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A cartographical introduction to South-East Asia: the Indian perspective


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Ever since Rgvedic times, the observation of the heavenly bodies was deemed necessary for the Indo-Aryan communities for vedic sacrifices and rituals, as these had to be attuned to the equinoxes, seasons, months, etc. When trade and commerce gradually developed, the knowledge of the stars proved to be of great value, as the stars proved pivotal in guiding the sailors to their destination. Besides, many other heavenly bodies were known in vedic days. The Great Bear or Saptarṣi Maṇḍala is already referred to in the Rgveda (I.24.10), while the Pole Star figures in a later part of the same text (VI.4.48). It seems that the spherical concept of the earth has been referred to in Rg. III.55.20 and X.89.4. It is precisely mentioned for the first time in the Śatapatha Brāhmaṇa (c. 800 B.C.), where we read (VII.1.1.37): “... this world doubtless is circular”. Its symbolical representation occurs in the gārha-patya, a circular sort of domestic altar, sometimes divided into twelve parts, which apparently stand for the twelve months of the year. The circular shape of the world has also been mentioned in the Śulva-śāstras, which are treatises on measurements. A knowledge of mathematical geometry was required for the construction of altars for vedic sacrifices. These assume greater importance with the passage of time. The later phase is reflected in such texts as those of Āpastamba, Kātyāyana, Māṇava, Maṭrāyana, Varāha, Vāḍhula and Hiranyakesīn. Of these authors, the first two date from the sixth or fifth century B.C., while the others may be from a slightly later period. Speaking in general terms, considerable progress was made in the knowledge of the stars, the movements of the heavenly bodies, seasonal variations,
eclipses, and the shape of the earth. These were some of the legacies handed down to paurânic cartographers from the pre-Christian centuries (cf. Thibaut 1889).

Meanwhile, the neighbouring country of China was also making efforts in the field of cartography. Whatever one may think of the Chinese tradition according to which map-making was known to the Chinese in B.C. 1125, if not B.C. 2000, it is very likely that they did have some sort of a map; but up to the fifth century B.C., Chinese cartographers assumed that the world was square (cf. Bagrow 1964:197). The conception of Indian cartographers that countries were separated by concentric rings (for details cf. D. C. Sircar 1967:47 ff.) gradually percolated into China also; it was not fully accepted, however, because during the ministry of P‘ai-Hsiu in A.D. 267 instructions were issued “requiring that maps be correctly oriented and divided by a net, not of meridians and parallels, but of lines intersecting at equal intervals to form squares which were intended to facilitate the measurement of distance (in li)” (cf. Bagrow 1964:198). A new official map covering eighteen sheets was hence drawn up. Nevertheless, the Indian idea that the earth was like a disc centring on mount Meru, entirely surrounded by oceans, did not fully die out. This idea was retained in Chinese maps, chiefly in those texts which were originally Indian.

In Greece, Pythagoras (c. 570-500 B.C.) and his followers in the Eleatic School tenaciously held on to the idea that the earth was globular in form. The division of the heavens and the terrestrial globe into zones on the basis of climate (such as summer and winter zones, etc.) is also ascribed to him: he seems to have held the view that the earth was situated in the centre of the universe. The same view was held by Strabo, who divided the earth into five climatic zones. Pliny also upheld the theory of the globular form of the earth, but he had a better understanding of the obliquity of the ecliptic and its influence upon the seasons, the variations in the length of day and night according to latitude, etc. (cf. Bunbury II 1959:380). From Pliny’s time to Ptolemy’s, not much was added to the prevalent European knowledge of geography. The expansion of Rome’s power, however, meant considerable changes in existing geographical ideas, particularly in regard to Asia and Africa. But in the process Ptolemy distorted many things, so as to “convert these real additions to existing knowledge into gross exaggerations, and distort the newly constructed map of the world with errors as great as those of his predecessors, though of a directly opposite

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character" (cf. Bunbury II, 1959:522). Even so, his work was much more reliable than what we know as regards Indian and Chinese cartography in the same period.

