Obituary: Kripa Shankar Shukla (1918–2007) *

1 Reminiscence

Professor Kripa Shankar Shukla was born on July 10, 1918 at Lucknow. He obtained M.A. degree from Allahabad University in 1941. After obtaining M.A. degree, he joined Lucknow University as a lecturer of mathematics. He was awarded D.Litt. degree for his work "Astronomy in the seventh century in India: Bhāskara I and his works" by Lucknow University in 1955. He retired from Lucknow University as a Professor of Mathematics in 1979.

Systematic study of the history of Indian astronomy and mathematics was carried on by Sankar Balakrishna Dikshit (1853–1898), Sudhakara Dvivedin (1860–1922) etc. around the end of the 19th century, and also by Prabodh Chandra Sengupta (1876–1962), Bibhutibhusan Datta (1888–1958), Avadhesh Narayan Singh (1901–1954) etc. around the first half of the 20th Century. The monumental work *History of Hindu Mathematics* (Vol. 1, 1935; Vol. 2, 1938) of Datta and Singh is well known. Prof. Shukla succeeded this work, revised the draft of its subsequent parts left by Datta and Singh, and published them in the *Indian Journal of History of Science* (1980–1993).

A. N. Singh was appointed to be a full time lecturer in mathematics at Lucknow University in 1928, and, after the publication of the *History of Hindu Mathematics*, started a project to study original sources of Indian astronomy and mathematics in the Department of Mathematics and Astronomy, Lucknow University in 1939. A. N. Singh collected several manuscripts etc. of the original sources, which are preserved in the Department now. Prof. Shukla joined this project in 1941, and succeeded it. His D.Litt. dissertation is one of its results. Prof. Shukla published several critical editions of original sources from the Department (and also from Indian National Science Academy etc. later). Some of them are accompanied by lucid English translation with detailed mathematical notes. Prof. Shukla sometimes collaborated with K. V. Sarma (1919–2005), who made a great contribution to the study of the history of Kerala astronomy.

I remember that Prof. Shukla did his best to make his mathematical notes easy to understand. When we read his notes, we feel as if we are being taught by him directly. It should also be mentioned that he noted several parallel

* Yukio Ohashi, *Indian Journal of History of Science*, Vol. 43, No. 3 (2008), pp. 475–485.

A. Kolachana et al. (eds.), *Studies in Indian Mathematics and Astronomy*,
Sources and Studies in the History of Mathematics and Physical Sciences,
https://doi.org/10.1007/978-981-13-7326-8_3

statements in other Sanskrit texts in the footnotes of his English translations. So, his English translations can also be used as a kind of annotated index of Sanskrit astronomical and mathematical texts. Only Prof. Shukla could do this.

When I was in Lucknow, the *Vaṭeśvara Siddhānta and Gola of Vaṭeśvara* was being printed at a press in Lucknow. Prof. Shukla visited the press almost every day, supervised its printing work by himself, and read its proofs very carefully. From this fact, we can understand why his edition is so reliable. These original sources are the most important foundation for future research.

I studied the history of Indian astronomy and mathematics under the guidance of Prof. Shukla from 1983 to 1987 as a research scholar (Ph. D. student) of Lucknow University. It was my first experience to live abroad, and was the most exciting period during my life. Prof. Shukla already had retired but kindly taught me how to read Sanskrit astronomical texts, both printed texts and manuscripts. I saw several people were visiting Lucknow to meet Prof. Shukla. Prof. Shukla did not create so called "school". It means that his works are open to everybody. Even if you have not met him, you can become his student by studying his works.

Prof. Shukla passed away on September 22, 2007, but we have to continue to study Indian astronomy and mathematics further. We should read his works again and again, and try to develop the study.

In the course of compiling the following list, I received valuable information and/or warmhearted encouragement from Dr. A. K. Bag, Dr. S. M. R. Ansari, Dr. Takao Hayashi, Dr. Sunil Datta, Mr. Ratan Shukla (son of Prof. K. S. Shukla), and several other people. I am grateful to all of them.

