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Notes on Some Sanskrit Astrological Authors

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Aller au sommaire du numéro

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Résumé de l'article

This paper supplements and corrects the information given in the works of David Pingree regarding four major authors on Tājika or Sanskritized Perso-Arabic astrology from the fourteenth to the seventeenth century: Tejaḥsiṃha, Yādavasūri, Bālakṛṣṇa and Balabhadra. It further contributes information on a fifth such author, Tuka, not discussed by Pingree.

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Notes on Some Sanskrit Astrological Authors

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1. INTRODUCTION

Any scholar engaging today with the history of astrology in India owes an enormous debt of gratitude to David Pingree (1933–2005), whose achievements in locating and cataloguing manuscripts of the vast body of relevant Sanskrit literature, and drawing up broad lines for dates and routes of transmission, were truly stupendous. On the level of individual authors and their works, however, mistakes are not infrequent in Pingree's publications, several of which have become standard reference works in the field – including his five-volume *Census of the Exact Sciences in Sanskrit* (CESS) and his *Jyotiḥśāstra: Astral and Mathematical Literature*. The following notes, dealing with a handful of authors on Tājika or Sanskritized Perso-Arabic astrology from the fourteenth to the seventeenth century, constitute a small contribution towards greater precision in their dating and the typically scant information we have on their general background. Particular attention will be given to the date of Balabhadra, author of the encyclopaedic Tājika work *Hāyanaratna* of which I am currently preparing an edition and translation. The other authors discussed in this paper are all cited in the *Hāyanaratna*. On the most important of all Tājika authors, Samarasiṃha (thirteenth century?), I shall say nothing here, as I hope shortly to deal with his literary output and sources in a separate publication.

While providing a general overview of the history of Tājika is not the purpose of the present paper, it may be briefly stated that the word itself is derived from the Arabic tribal name Ṭayyi᾽, via the Middle Persian *tāzīg* "Arab," and denotes a form of astrology that developed as a separate school in India in the early centuries of the second millennium CE. Although ultimately springing from the same Greek origins as pre-Islamic Indian astrology, Tājika comprises many technical elements not included in the first wave of astrological transmission from the northwest about a millennium earlier, and is thus the form of astrology in India that most closely resembles the medieval European variety, which similarly rests on Arabic foundations. A reasonably complete and coherent historiography of

the Tājika school will remain a desideratum until more in-depth studies of individual works and authors have been made, but some relevant introductory material has been published over the past two decades.[1]

2. TEJAḤSIṂHA (fl. 1337)

The earliest preserved Sanskrit work on Tājika following Samarasiṃha is the *Daivajñālaṃkṛti* authored by Tejaḥsiṃha, who is concisely described by Pingree as follows:

> The son of Vikrama of the Prāgvāṭavaṃśa, a minister of the Cālukya monarch Śāraṅgadeva (*ca.* 1276/1296), and the brother of Vijayasiṃha, Tejaḥsiṃha composed a *Daivajñālaṅkṛti* in Saṃ. 1393 = AD 1336.[2]

Although not stated by Pingree, Balabhadra mentions in passing that Tejaḥsiṃha had also written a gloss (*ṭīkā*) on a work by Samarasiṃha (*āha samarasiṃhaḥ…taṭṭīkākṛt tejaḥsiṃho 'pi*). Pingree gives the closing verses of the *Daivajñālaṃkṛti* from an unspecified source, which differs in places from the two manuscripts that I have had the opportunity to examine.[3] The readings of Pingree's source are generally preferable, and I reproduce them below with only minor corrections on the basis of manuscript evidence and with my own translations. The first five verses read:

> *lakṣmīr yasya pratene svayam acalam ihācandratāraṃ niveśaṃ*
> *yasmin muktāḥ phalanti praguṇataraganā doṣapaṅktyā vimuktāḥ |*
> *yasmin viśrāmabhājaḥ paramapṛthutaraśreṇayaḥ sajjanānāṃ*
> *so 'yaṃ prāgvāṭavaṃśo jagati vijayate 'nalpaśākhāviśālī | |*
>
> Victory in the world to that Prāgvāṭa dynasty, great with numerous branches, for which Lakṣmī herself provided an enduring dwelling-place for as long as the moon and stars shall last, here where pearls ripen in most excellent multitudes, free of any blemish, and where the most abundant guilds (*śreṇi*) of good men enjoy their peace!

1 See Pingree 1997; Sarma 2000; Gansten and Wikander 2011; Plofker 2011; Gansten 2012, 2014.

2 Pingree 1970–1994: A3 89a. The same information is repeated in Pingree 1981: 99, 130, 1997: 82.

3 These are Kerala 7758 (K), the earliest manuscript listed by Pingree, copied on 7 December, 1525, and a Nepalese manuscript microfilmed by the Nepalese-German Manuscript Preservation Project (NGMPP), microfilm A414/21 (N), not listed by Pingree, undated.

sphūrjaccālukyavaṃśodbhavanṛpatiśirobhūṣaṇībhūtakīrteḥ
śrīmacchāraṅgadevāhvayapuruṣapateḥ pādapadmaprasādāt |
sarvavyāpārapāraṃ sasukham upagataḥ[a] *sadguṇaughaikapātraṃ*
tatra śrīvikramāhvo 'jani vijitaripur mantriṇaḥ satyamitram | |

[a]Pingree: *samakham apagataḥ*.

There Śrī Vikrama was born, vanquisher of his enemies and [his] minister's true friend, the peerless vessel of a host of virtues, who with ease attained the further shore of all undertakings by the blessings of the lotus feet of the glorious King Śāraṅgadeva, whose fame had become the head-ornament of the kings born in the illustrious Cālukya dynasty.

mantrī tasmād athādau dhṛtavijayapadāṃ siṃhasaṃjñāṃ dadhāno
*jajñe vidvajjanānāṃ hṛdaya*kumudamuddāyi*vākcandrikā*bhṛt[a] |
*sāhityanyāyavādapramukha*parilasat*sarvaśāstrābdhipāraṃ*[b]
prāptaḥ saukhyaikapātraṃ vinayanayamukhaiḥ sadguṇair gītakīrtiḥ | |

[a]Pingree: *-kumudam uddāyi vākcandrikābhūt*. In this instance, neither K nor N is helpful; *-bhṛt* is my own (minimally invasive) conjecture.
[b]Pingree: *-pariṇamat-*.

