

APPLIED SCIENCES IN ŚRĪHARṢA'S NAIṢADHĪYACARITAM: A MULTIDISCIPLINARY EXPLORATION OF TRADITIONAL KNOWLEDGE SYSTEMS

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ABSTRACT:

Śrīharṣa's *Naiṣadhīyacaritam*, a celebrated *Mahākāvya* of classical Sanskrit literature, is not only a masterpiece of poetic imagination but also a repository of traditional knowledge systems and applied sciences. This research explores the rich references to various applied sciences and disciplines embedded within the text, including *Cikitsāśāstra* (medical science), *Pākaśāstra* (culinary science), *Aśvaśāstra* (equine science), *Mantraśāstra* (science of mantras), *Ayudhaśāstra* (military science), *Rasāyanaśāstra* (chemistry), *Prāṇiśāstra* (zoology), *Bhūtiśāstra* (physics), *Gaṇitaśāstra* (mathematics), and *Rājanītiśāstra* (political science). By adopting a multidisciplinary approach, this paper presents *Naiṣadhīyacaritam* as a crucial source of ancient scientific knowledge and its practical applications in everyday life, offering insights into the intellectual contributions of classical Sanskrit literature to modern interdisciplinary studies. This paper highlights how *Naiṣadhīyacaritam* serves as a microcosm of applied sciences in pre-modern India, bridging poetic beauty with scholarly rigor. It underscores the need to revisit such literary texts to unravel their contributions to traditional knowledge systems and their relevance in contemporary interdisciplinary studies. By applying modern interdisciplinary analytical approaches, the paper explores how traditional knowledge systems were embedded in literary expressions and their relevance in contemporary scientific discourse. It also seeks to identify the role of science in shaping cultural and intellectual traditions, focusing on the text's portrayal of human experience through a scientific lens. Through a detailed examination of Śrīharṣa's poetic framework, the research highlights the significant contributions of Indian intellectual traditions to global scientific development and their influence on art, literature, and societal progress.

KEY WORDS:

Śrīharṣa, *Naiṣadhīyacaritam*, Applied Sciences, *Vāstuśāstra*, Architecture, Astronomy, Health Sciences, Ancient Indian Knowledge Systems, *Pākaśāstra*, *Ayudhaśāstra*, *Gaṇitaśāstra* Traditional Knowledge, Literary Analysis, Sanskrit Literature.

INTRODUCTION

The exploration of traditional knowledge systems offers a profound insight into the intellectual and cultural heritage of India, where ancient texts serve as repositories of a multifaceted worldview. Among these, Śrīharṣa's *Naiṣadhīyacaritam* stands out as a significant literary work, blending elements of mythology, philosophy, literature, and applied sciences in a sophisticated manner. Written in Sanskrit, this epic narrative, revered for its narrative depth and poetic beauty, also embodies the richness of Indian scientific and technological thought, which was deeply intertwined with various facets of daily life, governance, medicine, astronomy, and more. In this context, the *Naiṣadhīyacaritam* not only narrates the story of King Nala and his trials but also encapsulates the applied sciences prevalent in ancient India, reflecting the seamless integration of knowledge across disciplines.

In this multidisciplinary exploration, we delve into how Śrīharṣa weaves practical knowledge and intellectual traditions into the narrative, underscoring the centrality of these sciences in the broader context of ancient Indian society. Śrīharṣa's narrative is rich with descriptions that transcend mere literary elegance, offering a complex portrayal of the scientific concepts that were advanced for their time. For instance, the work touches upon aspects of *Jyotiṣa* (astronomy), *Āyurveda* (medicine), *Vāstu Vidyā* (architecture), *Yantra Vidyā* (mechanical sciences), and military strategies, all within the fabric of the narrative. By closely analyzing these references, this paper seeks to elucidate how Śrīharṣa embedded practical scientific knowledge into his literary masterpiece, contributing to the intellectual tradition that formed the backbone of India's knowledge systems. In the sections that follow, this paper will explore Śrīharṣa's use of applied sciences in the *Naiṣadhīyacaritam*, offering a comprehensive analysis of how various domains of traditional knowledge were not isolated but were interconnected, contributing to the well-being and governance of society.

