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THE SOURCES AND AUTHORSHIP OF THE YUKTIKALPATARU*

1. For a study of the scientific works of Bhoja Paramāra of Dhāra, it is first essential to determine which of the treatises usually attributed to this scholar-king are indisputably his and eliminate those which could not conceivably have been written by him. This paper aims to show that the *Yuktikalpataru* (YK) falls in the latter category.

2. Bhoja is reputed to have written a number of works on almost all branches of learning. But it is remarkable that the YK is not mentioned in any of the post-Bhoja Sanskrit works until it was first noticed by Rajendralala Mitra in 1871.¹ Mitra implies that the YK is later than Bhoja, but Īsvaracandra Śāstrin, who brought out an edition of the YK based on three manuscripts in 1917,² states emphatically in a long Sanskrit introduction that this work is from the pen of Bhoja. Referring to Aufrecht's notorious statement that not a single work ascribed to Bhoja was written by him but by "authors who either lived during his reign, or some time after,"³ Śāstrin declares that the other books attributed to Bhoja may or may not have been written by him, but the YK is definitely his.⁴ Unfortunately, Īsvaracandra Śāstrin,

* Written originally for the Seminar on the Scientific Works of King Bhoja, Vikram University, Ujjain, March 1982. Some of these arguments have been reiterated with a wealth of detail by my student Dr Shakir Ali in his Ph. D. thesis "Bhoja ke nām se pracalit Yuktikalpataru kā samikṣātmak Adhyayan", Aligarh Muslim University, 1982, which remains unpublished.

1. Rajendralala Mitra, *Notices of Sanskrit Mss.*, No. 1, Calcutta 1871, p. 146 f., entry no. CCLXXI. See also his article "Furniture, Domestic Utensils, Musical Instruments, Arms, Horses and Cars in Ancient India", in *Indo-Aryans*, Calcutta 1881 (reprint: Delhi 1969), Vol. I, pp. 243-353, where he utilises the data from the YK.
2. *Yuktikalpatarūḥ Mahārājaśribhojaviracitūḥ*, ed. Isvara Chandra Sastri, Calcutta 1917 (Calcutta Oriental Series).
3. Theodor Aufrecht, *Catalogus Catalogorum*, Leipzig 1891 (reprint: Wiesbaden 1962), Pt. I, p. 418, s.v. Bhojadeva.
4. See the *Avataraṅikā* of the printed text:

अन्ये (औफ्रेह्ट) साहेबोक्ता ग्रन्था भोजरचिताः सन्तु न वा परमयं कल्पतरुर्भोज-
विरचित एव ।

being innocent of the principles of textual criticism, faithfully printed what he found in the mss., without exercising any critical judgment. Often he relegated legitimate readings to the footnotes and retained manifestly wrong readings in the text. He also retained wrong sub-titles and faulty repetition of lines. All this makes the study of the YK more difficult than it ought to be. The numbering of the verses is so eccentric that reference to the text becomes cumbersome.⁵

3. On the face of it, the YK has the makings of an extremely interesting Sanskrit document, containing encyclopaedic information on several secular matters. The following list of the thirteen *yuktis*, into which the work is divided, will give an idea of the variety of matters discussed here : I. *Nītiyukti* (pp. 1-17) ; II. *Dvandvayukti* (17-21) on fortifications; III. *Nagarīyukti* (32-44); VI. *Gṛhayukti* (44-49); VII. *Āsanayukti* (50-61) on thrones, stools, and cots; VIII. *Chatrayukti* (62-67) on royal parasols, common umbrellas and those without staffs (*nirdaṇḍa*); IX. *Dhvajayukti* (68-72); X. *Upakaraṇayukti* (72-83) on chowries, caskets, winecups, combs (*prasādham*) and canopies; XI. *Alaṃkārayukti* (84-139) on fifteen types of gems including loadstone (*ayaskānta*) and conchshell; XII. *Astrayukti* (139-176) on swords, shields, bows and arrows; and XIII. *Yāt-āyukti* (176-229) on *Nirājanā* horses, elephant, bullocks, buffalos, deer, dogs, goats, palanquins and ships. Some of these topics dealt with in this book were not discussed at all or not so elaborately in any extant Sanskrit work. Therefore, the hope that the YK would "help...towards focussing of light on the secular and practical side of the early Hindu civilization which is yet dark in many of its aspects"⁶ seemed quite legitimate when the book was published.

It also seemed a happy combination that this interesting treatise on royal arts and sciences should be written by the royal polymath of Dhāra, Bhoja Paramāra. Superficially there is evidence to show that the work is the product of Bhoja. The first verse reads:

नानामुनिबन्धानां सारमाकृष्य यत्नतः ।

तनुते भोजनृपतिर्युक्तकल्पतरुं मुदे ॥

Besides, all the colophons record that the YK is *bhojarājīya*. The final colophon adds the title of *mahārāja* to the author:

इति श्रीमहाराजभोजराजविरचितो युक्तकल्पतरुः समाप्तः ।

5. In our references to the YK, the first number denotes the page and the second the verse.
6. Narendra Nath Law, in his Foreword to the YK, Emphasis added.

Because of Bhoja's fame as the author of works on various subjects, many scholars assumed on the basis of the above evidence that this handbook for kings emanated from the fertile pen of Bhoja.

