

# Biographical Encyclopedia of Astronomers

© 2007 Springer

## Aryabhata II

Flourished (India), circa 950-1100

Aryabhata II, the Hindu astronomer, is best known for his work entitled *Mahasiddhanta* or *Aryasiddhanta*. It has been indirectly established that he lived and worked around the 10th century. In order not to confuse him with the well-known astronomer Aryabhata, who lived in the fifth century, he is known as Aryabhata II or the Younger.

The *Mahasiddhanta* or *Aryasiddhanta* is an astronomical compendium based on the orthodox tradition of Smritis (passages from Vedic literature). The treatise, written in Sanskrit, consists of 18 chapters and 625 ślokas (verses). The first 12 chapters deal with mathematical astronomy. Detailed derivations are presented on topics such as the mean and true longitudes of the planets, eclipses of the Sun and the Moon, the projections of eclipses, the lunar crescent, and the heliacal rising and settings of planets, including calculations on conjunctions of planets as well as planets with stars. The remaining six chapters of the *Mahasiddhanta* form a separate section called the *Goladhyaya* (On the Sphere), where topics on geometry, geography, and algebra are discussed with reference to celestial astronomy. In Chapter 17, for example, shortcuts are provided for determining the mean longitudes of the planets. In Chapter 18, under the section called *Kuttakādhyāya*, Aryabhata II discusses the solution of indeterminate equations of the first degree. He improves upon earlier methods and suggests a shorter procedure.

In his work, Aryabhata II also touches upon several arithmetic operations such as the four fundamental operations, operations with zero, extraction of square and cube roots, the rule of three, and fractions. To represent numbers, he adopts the famous katapayādi system of letter numerals. This practice does not conform to the method followed by some of his predecessors, who used the well-known bhūta samkhyā system of word numerals.

The text does not say anything about the year and place of Aryabhata II's birth, nor does it give any other personal information. In recent years, several scholars have attempted to establish an approximate period in which Aryabhata II lived, based on cross-references to his work by other contemporary and younger scholars. D. Pingee believed that Aryabhata II's treatise was written between 950 and 1100, and G. R. Kaye concludes that he lived before Bīrūni (973–circa 1050). However, B. Datta disagrees with Kaye's date and argues that Aryabhata II must have lived much later. Many recent articles on this subject state that his main work was written in 950. Brahmagupta (born 598) leveled several criticisms of Aryabhata I but not of Aryabhata II. S. Dikshita has therefore argued that Aryabhata II lives later than Brahmagupta. Another important point noted is that Aryabhata II tried to remove some discrepancies involving Brahmagupta's criticism of Aryabhata I. Thus Dikshita assigns gives him a date around śātavāhana śaka 875, which corresponds to 953. This corroborates the opinions of other historians as well.

*A. Vagişwari*

### Alternate name

Aryabhasha the Younger

## Selected References

- Bose, D. M., S. N. Sen, and B. V. Subbarayappa (1971). *A Concise History of Science in India*. New Delhi: Indian National Science Academy, p. 167.
- Datta, B. (1926). "Two Aryabhashas of al-Biruni." *Bulletin of the Calcutta Mathematical Society* 17:59-74.
- Dikshita, S. B. (1896). *Bharatiya Jyotisha*. Poona. (English translation by R. V. Vaidya. 2 pts. New Delhi: Government of India Press, Controller of Publications, 1969, 1981, pp. 95-99.)
- Dvivedin, Sudhakar (ed. and comm.) (1910). *Mahāsiddhānta*. Benares Sanskrit Series Vol. 36, nos. 148-150. Benares. (Reprint, New Delhi: Caukamba Sanskrit Prathista, 1995.)
- Jha, V. N. (1994). "Indeterminate Analysis in the Context of the Mahāsiddhānta of Aryabhaṭa II." *Indian Journal of History of Science* 29: 565-578.
- (1997). "Aryabhaṭa II's Method for Finding Cube Root of a Number." *Ganita Bharati* 19: 60-68
- Kaye, G. R. (1910). "The Two Aryabhata." *Bibliotheca Mathematica* 10: 289–292. Pingree, David (1970). "Aryabhata II." In *Dictionary of Scientific Biography*, edited by Charles Coulston Gillispie. Vol. 1, pp. 309–310. New York: Charles Scribner's Sons.
- Census of the Exact Sciences in Sanskrit*. Series A. Vol. 1 (1970): 53b–54a; Vol. 2 (1971): 15b–16a; Vol. 4 (1981): 28a; Vol. 5 (1994): 17a. Philadelphia: American Philosophical Society.
- (1992). "On the Date of the Mahasiddhanta of the Second Aryabhata." *Ganita Bharati* 14: 55–56