JYOTIṢA ŚĀSTRAM (ASTROLOGY) IN THE NAIṢADHĪYACARITAM

The science of astrology, which deals with the positions and movements of planets and stars, is referred to as “*jyotiṣa sūryādi grahāṇām bodhakaṃ śāstram*”, meaning the scripture that reveals knowledge about the Sun, planets, and time. Among the six *Vedāṅgas Śikṣā, Kalpa, Vyākaraṇa, Nirukta, Chanda*, and *Jyotiṣa* astrology is likened to the eyes of the Vedic person.¹ The importance of this profound science is also evidenced in the works of great poets. For

instance, Āsvaghoṣa mentions *nakṣatras* in the context of the birth of the Buddha in *Buddhacarita*.² Similarly, Kālidāsa, in *Raghuvamśa*, discusses the exalted planets during Raghu's birth and, in *Abhijñānaśākuntalam*, describes the *nakṣatras* during the *asura* war.³ Furthermore; Śrīharṣa incorporates astrological details in *Naiṣadhyācaritam*, such as in the Haṃsa-Damayantī dialogue, wedding processions, and Nala-Damayantī's marriage scenes.

In astrology, planets are categorized as auspicious (*śubha*) or inauspicious (*pāpa*). The waning Moon, Sun, Mars, Rāhu, Śani, and Ketu are considered inauspicious (*pāpagraha*), whereas Budha becomes inauspicious when associated with any of these planets. The remaining planets Budha, Brhaspati, Śukra, and the full Moon are considered auspicious (*saumya*). Mars, Śani, the Sun, and Rāhu are inherently malefic, while Budha, Brhaspati, Śukra, and the Moon are benefic. Śrīharṣa, in the 17th canto of *Naiṣadha*, describes *pāpagrahas*, stating that just as the *pāpagraha* Rāhu, due to eclipse *yoga*, tarnishes the spotless Moon, similarly, Kali arrived to destroy the sinless kingdom of Niṣadha.⁴

In *Jyotiṣa*, *tithis* also hold exceptional importance. *Tithis* are fifteen in number, ranging from *Pratipadā* to *Pūrṇimā* in the *Śuklapakṣa* and *Amāvasyā* in the *Kṛṣṇapakṣa*. Śrīharṣa refers to *Pratipadā tithi* as an *anadhya* (unsuitable for study), illustrating its significance with the tale of the king of Avantī, whose countless offenses did not provoke harsh words from the women in his kingdom because the crescent moon (*Pratipadā's candrakalā*) on Śiva's forehead remained ever-present in Ujjayinī.⁵

While describing the *Dvitiyā tithi*, Śrīharṣa compares the waxing crescent Moon (*Dvitiyā*) to a yearning lotus, removed from its radiance by the destiny-bearing *Śibikāvāhaka* who led Damayantī away from her union with king Nala.⁶ *Caturdaśī tithi* is associated with attaining invisible achievements, as Śrīharṣa portrays Damayantī as superior to the thirteen Mahādevīs, likening her to the form of *Caturdaśī* itself.⁷

Pūrṇimā tithi is extolled frequently in *Naiṣadha*. The gleaming palaces of Kuṇḍinapura reflected the surrounding earth and sky, illuminated by the full Moon of *Pūrṇimā*, making it seem as though the night itself was an honored guest.⁸ During *Śuklapakṣa*, the brightness of the Moon gradually increases; after one week, it becomes half-illuminated, and after another week, when the Moon is 180° away from the Sun, it reaches fullness. This alignment of the Sun, Earth, and Moon, with the Earth positioned between the Sun and the Moon, signifies *Pūrṇimā* or *Paurṇamāsī*. At this time, the Moon rises on the eastern horizon precisely at sunset. Śrīharṣa highlights the Moon's phases in describing both the *Malayādhīpati* and the twilight scenes of Nala and Damayantī.⁹