4. But a closer examination of the text, a careful analysis of the attributed and unattributed quotations and further a comparison of the YK with those works which are undoubtedly Bhoja's, show that this hope of a happy combination is misplaced and that centuries after Bhoja a mediocre compiler fabricated this work and passed it off as *bhojarājīya*.

5. A good place to start with is the architectural section of the YK, for we can compare it with Bhoja's renowned treatise on the same subject, the *Samarāṅgaṇasūtradhāra* (SSD). The YK devotes five *yuktis* to architecture : *dvandvayukti*, *nagarīyukti*, *vāstuyukti*, *rājagṛhayukti* and *gṛhayukti*. The *dvandvayukti* deals with fortresses, and here the word *dvandva* apparently means *durga*. It is not clear how *dvandva* came to have this meaning. The word does not occur anywhere else in this sense and seems to be unique to the YK.⁷

P.A. Mankad in an excellent article entitled "Samarāṅgaṇasūtradhāra and Yuktikalpataru: Whether these works are productions of one and the same king Bhoja of Dhārā Nagari"⁸ compared these two texts painstakingly both from the viewpoint of style and of content and found so vast a difference in style, technical terminology, units of measurement and architectural prescriptions that he came to the conclusion "that the works have emanated from different individuals and that if one of these is the product of king Bhoja of Dhārā Nagari, the other can never be his."⁹

6. An examination of the quotations will show that several of the sources from which the YK borrows are posterior to Bhoja. In this connection, the section on gems (pp. 85-137) proves to be a mine of useful clues. This section is the longest of the book containing some 480 verses, and is also longer than any other text on the *ratna-*

7. The *Śabdakalpadruma* and *Vācaspatya* cite the YK as the sole authority for this meaning of *dvandva*.

8. *Annals of the Bhandarkar Oriental Research Institute*, Poona, Vol. XVII (1935-36), pt. IV, pp. 358-370.

9. *Ibid.*, p. 370.

parikṣā, with the possible exception of the *Agastya-saṃhitā*.¹⁰ Here *Garuḍapurāṇa* is mentioned twelve times. But in actual fact, this section borrows about 160 verses from the extant *Garuḍapurāṇa*.¹¹ Five verses (85.52-86.56) are attributed to the *Viṣṇudharmottara*, but these occur also in the extant *Agnipurāṇa*. One verse (98.58) is attributed to both *Viṣṇudharmottara* and *Agnipurāṇa*. Another remarkable feature is that this section is sub-divided into *p. dmarāgaparikṣā*, *vajraparikṣā* etc., against the usual practice of dividing the *yuktis* into *uddeśas* as is done in the *upakaraṇayukti* etc. This practice is also borrowed from the *Garuḍapurāṇa*.

6.1 R C. Hazra in an article entitled "Is the Yuktikalpataru a Work of Bhoja?"¹² discusses the YK's indebtedness to the extant *Agni* and *Garuḍapurāṇa*. According to him, these two *purāṇas* are the spurious products of the Tantriks of Eastern India. The *Agnipurāṇa* was written some time during the ninth century, and the *Garuḍapurāṇa* not earlier than the tenth century. But their acceptance was quite limited and did not come about until several centuries later. The *Agnipurāṇa* could attain partial recognition in Bengal in the sixteenth century only and elsewhere much later. The *Garuḍapurāṇa* was unknown to other parts of India before the seventeenth century. Therefore Hazra concludes:

Under these circumstances it is quite unlikely that Bhoja of Dhārā, who flourished in the early part of the eleventh century A.D. at a place far away from Bengal, Orissa and Mithila utilised the *Agni* and *Garuḍapurāṇa* at a time when these two works are very little known even in their place of origin. As a matter of fact, Bhoja is not known to have shown any inclination towards Tantricism, and in none of the works ascribed to him is there any indication that he was familiar with the present *Agni* and *Garuḍapurāṇa* in any way. On the other hand, the utilisation of the contents of these two Purāṇas

10. *Agasiyapuktā Agastya-saṃhitā Buddhahatjaviracitā Ratnoparikṣā*, ed. Buddhisaṅgāra Śarmā and Kṛṣṇaprasāda Bhaṭṭarāi, Kathmandu 1963. On the *Agastya-saṃhitā*, see Wilhelm Rau, *Die Bremlinse im alien Indien*, Wiesbaden 1983, pp. 12-19. See also my "Tools of the Lapidary according to the *Agastya-saṃhitā*", in *Aṅghṛṇyam, Acharya Ramesh Chandra Shukla Felicitation Volume*, Badaun 1983, pt. 5, pp. 44-52.

