The Date and Nature of Sphujidhvaja’s *Yavanajātaka* Reconsidered in the Light of Some Newly Discovered Materials

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**Abstract**

This paper examines a number of crucial verses from the last chapter of Sphujidhvaja’s *Yavanajātaka*, a text that was widely believed to be the earliest Greek astral text translated into Sanskrit. In the light of some new materials, including a hitherto unreported Nepalese paper manuscript from the collection of the Nepal-German Manuscript Preservation Project (NGMPP), the date and nature of this important text are reconsidered.

1. Introduction

Since David Pingree’s edition and translation of the Sphujidhvaja’s *Yavanajātaka* in 1978, the text has established itself as one of the most important historical documents in various fields of Indology, from the history of mathematics and astral science, to Indian chronology and historical contacts among ancient cultures. A number of Pingree’s discoveries concerning the text have been widely quoted by scholars in the past decades. These discoveries may be summarized as follows: The *Yavanajātaka* was an astrological/astronomical work composed in 269/270 CE by Sphujidhvaja, an “Indianized Greek” who lived in...
the realm of the Western Kṣatrapas. The work was a versification of a prose original in Greek composed by Yavaneśvara in Alexandria in 149/150 ce. The work, though highly corrupted and clumsily expressed, contains algorithms of “ultimately Babylonian origin” and the earliest reference to the decimal place-value with a symbol for zero (bindu).

Pingree’s discoveries were based largely on readings from the last section of the Yavanajātaka, described by him as “Chapter 79 - Horāvidhiḥ”, an exposition of mathematical astronomy. In recent years, scholars including Shukla (1989) and Falk (2001) have pointed out some major flaws in some of Pingree’s interpretations and reconstitution of the text. However, further progress of a proper re-evaluation of the controversial contents of this chapter has so far been hampered by the lack of a better manuscript. In 2011–2012, additional materials including a hitherto unreported copy of the Yavanajātaka became available to the present author. This paper will therefore be the first attempt to reexamine Pingree’s key interpretations of the Yavanajātaka, focusing on this last chapter, in the light of the new textual evidences.1

TEXTUAL SOURCES

In his edition of the Yavanajātaka, Pingree remarked,

The difficulty of editing and understanding Sphujidhvaja arises from the fact that for most of the text we have only one very incorrectly written manuscript to rely on. The errors of N occur, on the average, at least once in every line. Often the expanded version of Mīnarāja or some other testimonium comes to our aid; sometimes a knowledge of Sanskrit grammar or idiom suggests the right reading, although Sphujidhvaja was not so exact in his use of Sanskrit as to make this criterion infallible. So we are occasionally forced simply to guess. And I am aware that I must have missed guesses that will occur to others, and that in some cases I will have guessed wrongly. Non omnia possimus omnes.

The “incorrectly written manuscript” N (folios 2–103) used by Pingree was in fact a microfilm of a Nepalese manuscript now in the possession of the National Archives in Nepal.2 The beginning folio as well as f. 102 are missing from the microfilm. Although I cannot verify the microfilm used by Pingree himself

1 A full critical edition of this last chapter is current under preparation and is due to be completed in 2013.

2 The manuscript is not dated although the variety of scribbles by different hands (titles, mantras, dedicatory lines, etc.) suggests that it was passed down from a long lineage of astrologers (jyotiṣika-s). On orthographic ground, N is probably dated around the twelfth century.
(kept in the archives of Brown University), it should be very similar or possibly identical to the black-and-white Nepal-German Manuscript Preservation Project (NGMPP) A31/16 film made on 13.9.1970. The manuscript in these films was first described, together with a transcription of the last four verses by H. P. Shastri in 1897, following R. Mitra’s initial survey of palm-leaf manuscripts in the Mahārāja’s Durbar library.\(^3\) Subsequently, Shastri himself and P. V. Kane (1955) continued to decipher the text.\(^4\) A copy of Kane’s transcription of the manuscript (ff. 2–10, 98–103) was made available to Pingree in 1958, which eventually became Pingree’s K (“Kane”). Together with another manuscript P (“Paris”) from Sylvain Lévi’s collection, the two manuscripts were used by Pingree to supply readings from the missing f. 102. Other manuscript fragments of the \textit{Yavanajātaka} were found by Pingree but their usefulness was limited. In addition, there were some important testimonia, most notably in the works of Mīnarāja and Utpala, whose readings often diverged from the manuscript readings.

The additional textual materials used in this paper come in three varieties:

i) alternate copies of N;

ii) an unreported copy of the \textit{Yavanajātaka};

iii) additional testimonia not reported by Pingree.

First of all, the microfilm Pingree used was not of the best quality, and that deficiency was exacerbated by the fact that the manuscript was already in a dilapidated state. In 1954, Giuseppe Tucci in fact took a complete set of photos of N (without f. 1 which was already missing, but with f. 102). Although the photo quality is less than desirable and is overall inferior to the black-and-white NGMPP film, it contains the missing f. 102 as well as critical readings at various places which were worn off or corrupted later on.\(^5\) In addition, a set of high-quality color digital photos of N were made in 2011 which provides the best reading among all sources so far, despite the source being in a very poor condition.\(^6\) These two new sources become our basis for improving on Pingree’s reading of N.\(^7\)

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\(^3\) Shastri 1897: 310–311.


\(^5\) I thank Francesco Sferra of Università degli Studi di Napoli “L’Orientale” who provided me with copies of Tucci’s photos as well as relevant documents concerning the circumstances when they were taken (Sferra 2008; Nalesini 2008). In addition, Sferra informed me that Pingree confirmed that Tucci’s photos contained materials he did not use for his 1978 edition when they were shown to him in the 1990s.