As we have seen, the speculations regarding the shape of the earth had begun in India in the pre-Buddhist period. These found prolific expression in the Purāṇas, however, which are the greatest repositories of Indian knowledge of cosmology, cosmovography and cosmogony. Many of the Purāṇas devote ten to fifteen chapters to the discussion of these topics. The Brahmanda (chap. 22), the Matsya (chap. 125), and the Vāyu (chap. 51), for instance, discuss the creation of the world, climatology, meteorology, etc., in some detail. In these texts, the world is described as an egg floating in the Ocean. If, as is generally believed, the nuclei of the oldest Purāṇas go back to the fifth century B.C., it will be very interesting to note that a Babylonian map from more or less the same period also presents a general scheme of the universe in the form of a disc floating on the sea (cf. Bagrow 1964:31). More specific reference to cartography, however, occurs in the dānakhaṇḍa or gift-section of the Purāṇas. About this matter Hemādri (A.D. 1261) in his Caturvarga Cintāmaṇi (cf. Siromani 1873 I: ch. 294) quotes a passage from the Matsyapurāṇa, which runs as follows: "... One should get the earth (replica or a diagram of it) prepared of gold, having the shape of Jambudvīpa and Maryādā mountains and Merurange in the centre, lokapālas, nine varṣas, hundreds of rivers and encircled by oceans".1 As millions of yojanas 2 cannot be represented on maps or globes, the Brahmandaapurāṇa states that the representation of Plaksadvīpa, with two hundred thousand yojanas, is to cover 16 aṅgulas (1 aṅgula = ¼ inch, according to Kauṭilya’s Arthasastra, Bk. II, chap. XX), while Hemādri maintains that 1000 yojanas are to be represented by ½ aṅgula. These references indicate positively that there were scales in use in the days of the Purāṇas and that the designers of maps had a choice in the determination of what scale to use in a particular case (cf. Siromani 1873 I: ch. 297). There are many such examples in other Purāṇas also. As these texts very often refer to gifts of the seven continents, as conceived by the compilers, it is reasonable to assume that these continents were represented in reduced scale in the dānakhaṇḍa globes or maps. Now, what was the shape of such maps or globes?

The Līṅgapurāṇa states that the world map is to be drawn on a sheet of gold that is quadrilateral in shape and measures one hasta, i.e., one cubit. The Skandapurāṇa states in the Nāgarakhaṇḍa (ch. 268, 4-13)
that such a representation of the whole earth could also be made in a circular form, but that the sheet of gold should weigh 100, 50, 25, or minimally 5 palas. It has to contain seven oceans, seven continents, seven principal mountains, and rivers like the Gaṅgā, etc. In the Padmapurāṇa (Uttarakhaṇḍa, chap. 217, 1-9), there are references indicating that maps were also prepared and preserved in book form, just as modern atlases, or drawn on square pieces of cloth with specified sides (cf. also Bhaviṣya, chap. 191, 7-24). Additional information is sometimes offered in other texts. In the Bhaviṣyapurāṇa (chap. 177, 3-8) we are told that sometimes the universe was constructed in two metallic hemispheres, according to scale, and these two were then joined together.

The above discussion leaves hardly any room for doubt that Indian maps and charts drawn under the direction of the priestly class only represented the Paurānic cosmography. One may recall in this connection that after Yuan Chwang’s return to China maps were drawn up to illustrate his book Si-yu-ki. In this map India was shown as being divided into five parts, the Five Indies of ancient texts. The oldest extant version of this map was copied by the Buddhist monk Jukai in 1363. According to it, Jambudvīpa was shown as a pear-shaped land lying to the south of Mt. Sumeru. In the centre was shown the lake Anavatapta (Mānasarovara), from which flowed the rivers Gaṅgā, Sindhu, Oxus and Tarim. The places visited by Yuan Chwang were recorded and the route along which he travelled was lined in red (Gole 1976:28). D. C. Sircar (1960:246-50) has also cited two instances of cartography being described as citra or ālekhya (picture-drawing). The one refers to “the map of the country” which was presented by Chi-Kieu-Mo (i.e. Śrī Kumāra or Bhāskaravarman of Kāmarūpa) to the Chinese general Wang Hiuen-tse. The other reference is to Act I of the Uttararāmacarita, written by Bhavabhūti (eighth century A.D.), “depicting particular regions”, but this may not necessarily refer to cartography. More important is the representation of maps given in F. I. Pullé’s Italian work (cf. Sircar 1960:248), which shows again that such representations were to affect the depictions of Paurānic cosmography. Two of the three maps published in this text have been reproduced from a MS of the Lokaprakāśa, composed by the Kasmir poet Kṣemendra in the eleventh century, which, however, “contains a good deal of later interpolation”, while the third map is from a MS of another work called Saṁgrahaṇī. Fig. 2 represents the usual concentric islands and encircling seas, while figs. 8 and 9 are representations of
Jambudvīpa. Thus all the Indian maps of earlier times so far tracked down are all cosmographic representations of the world. None of the extant maps examined by M. P. Tripathi in the MSS-libraries of India are very old, “at most four or five hundred years old”. He says (1969: 315) about these maps that the oceans are represented in them by circular rings coloured blue, while the rivers are shown by crude curved double lines coloured blue in the middle. Lakes and other water-bodies have also been shown in blue as a general rule. Mountains are represented by “flattened circles or crude rectangles or irregular figures bounded by lines”. As regards towns and cities, the cartographers have also used rectangles, but without any sense of proportion. All these leave hardly any doubt in our mind that early Indian cartography was unable to escape from the trammels of religious prescription, just as European cartography for many centuries.