Then [his] minister was born, taking from him the title Siṃha prefixed by the word Vijaya; possessing that moonlight of speech which brings joy to the night lotuses of the hearts of the learned; having attained the further shore of all sciences, shining with literature, logic, rhetoric and so forth: a peerless vessel of happiness whose praise was sung on account of his modesty, propriety and other virtues.

tasyoccair mānyabandhus tanujanir ajani khyātam[a] *ādau ca tejaḥ*
prānte siṃheti nāma pradadhad avanataḥ sarvadā sadgurūṇām |
kiṃcillabdhaprabodhaḥ pṛthumatividuṣāṃ pādapadmaprasādāt
snehaukaḥ sajjanānāṃ vinayanayayuto lokadurvākyabhīruḥ | |

[a]Pingree: *khātam*.

To him a son was born, greatly esteeming his kinsmen, bearing the name beginning with Tejas and ending with Siṃha; always subservient to good teachers, having gained a little knowledge by the blessings of the lotus feet of scholars of great intelligence; a recipient of the kindness of good men, endowed with modesty and propriety, fearing the censure of the world.

daivajñālaṅkṛtīti prathitam avitathaṃ saṃjñayā saṃpratene
tenedaṃ vatsarīyaṃ phalam iha sakalaṃ sarvalokopakṛtyai |
hṛjjīvāntarvibhūṣābharaṇagaṇanayā bibhrate[a] *ye grahajñāḥ*
śaśvad bhūbhṛtsabhāyāḥ śrutidhanagurutāmaitrabhājo 'tra te syuḥ | |

[a] Pingree: *vibhrate*.

He composed this [work] not wrongly famed under the name *Daivajñālaṃkṛti* (*The astrologer's ornament*), [comprising] the entire result of the year, for the welfare of all people. Those astrologers who carry [it] in their heart and soul, considering [it] an adorning jewel, will forever enjoy the attention, wealth, dignity and friendship of the royal court.

From these verses it is clear that the summary given by Pingree needs correcting: Tejaḥsiṃha was not "the son of Vikrama […] and the brother of Vijayasiṃha," but the son of Vijayasiṃha (no brother is mentioned). Further, it was Vijayasiṃha who served as a minister (*mantrin*) of Vikrama, who appears to have been a vassal ruler or higher official of some sort under Śāraṅgadeva. These relations were apparently clear to the scribe of Pingree's earliest listed manuscript (Kerala 7758, hereafter K), the colophon of which reads: *iti śrīmaṃtrīvijayasiṃhasutamaṃtrītejasiṃhena kṛtaṃ daivajñālaṃkṛti nāma varṣaphalaṃ samāptaṃ* (thus designating both Tejaḥsiṃha and Vijayasiṃha as *mantrins*).[4]

The Prāgvāṭas eulogized by Tejaḥsiṃha are a mixed Jain and Hindu kinship group, known today as Porwad or Porwal and generally considered to belong to the Baniya or merchant community. While Tejaḥsiṃha does not in so many words claim membership of this group, it seems a safe enough assumption to make. We may note that about two generations earlier, his Tājika predecessor Samarasiṃha, who explicitly identifies as a Prāgvāṭa, similarly mentions a family connection to the rulers of Gujarat in a ministerial capacity.[5]

In the quotation above, Pingree seems to have taken at face value the identification of Śāraṅgadeva as a "Cālukya;" as noted in his later publications, the Caulukyas (not in fact related to the earlier Cālukya dynasty of the Deccan) had

4 Even the descriptive label on the cover of the manuscript gives the author's name as *Tejaḥsiṃhaḥ Vijayasiṃhasutaḥ*. The colophon of N, by contrast, reads: *iti prāgvāṭānvayavijayasiṃhamānyabaṃdhutejārajīti* (?) *siṃhaviracitā daivajñālaṃkṛtiḥ samāptā*, apparently as a result of Tejaḥsiṃha's phrase *tanujanir ajani* having been corrupted into the metrically impossible *tadanur ajani* and *mānyabandhus* interpreted as a *karmadhāraya* compound.

5 Pingree (1981: 121 f.) remarks that a number of authors on *jyotiṣa* in Caulukya-era Gujarat were "state officials" and Prāgvāṭas, while others were Jains, and includes Tejaḥsiṃha in the former group. The similarity of the names Samarasiṃha, Vijayasiṃha and Tejaḥsiṃha – both in the suffix and in their general martial tenor – is also worth noting.

by this time been succeeded by the Vāghelās, of which Śāraṅgadeva was the "last reasonably successful" king.[6]

The subsequent verse gives the date of the text. Pingree offers the following reading, noting that it is "somewhat corrupt:'

> *śrībhūbhṛdvikramasya trinidhiśikhidharāsaṃmite 'bde tapasye*
> *māse 'jyarkṣe kavau x sitamadanadine 'trāgataṃ sadguror yat |*
> *pāraṃparyādhṛte 'pi svayamanubhavagranthajārthasya samyak*
> *pūrṇābdīyaṃ phalaṃ sadgrahagaṇitavidāṃ mantrireṇoḥ prasādam | |*

Pingree's source and the manuscripts examined by me all being to some extent defective, a certain amount of conjecture is called for in emending this verse; but the only serious difficulty is presented by the second *pāda*, where an "x" marks a missing (metrically long) syllable in Pingree's version.[7] It is doubtful what word could be meaningfully inserted here. Furthermore, the suggested *[a]jyarkṣe* conveys no meaning; *ijyarkṣe* would do so, but would demand a double *sandhi* to fit the metre (*māse ijyarkṣe* > *māsa ijyarkṣe* > *māsejyarkṣe*, without the apostrophe) – not unheard of, but substandard and perhaps unlikely in a carefully crafted closing stanza.