\(^6\) I thank also Harunaga Isaacson and Kengo Harimoto of Hamburg University for providing me the black-and-white copy of A31/16 as well as other MS fragments titled \textit{Yavanajātaka} in the NGMPP collections. The preparation of the color version of A31/16 as well as A1122–3 (see below) was facilitated by Isaacson and Albrecht Hanisch and was made available to me by Michio Yano.

\(^7\) \textit{Np} indicates Pingree’s reading of N which is not supported by our manuscript sources.
In 2011, I was informed by Michio Yano of his discovery of a hitherto unreported copy of the *Yavanajātaka* which was mistakenly recorded as *(Bṛhad)-yavanajātaka* in the NGMPP database. A digital set of color photos was produced (Q). Upon examination, this manuscript is found to contain significant readings which fill up some lacunae of our copies of N, as well as with significant variants. The manuscript contains 78 pages and was numbered up to 90, with therefore 12 pages missing. While this manuscript could be as late as the eighteenth century judging from the paper quality, it provides us also some additional information about the text which was not available in N. First of all, the verses were numbered, unlike in N. As far as the “last chapter” is concerned, Q grouped chapters 77–79 of Pingree’s edition into one chapter with 104 verses in total, which is more than 101 verses in N. Secondly, given the fact that Q contains variants significantly different from N and that the manuscript was copied at such a late date, there is a high chance of some other copies similar to Q being still extant in India and Nepal.

2. CRITICAL REMARKS

Pingree’s edition of the *Yavanajātaka* contains 2270 verses, in contrast to the “4000 verses” stated in the colophon (v. 62). It deals with various aspects of horoscope-based genethliacal astrology and is considered to be a prototype for a whole genre of such works known as jātaka which proliferated in the later age. The purported last chapter is unique in the sense that it deals with mathematical astronomy, the application of which was presumed in dealing with horoscope data such as date and planetary positions, but was usually treated separately in treatises belonging to the *ganita* (calculation) category. The contents of this pur-

---

8 At the top of the first folio of the manuscript was written in modern pen writing “ṣa 2387 / vidhā / vṛhadyavanajātakam”. While I cannot verify the particulars concerning this note, it may be noted that Shastri in his report also once described N as “vṛhatyavanajātaka” in which he later corrected to “vṛhatṣamhitā” (Shastri 1905: xxix–xxx).

9 Diwakar Acharya pointed out to me that although Nepalese paper manuscripts are dated as early as the thirteenth century in the NGMPP collection, Q could be as late as the seventeenth century based on the orthography and the red lines used for alignment.

10 The additional 3 verses are located in the missing pages and unfortunately cannot be identified.

11 This is not to be confused with the Buddhist jātakas which deal with the past lives of the Buddha and contain nothing of astronomical or astrological nature. The title jātaka to describe contents specifically dealing with horā appears to be a later usage when horoscopy emerged in India during the early centuries of the common era.

12 The three categories of *jyotihśāstra* according to Varāhamihira’s sixth-century *Bṛhatṣamhitā* (1.9, ed. Tripathī) that later became largely standard are: i) *ganita* or *tantra* (mathematical astronomy); ii) *horā* or *jātaka* (genethliacal astrology or horoscopy); iii) *samhitā* (collection of natural astrology and divinatory practices). It may be noted that while the *Vedāṅgajyotisa* attributed to
ported last chapter are remarkable in the sense that they are amongst the oldest Sanskrit jyotisa texts dealing with planetary motion and the computation of the number of civil days (ahargaṇa), if not the oldest extant; some of their features are attested in neither the surviving Greek sources nor the Indian ones. Nonetheless, the uniqueness of the work coupled with Pingree’s assumption of the corrupted nature of the manuscript led to his rather free emendations of the text, resulting in some highly questionable and some certainly wrong interpretations of the contents of the Yavanajātaka as we shall see in the examples below.

NUMERIC AND ALGORITHMIC EXPRESSIONS

In 1989, K. S. Shukla wrote a review on the last chapter of Pingree’s edition of the Yavanajātaka, which he described as “marred by faulty editing, the incorrect readings being adopted and the correct ones given in the apparatus criticus, with the result that the translation is incorrect at places and the meaning really intended by the author is lost.” In total, Shukla retranslated 10 verses, all dealing with time-measures and calculation of various time units in a yuga. What Shukla had essentially pointed out is that Pingree had failed to grasp the internal logic of the text and the numeric expressions by which numbers were expressed either normally [i–ii] or compositionally [iii–vi]:

- ekāsaṣṭiḥ (61 intercalary months in a yuga [abbr. i.y.] – v. 10) [i]
- saṣṭih śatam paṃcayutaṃ (60 + 100 + 5 = 165 years i.y. – v. 3) [ii]
- salasram apasaptasaṣṭikam (1000 – 7 × 6 = 958 omitted days i.y. – v. 5) [iii]
- paṃcāṣṭakaikena yatena yuktam dvīgūṇam salasram (5 × 8 + 1 + 2 × 1000 = 2041) [iv]
  - synodic months i.y. – v. 20
- śatpaṇḍakāgra diviśatī salasram ayoṭāni ṣaṭ (6 × 5 + 200 + 1000 + 60000 = 61230) [v]
  - tithi-s i.y. – v. 6
- śate dvicāḍaṣṭakāgra ṣaṭ cāyutāni (100 × 2 + 32 × 8 + 60000 = 60272) civil days [vi]
  - i.y. – v. 7

While the expressions appear to be quite straight-forward, Pingree chose to read or emend them rather arbitrarily:

Lagadha contains also elements of astrological nature such as the description of the governing deity for each naksatras, it deals by and large mathematical astronomy and contains no element of horoscopy or even references to planetary motion other than that of the Sun and the Moon.

Pingree’s Translation.

The Moon is to be characterized by waning and waxing in order. The titthi possesses the seed of the principles of the four (systems of time-) measurement. There are 60,265 (days) in a yuga.

