

CLASSICS OF
INDIAN MATHEMATICS

Algebra, with Arithmetic and Mensuration,
From the Sanskrit of Brahmagupta and Bhāskara

Translated by

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Foreword

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Foreword

It is indeed gratifying that Colebrooke's celebrated work, *Algebra, with Arithmetic and Mensuration, from the Sanskrit of Brahmagupta and Bhāskara*, is being reprinted. It was one of the earliest fruits of the European encounter with the scientific heritage of India. While many of the other books of this period became dated and are now merely historical curiosities, Colebrooke's work remains as useful today as when it appeared first in 1817.

Henry Thomas Colebrooke was born in London on 15 June 1765, as the third son of Sir George Colebrooke who was a member of the British Parliament and a director of the East India Company. Because of his father's association with the East India Company, a career in India was envisaged for the young Colebrooke. He was educated privately at home in classical languages, French, German and mathematics and was packed off, when he was barely seventeen, to India to join the service of the Company as "writer" at Calcutta in 1782. Four years later, he was appointed Assistant Collector at Tirhut. He began his study of oriental languages, especially Sanskrit. In 1789 he was sent to Purnia. Just about this time, in 1784, William Jones founded the Asiatic Society at Calcutta for "inquiring into the history and antiquities, the arts, sciences, and literature of Asia." Colebrooke was attracted by the activities of this newly founded Society, and decided to pursue the study of Sanskrit legal texts in order to gain a better knowledge of Hindu law—a knowledge that was essential for his professional career as well. His posting in 1795 as magistrate at Mirzapur, nor far from Benares, gave him the welcome opportunity to widen his knowledge of Sanskrit literature through the acquaintance of the pandits in the Benares Sanskrit College, which was founded by Jonathan Duncan in the year 1791. After an infructuous mission to the court of Nagpur from 1799 to 1801, he was appointed judge in the Calcutta Court of Appeal in 1801. The next ~~four years~~

thirteen years, which he spent at Calcutta, were his most productive period, both professionally and academically. In 1805 he was elevated to the position of the President of the Bench in the Court of Appeal and was concurrently appointed Professor of Hindu Law and Sanskrit at the College of Fort William. In 1807 he was made a member of the Governor-General's Council. He also took active part in the transactions of the Asiatic Society, first as a member and subsequently as its president, and contributed well-researched articles regularly to the Society's journal *Asiatick Researches*. He returned to England in 1814.

During his 32 years' stay in India, Colebrooke collected a large number of Sanskrit manuscripts. Several of these were copied especially for him. After his return to England, he donated this valuable collection of Indian manuscripts to the India Office. In 1823, he founded the Royal Asiatic Society in London, on the lines of the Asiatic Society of Calcutta. In 1824 he was elected President of the Astronomical Society. In subsequent years he was elected foreign member of the French Institute of Paris and of the Imperial Academy of St. Petersburg. He died on 10 March 1837. The articles he contributed to the various volumes of the *Asiatick Researches* and the prefaces he wrote to some of his publications were collected in two volumes and published under the title *Miscellaneous Essays* in the same year.

William Jones and Henry Thomas Colebrooke, mutually complementary personalities, can be said to be the pioneers of Indology. While Jones introduced Europe to the aesthetic qualities of Sanskrit *kāvya* through his English translation of Kālidāsa's *śakuntalā*, Colebrooke drew attention to the wealth of systematized knowledge in the *Śāstra* literature in Sanskrit. Colebrooke was the first European to master several branches of Sanskrit learning—both original texts and commentaries—and his writings were pioneering efforts in every one of these branches. His essay "On the Vedas or Sacred Writings of Hindus" (*Asiatick Researches*, vol. 8, 1805, pp. 369-476) was the first authentic account in a European language of the vast Vedic literature, and can be read even today with profit. Likewise his "Observations on the Sect of Jains," (*Asiatick Researches*, vol. 9, 1806, pp. 287-322; reprinted in *Miscellaneous Essays*, vol. 2, pp. 191-224) provides detailed information about the Jaina religious principles and practices. His *Grammar of Sanskrit Language* (Calcutta 1805) foreshadowed comparative linguistics. He was also the first to give a systematic account of the Sanskrit and Prakrit metres, with copious illustrations, and a list of metres arranged with mathematical precision ("On Sanskrit and Prakrit Poetry," *Asiatick Researches*, vol. 10, 1807, pp. 389-474; reprinted in *Miscellaneous Essays*, vol. 2,

pp. 62-165). He edited original texts like the *Hitopadeśa* (Calcutta 1804) and *Amarakośa* (Serampore 1808) and several Sanskrit inscriptions.

