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The Heritage of Astronomical Manuscripts in Mysore

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Abstract. The Mysore region, in south India has a rich heritage of astronomical manuscripts, with a significant collection preserved at the Oriental Research Institute (ORI), University of Mysore and numerous private family collections. These texts, are 400 years old palm-leaf manuscripts and some 200 years old paper manuscripts, written in a variety of languages. The archaic scripts are *Tigalari*, *Moḍi*, and *Nandināgari*. Some notable examples include:

- *Laghumānsa vyākhyā*: A comprehensive commentary on an astronomical treatise.
- *Bhūgola nirṇayahā*: Presents straightforward translations and descriptions of the earth and its fundamental constituents.
- *Grahagaṇita Bhaskara*: Contains solved examples of celestial events, specifically calculated for the year 1847.
- *Pratibhāgī tika*: Serves as a practical ready reckoner for determining planetary positions.

Also, we could identify, an astronomical work, previously believed to be lost. Its rediscovery emphasizes the immense academic and historical value of Mysore's *Vāsiṣṭha Siddhānta* manuscript heritage.

1. Introduction

Astronomy and mathematics are intricately integrated within the Indian intellectual tradition. A vast number of manuscripts on these subjects are found across the subcontinent, though only a limited portion has been subjected to systematic study. Thousands of palm-leaf and paper manuscripts have been catalogued, yet majority remain unexplored. The Oriental Research Institute (ORI), University of Mysore, for example, houses a collection of more than 3,000 manuscripts. Volume IX of its catalogue is devoted to works on astronomy (*Jyotiṣa*), many of which date from as early as the eleventh century and are preserved in a range of languages.

2. Challenges while editing the manuscripts

Deciphering manuscripts written in obsolete scripts presents considerable challenges, in comprehensive understanding. Archaic scripts such as *Moḍi*, *Nandināgari*, *Tigalari*, and *Nāgarī* are frequently found in these sources. There are a handful of scholars capable of deciphering these archaic scripts. It is also important that the reader must be proficient in these scripts before

editing the manuscripts, which gets further complicated by the distinctive narrative style, often characterized by extremely concise sentences.
Authenticating the manuscripts also poses difficulties, particularly in ascertaining authorship and determining the date of composition. Rendering the material into readable format, adds yet another layer of complexity. Although manuscripts are available in Kannada, Telugu, Malayalam, and Sanskrit, the present study is confined to Kannada sources. We will focus here on some of the manuscripts that are studied.

3. *Laghumānsa vyākhyā*

Two manuscripts titled *Laghumānsa Vyākhyā* (B 581 and B 583) are available. Of these, the first (B 581) is incomplete, while the second (B 583) largely reproduces the content of B 581 but extends it further to include worked examples of eclipses, and was used for analysis. A Detailed analysis of the text is available in Shylaja.et.al. [1].

4. *Bhūgola nirṇayahā*

As indicated by the title, the text is a description of the earth, written in Kannaḍa script, verses devoted to the description of the *dvīpas* (islands). The seven islands enumerated are *Jambu*, *Plakṣa*, *Śālmalī*, *Kuśa*, *Krauñca*, *Śāka*, and *Puśkara*. They are described as being encircled successively by different types of water: salt water, sweet (sugar) water, intoxicating water, black water, pure white water resembling curd, milky water, and finally Sindhu water. The dimensions of each island are given in yojanas.

5. *Grahagaṇita Bhāskara*

The paper manuscript (Manuscript No. B588) dated to 1847 CE, authored by *Tammayajvā* was considered. In the opening verses, the author offers his obeisance to the deities *Somanātha* and Honnadevi, and identifies himself as belonging to Parishipuri, with *palabha* (latitude) of 3|20 *aṅgula*.

The text predicts celestial events for 1847–1848 CE, simplifying traditional methods. Drawing on *Sūryasiddhānta* parameters is described in Subbarayappa [2]. The text determines mean positions through revolutions since *Kaliyuga*. An innovation by *Tammayajvā*, is the use of *kuvāsara* common denominator (1296000) and *bhūtasaṅkhyā* notation for planetary *bhagaṇas*, enabling faster and more practical astronomical computations. Another innovative idea provides the mean values using a simple relation.

Mean value = *ahargaṇa* $\{A/129600 + 1/B\}$ ---------(1)

where A and B are constants defined for individual planets starting from the sun.

Table 1 lists these multipliers A and B for each planet separately which are listed here.

Table 1. Replace this text with the table caption. Adapt the template table below or delete it and add a new table using either Insert – Table or by pasting from another document. Copy and paste the whole text box to add more tables. Place tables close to where they are cited in the text.

graha	*bhūtasaṅkhyā*	numeral A	*bhūtasaṅkhyā*	numeral B
ravi	*Vasu veda bāṇa rāma*	3548	*Dantā arka netra*	21232
candra	*pañca guṇa vāridhi śaila vedah*	47435	*Rasa Candra bāhu saptā aśva*	27216
kuja	*Tarka vasu naga sudhāmśa*	1886	*Vahni rasa rtu śailaih*	7663
budha	*Dasra guṇā calendra*	14732	*Rasā agni vedā ambara bhūmi*	10436
guru	*naṅda graha locanāni*	299	*Gaj endu pancā abdi vilocanaih*	24518
śukra	*Navat rasa śaila bānah*	5769*	*Vasu aṣṭa candra agni ku*	13188
śani	*Ambar abhānavah*	120*	*ṣad agni jala graho*	9436
candrocca	*Sudhāmśukh ābda yah*	401	***mādribhupai*	16725
pāta	*saśāṅkagobhuvh*	191	*Pancatriśītāmśujalaendu***	127250
bhuvāsara	*khakhābhragrahalo[ca]neṅdavah*	1296000		

* There is a scribal error here in the manuscript
** Letters are not legible to formulate the number

Among the celestial phenomena, particular emphasis is placed on the lunar eclipse of 24 September, 1847 and the solar eclipse of 9 October, 1847, both of which are discussed in considerable detail. A slight variation is observed between the eclipse timings recorded in the text and those obtained through calculation, the details are described in Shylaja [3].