New Translation.

The titthi, which is to be defined as the gradual waning or waxing of the Moon, is the soul of the principles of the four (systems of time-) measurement. Know that there are 60,000 plus 1000 plus 200 and 6 times 5 (i.e. 61,230) of them (i.e., titthi-s) in a yuga."

The number of titthis, 61230[v], is given here in a typical composite expression. Pingree chose to interpret teśām as referring to days (dināni) instead which led him to read 60265 = 65(!) + 200 + 60000 = 60265 “days”. Pingree’s reading is impossible not only because the juxtaposition of number necessarily entails multiplication which Pingree himself well understood, but also for the obvious error of leaving out the thousand (sahasram). The wrong interpretation led Pingree to the remark that “a more logical order might be achieved by interchanging 6c-d with 7c-d” and that “Sphujidhvaja gives only approximation”. The number given by Pingree is indeed closer to the actual number, 60272 days in a yuga which was given in v. 7:


trimśanmuhūrtaṃ dinarātram uktaṃ sūryodayāt kālabudhās tad āhuḥ |
teśāṃ sateA dve trikṛdaṣṭakāgreB ṣaṭ cāyutānyC arkayugam vadanti | 7 |

Ašate] p ed, sate N
Btrikṛdaṣṭakāgre] N, triśad ekakāgre p ed
Cṣaṭcā] N, satkhā p ed, satkā p ed
Pingree’s Translation.

A nychthemeron is said to consist of 30 muhūrtas; experts on time say that it begins with sunrise. They say that a yuga of the Sun consists of 61,230 (tithis).

New translation.

A nychthemeron (civil day) is said to consist of 30 muhūrtas; experts on time say that it begins with sunrise. They say that a yuga of the Sun consists of 60000 plus 200 plus 3² times 8 (i.e., 60,272) of them (civil days).

The number of days in a yuga is here given as 60272 [vi]. The expression for square (-kṛt) is well attested and is understood also by Pingree later in v. 23, but he chose to emend the phrase śate dve trikṛdāṣṭaṅgaṛe sat cāyutāni to śate dve triśadekakāṅgaṛe sat khāyutāni to force the number to read 200 + 30(!) + 61000(!) = 61230, which is the number of tithis, not the number of days. Errors such as these are found throughout Pingree’s translation, but even more alarming was his emendation or rather, insertion of expressions such as bindu and kha to represent zero in the two examples above (hence, vidyayutāni sat > binduyutāni sat; sat cāyutāni > khāyutāni). Thus, Pingree claimed,

[i]f my restoration…is correct, this is the earliest reference known to the decimal place-value system with a symbol for zero (bindu) in India. The extreme clumsiness with which Sphujidhvaja expresses numbers is a reflection of the fact that a satisfactory and consistent method of versifying them had not yet been devised in the late third century.¹⁷

In fact, both bindu and kha are not only fictitious but also superfluous. In other words, there is nothing clumsy about Sphujidhvaja’s expressions and the Yavana-jātaka provides no evidence of the use of the place-value system or zero, let alone instances of their earliest use.¹⁸ Similarly, Pingree’s implicit suggestion of

¹⁶ Thus he read trayas trayas trkṛt (stṛvṛn N) śadgunitās…liptās in v. 23a as “57 minutes” \((3 + 3² \times 6)\).

¹⁷ Ibid., 406, also 407.

¹⁸ This is not so surprising, given the fact that although the idea of void or null is certainly present in earlier Indian philosophical works and treatises on prosody (chandas) and grammar (vyākaraṇa), as many scholars have been keen to point out, nevertheless the inscriptive evidence for the use of zero as a decimal-place figure in India proper is surprisingly late. One of its first instances is generally recognized to be the Gwalior inscription of 876 ce where zero was in a list of donated items (Datta & Singh 1935:42,54). The earliest specimen of place-value notation in India is dated somewhat earlier in 693 ce, but as Salomon pointed out, undisputed cases of such notation are scarce through the eighth century ce (Salomon 1998:62). See also fn. 38.
the use of bhūtasaṃkhyā, the idiosyncratic way of representing numbers by symbolic words such as śara to mean five was based completely on his own emendation which is highly doubtful.\(^{19}\) In v. 9, we find the expression śatadvayoṃ śaṭ dviguṇam sahasram (2206) which Pingree emended to śaratriśat śaṭ dviguṇam sahasram (2041 = 5 + 30 + 6 + 2000).\(^{20}\) The emendation is extremely doubtful, not only because single digit numbers are never combined in this way as we have seen already, but also because the use of bhūtasaṃkhyā is not found elsewhere in the text, which employed standard numeric expressions despite the metrical constraint - a point that has serious consequence in Pingree’s interpretation of the “dates” of the text as we will shall see.

The correctness of our readings of the numbers in the text may be shown by the fact that they do agree with each other with minimal or no emendation to these composite numeric expression and algorithms. Hence, the number of tithis equals the number of synodic months times thirty: \(61230 \ [v] = 2041 \ [iv] \times 30\); the number of intercalary months equals the difference between the number of synodic months and and the number of solar months: \(61[i] = 2041 \ [iv] – 165 \ [ii] \times 12\), as given in the following verse which Pingree failed to interpret correctly:


\[
\begin{align*}
dināṃ cuṭḥuṣaṣṭi\( \text{A} \)-lavōnam āhus tithīṃ\( \text{B} \) ṭyūṣabdāntyam\( \text{C} \) at alas tu sarvam | trīṣaṣṭibhāgena yūtəm\( \text{D} \) sahasram yuge 'caṃnām\( \text{E} \) apasaptasat̮əṃ\( \text{F} \) | 5 |
\end{align*}
\]

