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EDUCATION FROM VEDA TO WARIGA: THE DIFFUSION AND LOCALIZATION OF JYOTIṢA IN THE NUSANTARA CONTEXT

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Abstract

This study examines the diffusion, transformation, and localization of Jyotiṣa, the Vedic science of astronomy and astrology, within the cultural and intellectual landscape of the Nusantara, particularly through its development into Wariga. As one of the six Vedāṅga, Jyotiṣa played a central role in regulating ritual time through astronomical and cosmological calculations. Its transmission to Southeast Asia, primarily through the Śaka calendrical system, occurred alongside broader networks of trade, religious exchange, and cultural interaction between ancient India and the Nusantara. Using a historical-textual and epigraphic approach, this study analyzes Vedic and Wariga texts alongside Javanese and Balinese inscriptions to trace the diffusion and adaptation of Jyotiṣa concepts within the local Pawukon framework. The findings demonstrate that Wariga was not a passive adoption of Vedic knowledge, but a creative reconstruction that integrated the luni-solar Jyotiṣa system with indigenous temporal cycles such as wuku and wewāran. This synthesis produced a hybrid epistemology in which time functions not only as an astronomical measure, but also as an ethical and symbolic construct embedded in the cosmological worldview of Hindu communities in the Nusantara, particularly in Java and Bali. In conclusion, Wariga represents a localized reformulation of Vedic temporal knowledge that sustained both cosmic order and the cultural continuity of Hindu civilization in the Nusantara.

Keywords: Jyotiṣa, Wariga, Diffusion, Localization, Intertextuality.

I. INTRODUCTION

Jyotiṣa stands out among the branches of Vedic science, playing a key role in the *Vedāṅga* as the knowledge of time. Rather than just tracking stars, it dives into how time works, cycles in the sky, plus how people connect with the cosmos by looking at both astronomy and astrology (Adnyana, 2019). Instead of being purely spiritual or purely technical, *Jyotiṣa* blends ritual and spiritual meaning with math-driven precision. Through the use of *Jyotiṣa*, it helps pick the right moments for *yajña*, guides when to start crafts based on daily Hindu time divisions, and shapes how time is used in *karma* practices. Beyond that, as part of Vedic knowledge, it holds its own weight and significance as the knowledge of time.

After “arriving” in Indonesia through the medium of Śaka system, especially in Java and Bali, *Jyotiṣa* didn't stay unchanged; it shifted shape over time, molded by local input, and on the hand also adapt with the local logic of time. Instead of just being copied, Nusantaran society of that period has reshaped it, crafting a unique system called *Wariga* to track time. It developed in *Java* and then has been preserved in Bali to this day. In Bali, *Wariga* uses cycles like *wuku*, *wewāran*, *penanggal-panglong*, *śaśih*, and *dauh*. Each of those are helping mark moments with purpose, astronomically-astrologically, or even theologically. For Balinese Hindus, these rhythms guide everyday actions, ceremonies, and any important events for Balinese Hindus (Ariana & Budayoga, 2023). *Wariga*'s survival shows not only how Vedic roots hold strong in different places, but also reveals the smart, adaptive thinking within Nusantaran culture.

Some academic papers investigated *Wariga* as a key ritual practice, as well as the incorporation of local wisdom (Sukerta, 2018; Bhattacharya, 2019; Damayanti, 2021). Nevertheless, little is known about how *Jyotiṣa* idea of time spread into Nusantara, then adapted and changed while forming *Wariga*. While scholars have talked about *Wariga* in Balinese Hindu life, especially rituals and indigenous wisdom; however, there is not enough attention has gone to the thinking journey behind it. Especially, how Vedic science of time “crossed the sea,” reached Java, and survived as *Wariga* in Bali. Furthermore, one big

question stays unanswered, was *Jyotiṣa* simply handed down and reshaped into *Wariga*; or did *Wariga* grow from active reinvention, showing local insight and creative thought?

This study aims to analyze and explain how *Jyotiṣa* and its systems spread, identify the adapted structures of *Jyotiṣa* within *Wariga*, yet also look at *Wariga* as a way of knowing that creates time-based insights tied to wider Hindu traditions of time, while at the same time fitting into Nusantara's unique setting, especially Bali. The exploration builds on ideas from intertextuality (Kristeva, 1980) alongside diffusion of innovation theory (Rogers, 2003). Through a qualitative-descriptive approach employing textual and historical analyses, this study also seeks to contribute intellectually to the understanding of the dynamics of traditional Hindu knowledge moving across cultures. Since *Wariga* shows a meeting point between *Vedāṅga* tradition and local wisdom, this overlap stays underexplored - yet this is precisely the focus of the present study.

II. METHOD

This study employs a qualitative approach with a descriptive-analytical method. This approach was chosen because the focus of inquiry lies in the examination of texts and ideas rather than empirical data. This study aims to explore how *Jyotiṣa* concepts spread and changed over time, leading to the creation of the *Wariga* system across Nusantara, especially in Bali. The sources of data consist of primary texts such as the *Vedāṅga Jyotiṣa*, *Sūryasiddhānta*, and *Bṛhat Saṃhitā*, along with *Wariga* texts such as *Wariga Bhagawan Garga* and *Wariga Krimping*. Besides these, inscriptions from *Java* and *Bali* that mention parts of the Śaka calendar, like *tithi*, *māsa*, and *rāśi*, are also utilized as historical data, showing how *Jyotiṣa* ideas spread into the Nusantara region. Furthermore, the data analysis carried in three key phases, (1) following the historical trajectory of *Jyotiṣa* diffusion based on textual and epigraphical sources; (2) comparing the structural composition of *Jyotiṣa* dan *Wariga*; and (3) interpreting the comparative findings hermeneutically to understand the localization of *Jyotiṣa* within the context of Nusantara.