11. Chs. 68-80 in Jīvananda Vidyasagar's edition, Calcutta 1980. The common verses are tabulated in Shakir Ali, *op. cit.*

12. *Professor P. K. Gode Commemoration Volume*, ed. H. L. Hariyappa and M. M. Patkar, Poona 1960 (Poona Oriental Series, No. 93), Pt. II, pp. 161-168.

in the *Yukti-kalpataru* shows that this work has nothing to do with Paramāra Bhoja as its author nor can it be dated so early.¹³

In this connection it is pertinent to add that the *ratnaparikṣā* section is not original to the *Garuḍapurāna* either. It was originally written by Buddhabhaṭṭa in the fifth or sixth century under the title *Ratnaparikṣā*. The opening verse pays homage to *ratna-traya* and Jina is referred to in verse 22. The compiler of the *Garuḍapurāna* removed these Buddhist traces and incorporated the whole work in the *Garuḍapurāna*.¹⁴

6.2 A source that can be dated more exactly is the *Mānasollāsa* from which the YK borrows some ninety verses.¹⁵ The *Mānasollāsa* (also known as *Abhilaṣitārthacintāmaṇi*) was written by Bhālokamālla Someśvaradeva III, the Cālukya king of Kalyāṇi, whose grandfather Āhavamālla Someśvara I vanquished Bhoja.¹⁶ This work was completed on Friday, the 22nd March 1129.¹⁷ It is clear as the Bhoja could not have written the YK which borrows from the *Mānasollāsa*. Nor can one argue that Someśvara may have borrowed from the YK.

Someśvara's treatment of gems, like the other parts of the book, is concise and exhibits a unity of authorship, whereas the section in the YK is loosely knitted and often repetitive. Consider, for example, eight sources of the pearl. These are enumerated in 107.43:

द्विपेन्द्रजीमूतवराहशङ्खमत्स्याहिशुकृत्युद्भववेणुजानि ।
मुक्ताफलानि प्रथितानि लोके तेषां तु शुक्लतुद्भवमेव भूरि ॥

13. *Ibid.*, p 166,

14. See Louis Finot, *Les Lapidaires Indiens*, Paris 1896, pp. vi-x, and also Ajay Mitra Shastri, *India as seen in the Bṛhatsamhitā of Varāhamihira*, Delhi 1969, p. 324, n. 1. Buddhabhaṭṭa's *Ratnaparikṣā* is critically edited and published with a French tr. by Finot, *op. cit.*, pp. 1-58. A second edition was published in *Ratnadīpikā Ratnaśāstram ca*, ed. P. S. Rama Sastri, Madras 1951 (Madras Government Oriental Series, No. LXXVIII). For the third edition, see n. 10 above.

15. *Mānasollāsa* II. 4. 402-536 (GOS 28, pp. 65-77). For the common verses, see Shakir Ali, *op. cit.*

16. Cf. Bilhaṇa, *Vikramāṅkadevacarita*, I. 91-96.

17. Cf. *Mānasollāsa* II. 2. 61-62 (GOS 28, p. 34). See also Vishwambhar Sharan Pathak, *Ancient Historians of India*, Bombay 1966, p. 85 and n. 2.

एवमन्यत्रापि

गजाहिकोलमत्स्यानां शीर्षं मुक्ताफलोद्भवः ।

त्वक्सारं शुक्तिशङ्खानां गर्भं मुक्ताफलोद्भवः ॥¹⁸

The first verse is from *Garuḍapurāṇa* and the second from the *Mānasollāsa*.

Or take the shape of the rough diamond. The diamond belongs to the cubic or isometric system of crystal architecture and its habit, i.e. the shape in which it is found in nature, is octahedral. That is to say it contains six solid angles (*koṇa*), eight facets (*daṭa*) and twelve edges (*dhārā*). This fact is stated as many as four times: 97.53, 54; 98.58; 100.74. Here 98.58 is admitted by the compiler himself to be from the *Viṣṇudharmottara* and *Agnipurāṇa*. 97.53 is from the *Garuḍapurāṇa* and 97.54 is from the *Mānasollāsa*.

Secondly, Someśvara rounds off the sections of his book, so to say, with his signature by mentioning his name. *Mānasollāsa* II. 4. 423 reads thus : *evam doṣā guṇāḥ proktā vajrāṅgām somabhūbhujā*. The compiler of the YK modifies this line thus : *evam doṣāguṇāḥ proktāḥ paribindor aśṅgataḥ* (101.87) which does not make any sense. Yet he betrays himself in 132.75 which reads as follows : *puṣparāgam iti proktaṁ rāṅga* (sic !) *somamahibhujā*. The printed edition of the *Mānasollāsa* II. 4. 525 has : *puṣparāgam iti khyātaṁ ratnaṁ ratnaparikṣakaiḥ*. This is probably a wrong reading and the original line must have read: *puṣparāgam iti proktaṁ ratnaṁ somamahibhujā*.¹⁹ Therefore, it is not Someśvara who borrowed from the YK, but the other way round.

This, however, does not mean that the compiler of the YK was familiar with the whole text of the *Mānasollāsa*. Someśvara's work also treats a number of topics that are dealt with in the YK : cf. *Mānasollāsa—āsana* 3.9.1133-1150; *cāmara* 3.10.1151-1160; *yāna* 3.16.1600-1659; *chatra* 3.17.1660-1669; *sāyā* 3.17.1670-1696 and so on. Yet in none of these sections the YK ever borrows from the *Mānasollāsa*. Therefore, it is certain that the compiler of the YK knew only the *ratnaparikṣā* section of the

18. This verse occurs with slight variations in *Mānasollāsa* II. 4. 424: *kolāhikarimat-syānām...* and in *Navaratnaparikṣā*, v. 58 (Finot, *op. cit.*, p. 152): *ibhāhikolamat-syānām...* It is remarkable that here the cloud is omitted and only seven sources are listed. However, in the verses that follow the cloud pearl is described.