\(\text{A} \) catuḥṣaṣṭi\( p_{esd} \), catuṣaṣṭi \( N \)
\(\text{B} \) tithiṃ\( p_{esd} \), tithi \( N \)
\(\text{C} \) yūṣabdāntyam\( N_{p}, \) praśabdāntyam \( p_{esd}^p \)
\(\text{D} \) trīṣaṣṭibhāgena yūtam \( s_{esd} \), trīṣaṣṭibhāgaṃ navataḥ \( N \), dviṣaṣṭibhāgaṃ navatīḥ \( p_{ed} \)
\(\text{E} \) vamānāṃ \( s \), tumānām \( N \), tv ṛtūnām \( p_{ed} \)
\(\text{F} \) apasaptasat̮əṃ \( N_{esd} \), apaśuddhaśat̮əṃ \( p_{ed} \)

\(^{19}\) It should be noted while Pingree assumed the use of bhūtasaṃkhyā, decimal place-value and zero in the Yavanajātaka, these concepts do not necessarily presuppose each other. Bhūtasaṃkhyā as word symbols without place-value is used in Pingala’s Chandaḥsūtra, dated generally before the second century BCE (Datta and Singh 1935: 58; Sarma 2009: 68–70). The earliest attested usage of bhūtasaṃkhyā with place-value is found somewhat later in the works of Varāhamihira (505–587 CE) such as the Pañcasiddhāntikā. The spuriously emended verses from Pingree’s edition of the last chapter of the Yavanajātaka have often been quoted as the earliest instance of the full use of bhūtasaṃkhyā, with place-value and zero, prior to Varāhamihira (Hayashi 1993: 24; Sarma 2009: 70–1; for other “controversial” instances, see Diller 1995: 59, fn.25).

\(^{20}\) 2206 is the number of sidereal months in a yuga or the number of lunar revolutions, whereas 2041 is the number of synodic months in a yuga. Pingree’s emendation is motivated apparently by his desire to make the numbers agree in his scheme. Here, Shukla implicitly agreed with Pingree because he had no access to the manuscript and had to rely solely on Pingree’s reading (Shukla 1989: 214).
Pingree’s Translation.

They say that a titthi equals a day minus 1/64th, but that every day equals a titthi plus 1/63 (of a day) in a yuga there are 990 seasons (ṛtu), (each) consisting of 62 (titthis).

New Translation.

They say that a titthi is equal to a day minus 1/64 (of a day) while a whole day is equal to (a titthi) plus 1/63 (of a titthi)…The number of omitted titthis (avamānām) in a yuga is equal to 1000 minus “7 times 6” (i.e., 1000–42 = 958).

Another interesting feature of the text is the use of time-measures which are defined in vv. 28–29. Their relations are given as: 3 ½ palas = 1 kuḍava; 61 kuḍavas = 60 liptās = 10 kalās = 1 nāḍika; 60 nāḍikās = 1 nycthemeron; 790 nimesas = 1 kalā; 2 nāḍikās = 1 muhūrta; in terms of values in increasing order: nimeśa ≈ 0.18”, pala 7.55”, kuḍava ≈ 23.61”, liptā 24”, kalā 24”, nāḍikā 24”, muhūrta (or ksana) 48’, dyunīśā (or ahoritni) 1 day or 24 hours. With the exception of muhūrta and liptā, which are defined the same across practically all extant Sanskrit texts, all others vary. It is noteworthy, however, that the relation of 1 nāḍikā = 10 kalās implied here is used also in Suśruta and Parāśara, and may be related to the Vedāṅgajyotiṣa as Shukla suggested. Pingree read in N kalāstāraśanāḍikās as kalās triṃṣa <ca> nāḍikās, resulting in the erroneous relation of 1 nāḍikā = 30 kalās. The correct reading should be kalās tā daśa nāḍikās which lead to the agreement of figures given in vv. 11–13 where the unit was used.

ASTRONOMICAL CYCLE AND BEGINNING OF THE YUGA

One of the key features of the Yavanajātaka is the use of an astronomical cycle of 165 years. Sphujidhvaja was aware of other types of astronomical cycles used by others (kecit), namely the Great Solar Yuga (mahat sauram) and the Smaller Yuga (sūkṣma) for predicting the eclipses (grahaṇārtham) as described in v. 2. While the yuga has been defined differently throughout the ages in India, the 165 years cycle is, however, not attested in any Greek or Sanskrit sources.

21 The relation given is possibly a rounded off figure from the definition of 1 nāḍikā = 201/20 kalās in Vedāṅgajyotiṣa (Shukla 1989:213).
22 Ibid., 217–220.
23 That is, equivalent to the cycle of 2041 (165 × 30) synodic months (Pingree 1978 II: 406). Pingree suggested that yugam mahat sauram refers most likely to the Mahāyuga of 4,320,000 years and commented that such a Mahāyuga is “certainly known in India by the second century A.D.” (Pingree 1963: 238). We are, however, not certain what Mahāyuga refers to or about the date of this concept. The Manusmṛti describes a Dīvya yuga of 12000 years while the Viṣṇupurāṇa describes a Mahāyuga of 4,320,000 years. For the five-year yuga of the Vedic period, see Achar 1997.
At the start of a series of verses that concern the calculation of time, the date of the epoch was given in relation to the Śaka era as follows:

**New Edition.**

\[
\begin{align*}
gate \text{sadagre}& \quad \text{`rdhaśate samānāṃ kālakriyāntatvam` idam śakānām} \\
ravir yuge& \quad \text{sūryadine prapede} \quad \text{kramāt tadabdādi yugādi bhānoḥ} \quad 14
\end{align*}
\]

\[\text{A} \text{sadagre}] \text{N, sad eke } p_{ed} \\
\text{Bkālakriyāntatva}] \text{N, kālakriyāttava} \text{ nip.} \\
\text{Craviryuge] emend., raveyuśam N, raveruše } p_{ed} \\
\text{Dprapede] emend., praderkah N, tprade `rke† } p_{ed}
\]

**Pingree’s Translation.**

When 66 years of the Sakas have elapsed, that is the truth (i.e., foundation) of the calculation of time. At dawn on Sunday begin that year and the yuga of the Sun.