III. RESULTS AND DISCUSSION

A. The Position of *Jyotiṣa* within the Structure of Vedic Knowledge

Hindus believe that the teachings of the *Veda* originate from divine revelation (*śruti*) or truths received by the *Ṛṣis* through profound spiritual realization. The term *śruti*, literally means “that which is heard,” signifies that these teachings were not human inventions, but sacred insights directly apprehended from the Divine and transmitted orally from generation to generation. This oral lineage underscores the *Veda*’s status as *apauruṣeya*, which is knowledge that transcends human authorship.

The principal structure of the *śruti* comprises four major textual collections: the *Samhitā* (collections of hymns and mantras), the *Brāhmaṇa* (ritual instructions), the *Āraṇyaka* (texts of meditative reflection and ascetic realization), and the *Upaniṣad* (metaphysical discourses on the nature of the Self and ultimate reality). Together, these texts form an integrated body of knowledge that unites the ritual, philosophical, and contemplative dimensions of Vedic spirituality.

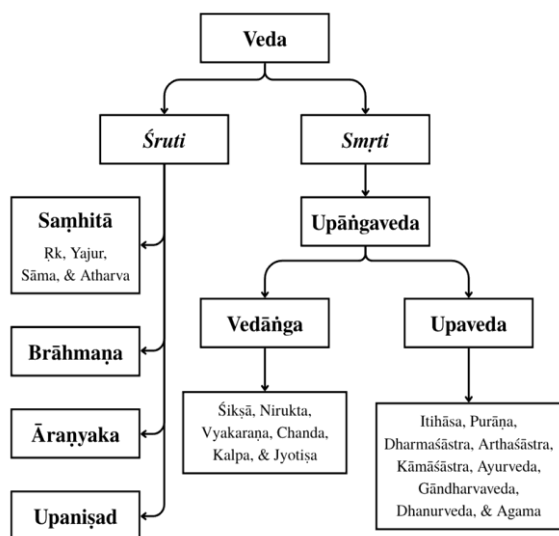


Figure 1. Vedic Scriptures Codification

The *Rgveda*, *Yajurveda*, *Sāmaveda*, and *Atharvaveda*, collectively known as the *Catur Veda*, constitute the foundational *Samhitā* corpus. They also serve as the root of subsequent *śruti*-based developments, including the *Brāhmaṇa*, *Āraṇyaka*, and *Upaniṣads*. Over time, to interpret, apply, and preserve the

teachings of the *śruti* within everyday and ritual contexts, derivative texts known as *smṛti* (“that which is remembered”) emerged. The *smṛti* literature encompasses an extensive range of writings, from the *Dharmasāstras* (legal treatises) and *Itihāsas* (epic histories such as the *Mahābhārata* and *Rāmāyaṇa*), to the *Purāṇas* (mythological narratives), and the *Vedāṅgas* (“limbs of the *Veda*”), which function as auxiliary sciences that aid in the understanding and correct execution of Vedic knowledge. Furthermore, the codification of the Vedic texts can be seen in figure 1.

The *Vedāṅga* evolved during the late Vedic and post-Vedic periods and consist of six disciplines: *Śikṣā* (phonetics), *Chandas* (metrics), *Vyākaraṇa* (grammar), *Nirukta* (etymology), *Kalpa* (ritual science), and *Jyotiṣa* (astronomy and astrology) (Lochtefeld, 2002). Among these, *Jyotiṣa* holds a particularly crucial position, as it provides the framework for determining the precise timing of rituals and religious observances. As stated in *Rg-Vedāṅga Jyotiṣa* 35–36, *Jyotiṣa* is regarded as the highest among the auxiliary sciences because the *Veda* itself was revealed for the purpose of performing *yajña* (sacrificial rites), and such rites must be conducted at divinely ordained times. The knowledge required to ascertain those sacred timings, which involves understanding cosmic order and astronomical precision, constitute the very essence of *Jyotiṣa* (Sastry & Sarma, 1985; Holay, 1989). *Jyotiṣa* thus integrates the empirical observation of celestial movements with spiritual insight, establishing the temporal structure upon which Vedic ritual life depends (Lochtefeld, 2002). In this light, *Jyotiṣa* functions not merely as an auxiliary branch of learning, but as a bridge between divine revelation and lived experience, ensuring that every human action is harmonized with the cosmic rhythm (*rta*), the universal law of order.

Within the broader framework of Vedic knowledge, *Jyotiṣa* is often described as “the eye of the *Veda*,” symbolizing its role in providing vision and clarity regarding the timing of ritual of *yajña* (Tiwari, 2025). While *Jyotiṣa* is the Vedic science of astronomy and astrology, its ultimate aim is to reveal the movement of

celestial bodies in order to guide the timing of *yajña* and other sacred duties. One of its earliest and most authoritative texts, the *Vedāṅga Jyotiṣa*, attributed to *Ṛṣi Lagadha* and dated to around the 13th century BCE, outlines the foundations of Hindu calendrical reckoning based on a luni-solar system. It introduces essential concepts such as *yuga* (five-year cycle), *tithi* (lunar day), and include the system of *adhikamāsa* (intercalary month), all designed to reconcile lunar and solar rhythms (Tiwari, 2025). As one of the *Vedāṅga*, *Jyotiṣa* is not only a technical aid for ritual performance but also a conceptual foundation for the entire Hindu astronomical and astrological tradition. Through its luni-solar system, its division of time according to celestial motion, and its interpretation of cosmic influences, *Jyotiṣa* weaves together empirical observation and spiritual understanding into a single epistemic fabric. It does not simply organize ritual time, but also constructs a cosmology that links human existence, *karma*, and the universe itself.