2 List of K. S. Shukla's works

Publication of original sources

The *Sūrya-siddhānta with the commentary of Parameśvara*, (Hindu Astronomical and Mathematical Texts Series No. 1), Department of Mathematics and Astronomy, Lucknow University, Lucknow, 1957. [Note: The *Sūrya-siddhānta* is very popular in India, but most of its printed editions are based on Raṅganātha's version (1603 AD). Prof. Shukla's edition is the first publication of its earlier version commented by Parameśvara (1432 AD). The readings of some other early versions are also shown in its footnotes. In this publication, only Sanskrit text is given without English translation, but a detailed introduction is given.]

The *Pāṭī-gaṇita of Śrīdharācārya*, (Hindu Astronomical and Mathematical Texts Series No. 2), Department of Mathematics and Astronomy, Lucknow

University, Lucknow, 1959. [Note: In this publication, Sanskrit text and English translation are given.]

Mahā-Bhāskarīya, Bhāskara I and his works, Part II, (Hindu Astronomical and Mathematical Texts Series No. 3), Department of Mathematics and Astronomy, Lucknow University, Lucknow, 1960. [Note: In this publication, Sanskrit text and English translation are given. In its introduction, it was announced that the "Bhāskara I and his works" would have been divided into 4 parts. Only parts II and III are published in Lucknow. The proposed Part IV (Bhāskara I's commentary on the *Āryabhaṭīya* of Āryabhaṭa I) was later published as the "*Āryabhaṭīya* Critical Edition Series, Part 2" in New Delhi in 1976 (see below). This (1976) edition's introduction may be considered to be the proposed Part I (General introduction).]

Laghu-Bhāskarīya, Bhāskara I and his works, Part III, (Hindu Astronomical and Mathematical Texts Series No. 4), Department of Mathematics and Astronomy, Lucknow University, Lucknow, 1963. [Note: In this publication, Sanskrit text and English translation are given.]

The Dhīkoṭida-Karaṇa of Śrīpati, (originally published in *Ṛtam* 1, 1969); Separately issued: Akhila Bharatiya Sanskrit Parishad, Lucknow, 1969. [Note: In this publication, Sanskrit text and English translation are given.]

Nārāyaṇa Paṇḍita's Bījagaṇitāvataṃsa, Part I, (originally published in *Ṛtam* 1, 1969/70); Separately issued: Akhila Bharatiya Sanskrit Parishad, Lucknow, 1970. [Note: In this publication, only Sanskrit text is given without English translation. Part II of this work was not available in its complete form in the manuscript used, and only its fragment has been appended in this publication.]

Āryabhaṭīya of Āryabhaṭa, critically edited with translation and notes, in collaboration with K. V. Sarma, (*Āryabhaṭīya* Critical Edition Series, Part 1), Indian National Science Academy, New Delhi, 1976. [Note: In this publication, Sanskrit text and English translation are given. This series was published on the occasion of the celebration of the 1500th birth anniversary of Āryabhaṭa on 2nd November, 1976.]

Āryabhaṭīya of Āryabhaṭa, with the commentary of Bhāskara I and Someśvara, (*Āryabhaṭīya* Critical Edition Series, Part 2), Indian National Science Academy, New Delhi, 1976. [Note: In this publication, only Sanskrit text is given without English translation, but a detailed introduction is given. The "*Āryabhaṭīya* Critical Edition Series" consists of 3 parts. Its Part 3 "*Āryabhaṭīya of Aryabhaṭa*, with the commentary of Sūryadeva Yajvan" was edited by K. V. Sarma and published in the same year.]

The Karaṇa-ratna of Devācārya, (Hindu Astronomical and Mathematical Texts Series No. 5), Department of Mathematics and Astronomy, Lucknow University, Lucknow, 1979. [Note: In this publication, Sanskrit text and English translation are given.]

Vaṭeśvara-siddhānta and Gola of Vaṭeśvara, 2 parts, Indian National Science Academy, New Delhi, 1985–1986. [Note: Its Part 1 is Sanskrit text, and Part 2 is English translation.]