Without knowing Pingree's source text, it is impossible to say whether *kavau* is in fact his emendation based on reconstruction from the other data given. We may note, however, that manuscript K shows no trace of this word, reading instead *māse mejyarkṣe vāre*. While that reading is in itself unsatisfactory in both metre and meaning, it suggests to me the following possibility:

> *śrībhūbhṛdvikramasya trinidhiśikhidharāsaṃmite 'bde tapasye*
> *māse* 'dyejyarkṣavāre *sitamadanadine 'trāgataṃ sadguror yat |*

The remaining two *pādas* require only minor corrections, supplied chiefly by K:

> *pāraṃparyād* ṛte 'pi[a] *svayam* anubhavanād[b] *granthajārthasya samyak*
> *pūrṇābdīyaṃ phalaṃ sadgrahagaṇitavidāṃ* aṃhrireṇoḥ[c] prasādāt[d] | |
>
> [a]N: *upataṃ*?
> [b]My conjecture; both manuscripts are one syllable short. K: *anubhavad*; N: *anubhavād*.
> [c]N: *aṅghri-*, with identical meaning.
> [d]N: *prasādaḥ*.

6 Pingree 1997: 82. Earlier, he had referred to Śāraṅgadeva as "Caulukya [Vāghela]" (Pingree 1981: 130).

7 The long syllable similarly left out of the third *pāda* (following *anubhava*) has been left unmarked.

> In the year of King Vikrama numbering one-three-nine-three, in the month of Tapasya, *today under the asterism and on the weekday of Bṛhaspati*, on the thirteenth day of the bright [fortnight], that result of the entire year which, even without the mediation of a good teacher, [I have proved] correct by my own experience with tenets from books, was concluded here by the blessing of the dust from the feet of true knowers of planetary calculation.

Even disregarding the more uncertain elements of this verse, the *Daivajñālaṃkṛti* can be dated to within a day: the *śukla-trayodaśī* of the month of Phālguna (Tapasya) in Vikrama *saṃvat* 1393 corresponds to 13–14 February, 1337 CE.[8] The *tithi* or lunar date in question – determined by the longitudinal separation of the sun and moon – began on Thursday afternoon and ended on Friday morning. Pingree's reading *kavau* "on [the day of] Venus" is thus possible in and of itself; but if the "asterism of Ijya [= Bṛhaspati or Jupiter]" (*ijyarkṣa*) is to be included, this means the *nakṣatra* Puṣya, which ended on Thursday evening. Either way, the date of the *Daivajñālaṃkṛti* needs to be moved forward from 1336, as stated by Pingree, to 1337.

The two manuscripts that I have examined contain a final verse not given by Pingree. While it provides no additional information about the text as such, it does tell us something about the self-perception of its author and the society in which he lived and worked. The stanza as preserved in both manuscripts is once more slightly corrupt; I give my tentative emendation below:

> *śūdrasyāṅgodbhavena grathitam idam ato nātra* śaithilyabuddhyā[a]
> *viprendrair daivavidbhir grahagatividuṣām uttamair apy avajñā* |
> dhāryā[b] *yasmāt* suvidyāpy avara*puruṣato*[c] *gṛhyate hy uddhṛtaṃ tad*
> *granthābdhes tājakāyā* mṛtaphaṇi*maṇivad*[d] *vitsu sāphalyam* etu[e] | |
>
> [a] K: *śaithilyam etat*.
> [b] N: *bhāryyā*, with identical meaning.
> [c] My conjecture. K: *suvidyātha para-*; N: *suvidyā pravara-*.
> [d] My conjecture. K: *smṛtaphala-*; N: *smṛtaphaṇi-*.
> [e] N: *eti*.

> This was composed by the son of a *śūdra*. Let not even eminent Brahman astrologers here, foremost in understanding of the courses of the planets, think little of it for that reason and hold it in contempt, for

8 This and other datings discussed in the present paper were made partially with the help of Michio Yano's excellent online application *Pancanga* (v. 3.14), available at: http://www.cc.kyoto-su.ac.jp/~yanom/pancanga/.

> good knowledge is [to be] accepted even from lowly men. May that [work], extracted from the ocean of books on the Tājika [science], be of use to the learned, like a jewel [extracted] from a dead cobra.

Three points seem to merit comment here. First, despite the prominent social position of the Prāgvāṭa community under the Caulukyas and Vāghelās, Tejaḥsiṃha seems acutely aware of his non-Brahman status, expressed here in terms of exaggerated humility.[9] Second, even if some works have been lost, it is unlikely that an "ocean of books on Tājika" existed in Sanskrit by the early fourteenth century; it is possible, therefore, that Tejaḥsiṃha is referring to Arabic-language manuals on astrology (although his own work is demonstrably dependent in large part on that of Samarasiṃha). Third, the snake-jewel analogy recurs about two centuries later in Gaṇeśa Daivajña's *Tājikabhūṣaṇa*, in the slightly different context of a general defence of Brahmans studying Tājika astrology.[10]

3. TUKA (fl. 1549–50)

Our next author is not, as far as I have been able to find, mentioned in any of Pingree's works, despite being quoted more than thirty times in Balabhadra's *Hāyanaratna* and remarked on by Weber.[11] It is thus a question in this instance of complementing rather than correcting the existing record of Tājika writers.[12]

The *Tājikamuktāvali*, consisting of 102 consecutively numbered stanzas of varying metres, is available to me in two manuscripts; its contents are fundamentals of Tājika astrology and, in particular, annual horoscopy.[13] The opening verses read:

> *sāṅgaśrutismṛtipurāṇakathetihāsasāhityagītasadanāya mahāmahimne |*
> *antenivāsigaṇavarṇitasadguṇāya pitre namo 'stu bhavate 'stu sadā śivāya | |*
> *śrīmanmahādevaguruṃ prasādya guṇādhikā tāntrikabhūṣaṇāya |*
> *muktāvalī tājikapūrvikeyaṃ viracyate daivavidā tukena | |*

9 An anonymous reviewer has suggested that *śūdrasyā-* should read *kṣudrasyā-* "of a low man," as Tejaḥsiṃha ought properly to be considered "a *vaiśya* with pretensions to *kṣatriya* status." While I am wary of imposing normative perspectives on a text that may be reflecting a different social reality, such an emendation is not impossible. However, there is so far no manuscript evidence to support it.