19. There are other instances also where the YK offers better readings than the printed text of the *Mānasollāsa*. For a future edition of the latter text, therefore, mss. of the YK and also of the *Navaratnaparikṣā* should be consulted.

Mānasollāsa. Finot has shown that mss. containing only this section from the *Mānasollāsa* were in circulation.²⁰ Here too there are two recensions. The first is a shorter one containing only 2. 4. 401-457, 465-536 of the printed edition. The colophon does not mention the name of the author. The second contains 57 additional verses including II. 4. 458-464 of the printed edition and the colophon reads thus: *iti nārāyaṇapaṇḍita-vīracite smṛtisāroddhāre navaratnaparikṣā caturdoṣaprakaraṇam samāptam*. It is obvious that some Nārāyaṇa Paṇḍita added some verses of his own to this section of the *Mānasollāsa* and incorporated it as the fourteenth chapter called *Navaratnaparikṣā* in his *Smṛtisāroddhāra*. We do not know who this Nārāyaṇa Paṇḍita is, nor is any ms. containing the whole text of the *Smṛtisāroddhāra* recorded.²¹ However, the YK does not contain any of the additional verses of the longer recension and must have relied on the shorter one. It is also likely that the ms. of the shorter recension used by the compiler of the YK did not mention the author. Hence we find in the YK some of the verses from the *Mānasollāsa* prefaced by *evam anyatrāpi*.

6.3 Three verses of this section occur also in the *Ratnadīpikā*²² of Caṇḍeśvara who flourished in the fourteenth century. But the *Ratnadīpikā* and the *Agastīya Ratnaparikṣā*²³ have many verses in common. Therefore it is difficult to say from which the YK borrowed the verses.

6.4 The rest of the verses, though not useful for dating the text, still throw interesting light on the constitution of this section and personal inclination of the compiler. I would like to divide them into two broad categories.

(i). With the exception of Varāhamihira, all *ratnasāsrakāras* classify the diamond into four castes : *vīpra*, *kṣatriya*, *vaiśya* and

20. Finot, op. cit., pp. xii-xiii; 141-178.

21. There is a *Smṛtisāroddhāra* (also called *Cakranārāyaṇanibandha*) by Viśvambhāra Trivedin (17th century), but it does not seem to contain a section on gemmology; see P.V. Kane, *History of Dharmaśāstra*, vol. I, Poona 1930, p. 544.

22. For an edition of the *Ratnadīpikā*, see n. 14 above. I have not seen V. W. Karambelkar's critical edition. The common verses are as follows :

YK	88.71	=	<i>Ratnadīpikā</i>	III; 2
	98.61	=		I, 23
	104.18	=		I, 35b-36a.

23. The *Agastīya Ratnaparikṣā* is included in Finot, op. cit., pp. 179-193.

sūdra.²⁴ But some southern texts belonging to Agastya's school extend this fourfold classification to all the gems.²⁵ Such verses of the YK which deal with the fourfold *jāti* of the gems may have been borrowed from some lost work of Agastya's school. There are several apocryphal works on gems attributed to sage Agastya. Finot has published two called *Agastimata* and *Agastīya Ratnaparikṣā* in his *Les Lapidaires Indiens*. A third work called *Agastyasamhitā* was published from Kathmandu. But it is difficult to date any of these texts. However, the indebtedness of the YK to these or similar texts is certain. For instance, YK 88 72-89.77; 121.75 are found in the *Agastīya Ratnaparikṣā*.²⁶ Furthermore, the YK gives two tariffs for the ruby. One (94.223) is from the *Garuḍapurāṇa*. The second tariff (95 27-35) is closer to the one given in the *Agastyasamhitā* (p. 22, lines 3-7).

(ii). In the second category may be placed those verses which contain pedantic elaboration of theory. One example will suffice. All *ratnaśāstrakāras* speak of eight sources of the pearl. These are—1. elephant, 2. cloud, 3. boar, 4. conch, 5. fish, 6. snake, 7. bamboo and 8. pearl oyster²⁷ The YK elaborates them still further. Elephants and boars belong to four castes, therefore there are four types of elephant pearls and boar pearls. Conch shells may be formed under any one of the 27 asterisms, hence pearls originating from conch shells are of 27 varieties, and so on (pp. 107-117). There is not much point in such division when many of these pearls are admitted to be unobtainable for human beings. Such verses may have been written by the compiler himself, exhibiting his predilection for unnecessary pedantry.

7. The next section called *astrayukti* is also useful for the dating of the YK. It occupies 37 pages of the printed text of which 34 are devoted to the sword and the rest to other weapons. This inordinately long section on the sword does not contain any information on the technology of manufacturing swords, their measurements, shapes,

24. Cf. for instance, Buddhabhaṭṭa's *Ratnaparikṣā*, v. 23 and *Mānasollāsa* II, 4. 408-412.

25. For example, the *Agastimata* (Finot, op. cit., pp. 77-139) and the *Agastīya Ratnaparikṣā*

26. YK 88.72-89.77; 121.75 = *Agastīya Ratnaparikṣā*, vv. 47-52, 90. Again *munindrāḥ* in YK 106. 3 and *munipuṅgava* in 134.89 suggest that these verses are from some lost work of the Agastya school.