**New Translation.**

When 56 years (of the yuga) have gone, this (i.e., the following) is the (upper) limit of the reckoning of time for the Śakas - On a Sunday in the yuga of the Sun, the Sun moved progressively; the beginning of that year is the beginning of the yuga of the Sun.

Based on his interpretation of v. 14, Pingree put the epoch to 23 March 144 CE, calculated from the well-established Śaka era of 78 CE. Falk, on the other hand, pointed out that the epoch should be placed before and not after the Śaka era, as the elapsed years (samānām) are not to be construed with the Śakas (śakānām) in two phrases. Furthermore, Pingree’s emendation of the numeric expression of sadagre `rdhaśate (56) to saḍ eke `rdhaśate (66) is unwarranted and was motivated by his attempt to match the astronomical configuration of the conjunction of Sun and Moon at Aries 0° described in pada cd.25 Quite remarkably, Falk showed that the year 22 CE (78–56) he proposed fulfilled the astronomical requirement as well. However, as typical of any epoch, this is very likely to be a backward calculation created for historical or calculatory purposes and does not necessarily constitute proof of the system’s antiquity as Falk claimed.26 Nevertheless, if

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24 I follow here Falk’s reading: “When 56 years (of the yuga) have gone, this is the state of (the sky leading to) the epoch of the Śakas…” (Falk 2001: 124).
25 Pingree 1978 II: 408.
26 Thus Falk claimed the date to be “when people from the West (yavana) spread their astronomical knowledge in South Asia”, coinciding “with the early years of Gondophares’ rule in India” (Falk 2001: 133). Backward calculation of epochs are well known, including the later Siddhāntic epoch of 3012 BCE, the Hijri year of 622 CE, or even the Anno Domini of our common era which was devised in 525 CE and popularized in the eighth century.
Falk’s interpretation is correct, 22 CE should be at best taken as the terminus post quem of this chapter of the *Yavanajātaka*.

**DATING AND AUTHORSHIP**

The often quoted dates and authorship of the *Yavanajātaka* claimed by Pingree are based on the last three verses of the text:


\[
\text{iti svabhāṣāracanā}\text{tiguptād viṣṇugraha<rkṣā>mśu<mato>'vatārāt} \quad \text{mahārṣimukhyair\anudṛṣṭatattvād dhorārtha\ratnākaravāksamudrā}\ | \ 60 \ |
\]

A rācanā\text{Q ed, rācanā N, varanā Ns}  
B tiguptād\text{emend. vasudeva, bhigu<ptā> N, bhiguptā Q, bhiguptām Ns\text{ed}}  
C viṣṇugraha <rkṣā>mśu<matō>'vatārāt\text{emend., viṣṇugraha<kṣā>nśuv+++<ṛā>t N, viṣṇugraha}+...Ns, viṣṇugraha<kṣe>++tātārāt Q, viṣṇugraha<kṣe>...\text{ped., viṣṇugraheṇdumāyāvatārāt}\text{emend. yokochi,}  
D ma<harṣi>mukhyair\text{emend. isaacson, ma++mukhyain N, mahar<li>mukhyair Q,}  
...Np, mahipamukhyair\text{ped}  
E tattvād dhorārθašāstra\text{emend. isaacson Ns, samudrā QN, samudrām \text{ped}}  
G 60\text{\text{ped, 102 Q}}


\[
sūryaprasādāgata\text{tattvadṛṣṭir lokānubhāvāya vacobhir ādyaiḥ | idam babhāṣe niravadyavāko} \text{horārthaśāstraṃ} \text{yavaneśvaraḥ prāk} | \ 61 \ |
\]

A sūryaprasādāgata\text{Q ed, sūryaprasādāga Q, sūryapraṣā+ga N, sudhāprasā+nvita Ns}  
B vākyo\text{Q, vakto Ns}  
C horārthaśāstraṃ\text{ped, horārthaśāstra N, horārthaśāstra Q}  
D 61\text{\text{ped, 103 Q}}


\[
sphujidhvaj\text{a Nāma babhīca rajā ya indracajrābhīr idam cakāra | nārāyanārkendumāyādīdṛṣṭam kṛṣṇaṃ caturbhīr matimāṃ sahasraḥ |} 62 \ |
\]

A sphujidhvajo\text{Q, sphūrjjidhvajo Ns}  
B nārāyanārkendumāyādīdṛṣṭam\text{emend., nārāyaṇārkendumāyādīdṛṣṭam Q, nārāyaṇā<rk>ndumāyādīdṛṣṭo N, nārāyaṇārkendumāyādīdṛṣṭam Np, nārāyaṇārkendumāyādīdṛṣṭvā Ns, nārāyaṇārkīndumeṣādīdṛṣṭam emend. Falk 2007: 143 fn2, nārāyaṇārkendumātībdadṛṣṭam} \text{ped}  
C kṛṣṇaṃ\text{ped, kṛṣṇāṃ Q, kṛṣvāṁ N, kṛtvā Ns}  
D matimāṃ\text{Q, matimān Ns\text{ped}}  
E 62\text{\text{ped, 104 Q}}
Pingree’s Translation.

Previously Yavanesvara (the lord of the Greeks), whose vision of the truth came by favor of the Sun and whose language is flawless, translated this ocean of words, this jewel-mine of horoscopy, which was guarded by its being written in his tongue (i.e., Greek), but the truth of which was seen by the foremost of kings (in the year) 71; (he translated) this science of genethlialogy for the instruction of the world by means of excellent words. There was a wise king named Sphujidhvaja who versified this entire (text), which was seen by him in the year 191, in 4,000 indravajra verses.