Amāvasyā tithi is equally significant in astrology. The day the Moon conjoins with the Sun, is known as *Amāvasyā*. Śrīharṣa refers to *Amāvasyā* as *Kuhū*, a term used in the Haṃsa-Damayantī dialogue. Damayantī, inquiring into the cause of her suffering, wonders whether the Moon, which derives coolness from the Sun during each month's *Amāvasyā*, returns with heat to torment her. She questions whether the Moon, which inherently possesses coolness, might have absorbed extreme heat from the Sun to intensify her anguish.¹⁰

A lunar month is divided into two phases, known as *Śukla Pakṣa* (waxing phase) and *Kṛṣṇa Pakṣa* (waning phase). The *Śukla Pakṣa* is dedicated to the gods, while the *Kṛṣṇa Pakṣa* is associated with the ancestors. From *Pratipadā* (first lunar day) to *Paurṇamāsī* (full moon), the *Śukla Pakṣa* occurs, and from *Pratipadā* to *Amāvasyā* (new moon), the *Kṛṣṇa Pakṣa* takes place. On *Amāvasyā*, the Moon aligns between the Earth and the Sun, rendering the side facing the Sun invisible from Earth. On this day, the Moon rises and sets alongside the Sun. Śrīharṣa also refers to this phenomenon when Damayantī describes King Nala's face as a full moon:

*rājā dvijānām anumāsabhinnāḥ pūrṇā tanūkr̥tya tanuṃ tapobhiḥ /
kuhūṣa dr̥śyetaratām kimetya sāyujyam āpnoti bhavanmukhasya //*¹¹

According to the principles of *Jyotiṣa Śāstra* (astronomy), the Moon shines by reflecting the Sun's rays. This concept is elucidated by Śrīharṣa when he narrates that upon Nala's arrival in Kuṇḍinapura, it was akin to the Moon being illuminated by the Sun's rays. As Śrīharṣa describes:

*rathādasau sārathinā sanāthād rājāvatīryāśu puram viveśa /
nirgatya bimbād iva bhānavīyāt saudhākaram maṇḍalam aṃśusaṃghaḥ //*¹²

Stars hold a significant place in the field of astronomy. There are 27 *Nakṣatras* (lunar mansions): Āśvinī, Bharanī, Kṛttikā, Rohiṇī, Mṛgaśīrā, Ārdrā, Punarvasu, Puṣya, Āśleṣā, Maghā, Pūrvaḥālguni, Uttarāḥālguni, Hasta, Citrā, Svātī, Viśākhā, Anurādhā, Jyēṣṭhā, Mūlā, Pūrvāṣādhā, Uttarāṣādhā, Abhijit, Śravaṇa, Dhaniṣṭhā, Śatabhiṣā, Pūrvabhādrapadā, Uttarabhādrapadā, and Revatī. Occasionally, Abhijit is included, bringing the count to 28, but traditionally, only 27 are considered primary. Scholars opine that the final phase of Uttarāṣādhā and the first four hours of Śravaṇa, constituting a total of 19 hours, form Abhijit *Nakṣatra*, which is often excluded from systems like *Halacakra*, *Kūrmacakra*, *Sarpākāra*, *Trināḍīcakra*, and *Khārjūra Cakra*. Śrīharṣa also acknowledges the prominence of the 27 *Nakṣatras*, stating: Atri Muni, the father of the Moon, had a single star (the Moon as a *Nakṣatra*, alternatively interpreted as the pupil of the eye). However, the Moon's prosperity surpassed even that of his father, as he was blessed with 27 *Nakṣatras* (symbolizing his consorts or stars). Thus, the Moon is deemed more fortunate than his father, Atri Muni.¹³

Śrīharṣa further depicts Damayantī amidst a constellation of stars, resembling a crescent moon.¹⁴ While describing Damayantī's beauty upon hearing of Nala from a swan, Śrīharṣa references Hasta *Nakṣatra*, stating:

*asamaye matir unmiṣati dhruvaṃ karagataiva gatā yadiyaṃ kuhūḥ /
punar upaiti nirudhya nivāsyate sakhi! mukhaṃ na vidhoḥ punarīkṣyate //*¹⁵