27. On the eightfold origin of the pearl, see my *Ṭhakkura Pherū's Rayaanaparikkhā*, Aligarh 1984, pp. 54-56.

decorations, handles, sheaths etc.²⁸ What is offered instead is a curious lore of auspicious and inauspicious signs on the surface of the swords.²⁹

7.1 The sources mentioned in this section are Nāgarjuna (p. 173), *Padmapurāṇa* (p. 150), *Pradīpa* (p. 145), *Bṛhaddhārta* (p. 169), Bhoja (p. 174), *Lauhadvīpa* (p. 143), *Lauhapradīpa* (pp. 145, 147, 148, 154), *Lauhārṇava* (pp. 141, 150, 158, 160), Vātsyā (p. 140) and Śārngadhara (pp. 144, 148). I am inclined to believe that *Lauhadvīpa* is a corruption for *Lauhapradīpa* and *Pradīpa* an abbreviation of the same.

7.2 It is interesting to note that the sub-sections here are not called *uddeśas* but *adhyāyas*. The colophons of these *adhyāyas* deserve our attention.

p. 140 : अथ खड्गपरीक्षा ।

p. 143 : इति भोजराजीये युक्तिकल्पतरौ खड्गपरीक्षायां सूत्राध्यायः (प्रथमः) ।

p. 154 : इति खड्गपरीक्षायाम् अङ्गाध्यायो द्वितीयः ।

p. 157 : इति लौहार्णवस्य खड्गपरीक्षायां वर्णाध्यायस्तृतीयः ।

p. 160 : इति लौहार्णवस्य खड्गपरीक्षायां जात्यध्यायः (चतुर्थः) ।

p. 165 : इति खड्गपरीक्षायां नेत्राध्यायः पञ्चमः ।

p. 168 : इति खड्गपरीक्षायाम् अरिष्टाध्यायः षष्ठः ।

p. 171 : इति खड्गपरीक्षायां भूम्यध्यायः सप्तमः ।

p. 174 : इति खड्गपरीक्षायां मानाध्यायः (अष्टमः) ।

From this it is reasonable to conclude that compiler of the YK borrowed the whole of the *khaḍgalakṣaṇaśiromaṇi* section comprising eight *adhyāyas* from a work called *Lauhārṇava*, that he attempted to rephrase the colophons as integral to the YK, but did so only at the end of the first *adhyāya* and betrayed himself in the colophons of the third fourth *adhyāyas*. The original colophons in the *Lauhārṇava* must have read uniformly as they do at the end of the third and fourth *adhyāyas*. The *Lauhārṇava* is otherwise unknown but for a short passage quoted in the *Lakṣaṇaprakāśa* of Mitramiśra.³⁰

28. A recent Telugu text, *Khaḍgalakṣaṇaśiromaṇi* of Navanappa of Pudukkoṭṭai (ca. 1980), ed. N. Venkata Rao, Madras 1950 (Madras Government Oriental Series XIV), is more interesting in this regard.

29. Reading the signs on swords seems to be an old profession going back to the time of the *Jātakas*; cf. Asilakkhanajātaka (no. 126) in *The Jātaka*, ed. V. Fausboll, vol. I, London 1962, pp. 455-458

30. *Viramitrodaya*, Vol. XX, Benares 1916, p. 295-96.

Thus we have in the YK a long and apparently continuous extract of about 220 verses from a lost *Lauhārṇava*. This extract begins with *atha khaḍgaparikṣā* (p. 140) and ends with *iti khaḍgaparikṣāyām mānādhyāyaḥ* (p. 174). The value of this extract for the history of science or technology is rather dubious. Nevertheless, the YK offers some curious beliefs from a work that is otherwise lost to us.

It must, however, be added that the long extract from the *Lauhārṇava* is interspersed with what are purported to be quotations from the *Padmapurāṇa*, *Śārṅgadhara* and *Lauhapradīpa*. But the verses attributed to the first two works are not found in the extant *Padmapurāṇa* and *Śārṅgadhara-saṃhitā*. As regards the quotations from the *Lauhapradīpa*, from the description of the contents of this work given in Weber's catalogue,³¹ it does not appear that the *Lauhapradīpa* has a section on the *khaḍgas* with such detailed enumeration of the auspicious and inauspicious signs. Moreover, the first six *adhyāyas* of this extract are uniform and continuous without any interruption. At this stage it is difficult to say whether these verses formed part of the texts to which they were attributed or whether the compiler inserted merely the names of authorities in order to make the YK more impressive. Whatever the case may be, the mention of the *Lauhapradīpa* and *Śārṅgadhara* and the implicit familiarity with these texts are again useful for the date of the YK.

7.3 Weber's catalogue lists a manuscript of the *Lauhapradīpa* written by Trivikrama who describes himself as *gauḍāntahpuravaidya*. This *Lauhapradīpa* cites, inter alia, the *Āyurvedasarvasva* of Bhojarāja and Vaṅgasena. Vaṅgasena's *Cikitsāsārasaṃgraha* is a well known work on *Āyurveda* which shows the influence of Cakrapāṇidatta's *Cikitsāsārasaṃgraha* (also known as *Cakradatta*) written in the eleventh century and is quoted by Hemādri who flourished in the 13/14th century. Therefore Vaṅgasena is placed at the beginning of the thirteenth century.³² Vaṅgasena is supposed to be a resident of Bengal, so was Trivikrama and so was the compiler of the YK as will be shown below. Therefore, even if we do not allow a large interval of time between Vaṅgasena and Trivikrama on the one hand, and

31. *Die Handschriften-Verzeichnisse der koeniglichen Bibliothek zu Berlin*. Erster Band: Verzeichnis der Sanskrit Handschriften, von A. Weber, Berlin 1853, p. 301, entry no. 974 (Chambers 475a).