10 *Tājikabhūṣaṇa* 1.4, also quoted by Balabhadra near the beginning of the *Hāyanaratna*. The "snake-jewel" or *nāgamaṇi* is a bone found in the head of a snake, believed to be efficacious against snake bites.

11 Weber 1853: 251.

12 The *Hāyanaratna* does cite a number of other works and authors not listed by Pingree, but none so apparently influential; see my forthcoming edition and translation.

13 Both manuscripts are from the NGMPP, microfilm 413/13, no date (they also appear, in different order, as microfilm 1065/2).

> To him who was the abode of the *śruti* with its ancillary [disciplines], the *smṛti*, the *purāṇas*, stories and *itihāsas*, literature and songs; the one of great glory whose virtues are praised by his host of students – let there be homage to that father, to you; let there ever be [homage] to Śiva.
>
> Seeking the blessing of his teacher, the illustrious Mahādeva, Tuka Daivavid composes this *Muktāvalī* (*Strand of pearls*) prefixed by *Tājika*, of great merit, for adorning the expert.[14]

The closing verses make it clear that the name of the author's father is Śiva (rather than Sadāśiva, although the ambiguity is probably intended), and that Mahādeva is his elder brother:

> *iti tājakamauktikāvalīṃ samahādevaśivaprasādataḥ |*
> *saguṇāṃ samalaṃkṛtikṣamām akṛta śrītukasaṃjñapaṇḍitaḥ | |*
> *gārgīyadaivajñaśivātmajena śrīmanmahādevavido 'nujena |*
> *suvṛttamuktāvalikā kṛteyaṃ vidbhir dhṛtā syāt puruṣārthasiddhyai | |*
> *śrīvājapeyādikayajñakṛdbhir vidvaddvijendrair bahubhiḥ śrutena |*
> *nikumbhavaṃśaikanṛpeśvarasya śrīpippalagrāmavare kṛteyam | |*
> *śāke pūrṇendusaṃyuktasvaravedendusammite |*
> *saumye saumyena varṣe 'sau kṛtā tājakapaddhatiḥ | |*
> *prāg granthaṭīkāgrahacitrahorāmuktāvalīsattithicandrikādīn |*
> *vidhāya yaḥ prāpa padaṃ munīnāṃ śivāya pitre praṇato 'smi tasmai | |*
>
> Thus the scholar called Śrī Tuka has, by the blessings of Śiva and Mahādeva, authored the excellent *Tājakamauktikāvalī*, fit for adorning [its readers]. Let this *Strand of pearls*, authored in beautiful verses by the son of Śiva Daivajña of the Gārgīya [*gotra*], by the younger brother of the illustrious scholar Mahādeva, be worn by the learned for accomplishing the ends of men.
>
> This [work] was authored by one known to many eminent and learned Brahmans performing sacrifices such as the Vājapeya in the beautiful Śrī Pippalagrāma of the peerless sovereign of the Nikumbha dynasty. In the year Saumya, numbering one-four-seven-one in the Śaka era, this handbook of Tājika was authored by the Soma sacrificer (*saumya*).[15]

14 Or, possibly, "the Tāntrika" (in a technical religious sense).

15 Or simply "by the good man." In either case, the word is a pun on the name of the year; but I believe it also alludes to the Vājapeya Soma sacrifice just mentioned.

> He who, having first composed commentaries on books and [works] such as *Grahacitra*, *Horāmuktāvalī* and *Sattithicandrikā*, reached the abode of sages – to that Śiva, my father, do I pay homage.

The Śaka year 1471, corresponding to 1549–1550 CE, was indeed named Saumya in the *cāndramāna* variant of the sixty-year *prabhavādi* cycle (sometimes called Jovian years, but not, in this instance, calculated from the mean position of Jupiter). The author's name and the connection to the Nikumbha lineage point in the direction of Maharashtra, where several places named Pipalgaon or Pimpalgaon are still found.[16]

There further exists a metrical *Tājikamuktāvaliṭippaṇī* of unknown authorship, possibly an autocommentary, the colophon of which describes it as a "book of corrections to the *Tājakamuktāvali* composed by Tuka Jyotirvid, son of the illustrious Śiva Daivavid' (*śrīmacchivadaivavitsūnutukajyotirvidracitāyās tājakamuktāvaleḥ śodhakapustakaṃ*). This too is available to me in two manuscripts (one incomplete); the text runs to 91 verses, excluding several folios setting forth some of the more technical material in tabular form.[17] Balabhadra does not distinguish between the *mūla* text and the *ṭippaṇī* but quotes from both under the single title *[Tājika]muktāvali*. Balabhadra also makes repeated references to Tuka's commentary on Samarasiṃha's seminal *Tājikaśāstra* (apparently no longer extant).[18]

4. Yādavasūri (fl. 1616?) and Bālakṛṣṇa (fl. c. 1650?)

Yādavasūri was the author of a fairly large work entitled *Tājikayogasudhānidhi*,[19] of which Pingree states that its date is "apparently" 1616, and that Yādavasūri wrote an autocommentary (*vivaraṇa*) on it.[20] While I have been unable to find a source for this date in the *mūla* text, I have not seen the *vivaraṇa*;

16 I am indebted to Ashok Aklujkar and Madhav Deshpande for these suggestions (personal communication).

17 The manuscripts of the *ṭippaṇī* are found in the same NGMPP microfilms as the *mūla* (413/13 and 1065/2) and are likewise undated.