Referring to Mṛgaśīrā *Nakṣatra*, Nala lovingly remarks to Damayantī: "Beloved, where has the mark of the deer gone from your moon-like face? Perhaps it has fled to the celestial Mṛgaśīrā *Nakṣatra*, pierced by Cupid's arrow resembling a flower.¹⁶

THE RATNAŚĀSTRA (SCIENCE OF GEMS) IN NAIṢADHĪYACARITAM

Śrīharṣa has provided detailed information about the origin, locations, and qualities and defects of gems in various sections of his illustrious text, such as the fifth, twelfth, fifteenth, and nineteenth cantos. Śrīharṣa mentions a mountain named “Ratnagiri,”¹⁷ which was a treasure trove of gems. Due to the abundance of gems, it was also called “Rohāṇa Parvata.” Śrīharṣa portrays the king of Mithilā as being more generous than the kalpavṛkṣa (wish-fulfilling tree) and Ratnācala (the mountain of gems). He also refers to the Vaidūrya parvata (Rohāṇa Parvata),¹⁸ which was exceptionally hard, as gems are naturally tough. These gems are carved and polished to give them their superior shapes. The Sumeruparvat (Rohāṇa, Ratnācala, or Vaidūrya Parvata) is described in the *Naiṣadhīyacaritam* in the context of King Kīkaṭa.¹⁹ It was a mine of precious gems²⁰ and a repository of pearls (*muktāphala*). The jewels contained within it increased day by day.

Śrīharṣa, while describing the Vaidūrya parvata, notes that the vaidūrya gems grow more radiant with the rumbling of clouds. This concept is elaborated in the *Naiṣadhīyacaritam* during the description of *Malayādhirāja*. The verse reads:

*anena rājñārthiṣu durbhagīkṛto bhavandhanadhwāna jaratnameduraḥ /
tathā vidūrādriradūratām gamī yathā sa gāmī tava keli śailatām //*²¹

In his depiction of the king of Kāñcī, Śrīharṣa mentions the *sphaṭika maṇi* (crystal gem) and identifies Mount Kailāśa as its place of origin. The finest *sphaṭika* gem is recognized by its water-like transparency; however, it becomes invisible when submerged in water. In his portrayal of the Mithilā king, Śrīharṣa refers to the gem called “pearl” (*muktā*), emphasizing its white color and even mentioning the existence of elephant pearls (*gajamuktā*). The garland of pearls worn by Nala, described in the *Naiṣadha*, consisted of large, perfectly spherical, and immaculate pearls, whose sight was said to bring a cooling sensation to the eyes.²²

The Śrīharṣa describes the gem “*Māṇikyā*” (ruby) during the depiction of Damayanti's necklace (*māṇikyahāra*), portraying it as having an *aruṇa* (reddish) luster.²³ Among the four types of *Māṇikyā* Prathama Jātaka, Dvitiya Jātaka, Saugandhika, and Kuruvinda the poet likens Damayanti's teeth (due to excessive betel nut chewing) to the radiance of the Kuruvinda *Māṇikyā*,²⁴ indicating that Kuruvinda *Māṇikyā* is red in color. Śrīharṣa states that gems are like mirrors and can reflect one's image.²⁵ Additionally, Śrīharṣa mentions that the origin of the Padmarāga *Maṇi* and all red-colored gems is Udayagiri (Udayācala) mountain.²⁶

A garland of Cintāmaṇi (wish-fulfilling gems), which could fulfill all desires, was gifted by Bhīma (obtained from Śiva) as dowry to his son-in-law Nala. The reflections of all items gems, ornaments, garments, etc. presented as dowry to Nala were visible on this garland, making it appear as though the desire-fulfilling garland itself carried all these items within.²⁷ Clearly, the Cintāmaṇi is also transparent.