New Translation.

In the past Yavaneśvara, whose vision of truth came from the grace of the Sun, whose sentences are blameless, from jewel-mine of horoscopy which is an ocean of words, [whose meaning] was very obscure by reason of being written in his own language (svabhāṣā-),27 whose truth was revealed by the foremost of great sages, which was descended from Viṣṇu, the planets, the nakṣatra-s and the Moon, taught this treatise of horoscopy in excellent words for the benefit of the world. There was a wise king named Sphujidhvaja who composed this entire (text), which was beheld (-dṛṣṭaṃ) by Viṣṇu, the Sun, the Moon, Maya and so on, in 4,000 indravajrā verses.

Pingree’s reading of viṣṇugraha in v. 60 as 71, which became the basis of his dating of Yavaneśvara’s original prose exemplar (78 + 71 = 149/150 ce), as well as the idea of “two names” and “two dates”, are in fact not original, but were adapted from Shastri’s report and transcription of the text dated 1897.28 Shastri read viṣṇugraha as 91, which was later adopted by Kane.29 Pingree disputed the reading with the argument that the inclusion of the pseudoplanets Rāhu and Ketu

27 Alexis Sanderson (personal communication) pointed out that the phrase svabhāṣā-racanātiguptā seems to be “an oddly hyperbolic way of referring to the fact that the original was in a language other than Sanskrit”. He thus proposed the possibility of the phrase meaning that “the meaning of the text was completely obscure by reason of being written in an [unfamiliar] jargon.” Such usage of the term bhāṣā, taken as synonymous with paribhāṣā to refer to “jargon” and not “language,” appears to be attested. This interpretation is indeed favorable if we take the non-bhūtasaṃkhyā interpretation of the new manuscript reading of v.60b. In other words, it is rather unlikely that author considered a text promulgated by Viṣṇu to be originally composed in Greek.

28 “There are evidently two names and two dates. The first is Yavanēçvara, in the year Viṣṇugraha, i.e., 91 of some era not mentioned who translated into Sanskrit a work from his own language. The second is Sphūrjjidhvaja in 191 of the same era who rendered the translation into 4,000 Indravajrā verses” (Shastri 1897: 311–312).

29 Kane 1955: 1. Furthermore, Kane speculated the era to be Gupta.
among the planets (graha) was “an impossibility in the second century”, but accepted nonetheless the assumption of the bhūtasamkhyā.\(^\text{30}\) The problem with this reading is the broken akṣara-s which follow, unreported by Shastri but reported by Pingree to be a mysterious “kṣe” marked with an obelus, which could in fact be “ksāṇśu” (Q) or “rkṣāṃśu” (as I emended).\(^\text{31}\) Leaving aside the problem of the unattested usage of viṣṇu to represent one, this extra syllable makes the bhūta-samkhyā highly unlikely if not impossible.\(^\text{32}\) As Falk had pointed out, such conversion “is not required or necessary” and “the truncated line may well refer to ‘the sun and the planets’”.\(^\text{33}\) It should also be noted that while it is not certain whether svabhāṣā- in 60a refers to Greek, judging from the Indian contents found throughout the Yavanajātaka, from the description of 28 nakṣatras in an exposition of traditional Indian yātrā military astrology,\(^\text{34}\) to all the Indian elements such as description of Indian deities, Āyurveda and even the Kāpālikas which are not attested in any Greek source at all, the prose version is extremely unlikely to be Greek, that is, if there was one.\(^\text{35}\) As such, Yavaneśvara should be considered to be a reference to the attributed source and not to the author of a textual exemplar. It appears that the Yavanajātaka is an original amalgamation of Greek and Indian astral sciences.

30 Pingree 1959: 282 fn.4.
Pingree’s famous reading of 191 (Śaka) years based on his emendation nārāyaṇāṅkendumitābda from nārāyaṇārkendumayādi similarly poses a series of major problems. First of all, his reading of the manuscript was faulty. All copies of N showed -āṅke to be an impossible reading, which should read -ārke instead according to Q.\textsuperscript{36} Secondly, it is highly doubtful that Sphujidhvaja employed bhūtasamkhyā at all as I have pointed out earlier; nowhere can it be shown that such system of numeric expression was used in this work. Thirdly, even if this turns out to be an exceptional bhūtasamkhyā, the reading indu (1) arka (12) nārāyaṇa (1) would generate an unlikely number of 1121, assuming the rather doubtful reading of nārāyaṇa as 1. These observations confirmed Falk 2007 ’s suspicion that “Pingree provides each of his two authors Yavaneśvara and Sphujidhvaja with a particular date, none of which may exist!”.\textsuperscript{37} In sum, on the grounds of both manuscript evidence as well as general observation of the text, the commonly accepted dating of 149/150 CE and 269/270 CE being the date of composition of the prose and versification of the Yavanajātaka by Yavaneśvera and Sphujidhvaja respectively must be discarded.