Over the centuries, *Jyotiṣa* evolved from its early Vedic form into the *Siddhānta* period, producing a series of seminal texts such as the *Sūryasiddhānta*, *Bṛhat Saṃhitā*, *Bṛhat Parāśara Horā Śāstra*, and other astronomy-astrological texts. These treatises expanded upon the foundational principles of *Jyotiṣa*, developing sophisticated astronomical calculations and predictive frameworks. Even the regional adaptations of Hindu astronomy and astrology across Asia, including in Southeast Asia, particularly Java and Bali, can be traced back to the fundamental principles and elements first articulated in *Jyotiṣa*.

Essentially, *Jyotiṣa* does not merely occupy a historical niche within the Vedic corpus, it serves as the living source from which subsequent Hindu astronomical-astrological sciences continue to flow. It may rightly be seen as the “mother” of Hindu astral sciences, the fountainhead of all later developments in the understanding of time and the heavens. Even the diverse calendrical traditions of Southeast Asia that emerged in later centuries, including those of Java and Bali, draw their intellectual nourishment from *Jyotiṣa*. Though they evolved distinct forms and terminologies, their

conceptual roots remain deeply intertwined with this ancient Vedic science of light and time.

A. The Structure of Time in *Jyotiṣa*

The *Vedāṅga Jyotiṣa* stands as the principal text for understanding the scientific framework of how time is constructed within the Vedic tradition. It consists of two main parts: the *Ṛg Vedāṅga Jyotiṣa* (RVJ) and the *Yajur Vedāṅga Jyotiṣa* (YVJ). Although these two texts emerged independently, with the RVJ preceding the YVJ, they are traditionally regarded as complementary, forming a unified corpus of the *Vedāṅga Jyotiṣa*. This text provides the foundational traditional model of the Vedic calendrical system, integrating mathematical, astronomical, ritual, and theological dimensions. Its framework became the cornerstone upon which later *Jyotiṣa* texts were developed, serving as the essential reference for all subsequent constructions of time within the Vedic and post-Vedic traditions that view space, time, and ritual as an indivisible unity.

According to Monkiewicz (2021), the concept of time in the *Vedāṅga Jyotiṣa*, both in RVJ and YVJ, can be divided into two principal categories: (a) topography, which concerns the mapping of the visible heavens, and (b) calendar, which refers to the calculation of time derived from the observation of celestial movements. The first concerns the spatial arrangement of celestial bodies, while the second concerns their cyclical patterns, both of which together constitute the Vedic science of temporal order. An explanation of the two groups of time elements can be seen in tables 5.1 and 5.2.

The text further details smaller units of time, ranging from half-day divisions to minute measurements of forty-eight minutes (48’) and even two minutes and twenty-three seconds (2’23”) (Monkiewicz, 2021). These fine calibrations reveal that early *Jyotiṣa* scholars, or *jyotiṣakas*, developed a sophisticated system of observation based on three primary celestial elements, i.e. the Sun (*Sūrya*), the Moon (*Soma*), and the stars (*tārā* or *str*), which formed the core of the Vedic temporal structure. Notably, planetary motion (*graha*) does not yet play a central role in these earliest formulations,

reflecting the embryonic phase of astronomical thinking in Vedic culture.

The alignment of these celestial components, combined with the concept of *svar* (the celestial realm), gave rise to a cosmological configuration that grounded the early Vedic understanding of time. The *Vedāṅga Jyotiṣa* thus portrays time not merely as a numerical sequence but as a manifestation of cosmic rhythm. Through continuous observation of recurring celestial phenomena, *jyotiṣakas* were able to divide time systematically to coordinate both religious rituals and daily activities (Monkiewicz, 2021).

Observations of recurring celestial phenomena enabled the *jyotiṣakas* of the early Vedic period to divide time into systematic segments arranged in a fixed sequence, serving both religious and practical purposes (Monkiewicz, 2021). These temporal divisions, as summarized in Tables 1-3, can be simplified into hierarchical cycles consisting of a five-year cycle (*yuga*), one-year, half-year, season (*ṛtu*), month (*māsa*), the bright and dark lunar fortnights (*śukla* and *kṛṣṇa pakṣa*), the day, and the smaller subdivisions of a single day. The temporal elements identified and utilized in the *Vedāṅga Jyotiṣa* remain relatively general in nature. Nevertheless, as noted by Monkiewicz (2021), these components formed the foundational framework upon which later *Jyotiṣa* texts were built. They became the principal temporal units referenced and elaborated upon in subsequent developments of *Jyotiṣa*-based calendrical systems.