The *Naiṣadha* also provides a description of emerald (*harinmaṇi*). Bhīma offered a plate made of emerald (*harinmaṇi*), gifted by Maya, to King Nala. This plate was known to neutralize the effects of poison. Śrīharṣa remarks that the green radiance emanating from it explains why peacocks, who always adorn themselves with green feathers, are unaffected by snake venom.²⁸ This shows that the emerald gem is transparent and emits a radiant glow over great distances. Śrīharṣa reinforces this in the wedding feast episode, where food served in emerald plates caused a delusion among guests they thought the plates contained only green leaves or were filled with leafy vegetables, due to the intense green radiance.²⁹

In the description of Damayanti's physical beauty, the Śrīharṣa also refers to the gem Pukhraj (*Puṣparāja*, *Puṣparāga*, or topaz). Śrīharṣa states that the radiance of gems like yellow (Pukhraj), white (*Sphaṭika* or pearls), red (*Māṇikyā*), and blue (*Nilama*) on Bhīmakumārī's body made her anointing with *Gorocana*, *Candana*, *Kunkuma*, and *Kastūri* seem unnecessary. He also mentions the *Gārutma Maṇi* (*aruṇavarṇa*), referenced in the nineteenth canto during the description of the bards awakening Nala.³⁰

While describing the sanctum of Nala's palace, Śrīharṣa mentions a floor inlaid with various gems, including Candrakānta (*dhavalavarṇa*) and Nilama. Śrīharṣa's accounts of Nala's crown, sanctum, and royal palace, as well as the royal palace of Vidarbhi, highlight the presence of numerous gems such as *Māṇikyā*, *Sphaṭika*, *Kaustubha*, *Padmarāga*, and *Vaijayanṭi Maṇi*. He describes Kailāśa mountain as a repository of *Sphaṭika Maṇis* and refers to a sapphire named Śāśaka (also called *Sūryakānta Maṇi*). Furthermore, Śrīharṣa describes the ocean (*Kṣīrasāgara*) as a treasure trove of gems in the *Naiṣadha Mahākāvya*.

While elaborating on the gems, the Śrīharṣa also notes their flaws and indicates that gems can be either genuine or artificial. He mentions that artificial gems often shine brighter than natural ones. In one episode, Damayanti's brother, Dama, to amuse the wedding guests, presented one pure and beautiful gem alongside an artificial gem that looked even more brilliant. He then invited a guest to choose between them. When the guest picked the more radiant artificial gem, Prince Dama, laughing, gave him both gems.³¹

From this discourse on gems, it is evident that even in the twelfth century; knowledge about gems was widespread, whether they were used as ornaments or for astrological purposes. Their relevance persists even today, as seen in their use by men and women for achieving goals or enhancing beauty. The practice of wearing gems by people in everyday life confirms their enduring significance and appropriateness.

ŚAKUNA ŚĀSTRA (SCIENCE OF OMENS) IN NAIṢADHĪYACARITAM

If we evaluate the philosophy of human life accurately, it becomes evident that human life resembles an unsolved puzzle. The human heart seems to be a playground for desires and thoughts and an abode for aspirations and the longing for life. The world is essentially a manifestation and expansion of these wishes and hopes. Those who are carried into the river of despair by these desires cannot truly be considered worldly beings, as the perpetual glow of

human longing continuously fills them with an almost ambrosial delight. *Śakuna* (omens) can be regarded as the speculative thoughts of humanity, deeply rooted in the human mind. References to them are found in texts like the *Rāmāyaṇa*, *Mahābhārata*, *Yājñavalkyasmṛti*, *Agnipurāṇa*, and the works of poets such as Mahākavi Kālidāsa, Māgha, and Śrīharṣa. Their continued relevance in contemporary times further validates their significance. Scholars have recognized *Śakuna Śāstra* (Science of Omens) as part of the *Samhitā* branch of *Jyotiṣa* (astrology). However, its detailed discussion here is due to its exceptional popularity in modern times.