\textsuperscript{31} I thank Harunaga Isaacson for pointing out to me the characteristic use of the ligature “ṅśu” to represent “ṃśu” in this manuscript. The important point here overlooked by Pingree is the last member of the compound - avatārāt which very much removes the possibility of a bhūtasamkhyā on one hand, and points to a curious reference to the lineage of the text on the other. While my emendation appears…
3. RECONSIDERATION OF THE YAVANAJĀTAKA

drawing from our observations above, a somewhat different picture of the Yavanajātaka begins to emerge. In the first place, the text is not as corrupted and clumsily composed as Pingree suggested, which other scholars such as Shukla and Falk have already pointed out. The conventional use of terminology, expressions and even time-measures suggests that the last chapter of the Yavanajātaka belongs to the same tradition of mathematical astronomy as all other extant Sanskrit texts in the early centuries of the common era, preceded possibly by the Vedāṅgajyotiṣa attributed to Lagadha and other lost works such as those of Vasiṣṭha and others mentioned in Varāhamihira’s Pañcasiddhāntikā. Disappointing as it may sound, the early evidences for the use of zero in a place-holder system and the bhūtasaṃkhyā as Pingree identified in the Yavanajātaka must now be refuted. While this does not mean to deny the claim of the discovery of zero as number in India, evidences for such mathematical innovation must be sought elsewhere as some scholars have attempted.38

to follow closer to the manuscript readings, Yūko Yokochi pointed out to me the striking resemblance between this pāda and v. 62c, and thus suggested the emendation viṣṇugraheṇaś-
dumāyāvatāt. If this is indeed the case, the repetitiveness appears to me rather odd, unless one concedes that v. 62 after all was an accretion. Regardless which interpretation we take, this problematic pāda leads us to speculate about the possibility of four astronomical schools which must be known to Sphujidhvaja, although to my knowledge, Soma has never been ascribed to a text, while Viṣṇu, Sūrya and Maya are indeed well attested as the source of astral science of various schools. Readings from another manuscript would be immensely helpful.

32 If my emendation is correct, a forced bhūtasamkhya reading may render the combination viṣṇu + graha + ṛkṣa- into the impossible figure of 2771 or 2871. The strangeness of viṣṇu to represent one has been noted by others (Sarma 2009: 66).

33 Falk 2007: 143 fn1. I have not adopted Falk’s suggestion but took it more generally to refer to Sphujidhvaja’s praising and justification of Yavaneśvara’s excellence.

34 Chapter 73, vv. 18–20.

35 Pingree himself admitted that “...it is clear that much of Sphujidhvaja’s material is derived not from Greek sources, but from an ancient Sanskrit tradition of military astrology” but did not elaborate further why that was the case if the work was supposed to be a translation/versification of a Greek original. The subject was treated in greater details in a paper I presented earlier this year during the workshop Vedica Neapolitana in Procida, Italy (Oct 5, 2012). “The Hinduization of the Genethliacal Astrology – from Yavanajātaka to Brhajjātaka.” A full version of the paper will appear in the journal of the University of Naples “L’Orientale.”

36 Falk 2007’s emendation of Pingree’s sāṅke to “ārkti” was based on mere guessing, as informed to the author by Falk personally.


38 See Staal 2009. It is curious that Staal began his essay by claiming that the evidence in support of the belief that zero originated in Indic Civilization “is almost zero”, but appeared to have accepted Pingree’s claim of the earliest evidence of decimal place-value system with a symbol for zero and its dating, which were referred to also in 1978 by Ruegg in his discussion of the history of the term śūnya. Regardless of whether Staal was aware of the unreliability of Pingree’s assertion, one can say that nonetheless he was more interested in earlier evidences in what he called “beyond writing” and the “prehistory of zero” (Staal 2010: 6, 14 ff).
While many astrological concepts described in the first 78 chapters such as the ascendent (horā < ὥρα), decan (drekkāṇas/drekāṇas/drekkas/drekas < δεκαόσ), minute (liptā < λεπτόν) must be connected to their Greek parallels given their blatant resemblance and the lack of antecedents in the Vedic corpus, indigenous concepts such as karma, Āyurveda and references to Hindu deities, as well as elements not attested any extant Greek sources such as the yuga of 165 years must not be overlooked. Pingree’s views that the latter reflects Sphujidhvaja’s attempt of Hinduization and that the “Greek original from Alexandria” belonged to a lost school of Greek astronomy are at best conjectural. Specifically, the questions of where the contents of this last chapter of the Yavanasāṁhitā ultimately comes from and how much of it owed to the Greeks, remain open. Given the evidences we have seen so far, the text Sphujidhvaja composed appears to be original, based on an indigenous tradition where elements of Greek and Indian astral sciences were thoroughly amalgamated.

As for the identities of Yavaneśvara and Sphujidhvaja, it should be noted that historically the two names must have been considered by at least some Indian pandits to be referring to the same person. Although this interpretation appears unlikely given the use of prāk in 61d and the unique description of the source in vv. 60–61 in contrast to v. 62, Yavaneśvara was likely a general attribution rather than a reference to a specific historical figure. Pingree’s treatment of the two names to refer to two unique individuals was motivated by his fictitious readings of the bhūtaśaṃkhyā, which are now shown to be impossible.

The earliest “hard” evidences we have so far for the use of zero as well as bhūtaśaṃkhyā are to be found somewhat surprisingly in the inscriptions of the Indianized kingdoms in South-east Asia in late sixth and seventh, the first of which is a Khmer stele K.151 dated śaka 520 or 598 ce (Billard & Eade 2008: 398; for general discussion and other slightly later but nonetheless significance references, see Cœdès 1931: 323–328; Datta & Singh 1935: 66; 1999: 125–6; Salomon 1998: 61–63).

For general discussion on Greek loans in Sanskrit, see Burrow 1955: 387–388; for specific discussion on astronomical loans, see Yano 1987.

Incidentally, this last chapter was titled only “horā” and not “horāvidhi” as Pingree claimed. As pointed out earlier, Q grouped chapters 77–79 together as one chapter which was titled in the colophon as “horā”. Rather remarkably in N, Pingree’s chapters 77 and 78 were not given any title and Pingree conjectured them to be “karmārambhāḥ” and “ārambhavidhiḥ” respectively in his edition. The title “horāvidhiḥ” is an emendation by Pingree and was not reported by Shastri when N was presumably in a better state (Shastri 1911: 5–6). Q reads simply yavanajātake horā pari-samaṃpātā.