Table 1. Elements Based on Celestial Topography

No.	Element	Term (Sanskrit)	Mentioned in
1.	Sky	<i>svar</i>	ṚVJ 5, YVJ 6
2.	Stars	<i>str</i>	ṚVJ 30, YVJ 43
3.	1/27 Lunar Constellation	<i>nakṣatra</i>	ṚVJ 28, YVJ 35
4.		<i>rkṣā</i>	ṚVJ 14, YVJ 18
5.		<i>bha</i>	ṚVJ 9, ṚVJ 18, YVJ 10, YVJ 36
6.	Sun	<i>sūryā</i>	ṚVJ 18, ṚVJ 30, YVJ 36, YVJ 43

7.		<i>sūrya</i>	ṚVJ 6, YVJ 7
8.		<i>arka</i>	ṚVJ 5-6, YVJ 6-7
9.	Solar Path	<i>ayana</i>	ṚVJ 5, ṚVJ 22, YVJ 6, YVJ 40
10.	Moon	<i>soma</i>	ṚVJ 5, ṚVJ 18, ṚVJ 30, YVJ 6, YVJ 36, YVJ 43
11.		<i>candramas</i>	ṚVJ 6, YVJ 7
12.	Lunar Phase (Full or New Moon)	<i>parvan</i>	ṚVJ 31, YVJ 23
13.	Full Moon	<i>paurṇamāsī</i>	ṚVJ 33

Source: Monkiewicz, 2021

Table 2. Elements Based on the Calendar System

No.	Element	Term (Sanskrit)	Mentioned in
1.	Five-Year Cycle	<i>yuga</i>	ṚVJ 1, ṚVJ 5-6, ṚVJ 32, YVJ 1, YVJ 5, YVJ 6-7, YVJ 28
2.	One Year	<i>saṃvatsara</i>	ṚVJ 1, YVJ 1
3.		<i>varṣa</i>	ṚVJ 32, YVJ 5
4.		<i>abda</i>	YVJ 28
5.	Half-Year	<i>ayana</i>	ṚVJ 1, ṚVJ 7, YVJ 1, YVJ 8, YVJ 28
6.	Season	<i>ṛtu</i>	ṚVJ 1, ṚVJ 9, ṚVJ 19, YVJ 1, YVJ 10, YVJ 28
7.	Month	<i>māsa</i>	ṚVJ 19, YVJ 28
8.	Lunar Fortnight	<i>pakṣa</i>	YVJ 23

9.	Bright Lunar Phase	<i>śukla</i>	RVJ 5, RVJ 32, YVJ 5, YVJ 6
10.	Dark Lunar Phase	<i>kṛṣṇa</i>	RVJ 32, YVJ 5
11.	Day	<i>ahan</i>	RVJ 18, YVJ 28, YVJ 36
12.		<i>dina</i>	RVJ 1, YVJ 1
13.		<i>div</i>	RVJ 18, YVJ 36
14.		<i>divasa</i>	RVJ 22, YVJ 40
15.	Lunar Day	<i>tithi</i>	RVJ 31, YVJ 23
16.	Equinox	<i>viṣuvat</i>	RVJ 31, RVJ 33, YVJ 23

Source: Monkiewicz, 2021

Table 3. Elements of Daily Time Units

No.	Element	Term (Sanskrit)	Mentioned in
1.	Daytime	<i>gharma</i>	RVJ 7, YVJ 8
2.		<i>divasapramāṇa</i>	
3.	Nighttime	<i>kṣapā</i>	
4.	1/30 of a Day (48')	<i>muhūrta</i>	RVJ 7, RVJ 16, YVJ 8, YVJ 38
5.	1/60 of a Day (24')	<i>nāḍika</i>	
6.	2'23"	<i>kalā</i>	RVJ 16, YVJ 38

Source: Monkiewicz, 2021

When examining later *Jyotiṣa* texts, such as the *Bṛhat Saṃhitā*, the *Sūryasiddhānta*, and the *Bṛhat Parāśara Horā Śāstra*, it becomes evident that the temporal structures described in the *Vedāṅga Jyotiṣa* and in the earlier Vedic scriptures (*R̥gveda*, *Yajurveda*, and *Atharvaveda*) were not only retained but also recalculated and refined. These refinements involved increasingly complex computations, resulting in more precise time units than those found in the earlier tradition. The evolution of these systems reflects both the mathematical

advancement and the philosophical deepening of the Vedic understanding of time. Explicit references to these later temporal elements can be found in *Bṛhat Saṃhitā* II.4–6, which delineates in detail the hierarchical structure of time measurement, ranging from vast cosmic cycles to minute subdivisions of temporal flow, as follow:

तत्र प्रगणिते ।

पौलिश रोमक वासिष्ठसौरपैतामहेषु

पञ्चस्वेषु सिद्धान्तेषु

युगवर्षायनर्तुमा

सपक्षाहोरात्रयाममुहूर्तनाडी

प्राणत्रुटित्याद्यवयवादिकस्य

कालस्य क्षेत्रस्य च वेता ।

चतुर्णां च मानानां

सौरसावननाक्षत्रचान्द्राणामधिमास

कावमसंभवस्य च कारणाभिज्ञः ।

षष्यब्दयुगवर्ष मासदिनहोराधिपतीनां प्रतिपत्तिच्छेदवित् ।

tatra pragaṇite,

pauliśa romaka

vāsiṣṭhasaurapaitāmaheṣu

pañcasveteṣu siddhānteṣu

yugavarṣāyanaṛtumā

sapakṣāhorātrayāmamuhūrtanāḍī

prāṇatruṭityādyavayavādikasya

kālasya kṣetrasya ca vetā;

caturṇāṃ ca mānānām

saurasāvananākṣatracāndrāṇām

dhimāsa kāvamasambhavasya ca

kāraṇābhijñāḥ;

ṣaṣyabdayugavarṣa

māsadinahorādhipatīnām

pratipatticchedavit.