A Critical Study of the Laghumānasa of Mañjula, Indian Journal of History of Science, Vol. 25, 1990, Supplement; also separately issued, Indian National Science Academy, New Delhi, 1990. [Note: In this publication, Sanskrit text and English translation are given].

Handbook

Āryabhaṭa: Indian Mathematician and Astronomer (5th Century AD). Indian National Science Academy, New Delhi, 1976. [Note: This handbook is a kind of general introduction to the "*Āryabhaṭīya* Critical Edition Series" published in the same year. The "*Āryabhaṭīya* Critical Edition Series, Part 1" itself also has a detailed introduction].

Research papers

"The evection and the deficit of the equation of the centre of the Moon in Hindu Astronomy", *Proceedings of the Benares Mathematical Society*, New Series 7.2 (1945) 9–28. [Note: The *Proceedings of the Benares Mathematical Society* was succeeded by the *Gaṇita*. See below.]

"On Śrīdhara's rational solution of $Nx^2+1=y^2$", *Gaṇita*, 1.2 (1950), 53–64. [Note: Regarding this paper, also see his edition of the *Pāṭī-gaṇita* (1959), Introduction, p. xxxii, footnote 1. The *Gaṇita* is a journal published by Bhārata Gaṇita Pariṣad, Department of Mathematics, Lucknow University.]

"Chronology of Hindu achievements in astronomy", *Proceedings of the National Institute of Sciences of India*, 18.4 (1952), 336–337. [Note: This is a paper read at the "Symposium on the History of Sciences in South Asia" held in Delhi. It can be said that the modern study of the history of Indian science made great progress since this symposium. The National Institute of Sciences of India started to publish the *Indian Journal of History of Science* in 1966. The National Institute of Sciences of India is the present Indian National Science Academy.]

"Ācārya Jayadeva, the Mathematician", *Gaṇita*, 5.1 (1954), 1–20.

"On three stanzas from the *Pañca-siddhāntikā*", *Gaṇita*, 5.2 (1954), 129–136.

"A note on the *Rāja-mṛgāṅka* of Bhoja published by the Adyar Library", *Gaṇita*, 5.2 (1954), 149–151.

"Series with fractional number of terms", *Mathematical and Statistical Association Magazine*, (Lucknow University), 1 (1958), 30–38.

"Hindu methods for finding factors or divisors of a number", *Gaṇita*, 17.2 (1966), 109–117.

"Āryabhaṭa I's astronomy with midnight day-reckoning", *Gaṇita*, 18.1 (1967), 83–105.

"Early Hindu methods in spherical astronomy", *Gaṇita*, 19.2 (1968), 49–72.

"Astronomy in ancient and medieval India", *Indian Journal of History of Science*, 4.1–2 (1969), 99–106. [Note: This volume is the collection of papers presented at the "Symposium on the History of Sciences of Ancient and Medieval India", held in Delhi, 1968.]

"Hindu Mathematics in the seventh century as found in Bhāskara I's commentary on the *Āryabhaṭīya*", *Gaṇita*, 22.1 (1971), 115–130; 22.2 (1971), 61–78; 23.1 (1972), 57–59; 23.2 (1972), 41–50.

"Hindu astronomer Vaṭeśvara and his works", *Gaṇita*, 23.2 (1972), 65–74.

"Characteristic features of the six Indian seasons as described by astronomer Vaṭeśvara", *Jyotiṣa-kalpa*, 3.4 (1972), 43–47. [I have an off-print of this paper, and the volume number is mentioned as "*Varṣa* 3, *aṅka* 4", but the year of publication is not mentioned there. R. C. Gupta's list (1998) (see the section of references below) has this paper, and mentions its volumes and year as "3.11 (Aug 1972)". They are inconsistent, but I tentatively use this year of publication.]