32. Atridev Vidyalamkar, *Āyurved kā brhat Itihās*, Varanasi 1960, p. 278.

Trivikrama and the compilation of the YK on the other, the YK could not have been compiled earlier than the end of the thirteenth or the beginning of the fourteenth century. We reach the same conclusion from the fact that Śaṅgadhara is referred to twice in this section, implying thus a familiarity with the name of the author of the *Śaṅgadhara-saṃhitā* (if not with the text itself) which is placed in the thirteenth century.³³

8. The *astrayukti* is followed by the *yūtrāyukti* which contains a long section on horses under the name *aśvaparīkṣā*. P. K. Gode compared this section with Nakula's *Aśvacikitsita* and found that the YK borrowed from the latter work.³⁴ Assuming that the YK is the work of Bhoja, Gode concluded that Nakula's work must be placed before AD 1000. Since this assumption has been proved wrong, Gode's proposed *terminus ad quem* for Nakula's treatise remains without foundation. Therefore, a new attempt must be made to date this work without reference to Bhoja.

8.1 E. D. Kulkarni in his edition of the *Śālihotra*,³⁵ also attributed to Bhoja, made an excellent comparison of the *aśvaparīkṣā* section of the YK, *Śālihotra* and Nakula's *Aśvacikitsita* and found a great correspondence between these three texts. Kulkarni himself believes that the *Śālihotra* is written by Bhoja,³⁶ but his reasons are not really convincing. On the contrary, from the comparison of these three texts made by him it becomes obvious that just as the compiler of the YK drew heavily from the *Aśvacikitsita* so did another person compile the *Śālihotra* on the basis of Nakula's text and passed it off as *bhojakṛta*. It is worth noting that Bhoja is reputed to be an authority on horses and that his verses are cited in the commentary to Jayadatta's *Aśvavaidyaka*. According to Kulkarni, these verses are found neither in the YK nor in the *Śālihotra*.³⁷ If these verses formed part of Bhoja's treatise on horses, that work is lost to us save this single quotation.

33. D. M. Bose et al (ed.), *A Concise History of Science in India*, New Delhi 1971, p. 263.

34. "Date of *Aśvacikitsita* of Nakula—Before A. D. 1000", in his *Studies in Indian Literary History*, vol. III, Bombay, 1954, pp. 161-168.

35. E. D. Kulkarni (ed.), *Śālihotra of Bhoja*, Poona 1953.

36. *Ibid.*, pp. xvi-xvii.

37. *Ibid.*, pp. xv.

8.2 The other sections of this *yukti*, especially on goats, buffaloes, dogs etc. seem to be the work of compiler himself in view of his predilection for classifying every conceivable thing into four castes of *vipra*, *kṣatriya*, *vaiśya* and *śūdra*,

9. Likewise the *yānoddeśa* (p. 215 ff), in the absence of evidence to the contrary, seems to be the original work of the compiler, or at least the *nauyāna* section and that on architecture seem to emanate from the same source, since both sections employ the decimal units of linear measure, like *rājahasta* etc.³⁸ Assuming that a *hasta* (=cubit) is equal to half a yard or roughly 0.45 metres, we give below these units and their modern values.

<i>hasta</i>		=	1 cubit	=	0.45 m.	
<i>rājahasta</i>	=	10 <i>hastas</i>	=	10 cubits	=	4.5 m.
<i>rājadaṇḍa</i>	=	10 <i>rājahastas</i>	=	100 cubits	=	45 m.
<i>rājacchatra</i>	=	10 <i>rajadaṇḍos</i>	=	1000 cubits	=	450 m.
<i>rājakāṇḍa</i>	=	10 <i>rājacchatras</i>	=	10000 cubits	=	4.5 km.
<i>rājapuruṣa</i>	=	10 <i>rājakāṇḍas</i>	=	100000 cubits	=	45 km.
<i>rājapradhānī</i>						
or <i>rājadhānī</i>	=	10 <i>rājapuruṣas</i>	=	1000000 cubits	=	450 km.
<i>rājakṣetra</i>	=	10 <i>rājadhānīs</i>	=	10000000 cubits	=	4500 km.

The last three units are so huge that they have no practical relevance in the construction of cities, let alone forts and houses. An examination of the measurements given for houses and cities shows that the houses are too small and cities too huge. For instance, measurements are given for twelve types of palaces called *sundara*, *sarvatobhadra* and so on. Here the length of *sundara* is 51 cubits, width 40 cubits and the number of doors twenty ! (p. 38). Either the printed text is too corrupt, or the prescriptions are far removed from reality.