Translation:

A person (*jyotiṣaka*) must study the works of Pauliśa, Romaka, Vasiṣṭha, Sūrya, and Pitāmaha; he must possess correct knowledge of one *yuga*, *varṣa*, *āyana*, *ṛtu*, *māsa*, *pakṣa*, *ahorātra*, *yama*, *muhūrta*, *nāḍī*, *vināḍī*, *prāṇa*, *truṭi*, as

well as the parts of *truṭi* and other divisions of time, also the division of space. He must have a clear understanding of the four ways of measuring time, which include: *saura* - based on the Sun, *sāvana* - the duration of time based on the movement of planets and stars (*nakṣatra*) or civil day, and *cāndra* - the calculation of time based on the Moon, together with *tithi* and the *adhimāsa* system or the addition of a month in one year. He must also know the beginning and end of *ṣaṣṭyabda*, *yuga*, *varṣa*, *māsa*, *dina*, and *horā*, as well as know the rulers (*Devāta* or Planets) who preside over each unit of time. (Sastri & Bhat, 1946)

The explanation above illustrates the remarkable complexity and systematic nature of temporal understanding within the science of *Jyotiṣa*, which encompasses the division of time from the grandest scale, such as *ṣaṣṭyabda* (the sixty-year cycle), to the smallest measurable unit, *truṭi*. These temporal components were not only of scientific importance but were also deeply intertwined with the social order and theological dimensions of *Jyotiṣa* in its time. Together, they formed the foundation for the *Jyotiṣa*-based calendrical systems of ancient India, such as the *Vikrama* and *Śaka* eras. The principal temporal elements consistently present in these calendar systems include *ṣaṣṭyabda*, *yuga*, *varṣa* (year), *māsa* (month), *tithi* (lunar day), *nakṣatra* (lunar constellation), *yoga* (astronomical conjunction), *karāṇa* (half of a *tithi*), and *dina* (day). Together, these elements constitute the *pañcāṅga* (*tithi*, *nakṣatra*, *yoga*, *karāṇa*, and *dina*) or the “five limbs” of the Hindu almanac, which has remained a central instrument for determining auspicious times (*muhūrta*) and maintaining the harmony between ritual practice and cosmic order (Rao, 2005).

A. The Historical Path of *Jyotiṣa* Diffusion to Nusantara

The science of *Jyotiṣa* holds a central position within the Vedic tradition. As one of the six *Vedāṅgas*, the auxiliary branches of knowledge that support the understanding and execution of Vedic teachings, *Jyotiṣa* is closely related to Vedic astronomy and astrology. Its principal

function is to determine and regulate temporal order through the observation of celestial phenomena, particularly the movements of the Sun, Moon, planets, and stars. Based on these calculations, every sacred ritual is expected to be performed in harmony with the pulse of the cosmos itself. In early Vedic texts such as the *Catur Veda Saṃhitā*, the *Vedāṅga Jyotiṣa*, the *Sūryasiddhānta*, and the *Bṛhat Saṃhitā*, time is understood not merely as an astronomical measurement but as a principle of order (*ṛta*) that maintains equilibrium between the macrocosm and the microcosm.

अवर्तयत्सूर्यो न चक्रं

avartayat sūryo na cakram.

Translation:

Just as the Sun steadfastly revolves along its ordained path. (*Rg Veda* II.11.20; Pāramita, 2016: 142)

द्वादशारं नहि तज्जराय वर्वर्ति चक्रं
परि द्यामृतस्य ।

आ पुत्रा अग्ने मिथुनासो अत्र सप्त
शतानि विंशतिश्च तस्थुः ॥

*dvādaśāraṃ nahi taj jarāya varvarti
cakram pari dyām ṛtasya; ā putrā
agne mithunāso atra sapta śatāni
viṃśatiś ca tasthuḥ.*

Translation:

The wheel with twelve spokes (months or stellar constellations), belonging to the Eternal One (the Sun), revolves around the celestial sphere and never grows old; seven hundred and twenty sons (360 days and 360 nights) dwell within it in pairs, O *Agni*. (*Rg Veda* I.164.11; Pāramita, 2016: 112-113)

From these Vedic conceptions, it is understood that one month consists of thirty lunar days, and twelve such months constitute one year, comprising 360 days and 360 nights that exist in complementary pairs. The Sun (*Sūrya*) and the Moon (*Candra*) thus became the key celestial elements for determining time in the Vedic age. Within this luni-solar framework, the

cycles of the Sun and the Moon were observed and harmonized to maintain equilibrium between the two celestial forces.

The religious dimension of this temporal understanding is vividly expressed in the *Atharva Veda*, which regards celestial bodies not merely as markers of time or inanimate entities moving through fixed orbits, but as manifestations of divine reality worthy of veneration. This devotional sentiment is clearly articulated in *Atharva Veda* XIX.9.7, which contains a hymn of invocation for,

शं नो दिविचरा ग्रहाः ।

śaṃ no divicarā grahāḥ.

Translation:

May all the planets that move across the heavens bring auspiciousness to us all. (Pāramita, 2016: 1289)

Not only each *graha* within the *navagraha* (the nine planetary deities), but also the numerous constellations scattered across the heavens were revered and employed as markers of time (*Atharva Veda* XIX.9–10).