"Use of hypotenuse in the computation of the equation of the centre under the epicyclic theory in the school of Āryabhaṭa I ???", *Indian Journal of History of Science*, 8 (1973), 43–57. [Note: This is a paper to refute the assertion of T. S. Kupanna Shastry.]

"The *Pañca-siddhāntikā* of Varāhamihira (1)", *Gaṇita*, 24.1 (1973), 59–73; and also in the *Indian Journal of History of Science*, 9.1 (1974), 62–76. [Note: This is a paper read at the Seminar organised by the Indian National Science Academy, New Delhi, on the occasion of the 500th Birth Anniversary of Nicolaus Copernicus on February 19–20, 1973. The paper published in the *Indian Journal of History of Science* has a short "Note" at the end which is not included in the paper in the *Gaṇita*.]

"Āryabhaṭa", in *Cultural Leaders of India, Scientists*, Publications Division (Government of India), New Delhi, 1976, pp. 83–99.

"The *Pañca-siddhāntikā* of Varāhamihira (2)", *Gaṇita*, 28 (1977), 99–116.

"Glimpses from the *Āryabhaṭa-siddhānta*", *Indian Journal of History of Science*, 12.2 (1977), 181–186. (This issue is the Proceedings of the Symposium on the 1500th Birth Anniversary of Āryabhaṭa I held in New Delhi, November 2–4, 1976).

"Series with fractional number of terms", in S. Bhaskaran Nair (ed.): *Bhāratī-bhānam* (Light of Indology), Dr. K. V. Sarma Felicitation Volume, Panjab University Indological Series 26, Vishveshvaranand Vishva Bandhu Institute of Sanskrit and Indological Studies, Hoshiarpur, 1980, pp. 475–481.

"Astronomy in ancient India", in *Bhāratīya Samskriti*, Bhāratīya Samskriti Samsad, Calcutta, 1982, pp. 440–453. [Note: I have not seen this paper, but R. C. Gupta's list (1998) (see the section of references below) mentions this paper.]

"A note on Raymond P. Mercier's review of *Karaṇaratna* of Devācārya", *Gaṇita Bhāratī*, 6 (1984), 25–28.

"Phases of the Moon, rising and setting of planets and stars and their conjunctions", in S. N. Sen and K. S. Shukla (eds.): *History of Astronomy in India*, (originally published in *Indian Journal of History of Science*, Vol. 20, 1985), Indian National Science Academy, New Delhi, 1985, pp. 212–251; Second Revised Edition, 2000, pp. 236–275.

"Main characteristics and achievements of ancient Indian astronomy in historical perspective", in G. Swarup, A. K. Bag and K. S. Shukla (eds.): *History of Oriental Astronomy*, (Proceedings of an International Astronomical Union Colloquium No. 91, New Delhi, India, 13–16 November 1985), Cambridge University Press, Cambridge, 1987, pp. 9–22.

"The Yuga of the *Yavanajātaka*, David Pingree's text and translation reviewed", *Indian Journal of History of Science*, 24.4 (1989), 211–223.

"Vedic Mathematics—The illusive title of Swamiji's book", *Mathematical Education*, 5.3 (1989), 129–133. [Note: This is a paper read at the National Workshop on Vedic Mathematics held at University of Rajasthan, Jaipur, 1988. The same paper was also published as follows.]

"Vedic Mathematics—The deceptive title of Swamiji's book", in *Issues in Vedic Mathematics*, Proceedings of the National Workshop on Vedic Mathematics, 25–28 March, 1988, at the University of Rajasthan, Jaipur, Maharshi

Sandipani Rashtriya Veda Vidya Pratishthan, Ujjain, (in association with Motilal Banarsidass, Delhi), 1991, (reprinted: 1994), pp. 31–39.

"Magic squares in Indian mathematics", in *Interaction between Indian and Central Asian Science and Technology in Medieval Times*, Vol. 1, (Indo-Soviet Joint Monograph Series), Indian National Science Academy, New Delhi, 1990, pp. 249–270.