Two areas received his special attention : Hindu law and exact sciences. His *Digest of Hindu Laws* (Calcutta 1798) was highly acclaimed; so also his *Two Treatises of Hindu Law of Inheritance* (Calcutta 1810), which contains his translation of Vijñāneśvara's *Mitākṣarā* and Jīmūtavāhana's *Dāyabhāga*. These two works were used extensively in the law courts.

Colebrooke's various writings on Indian mathematics and astronomy laid the foundations for the study of the history of science in India. Some of his notable contributions are "On Indian Weights and Measures," (*Asiatick Researches*, vol. 5, 1797, pp. 91-109); "On the Indian and Arabian Division of the Zodiac," (*Asiatick Researches*, vol. 9, 1807, pp. 323-376; reprinted in *Miscellaneous Essays*, vol. 2, pp. 321-373); and "On the Notion of the Hindu Astronomers Concerning the Precession of the Equinoxes and Motions of the Planets," (*Asiatick Researches*, vol. 12, 1816, pp. 209-250; reprinted in *Miscellaneous Essays*, vol. 2, pp. 374-416).

The most important of these writings is, without any doubt, the *Algebra, with Arithmetic and Mensuration, from the Sanscrit of Brahmegupta and Bhāscara*, which was published in 1817 by John Murray at London. This work contains English translations of two classics of Indian mathematics, namely, Bhāskara's *Līlāvātī* and *Bījagaṇita*; and of the twelfth and eighteenth chapters of Brahmagupta's *Brāhmasphuṭasiddhānta*. Colebrooke's main purpose was to elucidate the state of algebra as reflected in the writings of Bhāskara. But since Bhāskara himself mentions Brahmagupta as one of his sources, Colebrooke thought it necessary to append the translation of two relevant chapters from Brahmagupta's *Brāhmasphuṭasiddhānta*; the twelfth and eighteenth which deal with arithmetic and algebra respectively. These translations are enriched by copious extracts from various commentaries: by Gaṅgādhara, Śūryadāsa, Gaṇeśa and Rāmakṛṣṇa on the *Līlāvātī*; by Kṛṣṇa Daivajña and Rāmakṛṣṇa on the *Bījagaṇita*. Moreover, he also made use of the Persian translations of these mathematical treatises, viz. Abū al-Faiḍ Faiḍī's translation of the *Līlāvātī*, which he wrote at the instance of Akbar in 1587, and 'Ata' Allah Ruṣhdī's translation of the *Bījagaṇita*, which was prepared at the court of Shah Jahan in 1634.

These four translations are preceded by a preface entitled "Dissertation (on the Algebra of the Hindus)," where Colebrooke seeks to situate Indian Algebra in the context of developments in other parts of the world. This is followed by fourteen highly informative appendices dealing, among others,

with the dates of various Sanskrit mathematical texts and their authors, knowledge of Algebra among the Arabs and Italians, exchanges between India and the west in astrology and astronomy, and so on.

It should be remembered that none of these texts or commentaries were available in print at the beginning of the nineteenth century, nor were there any manuscript libraries with catalogued collections. Colebrooke's entire work is based on manuscripts which had to be located in the private collections of individual pandits and which had to be copied afresh for Colebrooke's use.

Colebrooke's "Dissertation" commences with the following words : "The history of sciences, if it want the prepossessing attractions of political history and narration of events, is nevertheless not wholly devoid of interest and instruction. A laudable curiosity prompts to inquire the sources of knowledge; and a review of its progress furnishes suggestions tending to promote the same or some kindred study. We would know the people and the names at least of individuals, to whom we owe particular discoveries and successive steps in the advancement of knowledge. If no more be obtained by the research, still the inquiry has not been wasted, which points aright the gratitude of mankind." Our gratitude is due to Colebrooke for illuminating an important part of India's scientific heritage.

Sharada Publishing House deserves our felicitations for bringing out the first Indian reprint of this unique document. Colebrooke's orthography of Sanskrit words is, of course, outdated but not his translation of the mathematical texts. It is hoped that this facsimile edition will arouse fresh interest in the history of mathematics in India.

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