Furthermore, as the intellectual systems of ancient India evolved and engaged in contact with other cultural spheres across Asia, *Jyotiṣa* emerged as one of the most influential forms of cultural transmission. The diffusion of Vedic astronomical and astrological concepts into Southeast Asia, particularly through the medium of the *Śaka* calendrical system, occurred alongside the expansion of trade networks, intellectual exchange, and political relations between India and the Nusantara (Juergensmeyer & Roof, 2012; Sengupta, 2017). Through these routes of commerce, royal diplomacy, and religious exchange, *brāhmaṇas* are believed to have brought with them the texts and systems of knowledge related to time reckoning, calendrical computation, and ritual regulation. This transmission did not occur instantaneously but unfolded gradually through a series of repeated cultural encounters that facilitated the exchange of ideas, values, and religious symbols across major cultural centers in the Nusantara.

The earliest traces of Vedic knowledge in the region can be identified through the use of the

Śaka calendrical system, recorded in various epigraphical remains, particularly those discovered on the islands of Java and Bali. Notable examples include the fifth-century *Tugu Inscription* and the sixth-century *Kebon Kopi II Inscription* from the Tarumanegara Kingdom (Titahadiyarti, 2015; Ningsih & Nailufar, 2021; Ardyamarthanino & Ningsih, 2022). During the Hindu-Buddhist period, between the eighth and fifteenth centuries CE, kingdoms across Java and Bali systematically adopted the *Śaka* system (Museum Nasional, 1985/1986; Mutamakin, 2018). This phenomenon demonstrates that the *Śaka* calendar, rooted in the science of *Jyotiṣa*, was not merely adopted for administrative purposes but also functioned as a temporal framework for ritual practices and as an instrument of royal legitimation.

This evidence also indicates that the reckoning of years and temporal elements derived from *Jyotiṣa* had been adopted as both administrative and religious references since the earliest periods of Hindu kingdoms in the Nusantara (Mutamakin, 2018). Although these systems did not always directly cite *Jyotiṣa* texts, the calendrical calculations they employed exhibit clear congruence with the luni-solar principles underlying the *Jyotiṣa* tradition. Interestingly, a closer examination of historical evidence reveals that this system did not stand alone but was harmonized with a local temporal framework known as the *Pawukon* system, an indigenous structure based on the cyclical reckoning of *wuku* and *wewāran* (days).

The alignment between the two systems is evident in the *Wanwan Banen Inscription*, discovered in Central Java and dated to the year 746 *Śaka*. This inscription demonstrates the fusion of *Jyotiṣa*'s *pañcāṅga* elements with several *Pawukon* components. According to Rao (2005), the *pañcāṅga* traditionally consists of *tithi*, *vāra*, *nakṣatra*, *yoga*, and *karaṇa*; however, in this case, additional local elements such as *wuku* and *wewāran*, particularly *pañcawāra* and *saptawāra*, are also integrated. The inscription records the following text:

“swastiśakawarṣatita 746 i
śwawamanamaśa tithi pratipada
śuklapakṣa sthāna bawakaraṇa

*aswini nakṣatra aswi dewata śiwa
yoga balawa karaṇa doḷajyani
winadhīpa. wa. śa. juluṅ. wara...”.
(Museum Nasional, 1985/1986: 15)*

Based on the text, the calendrical elements mentioned include the year 746 Śaka; the month of Śrāvaṇa; the first tithi of the bright fortnight; the karaṇas bava and bālava; the nakṣatra Aśvinī and its corresponding deity Aśvinī Devatā; the yoga Śiva; and Śani-vāra as the saptawāra day. These are further combined with the wuku Julungwangi and the pañcawāra Wage. The Wanwan Banen Inscription thus reveals a creative process of synthesis that took place during the early ninth century in Central Java under the Old Mataram Kingdom. This synthesis reflects not a one-sided adoption, but a reciprocal adaptation that positioned the Jyotiṣa-based temporal system within the framework of local needs, both for religious ceremonies and for formal calendrical administration.

In this context, the diffusion of Jyotiṣa into the Nusantara did not merely involve the transfer of terminology, but rather a dialogical exchange of meaning between two distinct cultural systems. The people of the Nusantara (especially in Java) reinterpreted the astronomical and astrological concepts of Jyotiṣa through the lens of their own cosmological understanding. This is evident in the emergence of local temporal units such as wuku and wewāran, which coexist alongside tithi and māsa. The wuku-wewāran system has no parallel in Jyotiṣa texts, nor does its combination with tithi-māsa, which originates from the luni-solar framework. Such adaptation illustrates the local culture’s intellectual capacity to internalize external knowledge while preserving its own cultural orientation.

This historical process affirms that the dissemination of Jyotiṣa into the Nusantara cannot be understood merely as a transfer of astronomical or astrological knowledge which related to time reckoning. In its encounter with the local culture, Jyotiṣa transformed into a new system, not through the loss of its original roots, but through the discovery of a different medium of expression. It was through this very process that Wariga emerged as a distinctive system of temporal knowledge, as one that preserves the

traces of Jyotiṣa while radiating the creative and localized character of the Nusantara.

B. Structural Localization: From Jyotiṣa to Wariga

The diffusion of Jyotiṣa through the Śaka calendrical system into the Nusantara did not result in a passive reception of this body of knowledge. Rather, it progressed toward a stage of structural localization that can rightly be described as creative. In this context, Hindu communities in the Nusantara, particularly in Java and Bali, did not merely replicate the Vedic temporal structure but reconfigured its elements in accordance with their own local cosmology. What is referred to here as “local cosmology and time” is the Pawukon calendrical system, which is constructed upon two primary temporal components: wewāran (cyclical day count) and wuku (weekly cycle). The Pawukon system provided the foundational framework upon which the Śaka calendar was adjusted and synchronized, ensuring its harmony with the indigenous system that existed exclusively in the Nusantara.