Hindi papers

[Note: The following Hindi papers are listed in R. C. Gupta's paper (1998) (see the section of references below). They may be incorporated in the above list of research papers, but I quote them separately from Gupta's paper, because I have not seen them, and it is not possible at present to ascertain their original Hindi title.]

"The *Pātīgaṇita* of Śrīdharācārya", *Jñanaśikhā* (Lucknow), 2.1 (1951), 21-38.

"Indian Geometry", *Svatantra-Bhārata* (Lucknow), 1957, pp. 1 and 11.

"Ācārya Āryabhaṭa's *Ardharātrika-Tantra*", *C. B. Gupta Abhinandana Grantha*, New Delhi, 1966, pp. 483–494. [Note: According to the bibliography of Prof. Shukla's edition and English translation (1976) of the *Āryabhaṭīya*, this is a Hindi version of his English paper "Āryabhaṭa I's astronomy with midnight day-reckoning" (1967).]

"Ancient and medieval Hindu astronomy", *Jyotiṣa-kalpa* (Lucknow), 3.6, (1972), 32–37.

Book reviews

O. Neugebauer and D. Pingree, *The Pañcasiddhāntikā of Varahamihira*, Kopenhagen, 1970–1971, in *Journal of the American Oriental Society*, 93.3 (1973), 386.

David Pingree, *Census of the Exact Sciences in Sanskrit*, Series A, Vol. 3, Philadelphia, 1976, in *Indian Journal of History of Science*, 13.1 (1978), 72–73.

K. V. Sarma (ed.), *Cañdracchāyāgaṇitam* of Nīlakaṇṭha Somayājī, Hoshiarpur, 1976; *Siddhāntadarpaṇam* of Nīlakaṇṭha Somayājī, Hoshiarpur, 1976; *Rāśigolasphuṭanīti* of Acyuta Piṣāraṭi, Hoshiarpur, 1977, in *Indian Journal of History of Science*, 13.1 (1978), 73–74.

A. K. Bag, *Mathematics in Ancient and Medieval India*, Delhi, 1979, in *Gaṇita Bhāratī*, 3.3–4 (1981), 107–108.

R. C. Pandeya, *Grahalāghavam Karaṇam*, 2 parts, Jammu, 1976–77, in *Gaṇita Bhāratī*, 3.3–4 (1981), 108–109.

David Pingree, *Census of the Exact Sciences in Sanskrit*, Series A, Vol. 4, Philadelphia, 1981, in *Journal of the History of Astronomy*, 13.3 (1982), 225–226; and also *Indian Journal of History of Science*, 18.2 (1983), 221-222.

S. L. Dhani, *Prācīn Bhārat men Vijñan*, Panchkula, 1982, in *Indian Journal of History of Science*, 19.1 (1984), 86–87.

A. Rahman et al., *Science and Technology in Medieval India—A Bibliography of Source Materials in Sanskrit, Arabic and Persian*, New Delhi, 1982, in *Indian Journal of History of Science*, 19.4 (1984), 412–413.

B. V. Subbarayappa and K. V. Sarma, *Indian Astronomy—A Source-Book*, Bombay, 1985, in *Indian Journal of History of Science*, 22.3 (1987), 273–275.

Hindi translation of the book of Datta and Singh

[Avadhesa Narayana Simha and Bibhutibhusana Datta] [translated into Hindi by Kripasamkara Sukla]: *Hindu Gaṇita-śāstra kā Itihāsa*, Part 1, Hindi Samiti, Lucknow, 1956; 2nd ed., 1974. [Note: As far as I know, its Part 2 has not been translated into Hindi. The Hindi Samiti is an organisation to publish academic books in Hindi, and the Hindi translation (1957) of the *Bhāratīya Jyotiṣa* of Śaṅkara Bālakṛṣṇa Dīkṣita and the *Bhāratīya Jyotiṣa kā Itihāsa* (2nd ed.: 1974) of Gorakha Prasāda were also published by this organisation.]

Revision of the papers of Datta and Singh

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Hindu geometry", *Indian Journal of History of Science*, 15.2 (1980), 121–188.