But what is far more interesting are these decimal units of linear measure, which are analogous to the modern metric system. This seems to be the only instance in India until modern times, where decimal

38. YK 23, 148-151. Bahadur Chand Chhabra speculates whether the term *rāja* in *rājahasta* etc. has anything to do with masons (*rāj* in Hindi) in a paper "Bhoja and Shipbuilding" read at the Seminar on 'The Contribution of King Bhoja to Indian Learning', Vikram University, Ujjain, February 1970. Professor V. Venkatachalam kindly sent me a copy of this paper.

units are used either for length, or area, or volume, or weight.³⁹ It would be extremely interesting for the history of Indian metrology to know the date and provenance of this section of the YK. Unfortunately, until the YK can be dated absolutely, the introduction into India of these decimal units of length remains undated.

9.1 It has been claimed that the YK is unique because of its section on ship-building. As Hazra states,⁴⁰ it is one of the chief sources of Radhakumud Mukerji's *A History of Indian Shipping and Maritime Activity from the Earliest Times*.⁴¹ Elsewhere Radhakumud Mukerji observes :

The fact is that though ancient India can boast of considerable naval enterprise, the only important piece of direct evidence on the subject that is available in our present state of knowledge is that embodied in the Ms. called *Yuktikalpataru* which, in one of its chapters, deals directly with boats and ships and gives details about their construction, varieties, measurements, sizes, decoration and accommodation. As the only repository of this direct evidence the Ms. deserves critical notice for its unique importance.⁴²

39. Saradha Srinivasan, in her *Mensuration in Ancient India*, Delhi 1979, gives tables of measures from a vast number of sources, but there is not a single table with decimal units. Incidentally, both Mankad, *op.cit.*, p. 366, and Srinivasan, pp. 29-30, err in taking *tantu* etc. as linear measures. YK 62. 450-51a reads thus:

नवभिस्तनुभिः सूत्रं सूत्रैस्तु नवभिर्गुणः ।
गुणैस्तु नवभिः पाशो रश्मिस्तैर्नवभिर्भवेत् ॥
नवाष्टसप्तषट्संख्यै रश्मिभी रज्जवः क्रमात् ।

The context is the description of the rope (*rajju*) for the parasol. This is made by twisting a specific number of threads together. Therefore, the above passage should be interpreted thus: "By [twisting] nine *tantus* [together] a *sūtra* [is made]. By [twisting] nine *sūtras* [together] a *guṇa* [is produced]. By nine *guṇas* a *pāśa*, by nine *pāśas* a *raśmi*. *Rajjus* [are made by twisting] nine or eight or seven or six *raśmis* [together according as it is Kṛta, Tretā, Dvāpara or Kali, cf. *yugakramā* in 62.448] respectively."

That is to say, in Kali era a *rajju* is made by twisting $9 \times 9 \times 9 \times 9 \times 6 = 39366$ *tantus*. I am not sure about the function of the *rajju* in an umbrella, but a *rajju* so produced ought to be strong enough to hold an elephant.

It is of course clear that these are not linear measures. Had they been so, the length of the initial unit, *tantu*, would have been given. But as technical terms from the domain of rope-making, these deserve attention.

40. R. C. Hazra, *op.cit.*, p. 161.

41. London 1912.

42. "Notes on Ancient Hindu Shipping", in *R.G. Bhandarkar Commemoration Volume*, Poona 1917 (reprint: Varanasi 1976), pp. 447-455. The quotation is from pp. 448-49

I am not in a position to say whether the measurements given for different classes of ships have any basis in reality, say in the Bengal region. But there is some confusion in the interpretation of these measurements which needs to be set at rest. When Radhakumud Mukerji wrote *A History of Indian Shipping* in 1912, he must have consulted only the *nauyāna* section of the YK. Since this section did not contain the definition of the *rājahasta* (which occurs almost at the beginning of the text on p. 33) Mukerji assumed that the expression *rāja* denoted the number sixteen⁴³ and accordingly interpreted *rājahasta* as sixteen cubits. Later when he had access to the complete ms. of the YK and thus to the definition of *rājahasta* as ten cubits, he corrected himself in an article "Notes on Ancient Hindu Shipping."⁴⁴ Subsequent writers on the subject did not notice this article and perpetuated the wrong measurements as given in *A History of Indian Shipping*⁴⁵ Therefore, for correct measurements one should consult the above-mentioned article.

10. From the foregoing it is clear that the YK was not written by Bhoja Paramāra in the first half of the eleventh century but by some unknown compiler who draws heavily on texts belonging to periods as late as the thirteenth century. Therefore, the compiler must have belonged to the fourteenth century at the earliest, or later if we follow Hazra's arguments. It is even possible to say to which part of India the compiler belonged. Hazra has shown that he belonged to "Eastern

43. Cf. Bibhutibhusan Datta and Avadhesh Narayan Singh, *History of Hindu Mathematics: A Source Book*, Bombay 1962, pt. 1, p. 56, where the words *nṛpa*, *bhūpa*, *bhūpati* etc. are given the numerical value of sixteen.

44. See n. 42 above

45. For instance, Mamata Chaudhuri, "Ship-building in the Yuktikalpataru and Samarāṅgaṇa Sūtradhara", *Indian Journal of History of Science*, 11.2 (November 1976), pp. 137-147. Moti Chandra, in his *Sārthavāha*, Patna 1953, p. 212 ff., also gives these measurements and attempts to interpret some of the names of these ships. See also his presidential address at the technical sciences section of the AIOC, Lucknow Session, 1951, printed in *The Journal of the Uttar Pradesh Historical Society*, vols. XXIV-XXV (1951-52), pp. 161-185, esp. pp. 184-185 on the YK. But interestingly enough all references to the YK are dropped from the second edition of the *Sārthavāha*, Patna 1966, and also from the English version of this book, *Trade and Trade Routes in Ancient India*, New Delhi 1977. Maybe he was also convinced of the spurious nature of the YK. Chhabra, *op.cit.*, realises that Mukerji's value of 16 cubits for the *rājahasta* is contrary to its definition in the YK, but does not seem to be aware of Mukerji's paper in the *Bhandarkar Volume*.