18 Interestingly, the *ṭippaṇī* itself refers to "the opinion of Balabhadra" (3.19: *balabhadramatoktānāṃ*), which must be either a later interpolation or a reference to a different Balabhadra. Although Pingree's CESS lists several authors of this name, none except the author of the *Hāyanaratna* is stated to have written on Tājika.

19 The author's own figure for the number of verses is 547 (*agajaladhiśara*; see 16.28), which he further equates with 844 *anuṣṭubh* stanzas (or *granthas*; in other words, approximately 6752 syllables). The primary manuscript examined by me (see below) comprises 555 verses.

20 Pingree 1981: 99, 1970–1994: A5 335b. The earliest manuscript cited by Pingree was copied in 1667, but Balabhadra (1649; see below) quotes the *Tājikayogasudhānidhi* frequently.

possibly the date is stated or implied there. Pingree further claims that the author "belonged to a family dwelling at Prakāśa in Gujarat," for which he gives no source (but cf. the verses excerpted from Bālakṛṣṇa below). The repeated statements that Yādavasūri was a resident of Vāī (once, "Vāī on the Kṛṣṇā River')[21] are, however, based on a metrically and syntactically corrupt reading of the antepenultimate verse of his main work as excerpted (or emended?) by Pingree:[22]

> *śrīvatsasaṃjñād dvijapuṅgavādyaḥ śrīvāīnāmni supure ca sādhvī |*
> *śrīyādavena vyaracīha tena sudhānidhis tājikayogapūrvaḥ | |*

On examination of the two complete manuscripts available to me,[23] the doubly unmetrical reading *śrīvāīnāmni supure* "in the good town named Vāī" is found to be unsupported; in its place we find the name of the author's mother:

> *śrīvatsasaṃjñād dvijapuṅgavād yaṃ śrībhāyināmnī suṣuve ca sādhvī |*
> *śrīyādavena vyaracīha tena sudhānidhis tājikayogapūrvaḥ | |*
>
> The *Sudhānidhi* prefixed by *Tājikayoga* was composed by that Śrī Yādava whom the good lady named Śrī Bhāyi bore to the bull among the twice-born called Śrīvatsa.

Apart from invalidating any association between Yādavasūri and any of the places in India known as Vai, and hence also the idea that he was instrumental in "the southward spread of *tājika*",[24] this verse throws an intriguing light on the metrical colophon appearing at the end of each of the *Tājikayogasudhānidhi's* sixteen chapters:

> *śrībhāyipādajalajātakṛpāttavidyaśrīyādavena racite svaguruprasādāt |*
> *tārtīyayogasusudhānidhināmadheye … | |*
>
> [This concludes chapter so-and-so] in the [work] named *Tārtīyayogasusudhānidhi*, composed through the blessings of his teacher by the Śrī Yādava who received his knowledge by the grace of the lotus feet of Śrī Bhāyi.[25]

21 Pingree 1997: 84.
22 *Tājikayogasudhānidhi* 16.27; Pingree 1970–1994: A5 335b.
23 The first is a manuscript from the Acharya Shri Kailasa Sagarsuri Gyanmandir in Koba, numbered 16650, copied on 26 July, 1804; the second is another NGMPP manuscript, microfilm A412/11 (N), undated. Neither is listed by Pingree.
24 Pingree 1997: 84.
25 *Tārtīya* (with variants) is not uncommon as a synonym of Tājika. Possibly it means "Tataric" in the generalized sense of "Muslim." The name *śrībhāyi* is occasionally written *śrībhāi*.

Whether the "teacher" and "Śrī Bhāyi" are one and the same is not entirely clear, but either way it appears that Yādavasūri considered his mother to have been his first *guru* in the field of Tājika – surely an unusual circumstance in the seventeenth century, and one that raises questions about the mother's family background.

Pingree connects "Yādava Bhaṭṭa or Sūri" with another Tājika author, Bālakṛṣṇa[bhaṭṭa], whom he identifies as the son of the former, and whose *floruit* he puts at c. 1625/1650 without stating any source.[26] I have not so far had the opportunity to examine any complete manuscript of Bālakṛṣṇa's *Tājikakaustubha*, but from the closing verses excerpted by Pingree it does not seem to mention a date.[27] The same verses do, however, preclude the possibility of Bālakṛṣṇa being the son of Yādavasūri. Pingree's versions, with my own tentative corrections and translations, read as follows:

> *yā tāpyuttaratīrasaṃśrayavatī khyātā prakāśā purī*
> *yaś cāsīd iha yājñavalkyatilakaḥ śrīrāmajit paṇḍitaḥ |*
> *ṣaṭśāstrādhyayanādhirāṭ samabhavan nārāyaṇas tatsutas*
> *tatsūnur nayavedavit samabhavad yo rāmakṛṣṇābhidhaḥ | |*
> *tadaṅgajo yādavabhaṭṭanāmā* nānāgamārthākalito[a] *babhūva*
> *sāhityapīyūṣasupoṣitāṅgaḥ* śritaprakāśo[b] *jagati prasiddhaḥ | |*
> *iha yādavabhaṭṭajātajanmā janakāṅghryambujaṣaṭpadas tatāna |*
> *sa hi tājikakaustubhābhidhānaṃ kamanīyaṃ bhuvi bālakṛṣṇabhaṭṭaḥ | |*
>
> [a] Pingree: *nānāgamārthakalito*.
> [b] Pingree: *śritaḥ prakāśo*.
>
> In the town known as Prakāśā, nestling on the northern bank of the Tāpī, lived Śrī Rāmajit Paṇḍita, ornament of the Yājñavalkya [lineage]. Nārāyaṇa was born as his son, mastering the study of the six sciences; as his son was born the knower of law and the Vedas named Rāmakṛṣṇa. His son was named Yādavabhaṭṭa, versed in the meanings of various works, his body well-nourished by the nectar of literature, residing in Prakāśa [but] celebrated in the world. Now Bālakṛṣṇabhaṭṭa, born to Yādavabhaṭṭa and being a bee at his father's lotus feet, has brought the pleasing [work] called *Tājikakaustubha* into the world.