This process of adjustment is evident in the way the Śaka system was adapted within local inscriptions. As discussed earlier with reference to the Wangwang Bangen Inscription, similar patterns appear in other epigraphic records such as the Kuti or Gandhakuti Inscription of the Medang Kingdom, dated to the mid-ninth century CE. This inscription, discovered in Sidoarjo, East Java, records the following calendrical data:

*“swasti śakawarsatita 762 śrawaṇa
masa. tithi pañcadaśi śuklapakṣa.
ma. po. ra. wāra namahil.
grahacāra. neritistha.
daniṣṭhanakṣatra. piwāśyādewatā.
mahendramandala.
sobhāganayoga. balawakarāṇa
śaśiparwoṣa. bagomuhurta.
kumha raśi.” (Museum Nasional,
1985/1986: 16)*

From this inscription, the recorded temporal components include the year 762 Śaka; the month of Śrāvaṇa; the fifteenth tithi of the bright

fortnight (Fullmoon); *maulu* (*ṣaḍwāra*); *pon* (*pañcawāra*); *ravivāra* (Sunday); the *wuku Manahil*; *daniṣṭha nakṣatra*; its presiding deity *Piwāśyā Devatā*; *sobhāgana yoga*; *bālava karaṇa*; and *kumbha rāśi*. Notably, this inscription adds the elements of *ṣaḍwāra* and *rāśi* yet retains the complete *pañcāṅga* structure without omission.

Further evidence from later inscriptions, such as the fifteenth-century *Waringin Pitu Inscription* of the Majapahit Kingdom, shows that the same *Jyotiṣa* elements continued to be employed, reflecting a remarkable continuity with earlier Javanese inscriptions. The *Waringin Pitu Inscription* records the following calendrical details:

“*swasti śri śākawarṣātita 1369. mārggaśira māsa. tithi pañcadaśi śuklapakṣa. tu. u. bu. wāra. kurantil. dakṣiṇastha grahacāra. rohiṇi nakṣatra. prajāpati dewata. mahendramaṇḍala. sadya yoga. kowera parwweśa. śakrāgni muhurtta. wawa karaṇa. Wṛṣabha rāśi.*” (Museum Nasional, 1985/1986: 126)

According to this inscription, the calendrical elements include the year 1369 *Śaka*; the month of *Mārggaśirṣa*; the fifteenth *tithi* of the bright fortnight; *tungleh* (*ṣaḍwāra*); *umanis* (*pañcawāra*); *budha-vāra* (Wednesday); the *wuku Kulantir*; *rohiṇi nakṣatra*; its deity *Prajāpati Devatā*; *sādhyā yoga*; *bāva karaṇa*; and *vṛṣabha rāśi*. The consistency observed across inscriptions, from the Old Mataram period to the Majapahit Kingdom in the fifteenth century, demonstrates a sustained integration of the complete *pañcāṅga* system alongside additional *Jyotiṣa* and local temporal elements. This enduring pattern reflects not only the preservation of the Vedic astronomical-astrological framework but also its dynamic adaptation within the cultural and ritual life of the Javanese and Balinese Hindu communities.

Beyond the epigraphic evidence found in Java, similar traces are also present in Bali, particularly in inscriptions dated to the twelfth century. One such example is the *Sukawana B*

Inscription, discovered in Bangli, which records the following date: “*śaka 1103 śrāvāna māsa, tithi navamī śukla pakṣa, ma, pā, bu, vāra, wayang*” (Suarbhawa et al., 2013). The *Sukawana B Inscription* demonstrates the combination of *Jyotiṣa* elements with *wuku* and *wewāran* components, much like those found in earlier inscriptions elsewhere in Bali. However, the *pañcāṅga* elements appear to have been reduced, leaving only *tithi* and *dina*.

Inscriptions from twelfth-century Bali consistently display a similar calendrical format, employing the month (*māsa*), *tithi*, and *Śaka* year, in conjunction with *wuku* and *wewāran*. This pattern has been continuously preserved in Bali up to the present day, maintaining the core elements of *māsa*, *tithi*, *dina*, and *varṣa*, which have been recalibrated within the temporal framework of the *Pawukon* system. Such adaptation suggests that the knowledge originating from India was not merely transplanted but was reworked within a cultural framework possessing its own temporal consciousness.

At the structural level, this adaptive process is also reflected in the shifts of terminology and the reorganization of temporal computation. Concepts from *Jyotiṣa* such as *tithi*, *māsa*, *nakṣatra*, and *vāra* were rearticulated into forms more closely aligned with local epistemological systems. For example, *tithi* (*śuklapakṣa* and *kṛṣṇapakṣa*), which in *Jyotiṣa* refers to the angular distance between the Sun and the Moon, underwent a phonetic transformation into *penanggal* (*śuklapakṣa*) and *panglong* (*kṛṣṇapakṣa*) in the Balinese calendar, both retaining the same function of denoting lunar phases. Similarly, *māsa*, meaning “month” in the lunar sense, was adapted phonetically into *śaśih* which also has the same meaning related to month and Moon; *nakṣatra* which is referring to stellar constellations, became *lintang* which also has meaning as star; and *vāra*, which in *Śaka* system denotes the seven days of the week, was likewise adopted with corresponding names.