Later records seem to suggest, however, that the Brāhmaṇas, enmeshed in the network of these cosmological and cosmographical ideas, propagated these same ideas among their pupils and disciples. They gradually tightened the injunctions against crossing the seas and were consequently unenlightened about the geographical conditions of an ever-widening world. While hundreds of Brāhmaṇas were found in Malaya and some in other countries of South-East Asia in the first few centuries of the Christian era, they grew lesser in number with the passage of time. The field was therefore left open for the non-Brāhmaṇa and the Buddhist missionaries to pursue their respective avocations outside India. It is these people, and not the Brāhmaṇas, who kept charts for navigation in the Indian Ocean. A stray reference occurs in the Brhatkathāśloka Sāringgraha of Buddhavāmin (canto XIX, 107), where we read: “In the course of his voyage, Manohara explored and determined the geographic position of Śrīgavan mountain and the city of Śrīkuṭjanagara and then put it down on his chart”. The use of the term samputaka in the text implies that the map was something like an atlas.

Although the priestly class could not cut itself off from the moorings of vedic and paurāṇic cosmographical ideas, Indian astronomers and mathematicians were recording great advances in scientific matters and in their practical application. Nautical sciences also developed in a satisfactory way. In Bk. VII, 2.16, of the Milindapañha, which I place in the third or fourth century A.D., we read: “And again, O king, as the pilot puts a seal on the steering apparatus, lest any one should touch it”. The author of the text uses the word yanta = Sanskrit yantra
to signify this steering apparatus. It seems to indicate that the course of
the ship was guided by this apparatus, which was of such importance
that the steersman would not allow others to touch it. A little later was
born the famous astronomer Āryabhaṭa (A.D. 476), who could assert
that the earth is a sphere and that it rotates round the Sun. He as well
as Varāhamihira (A.D. 550), Brahmagupta (A.D. 598) and some others
made a tremendous contribution to the astronomical and mathematical
sciences, leading to the invention of the decimal system of notation,
which spread to the west through Arab savants. Seen from the perspec-
tive of the nautical sciences, this advanced knowledge led to a practical
application in the measurement of objectives. Brahmagupta, for ex-
ample, in his Brahmasthūrāsiddhānta (22, 25-29) has described an
apparatus called yasti-yantra, a sort of Pole-apparatus,4 to measure
the altitudinal or the vertical angle of the star in question. Further pre-
cision was attained in the time of Śrīpati (c. 1039 A.D.), who evolved
a scientific instrument called tri-phalaka. It was a sort of tripod or
plane-table standing on three legs of about four feet in height which
was used, along with other accessories, to determine the height of the
Polestar and therewith also the latitude and co-latitude of a place. It is
also worthy of note that the practice of using water to determine the
level of a surface, as is done now with the aid of a spirit-level, was
known in India from the days of Āryabhaṭa and Brahmagupta, though
Śrīpati, if not the first, is better known for using it for his apparatus.
An improved version of it is called dhi-yantra in the Siddhāntaśiromaṇi
(yantrañadhīya, 12.40) of Bhāskarācārya (A.D. 1150). It is very difficult
to believe that this knowledge was not utilised for the development of
cartography for the benefit of Indian mariners.