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Hindu trigonometry", *Indian Journal of History of Science*, 18.1 (1983), 39–108.

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Use of calculus in Hindu mathematics", *Indian Journal of History of Science*, 19.2 (1984), 95–104.

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Magic squares in India", *Indian Journal of History of Science*, 27.1 (1992), 51–120.

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Use of permutations and combinations in India", *Indian Journal of History of Science*, 27.3 (1992), 231–249.

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Use of series in India", *Indian Journal of History of Science*, 28.2 (1993), 103–129.

[Bibhutibhusan Datta and Avadhesh Narayan Singh, Revised by Kripa Shankar Shukla]: "Approximate value of surds in Hindu mathematics", *Indian Journal of History of Science*, 28.3 (1993), 265–275.

Text books

[Note: Several pioneer mathematicians and astronomers were also excellent educators. Most of the Indian students of mathematics must have used texts books written by Gorakh Prasad, who was also a historian of Indian astronomy. Prof. Shukla also wrote two text books.]

[R. S. Verma and K. S. Shukla]: *Text-Book on Trigonometry*, Pothishala Private Limited, Allahabad, 1951; Ninth edition: 1980.

[R. P. Agarwal and K. S. Shukla]: *Text-Book on Algebra*, The City Book House, Kanpur, 1959; Eighth Revised and Enlarged Edition: 1983.

Editorial works

[S. N. Sen and K. S. Shukla (eds.)]: *History of Astronomy in India*, (originally published as *Indian Journal of History of Science*, Vol. 20, 1985), Indian National Science Academy, New Delhi, 1985; Second Revised Edition, 2000. [Note: This book was released to commemorate the IAU Colloquium in 1985 (see the following book.) This book was first released without "Notes and references, Bibliography, Index and Errata" (pp. 437–526), and this portion was later sent to subscribers. It seems that a complete issue with "Notes" etc. was also published. The Second Revised Edition (2000) is published by INSA. K. S. Shukla's paper is also included in this book (see the above section of research papers).]

[G. Swarup, A. K. Bag and K. S. Shukla (eds.)]: *History of Oriental Astronomy*, (Proceedings of an International Astronomical Union Colloquium No. 91, New Delhi, India, 13–16 November, 1985), Cambridge University

Press, Cambridge, 1987. [K. S. Shukla's paper is also included in this book (see the above section of research papers).]

Contribution to other books

Bina Chatterjee: *Śiṣyadhīvṛddhida Tantra of Lalla*, Part 2, Indian National Science Academy, New Delhi, 1981. [Note: The English translation of its chapter 21 (Astronomical Instruments), which was left untranslated by Chatterjee, was supplied by K. S. Shukla.]

T. S. Kuppanna Sastry (posthumously edited by K. V. Sarma): *Pañcasiddhāntikā of Varāhamihira*, P.P.S.T. Foundation, Madras, 1993. [Note: The English translation of its chapter 14 (Graphical Methods and Astronomical Instruments), which was left untranslated by Sastry, was supplied by K. S. Shukla.]

3 References

Sinvhal, S. D.: "Dr. Avadhesh Narain Singh (a life sketch)", *Gaṇita*, 1954, Vol. 5, No. 2, pp. i–vii.

Anonymous, "Professor Kripa Shankar Shukla", *A Date with Mathematicians*, The Mathematical Association of India, Delhi Chapter, 1989, pp. 27–31.

Ohashi, Yukio: "Prof. K. S. Shukla's Contribution to the Study of the History of Hindu Astronomy", *Gaṇita Bhāratī*, 17 (1995), 29–44.

Gupta, Radha Charan: "Dr. Kripa Shankar Shukla, Veteran Historian of Hindu Astronomy and Mathematics ", *Gaṇita Bhāratī*, 20 (1998), 1–7.

Nigam, Aruna: Brief History of the Section of Hindu Mathematics, Department of Mathematics and Astronomy, Lucknow University", *Gaṇita Bhāratī*, 20 (1998), 101–103.