This transformation did not end merely with the alteration of terminology; it gave rise to an entirely new temporal system with its own distinct character. In the Nusantara, concepts derived from *Jyotiṣa* were merged with

indigenous systems that had preexisted in the region, such as *wuku* and *wewāran*. The *wuku* system divides time into thirty weeks, while *wewāran* organizes cycles of days that vary from one to ten days. These two systems are absent in the *Jyotiṣa* tradition, yet they served as the framework through which the *Jyotiṣa*-based calendrical structure, transmitted via the *Śaka* calendar, could be effectively integrated into the social and ritual life of Balinese society. This synthesis resulted in a “hybrid” calendrical system: a fusion between the astronomical calculations of the Vedic *Jyotiṣa* and the indigenous temporal cycles of the *Pawukon*. Consequently, *Wariga* emerged not merely as a timekeeping device but as a comprehensive system of knowledge encompassing cosmological as well as socio-religious dimensions unique to the peoples of the Nusantara, particularly the Javanese of the classical period and the Balinese of today.

Within this adaptive process, the orientation of temporal meaning also underwent a fundamental transformation. In *Jyotiṣa*, time was regarded primarily as an astronomical entity with technical and mathematical functions. In *Wariga*, however, time acquired ethical and symbolic dimensions. It was no longer perceived merely as a quantitative measure but as a qualitative mode of being, one that governs the harmony between humans, nature, and the divine. In this context, *Wariga* serves as an instrument for maintaining equilibrium between ritual practice and the rhythms of everyday life. The selection of auspicious days (*dewasa ayu*), for instance, is not merely a mathematical determination based on luni-solar calculations, but also a process that harmonizes with the *Pawukon* system, an inherently non-astronomical framework that reflects the synthesis of cosmic and cultural order in the Nusantara conception of time, particularly preserved in Bali.

This shift in orientation demonstrates that the adaptation of *Jyotiṣa* in the Nusantara was a process of comprehensive recontextualization, one that encompassed language, systems of thought, and even epistemological purpose. The Vedic knowledge once oriented towards ritual precision and astronomical accuracy was reworked into a local science grounded in social and spiritual equilibrium. Within *Wariga*, every calculation of time simultaneously functions as a form of ethical knowledge, as it is intimately linked to moral order and collective well-being. The entire structure affirms that this localization was not an act of mere imitation, but rather a restructuring of sacred knowledge so that it could resonate meaningfully within the horizons of local culture.

From this account, it becomes evident that the structural localization of *Wariga* reflects the intellectual capacity of the peoples of the Nusantara to internalize and reformulate *Jyotiṣa* into a new epistemic system without severing its connection to Vedic tradition. This transformation shaped *Wariga* into a calendrical system that is not only functional but also reflective, a means by which Hindu communities in the Nusantara understand time as a bridge between the sacred and the profane, between cosmic order and the rhythms of human life.

Tabel 4. Fundamental Elements of Time Based on *Wariga*

No.	Element	Relations to
1.	<i>Wewāran</i> - comprising <i>Ekawāra</i> to <i>Daśawāra</i>	Based on <i>Pawukon</i> system with the localization of <i>dina</i> become <i>saptawāra</i> .
2.	<i>Wuku</i>	Pure <i>Pawukon</i> (Indigenous to Nusantara)
3.	<i>Penanggal/Panglong</i>	Localization of <i>tithi</i> from <i>Jyotiṣa-Śaka</i>
4.	<i>Śasih</i>	Localization of <i>māsa</i> from <i>Jyotiṣa-Śaka</i>
5.	<i>Dauh</i>	Believed to have developed domestically

Source: processed by the author

Such adaptation stands as evidence that knowledge endures and evolves when it takes root within the living context of culture, rather than being reproduced in static form. In this way, *Wariga* stands as a distinctive manifestation of the wisdom of the Nusantara, an interpretive renewal of the luminous science of *Jyotiṣa*, reborn within a new cultural expression.

IV. CONCLUSION

This study establishes that the diffusion of *Jyotiṣa* into the Nusantara was not merely a transmission of astronomical and astrological knowledge from India to Southeast Asia, but a process of profound epistemological and cultural transformation. It involved an encounter between the Vedic - *Jyotiṣa* tradition and the indigenous *Pawukon* system that generated a localized reconstruction of temporal knowledge rooted in the cosmological worldview of the Nusantara peoples. Through the medium of the Śaka calendar, *Jyotiṣa* was reinterpreted within an existing local framework of time reckoning that had long shaped the ritual and cultural consciousness of the region.

The analysis of various inscriptions from Java and Bali reveals that this adaptation involved a creative synthesis between the luni-solar *pañcāṅga* system of *Jyotiṣa* and local temporal components such as *wuku* and *wewāran*. Rather than functioning as a direct continuation of the Indian calendrical model, *Wariga* emerged as a recontextualized system of knowledge that integrated Vedic astronomical principles with indigenous modes of temporal understanding. In this process, time was no longer understood solely as a technical or mathematical calculation, but also as an ethical, symbolic, and cosmological construct embedded within the lived religious experience of Hindu communities in the Nusantara.

The synthesis of *Jyotiṣa* and *Pawukon* into *Wariga* demonstrates how sacred knowledge can be continuously reformulated through cultural encounter without losing its foundational cosmological orientation. *Wariga* therefore represents a hybrid epistemology of time, one that bridges Vedic astral science and local cosmological consciousness within the distinctive intellectual landscape of the Nusantara.

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