Śakuna refers to auspicious (or inauspicious) signs or indicators that provide information about the success or failure of an endeavor. Clearly, *Śakuna Śāstra* is the study that analyzes such omens. It is also referred to as The Science of Omens. The *Viśvakosha* states:

“*śakunaṃ tu śubhāśaṃsā nirmite śakunaḥ pumān.*”

The *Agnipurāṇa* mentions six types of *śakunas*. In the *Naiṣadhīyacarita*, Śrīharṣa describes *śakuna* in the context of Indra appointing Nala as his messenger for arranging Damayantī's *svayambara*. Indra says: “O Nala! Like Bharata (son of Duṣyanta), Arjuna (Sahasrārjuna), and Vainya (King Pṛthu), remembering your name grants success to travelers. If you doubt the success of your mission, it would render all auspicious signs ineffective.” Here, Indra implies that the mere recollection of names like Bharata during a journey leads to the fulfillment of one's purpose. Therefore, as an embodiment of auspiciousness, your mission cannot fail; otherwise, these auspicious signs would lose their significance for others. It is also said that one who remembers the names of Bharata, Arjuna, Pṛthu, and Nala before embarking on a journey achieves success and returns home safely.³²

Śrīharṣa notes that in the *Naiṣadhīyacarita*, auspicious *śakunas* are shown to include the sight of certain birds, such as cranes, which were visible to swans. Conversely, tigers and snakes, considered inauspicious, are described as hidden among branches. *Śakuna* experts can also interpret omens based on bodily sensations like twitching. In Indian culture, twitching on the right side of a man's body and the left side of a woman's body is deemed auspicious, while the reverse is considered inauspicious. For instance, if a man's right eye or a woman's left eye twitches before a journey or an important task, it is believed that the *śakuna* is favorable, and the task will be successful. This concept is also emphasized in the *Naiṣadhīyacarita*. When Nala entered Kuṇḍinapurī as a divine messenger, his body showed signs of auspicious omens:

*svidyatpramodośrulavena vāmaṃ romāñcabhṛtpakṣmabhir asya cakṣuḥ /
anyat punaḥ kampam api spharatvāt tasyāḥ puraḥ prāpa navopabhogam //*³³

Here, Śrīharṣa appears influenced by the depiction in Kālidāsa's *Abhijñānaśākuntalam*.³⁴ Although Nala was a messenger, Śrīharṣa's extraordinary description hints at Nala's future union with an ideal wife. In the *svayambara* episode, King Bhīma faced the challenge of introducing the assembled kings to Damayantī. To solve this, Bhīma meditated with unwavering focus on his family deity, Bhagavān Cakrapāṇi.³⁵ This tradition of invoking one's deity before a journey or task persists in Indian culture today, signifying a form of *śakuna*. After King Bhīma's invocation, Goddess Sarasvatī ensured that the kings' arrival was marked by auspicious omens, and King Bhīma honored them like guardians of the world. This demonstrates that meeting someone accompanied by favorable omens often indicates that the individual will bring good fortune.

Śrīharṣa also describes auspicious objects like ceremonial pots (*maṅgalakalaśa*), mirrors, scattered grains of rice (*lāja*), fruits, and flowers as *śakunas* in the context of Nala's marriage procession. He narrates how Nala, as the groom, was greeted with auspicious items like yogurt, rice, and water-filled pots while approaching King Bhīma's palace.³⁶ This tradition continues in Indian culture, confirming the relevance of *śakunas* even today. From the above descriptions, it becomes evident that Śrīharṣa was well-versed in *Śakuna Śāstra*.

SĀMUDRIKA ŚĀSTRA IN NAIṢADHĪYACARITAM

Sāmudrika Śāstra is the science that interprets auspicious or inauspicious results by examining the body parts, sub-parts, and the signs or features present on a person's body. Through its study, an individual can assess their personality and gain a limited understanding of their future. The descriptions of *Sāmudrika Śāstra* are found in the *Rāmāyaṇa*, *Mahābhārata*, *Agnipurāṇa*, *Aṅgavijjā*, and *Bṛhatsamhitā*, as well as in the celebrated works of Bāṇa, Śūdraka, Daṇḍin, and the great poet Kālidāsa. Even today, the study of palmistry (a component of this discipline) among the masses demonstrates the ancient origins and relevance of this subject. Śrīharṣa, the author of *Naiṣadhīyacaritam*, also validated the significance of *Sāmudrika Śāstra* by incorporating its principles to underline its relevance in daily life. He elaborated on the *Sāmudrika* belief that “a beautiful form houses beautiful qualities.” He illustrated this principle by comparing a swan (*haṃsa*) to this tenet, where King Nala praises the swan by saying: “O swan! Your form is incomparable, and your virtues are beyond description. The secret of *Sāmudrika Śāstra* is that wherever there is a beautiful form, there reside beautiful qualities, and you are the best example of this.”³⁷