We also find an illustrative example of *Śṛṅgonnati* (orientation of the crescent moon) in the text. Only the calculations are found with an example to discuss the procedure in detail. A more detailed study of this manuscript is currently in progress.

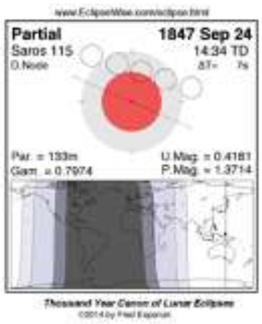

Figure 1. Lunar eclipse of 24 September, 1847 as shown in NASA canon of lunar eclipses.

6. *Pratibhāgī tika*

Manuscript no. 8407 is a palm-leaf commentary, as the name says *Pratibhāgī* (for every degree), written in Kannaḍa *moḍi* script, presents the parameters for calculations in concise verses with depiction of numerals. Unlike works such as the *Laghumānsa Vyākhyā* or *Grahagaṇita Bhāskara*, it does not provide exclusive worked-out examples; rather, it is confined to the description of procedures. A notable feature is its ready-reckoner system, in which tabulated values can be directly employed to compute astronomical parameters once the *ahargaṇa* (the fundamental quantity in Indian astronomical calculations) has been determined. Here we find the *padakam* (tabulation), written separately for all the five planets. It has separate columns for thousands, hundred, tens and units. Using these columns the *ahargaṇa* is split into units, tens, hundreds and thousands and the values are directly taken from the table and they are added together to get the final values. This ready-reckoner table represents the most distinctive aspect of the text. A detailed analysis of the manuscript is currently underway.

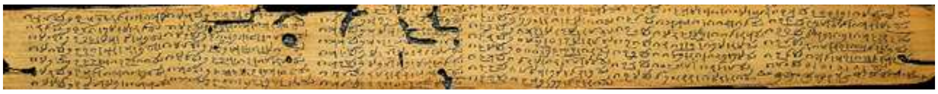

Figure 2. The table format described in the manuscript. (courtesy: Oriental Research Institute, Mysore, India)

7. *Vāsiṣṭha Siddhānta*

All major texts of Indian astronomy make reference to the five *siddhāntas*, among which the *Vāsiṣṭha Siddhānta* (VS) is included. The work is cited in the *Pañcasiddhāntikā* of *Varāhamihira* (7th century CE). The Oriental Research Institute (ORI), has a copy of the *Vāsiṣṭha Siddhānta* (Manuscript No. 609) identified for the first time. The manuscript is written in Kannaḍa script, though the language of the text is Sanskrit. No information is available regarding its author or date. The present manuscript preserves four chapters of the *Vāsiṣṭha Siddhānta*, which briefly describe:

- Time measurement and orbital lengths: Calculates planetary revolutions in a *yuga* using orbital lengths, matching *Sūryasiddhānta* values.
- Planetary positions: Describes methods for mean and true positions; notes that node positions must be derived observationally.
- Eclipse and lunar computations: Includes eclipse timings and crescent orientation.

Cosmological model: Presents a concise model of the solar system.

8. Discussion

Laghumānsa Vyākhyā showcases innovative astronomical methods, including *dyugaṇa*-based simplifications, and eclipse examples. *Grahagaṇita Bhāskara* presents precise planetary computations with clear worked examples, tabulated *graha bhāgaṇa*, and an observational correction (*driggocara*).

In *Pratibhāgī ṭikā*, a simplified method, for calculating astronomical values efficiently can be perceived. Although the rationale behind the construction of the associated tables is not explicitly discussed. *Bhūgola Nirṇayaḥ* just gives names of islands, notably omitting mathematical computations. The *Vāsiṣṭha Siddhānta* is considered older, than the *Pañcasiddhāntikā*. The verses preserved in the text make reference only to the Sun and Moon, without discussion of the other planets. The methods for calculating *tithi* and *nakṣatra* are explained in detail.

9. Conclusion

The rich collection in Mysore, brought out *Vāsiṣṭha Siddhānta*, hitherto unknown, and worked examples based on *Laghumānsa Vyākhyā* for the first time. The other medieval manuscripts discussed here, reveal the gradual refinement of astronomical parameters over the centuries. Each astronomer brought a distinct perspective to the formulation of these parameters: for instance, while the *Laghumānsa Vyākhyā* employs the concept of *dyugaṇa*, the *Grahagaṇita* adopts a different set of terminologies. The representation of astronomical models also varies across texts, reflecting both conceptual improvisations and evolving computational methods. Nevertheless, a thorough and systematic study of manuscripts remains essential for gaining a deeper understanding of the development of astronomy in regional contexts and, more broadly, the growth of Indian astronomy during the medieval period.

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