the study group name which “was generated mathematically by the permutation of the initial letters” of the name of authors; Sreeramula Rajeswara Sarma, Takanori Kusuba, Takao Hayashi, and Michio Yano, and also means friendship as a word of Sanskrit.

A general history and some important achievements of Indian Mathematics are gradually known in recent days but the *GSK* and its author Ṭhakkura Pherū is little known, one of the reasons is that the *GSK* was written not in Sanskrit, the Indian academic language, but in Apabhraṃśa, a late medieval language of North India. It is very welcome that every sincere reader can approach the mathematical achievement of Ṭhakkura Pherū through the English translation and detailed commentary provided in this tome.

This book consists of four parts and appendices: Part I Introduction, part II Text, part III English Translation, and Part IV Mathematical Commentary.

Part I provides us the basic information of Ṭhakkura Pherū and the *GSK*. Ṭhakkura Pherū was born in Kannānā (modern Kaliyana in the Bhiwani district of Haryana state, not far from Delhi) around AD 1270. He belonged to the Śrīmāla caste and was a member of Kharatara sect of Śvetāmbara Jains. The Śrīmāla Jains controlled minting and banking in Delhi area and had good relationship with Muslim rulers at that time. The experience in this field was reflected in Pherū’s treatises.

A manuscript of Pherū’s writings was discovered in 1946 and published in 1961 by Agar Chand Nahata and Bhanwar Lai Nahata. The location of the manuscript is unknown now and the Nahatas’ edition is the only material available to us. The edition contains seven works all written in Apabhraṃśa: the *Kharataragaccha-yugapradhāna-catuhpadikā*, a small work of piety, the *Ratnaparīkṣā*, a work on gemology, the *Jyotiṣasāra*, on Astronomy, the *Vāstusarā*, on architecture and iconography, the *Dravyaparīkṣā*, on coinage, the *Dhātūtpatti*, on minerals, metals, and perfumery materials, and the *GSK*.

Part II is “a revised edition” of the *GSK*. The authors emend the text of Nahatas’ edition whenever needs arises, retaining the original readings in foot-notes. They also provide the text in the form of ‘padapāṭha’, in which words are separated each other independently of phonetic changes. This arrangement is useful for searching a word in the text. The

original form can be restored according to the procedure explained in the introduction of part II.

Part III and IV are English translation and commentary, the most useful parts for most readers.

The *GSK* consists of five chapters which are divided into two parts. The first part containing the first three chapters is based on the framework of traditional Indian mathematics but the second part including the fourth and fifth chapters deals a variety of materials which Pherū learnt from his own experience and his contemporaries.

The titles of the chapters are:

- chapter 1** *pañcaviṅśatiparikarmmasūtra* (rules for twenty-five fundamental operations)
chapter 2 *aṣṭau bhāgajātaḥ* (eight class of (reduction of) fractions)
chapter 3 *aṣṭau vyavahārāṇi* (eight types of procedures)
chapter 4 *deśādhikārādyaḥ catvāri adhikārāṇi* (four topics beginning with the topic on region)
chapter 5 *uddesapañcagam* (quintet of topics).

The most attractive topic to me is magic squares discussed in chapter 4 (*GSK* 4.38–45). According to the authors “this is the first discussion of magic squared in a mathematical text in India.” We can find a general procedure to make magic squares. Following is a magic square I made according to the procedure mentioned this part:

| | | | | |
|----|----|----|----|----|
| 11 | 18 | 25 | 2 | 9 |
| 10 | 12 | 19 | 21 | 3 |
| 4 | 6 | 13 | 20 | 22 |
| 23 | 5 | 7 | 14 | 16 |
| 17 | 24 | 1 | 8 | 15 |

Substantial appendices are included at the end of the book.

- Appendix A** A concordance of parallel topics of the *GSK* and other typical works.
Appendix B List of the ‘type (*jāti*) problems in modern notation for each of which Indian mathematicians give specialized algorithms.
Appendix C Index to the numbers appeared in the text.
Appendix D A glossary-index to the text: for readers’ convenience equivalents in Sanskrit, Arabic, or other languages are attached for almost all words.

Bibliography

Index of Mathematical Terms Index of English terms in Introduction, translation, and commentary.

Index of Things Mentioned in the Text Another index of English words.

Index of Sanskrit/Prakrit Authors and Titles

This is a unique study on Indian mathematics written in Apabhraṃśa. It must be valuable as a primary source or a good textbook with excellent references for everyone interested in the History of mathematics.

Setsuro IKEYAMA