26 Pingree 1970–1994: A4 243 f. To the best of my knowledge, the author of the *Tājikayogasudhānidhi* is nowhere referred to as Yādavabhaṭṭa.

27 The early estimate of c. 1625 may possibly be due to the *Tājikakaustubha* being cited in Balabhadra's *Hāyanaratna*, which Pingree mistakenly dated to 1629; see below.

While Yādavasūri gives the name of his father unambiguously as Śrīvatsa, Bālakṛṣṇa thus states that *his* father, Yādavabhaṭṭa, was the son of Rāmakṛṣṇa. This further means that there is no connection between Yādavasūri and Bālakṛṣṇa's ancestral home in Prakāśa/Prakāśā.

5. BALABHADRA (fl. 1649–1654)

As discussed by Pingree, Balabhadra composed two voluminous *nibandhas* or "meta-commentaries," the *Hāyanaratna* on Tājika and the *Horāratna* on Indian astrology in the classical (pre-Islamic) style.[28] The dating of the former is somewhat complex: it appears at the very end of the work in the form of a mathematical riddle, and the stanza (a partial pastiche of Bhāskara's *Siddhāntaśiromaṇi* 5.8) has been very imperfectly preserved in the manuscript tradition, presumably due to its unintelligibility to many of the scribes who copied it. The latter half-stanza, giving the year, is unfortunately entirely omitted by the two earliest manuscripts available to me.

The version of this stanza cited by Pingree[29] is the one found in the printed edition of 1905 to which he refers elsewhere.[30] Although it is reproduced without comment, this version is in fact too corrupt for any information beyond the year to be salvaged from it:

> *yo me māsakṛteḥ samaḥ karahato yogas tithiḥ syāt tathā*
> *trir vārām iti taiḥ sahārdhasadṛśaṃ bhaṃ sarvayoge punaḥ |*
> *bhūvāṇākṣakubhir bhaved upamitir granthasya tāvad dhi yas*
> *taṃ manye gaṇitadvayajñakamalaprodbodhane bhāskaram | |*

My edited version, based on six manuscripts which retain the stanza wholly or in part, is as follows:[31]

> *yogo māsakṛteḥ samaḥ karahṛto yogas tithiḥ syāt tithis*
> *trighnā vāramitis tadardhasadṛśaṃ bhaṃ sarvayoge punaḥ |*
> *bhūvārākṣakubhir bhavec chakamitir granthasya tāṃ vetti yas*
> *taṃ manye gaṇitadvayajñakamalaprodbodhane bhāskaram | |*

28 Pingree 1970–1994: A4 234 ff. 1981: 99, 1997: 85 ff. For the place of the *nibandha* in the taxonomy of Sanskrit commentarial literature, see Ganeri 2010.

29 Pingree 1970–1994: A4 236a.

30 Pingree 1997: 86 n. Pingree equates the edition's Śaka 1826/Vikrama 1961 with 1904 CE but neglects the month stated, Māgha, which began only on 22 January (*pūrṇimānta*) or 5 February (*amānta*), 1905 CE.

31 See my forthcoming edition for details.

> The *yoga* is equal to the square of the month; the lunar date is the *yoga* divided by two; the lunar date multiplied by three is the number of the day; the asterism equals half of that; and when all is added to one-five-seven-one, the Śaka date of the book results. Whoever understands that, I consider him to be a sun to make the lotus flowers [that are] the knowers of the two [kinds of] mathematics blossom.[32]

The elements of the Indian calendar are given here in numerical form: the synodic month (*māsa*), lunar date or phase (*tithi*, of which there are 30 in a month), day of the week, asterism occupied by the moon (*nakṣatra*, normalized as 27 equal divisions of the ecliptic), and *yoga*, which in this context means the sum of the ecliptical longitudes of the sun and moon counted from 0° sidereal Aries and arranged in a series of 27 divisions from 0° to 360°. The only element omitted is the *pakṣa* or fortnight, presumably because a numerical value assigned to it would be ambiguous: whether the month begins and ends at new moon (*amānta*, making the *śuklapakṣa* or waxing fortnight the first) or at full moon (*pūrṇimānta*, making the *kṛṣṇapakṣa* or waning fortnight the first) is a matter of regional variation. The *tithis* must thus be understood as being numbered from 1 to 30 rather than from 1 to 15.

Balabhadra tells us that the *yoga* must be the square of some integer and divide by 2, which, with a maximum of 27, gives the possibilities 4 and 16. The month, which is the square root of the *yoga*, is therefore either 2 or 4; and the lunar date, which is half the *yoga*, is either 2 or 8. The day of the week must be 3 times the lunar date and, of course, no higher than 7; it must also divide by 2. The only possibility is 6, which is 3×2. Therefore the lunar date is necessarily 2, the *yoga* 4, and the month 2; and the asterism, the number of which should be half that of the day of the week, is 3. Converting these numbers into the more usual format, the date thus arrived at is the second lunar day (*dvitīyā*) of the month of Vaiśākha in the Śaka year 1571, in the asterism Kṛttikā and the *yoga* Saubhāgya.