41 Bhāskara quoted v. 55 twice in his commentary on the Aṣṭādhikaṭṭha, attributed the verse to “Sphujidhvajayavaneśvara” (uktam ca Sphujidhva jayavanesvareṇa), suggesting that Bhāskara understood Yavaneśvara and Sphujidhvaja to be the same person. Citations of the Yavanajātaka attributed to “Yavaneśvara” are found in Utpala’s commentary on Bṛhajjātaka 7.9 (ed. Jhā) and Bṛhatsaṃhitā (as reported by Kern in his edition, quoted in Shastri - see next note). In fact, whenever the Yavanajātaka was quoted, Yavaneśvara was consistently referred to, not Sphujidhvaja.

42 Shastri 1897: 312.

43 The usage would be similar to the yavanācārṇy in later texts. It is doubtful that the title refers to a single person.
Furthermore, since it is not completely certain whether the colophon was written by Sphujidhvaja himself, its contents should not be accepted too hastily without reservation. At any rate, there is no evidence of the existence of a Greek text in prose from which Sphujidhvaja versified, as Pingree claimed.

To sum up, the most we can say in the absence of further evidence is that the Yavanajātaka is an early Indian jyotiṣa text which incorporated elements of Greek astrology and astronomy. The unique yuga system it described suggests that it is a transitional work which modified upon prevalent jyotiṣa works such as the Vedāṅgajyotiṣa. It is dated some time after 22 CE and could be as late as the early seventh century when it was first quoted by other authors such as Bhāskara in his commentary on the Āryabhatīya. While the uncertainty of the dating of the

44 That is, v. 62 and possibly vv. 60–62. Although it is not usual for Sanskrit authors to refer to themselves in third person out of modesty (I thank Dominik Wujastyk for pointing that out to me), the phrase sphujidhvajo nāma rājā gives at least the possibility that this verse, and possibly the following ones as well, was composed by a disciple-scribe in the manner the Vedāṅgajyotiṣa was described as “the lore of time of the Great Sage Lagadha” (kālajñānaṃ lagadhasya mahātmānaḥ) proclaimed by the anonymous author in first person (pravakṣyāmi) in VJ-R 2 (see Kuppanna Sastry 1985: 35–36). The possibility that v. 62 could be a later addition may be further corroborated by the not so accurate description of the text, i.e., 4000 verses in īndravājra meter, when the actual number of verses was likely to be less (though possibly more than the 2270 verses reported in Pingree’s edition given the evidences from Q - see above) and the verses, technically speaking, in upajāti meter.
Yavanajātaka may be upsetting to some, it creates also new, interesting questions to be answered. For example, the kāpālikas or the “skull-bearers” (translated by Pingree rather inconsequentially as “beggars”) described in the text (v. 62.25) would have been taken in the past as a remarkably early reference to the tantric Śaiva cult; now, suchlike references have to be reexamined together with other materials outside the text which may in turn provide us hints for the true dating of the Yavanajātaka.\textsuperscript{45} Even more challenging questions are posed by a number of parallel passages found in the Sārāvali of Kalyāṇavarma and the Vṛddhayavanajātaka of Mīnarāja (a work twice the size of the Yavanajātaka), as well as a handful of hitherto unexamined manuscripts all bearing in their titles variations of “Yavanajātaka” purportedly authored by certain Yavanācārya(s).\textsuperscript{46} For decades, Pingree assumed that these works simply quoted from or were influenced by the Yavanajātaka of Sphujidhvaja. Given that the dating of the text has now been put into question, their relationship must be reexamined, together with many yet unidentified or unread jyotiṣa manuscripts and fragments in collections such as the NGMPP.

\textbf{ABBREVIATIONS}

\begin{itemize}
  \item N \quad NGMPP A31/16 = NAK 1180/vi.jyaut. 45, 103 ff.
  \item N\textsubscript{t} \quad Tucci 13(XLIX.21–38) and 34(ex35) (XLII.1–9), dated 1954, ff. 2–103.
  \item N\textsubscript{bw} \quad NGMPP black-and-white microfilm, dated 1970, ff. 2–101,103.
  \item N\textsubscript{c} \quad NGMPP color photos, dated 2011, ff. 2–101,103.
  \item Np \quad Pingree’s reading of N (Np = reading unsupported by MS reading)
  \item Ns \quad Shastri (1897)’s reading/emendation of N
  \item Q \quad NGMPP A1122/3
  \item P \quad As reported by Pingree 1978: 23. Copy of N made for P. V. Kane, dated c. 1955, recopied by Pingree in 1958, ff. 2–10, 98–103.
  \item K \quad As reported by Pingree 1978: 23. MS A.3 of the collection of Sylvain Lévi, copied c. 1890, 66 ff.
  \item B \quad Bhāskara’s commentary on Āryabhaṭiṭṭa (kālakriyāpāda). Shukla 1976 edition.
  \item U \quad Utpala’s commentary on Brhajjātaka
\end{itemize}

\textsuperscript{45} The term is found in Sanskrit literature from sixth century onward: Kāpālika was mentioned in the chapter on omens, “Circle of Quarters” (antaracakram), in Varāhamihira’s Brhat-samhita (v. 86.22). Earlier reference in Prākrit is found in Hāla’s Gāhāsattasaī (Skt. Gāthāsaptaśatī), dated generally third to fifth century CE (Dyczkowski 1988: 26).

\textsuperscript{46} See for example the description of various Yavanajātaka MSS (Kane 1955: 2). Pingree had made a brief survey of these works though it is by no means exhaustive and much of the contents are yet to be deciphered (Pingree 1978 I: 28–39).
Pingree’s emendation 1978
Shukla’s emendation 1989
reconstruction from unclear reading
obelus: problematic/uncertain reading

BIBLIOGRAPHY

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