India and most probably to Bengal.”⁴⁶ I summarize Hazra’s arguments.

The statement that the *pāścātyas* (i. e. people of the western part of India) use the inferior types of *jalayānas* (229.32) establishes the compiler to be an Easterner. Almost all the mss. of the YK are in Bengali script and show that the work was read in Bengal more than anywhere else. The preference for the timber of the Gambhāri tree (*Gmelina arborea*) for the construction of boats and seats reflects ~~for the construction of boats and seats reflects~~ the conditions of Bengal and Assam. The Sanskrit word *matsyaraṅga* used for the kingfisher (70.19) occurs in Sanskrit lexica of Bengal only. The word becomes *māchrāṅgā* in colloquial Bengali.⁴⁷ Hazra’s contention is supported by fact that the YK refers to obscure Āyurvedic text of Bengal like *Lauhapradīpa*.

11. Now there remains the question of frequent quotations attributed to Bhoja in the YK. Do they at least belong to Bhoja? Rajendralala Mitra says: “*Yuktikalpataru* . . . frequently quotes from an author of the name Bhoja (*bhojepi*) meaning probably Bhoja Rājā of Dhārā.”⁴⁸ Hazra also seems to share this view when he says: “.....it is quite reasonable to conclude that the *Yukti-kalpataru* was compiled not by Bhoja himself but by some unknown writer who widely utilised Bhoja’s work or works and tried to pass his compilation under the name of that illustrious king.”⁴⁹ However, Shakir Ali has shown that not a

46. R. C. Hazra, *op.cit.*, p. 168.

47. *Ibid.*, pp. 166-168. To the occurrences of the word *matsyaraṅga* cited by Hazra, we may add a stanza from the *Subhāṣitaratnakośa* compiled by Vidyākara (ed. D D. Kosambi and V.V. Gokhale, HOS 42, Cambridge, Mass., 1957, p. 207, v, 1155) which contains a graphic description of the kingfisher:

उत्प्लुत्य दूरं परिधूय पक्षाबधो निरीक्ष्य क्षणबद्धलक्ष्यः ।

मध्ये जलं बुद्धति दत्तज्ञम्पः समत्स्यमुत्सर्पति मत्स्यरङ्गः ॥

Some mss. attribute this verse to Vākpatirāja and others say *kasyacit*. The compilation, however, was made in Bengal. One is tempted to add the equally beautiful translation by Ingalls (*Sanskrit Poetry from Vidyākara’s Treasury*, tr. by Daniel H. Ingalls, Cambridge, Mass. 1968, p. 235):

The kingfisher darts up high and shows his wings,

Peering below, he takes a quick aim,

Then, in a flash, straight into the water,

He dives and rises with a fish.

48. *Notices of Sanskrit Mss.*, No. 1, p. 146 f.

49. R.C. Hazra, *op.cit.*, p. 163.

single quotation attributed to Bhoja is found in the known works of Bhoja⁵⁰ In some cases it is quite certain that Bhoja could not have been the author of these statements. For example, consider the definition of the fortress attributed to Bhoja:

भोजस्तु—

यदेव वैरिदुर्लङ्घ्यं विस्तीर्णं विषमञ्च तत् ।

सप्रवेशापसरणं तद् द्वन्द्वमुत्तमं विदुः ॥ (21.143)

It has been stated above that the work *dvandva* in the sense of fortress is unique to the YK and is not used anywhere in the SSD. Therefore a statement that contains the word *dvandva* in this sense cannot be Bhoja's unless the compiler modified the original *durga* into *dvandva*. This proviso is not necessary for the next quotation:

भोजेनापि नगरयुक्तरन्यथोक्ता । तद्यथा—

राज (ज्ञः) स्वहस्तैः कोट्या च राजक्षेत्रमुदाहृतम् ।

एतेन परिमाणेन भूपः पत्तनमारभेत् ॥ (25.169)

That the unit *rajaṅsetra* (=one crore cubits=4500km.) and others are peculiar to the YK has been shown above. Bhoja cannot be the author of the statement which defines the *rajaṅsetra*, nor of the absurdity, we should hope, of prescribing 4500 km. as the measurement of a seaport or a city. For the same reason, the quotation attributed to the *Parāśarasamhita* (25.172) is also dubious.

It is difficult to say whether the compiler of the YK himself fabricated all the quotations attributed to Bhoja, or whether he had before him a work or works purported to have been written by Bhoja but which were in reality fabrications. In the latter event, the compiler of the YK was not the first one to fabricate texts under the name of Bhoja, but there were many before him who did so. This is not surprising in view of the fabulous character attributed to the illustrious Bhoja within a short span of time after his death. For a proper study of his achievements in literature and science, therefore, we must sift fact from much fiction, and this paper, it is hoped, is one attempt in this direction.

50. Shakir Ali, *op.cit.*

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