Through the knowledge of *Sāmudrika Śāstra*, a map of the personality of both men and women can be created by analyzing their bodily features. Śrīharṣa, in his description of various men such as King Nala and other monarchs, as well as various women like Damayantī, Sarasvatī, and her companions, discusses their physical attributes in *Naiṣadhīya*. For instance, he mentions that King Nala's hair was black, more beautiful and lively (curly) than the tail hair of a camari cow:

*svabālabhārasya taduttamāṅgajaiḥ samaṃ camaryeva tulābhilāṣiṇaḥ /
anāgase śamsati bālacāpalaṃ punaḥ punaḥ puccha vilolanacchalāt //*³⁸

In the *Agnipurāṇa*, it is stated that the hair of an ideal man should be black. According to *Sāmudrika Śāstra*, a person whose soles are marked with upward lines is destined to occupy the highest positions. This belief is expressed as: “*ūrdhva rekhāṅkitapadaḥ sarvotkarṣaṃ bhajet pumān iti sāmudrikāḥ*” Śrīharṣa supports this notion, stating that

Brahmā, foreseeing King Nala's eminence and the adornment of his lotus-like feet with the crowns of the entire world's rulers, marked his soles with upward lines. Considering this, Brahmā preordained the upward markings on Nala's feet to symbolize his destined greatness.³⁹

In the description of the beauty of Damayantī and Sarasvatī, Śrīharṣa references the features of women as prescribed in *Sāmudrika Śāstra*. Regarding Damayantī, Śrīharṣa writes that the maiden, with her resplendent charm, surpassed the grace of the beauties of the three worlds. Hence, she was named Damayantī. Her radiance eclipsed the allure of the celestial maidens, and thus, she was named Damayantī.⁴⁰

A woman's navel, according to *Sāmudrika Śāstra*, should be deep and delightful, resembling a whirlpool of water. Her hands, marked with lotus-like lines, are considered auspicious. Sarasvatī's hands bore marks of a fish and a lotus. Describing her beauty, Śrīharṣa writes:

*sapallavaṃ vyāsaparāśarābhyāṃ prañītabhāvādubhayībhaveṣṇu /
tanmatsyapadmamādyupalakṣyamāṇaṃ yatpāṇiyugmaṃ vavṛte purāṇam //*⁴¹

The private parts (*yoni*) of women, in *Sāmudrika Śāstra*, are deemed ideal if they resemble the shape of a pīpala tree leaf. Supporting this view, Śrīharṣa states:

*aṅgena kenāpi vijetumasyā gaveṣyate kiñcalapatrapatram /
no cedviśeṣāditaracchadebhyastasyāstu kampastu kuto bhayen //*⁴²

The eyebrows of women, according to *Sāmudrika Śāstra*, should not meet in the center. Damayantī's eyebrows also adhered to this standard. Śrīharṣa describes her beauty as follows:

*ayodhi tadvairyamanobhavābhyāṃ tāmeva bhaimīmavalambya bhūmīm /
āha sma yatra smaracāpamantaśchinnaṃ bhuvau tajjayabhaṅgavārtām //*⁴³