As the moon has to be almost new in order to occupy the asterism Kṛttikā (in sidereal Aries/Taurus) in the spring month of Vaiśākha, it is evident that Balabhadra follows the *amānta* system; the *pakṣa* is thus *śukla*. The sixth day counted from Sunday – generally considered the first day of the week – would be Friday; but in the context of reconstructing a date, the day of the week was used as a control device to verify the correctness of other parameters, typically based on a day count (*ahargaṇa*) from the epoch of the current age or Kaliyuga.[33] This

32 The word *bhāskaram* used here for "sun" is, in the original verse from the *Siddhāntaśiromaṇi*, a punning allusion to the name of the author.

33 See, e.g., Rao 2000: 73.

epoch (17–18 February, 3102 BCE) was a Friday, making Wednesday the sixth day in a weekly cycle. All these variables conform to the afternoon of Wednesday, 14 April, 1649 CE.

The one purely conjectural emendation in this reading, and its crucial element, is the phrase *bhūvārākṣakubhir*, expressing, in *bhūtasaṃkhyā* or word numerals, the Śaka year 1571 (reading, as always with numbers, right to left: *bhū* = earth = 1; *vāra* = day of the week = 7; *akṣa* = arrow [of Kāma], i.e., the senses = 5; *ku* = earth = 1). As already mentioned, the half-stanza containing this word is omitted by the earlier text witnesses; the later manuscripts, as well as the edition used by Pingree, all read *bhūvāṇākṣakubhir* (*vāṇa* = arrow = 5) and even add, in explicatory numerals, "1551." This reading, corresponding to 1629 CE, is accepted by Pingree, who cites it repeatedly.[34] There are, however, at least four reasons to doubt its correctness.

First, the calendric elements do not fit together: it is impossible to get a perfect match for the *tithi*, *nakṣatra* and *yoga* in the year 1629. The discrepancy is not a huge one – an error of 4° to 5° in the longitude of the moon would give a window of a few hours – but such an error would be unexpectedly large, and even more so in an author of Balabhadra's standing.[35]

Second, Balabhadra enjoyed the patronage of the Mughal prince Shāh Shujāᶜ (1616–1661, second son of the emperor Shāh Jahān), to whom he refers respectfully in the closing sections both of the *Hāyanaratna* and of his later *Horāratna*. Towards the end of the present work, Balabhadra casts a revolution figure (annual horoscope or *varṣakuṇḍalī*) for the prince's thirty-third year of life, commencing in Śaka 1570 = 1648 CE. There seems to be no reason why he should have chosen for his example a date still nineteen years into the future; it is far more likely for the revolution in question to refer to the prince's latest birthday at the time of writing.[36] Moreover, a date of 1629 would make Shāh Shujāᶜ no more than thirteen years old at the time of the completion of

34 Pingree 1981: 99, 1997: 85.

35 Krishnamurthi Ramasubramanian has informed me (personal communication, 10 June, 2017) that in his extensive experience of planetary calculations using formulae from traditional Sanskrit texts, the maximum error in lunar longitudes is of the order of 2°, and that too only for dates centuries later than the composition of the texts used. The overlap of calendric factors produced by an error of some 4° would occur in the early hours following sunrise on 25 April, 1629.

36 As early as 1853, Weber concluded that the year of this revolution figure could be used to date the *Hāyanaratna*, although he was confused by the reading "1577," which, as he notes, does not match Shāh Shujāᶜ's stated age at the time (Weber 1853: 245 f.). This reading seems to be a mistake confined to the single manuscript used by Weber (Berlin 881/Chambers 182, copied on 7 June, 1777; see Pingree 1970–1994: A4 234b); all other manuscripts examined agree on the reading "1570."

the *Hāyanaratna*. This tender age seems unlikely in view of the admiration expressed by Balabhadra for the prince's royal eminence and military prowess, even taking into account the typically hyperbolic nature of such statements (*sakalabhūpālamūrdhāmaṇinīrājitacaraṇakamalānāṃ bhūmaṇḍalākhaṇḍalānāṃ* "vanquisher of the sphere of the earth, whose lotus feet are illuminated by the crown jewels of all its kings").[37]

Third, in the penultimate verse of the work, Balabhadra explicitly states that it was composed in the presence of, or in proximity to (*-antike*), Shāh Shujāᶜ in Rajmahal (in the present-day Jharkhand state of India, just on the border of West Bengal). This information is likely to have escaped Pingree, as the version that he reproduces from the 1905 edition is once more corrupt:[38]

> *pṛthvīpate mahāvīra śrīmatsāhisujātike |*
> *śrīrājamahalasthena mayā grantho vinirmitaḥ | |*

The correct reading, again on the basis of manuscript evidence, is:

> *pṛthvīpatimahāvīraśrīmatsāhisujāntike |*
> *śrīrājamahalasthena mayā grantho vinirmitaḥ | |* [39]

Rajmahal, which had been established as the capital of the Mughal *subah* or province of Bengal in 1595, became the residence of Shāh Shujāᶜ on his appointment as governor (*subahdār*), which took place only in 1639.[40] In a later publication, Pingree interprets *rājamahala* as referring to "the royal palace, presumably in Agra';[41] but it does seem a coincidence too many that Balabhadra should, in 1629, have opted to employ the Arabic loanword *mahala* as a generic term for "palace" (for which several indigenous Sanskrit words exist), despite the existence of a regional capital of the Mughal Empire specifically named Rājamahala (Rajmahal), and that, a decade later, his patron should have relocated to that same city.

Fourth and last, Balabhadra's later opus, the *Horāratna*, is securely dated to January, 1654.[42] It appears more likely that some five years should have passed

37 Pingree (1997: 85) speculates on "what or who induced the young prince to undertake this activity." The simplest solution is that he did not.

38 Pingree 1970–1994: A4 236a.

39 A similar phrasing is found in the author's *Horāratna*, as reported by Pingree (1970–1994: A4 237a): *…pṛthvīpatiḥ sāhaśujādhināthaḥ | | tadantikasthena kṛtaṃ mayaitat khacandrasaptendumite 'bdakāle | maghau* [*sic* – read *māghe*?] *caturthyāṃ sitapakṣajāyāṃ …*

40 See Prakash (1985: 39), who further states that Shāh Shujāᶜ was temporarily replaced as *subahdār* by Nawāb Fidaī Khān but returned to office in 1648.