This supposition is further buttressed by references to charts in
foreign texts, one of which is the Travels of Marco Polo. It may be
recalled that during his homeward voyage from the Far East, Marco
Polo alluded to three maps in the course of his narrative.5 The first
reference mentions “things that were pointed to him on the maps of
the mariners of the Indies aforesaid”. The second reference is to Marco
asking his readers to “find in the charts of the mariners of these seas”.
The third reference records that the sea of India has 12,700 islands,
inhabited and uninhabited, “according to the charts and documents of
experienced mariners who navigate the Indian seas”. Although Marco
Polo does not specifically point out the nationality of the mariners
using these charts, it is very likely that he had in mind not only Indian
sailors, particularly those of Gujerat, but also those of western Asia.
Indeed, long afterwards Albuquerque referred to the great ability of Gujerati sailors. On the way to Malacca he caught one Gujerati ship in Simhalese waters, “and he was very glad to find it belonged to the Gujeratis, as he felt his voyage would now be carried out safely, for the Gujeratis understand navigation of those parts (i.e. Malayan waters) much more thoroughly than any other nations on account of the great commerce they carry in these places” (cf. Gray Birch 1880: 58). He later on captured more Gujerati ships. A few years before Albuquerque, Vasco Da Gama had come to Calicut (1498), and De Barros, while describing the charts applicable to Indian coasts as used by the Gujerati pilot of Vasco Da Gama, mentioned the fact that the map was equipped with a net of rectangular coordinates, which marked it off from the pattern of radiating rhumb-lines of the portolan charts. The Moorish pilot concerned showed him the map of the whole coast of India, furnished with meridians and parallels, but not rhumbs of winds (cf. De Goeje 1877:17). For this reason these charts were not over-crowded, and the small squares formed by these meridians and parallels exactly represented the coast in terms of two rhumbs, i.e., north-south or east-west (cf. De Barros I, IV, VI). There is no doubt that Indian mariners passing through the Indian Ocean made profitable use of latitude and longitude as well as bearings from constellations, and improved upon them. In the charts of the Turkish admiral Sidi Ali Ben Hossein, dated 1554, we find a close network of lines intersecting each other at right angles. The horizontal lines indicate the parallels, but they depend upon the altitude of the Pole Star, as well as of the Little Bear, the Calves and the Barrow of the Great Bear upon the horizon. Here this altitude was expressed by ışba’s or “fingers” (aṅgulis), but not by degrees, as was done by contemporary astronomers of the western or Arabic world. Each ışba was equal to 1° 42' 50". It is interesting to note that each ışba c was divided into zams or one-eighth part of the day. The zam corresponds exactly in meaning and usage to Sanskrit yāma (= prahara), of which 8 constitute a full day of 24 hours. When the term zam is applied to measure distance, it signifies one eighth part of an aṅguli or ışba c. Parallels were drawn at intervals of 1/8 th of an ışba c, while the meridians were probably drawn at intervals of zams, i.e., one eighth of an ışba c, signifying three hours’ sail, i.e., about thirteen nautical miles. By extracting data from Sidi Ali’s work, one can find out the actual value of ışba c in degrees and minutes from latitudes or the polar altitude of known places. The result is that the value of the ışba c and zam is 96' and 12'
respectively in the celestial arc. The different methods used in western and west Asian calculations and the use of Sanskrit terms in the nautical vocabulary of Sidi Ali and of others, not mentioned here, underline the role of the mariners of India in the development of nautical science and cartography in the Indian Ocean area. It is obvious that this type of cartography was absolutely different from the cosmographical maps preserved by the Indian priestly class, apparently for religious purposes. The nautical charts or maps used largely by the Indian mariners were really the creation of the non-Brahmin practical men of the world who crossed the Indian Ocean many times from pre-Christian centuries onwards in search of wealth. Those charts were probably kept for confidential use by the master-mariners. The massive Indian cultural influence on South-East Asia, the emergence of Indianized states and India’s commercial activities in that part of the world can not have been effected by travelling only in foreign vessels.

NOTES

1 The passage has been translated by Tripathi 1969:280-81. The data collected by the author are useful, but he has handled them in an uncritical way in many places.

2 This is an Indian unit in the calculation of distance, equivalent to 6.71 British miles. However, like the Chinese li, it was not uniform everywhere in India, and varied in different centuries also. Cf. A. Cunningham 1963:483-85.

3 The pala is a unit of weight. A table in which this unit figures is to be found in Kautilya’s Arthasastra, Bk. II, chap. XIX. It corresponds to 320 ratis = 585.60 grains.

4 The mechanism consisted of a straight pole placed perpendicularly on the ground, with a horizontal stick fixed on top of the pole in such a way that the eye of the observer and the star in question were in a line forming an angle with the erect pole. With this apparatus, the observer tried to determine the latitude of the Polestar.

5 Yule II, 1903:245, 312, 424. A probable view of Marco Polo’s geography has been published in Yule I, 1903:108.

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