41 Pingree 1997: 85.

42 Pingree 1970–1994: A4 236a, 237a; see note 39.

between the composition dates of these two *nibandhas* than a quarter of a century – particularly as the *Horāratna*, in listing Balabhadra's previous writings, mentions the *Hāyanaratna* last.

In view of the above considerations, I believe my emendation to be correct. Two supportive arguments may be adduced: first, the resemblance of the characters *rā* and *ṇā* in the so-called Calcutta or northern style of Devanāgarī; second, my admittedly subjective impression that, in practice, *vāṇa* "5" is more frequently encountered as a word numeral than *vāra* "7," which, if correct, would further increase the likelihood of the latter being mistaken for the former.

With Balabhadra's *floruit* thus narrowed down to 1649–1654, and considering that of his teacher Rāma Daivajña (1590–1600), reasonable conjecture may place his year of birth between c. 1600 and 1615. The year of his death is unknown, as are the circumstances of his life after Shāh Shujā^{c} was repeatedly defeated in the fratricidal struggles over the imperial throne that commenced in 1658.

6. CONCLUSION

In closing, our findings regarding the five Tājika authors discussed above may be summarized as follows.

Tejaḥsiṃha was the son of Vikrama's minister (*mantrin*) Vijayasiṃha, all three apparently belonging to the Prāgvāṭa kinship group. Vikrama in his turn was a high official or intermediate ruler under the Vāghelā king Śāraṅgadeva. Tejaḥsiṃha's *Daivajñālaṃkṛti* was completed in early 1337, most probably on 13 February.

Tuka, son of Śiva and student of his own elder brother Mahādeva, completed his *Tājikamuktāvali* in 1549 or early 1550. He may or may not be the author of a metrical *ṭippaṇī* on the same text; Balabhadra quotes from both works under the title of the *mūla*.

Yādavasūri, author of the *Tājikayogasudhānidhi*, did not, so far as we know, hail from Prakāśa in Gujarat or live in Vāī, and there is nothing to suggest that he helped spread Tājika further south. He apparently learnt Tājika astrology from his mother, who was called Śrī Bhāyi. Yādavasūri was definitely not the father of the Bālakṛṣṇa who wrote the *Tājikakaustubha* and whose family did live in Prakāśa. Neither the *Tājikayogasudhānidhi* nor the *Tājikakaustubha* mentions its date of completion.

Despite *prima facie* manuscript support for the year 1629, the date of completion of Balabhadra's *Hāyanaratna* must be revised to 14 April, 1649, on the basis of both text-internal and text-external evidence: a horoscope cast for the year 1648; the harmonization of calendric elements; the dates of Balabhadra's patron Shāh Shujā^{c} and his life events relative to the place of composition; and the date of Balabhadra's other main opus.

REFERENCES

Ganeri, Jonardan (2010). "Sanskrit Philosophical Commentary". In: *Journal of the Indian Council of Philosophical Research* 27, pp. 187–207. ISSN: 2363-9962. URL: https://www.academia.edu/2160162/Sanskrit_Philosophical_Commentary_2010_ (visited on 07/29/2017).

Gansten, Martin (2012). "Some Early Authorities Cited by Tājika Authors". In: *Indo-Iranian Journal* 55.4, pp. 307–319. DOI: 10.1163/001972412x620385.

— (2014). "The Sanskrit and Arabic Sources of the Praśnatantra Attributed to Nīlakaṇṭha". In: *History of Science in South Asia* 2.1, p. 101. DOI: 10.18732/h23w27.

Gansten, Martin and Ola Wikander (2011). "Sahl and the Tājika Yogas: Indian Transformations of Arabic Astrology". In: *Annals of Science* 68.4, pp. 531–46. DOI: 10.1080/00033790.2010.533349.

Pingree, David E. (1970–1994). *A Census of the Exact Sciences in Sanskrit*. 5 vols. Memoirs of the American Philosophical Society 81, 86, 111, 146, 213. Philadelphia: American Philosophical Society. ISBN: 9780871692139. Unfinished at the time of the author's death in 2005.

— (1981). *Jyotiḥśāstra: Astral and Mathematical Literature*. Vol. 6.4. A History of Indian Literature. Wiesbaden: Harrassowitz. ISBN: 9783447021654.

— (1997). *From Astral Omens to Astrology: from Babylon to Bīkāner*. Vol. LXXVIII. Serie Orientale Roma. Rome: Istituto Italiano per L'Africa e L'Oriente.

Plofker, Kim (2011). "'Yavana' and 'Indian': Transmission and Foreign Identity in the Exact Sciences". In: *Annals of Science* 68.4, pp. 467–76. DOI: 10.1080/00033790.2011.615341.

Prakash, Om (1985). *The Dutch East India Company and the Economy of Bengal, 1630–1720*. Princeton, NJ: Princeton University Press. ISBN: 0691054479.

Rao, S. Balachandra (2000). *Indian Astronomy: An Introduction*. Hyderabad: Universities Press. ISBN: 9788173712050.

Sarma, Sreeramula Rajeshwar (2000). "Jyotiṣarāja at the Mughal Court". In: *Studies in Indian Culture, Science and Literature, Being K. V. Sarma Felicitation Volume, Presented to him on his 81st Birthday*. Ed. by Natesa Gangadharan, S. A. S. Sarma, and S. S. R. Sarma. Sree Sarada Education Society Research Series 1. Chennai: Sri Sarada Education Society Research Centre, pp. 363–71.

Weber, Albrecht (1853). "Zur Geschichte der indischen Astrologie". In: *Indische Studien. Beiträge für die Kunde des indischen Althertums* 2, pp. 236–87.

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