PĀKAŚĀSTRA (CULINARY SCIENCE) IN NAIṢADHĪYACARITAM

The process of preparing or cooking food is referred to as *pāka* (action). The comprehensive knowledge of methods by which dishes can be prepared to become delectable falls under the domain of *Pākaśāstra* (the science of cooking). In Vedic texts, the process of cooking *puroḍāśa* is explicitly documented, which suggests that the origin of *Pākaśāstra* can be traced back to the Vedic period. Furthermore, references available in *Manusmṛti*, *Mahābhārata*, and *Bhāgavata Purāṇa* also provide indications of the prevalence of this knowledge. The presiding deity of culinary activities is Agni (fire). Agni is addressed by the term *sūpāyana*.⁴⁴ Hence, the act of cooking may also be termed *sūpa* (action). Śrīharṣa, in the fourteenth canto of the *Naiṣadhīyacarita*, narrates an incident during the *svayaṃbara* of Nala and Damayantī, where the gods, pleased with the worship, grant various boons to the couple. This account includes references to culinary science. In the sixteenth canto of the *Naiṣadhīyacarita*, the poet describes the variety of dishes and their exquisite flavors, demonstrating a profound knowledge of *Pākaśāstra*.⁴⁵ From all the above descriptions; it becomes evident that both Nala and Śrīharṣa were well-versed in the science of cooking.

AŚVAŚĀSTRA (THE SCIENCE OF HORSES) IN NAIṢADHĪYACARITAM

The science of horses, or *aśvaśāstra*, encompasses comprehensive knowledge regarding the color, breed, height, and stature of a horse, as well as the structure of its neck, tail, and hooves, its sounds, defects, virtues, and the diagnosis of its ailments. The *Śrīharṣa* provides detailed descriptions related to *aśvaśāstra* in the *Naiṣadha*, offering insights into both his own expertise and that of Nala in this discipline.⁴⁶ In the references available in the *Naiṣadhīyacarita*, characteristics of an excellent horse are also elaborated. In the first canto, when King Nala, overcome by the pangs of love, wishes to go to the garden, the attendants bring forth a magnificent white horse. This horse, constantly scraping the ground of the stable with its restless hooves, possessed speed surpassing strength, a stature exceeding that of ordinary men, and was adorned with exceptional embellishments. Its neck bore a celestial jewel (*devamaṇi*), and its middle throat region was adorned with shining, crescent-like white hair. It trod the earth incessantly, its lips restless yet silent, as if aware that this king (Nala) understood its intentions.⁴⁷

It is evident that the finest horseman is one who can discern and comprehend the expressions and unspoken gestures of a horse. Clearly, Nala must have been well-versed in *aśvaśāstra* to have mastered the art of horse management. Through such vivid descriptions, the *Śrīharṣa* himself is also revealed as an expert in the intricacies of *aśvaśāstra*.

MANTRA-ŚĀSTRA IN NAIṢADHĪYACARITAM

In the *Naiṣadhīyacaritam*, Śrīharṣa has presented references to *mantra-śāstra* in various contexts. In the nineteenth canto of this *mahākāvya*, while describing the efforts of the *vaitālika* singers to awaken King Nala, Śrīharṣa alludes to the story of *Daitya-guru Śukrācārya's mṛtasañjīvanī vidyā*. This esoteric science, a part of *tantra-vidyā*, is famously known for its ability to revive the dead.⁴⁸

Describing Damayantī as possessing mastery in *mantra-siddha vidyā*, Śrīharṣa also references the *tāraka mantra* during the depiction of the King of Kāśī. In this context, Damayantī narrates to the King of Kāśī that Lord Śiva imparts the supreme *tāraka mantra* to beings who relinquish their bodies in Vārāṇasī. This mantra enables the soul to attain *sāyujya mukti*, merging into Śiva's form.⁴⁹

These references underscore Śrīharṣa's keen interest in *tantra-mantra-śāstra* and also affirm the relevance and prevalence of these sciences in the twelfth century.

ĀYUDHAŚĀSTRA (SCIENCE OF WEAPONS) IN NAIṢADHĪYACARITAM

In the *Naiṣadha Mahākāvya*, Śrīharṣa has also referred to facts related to *Ayudhaśāstra* in the context of describing kings and the valor of Nala, where, alongside the kings, the expertise of Nala in weaponry is evident.⁵⁰ Under the category of *Śāstrāyudha* (weaponry), the *Śrīharṣa* mentions the *kṛpāṇa* (sword). He states that the warriors of Nala, through their skill in combat, would slay enemies with the strikes of their swords, and Nala's fame spread to

the farthest corners of the world.⁵¹ The submarines used in modern warfare can, in a general sense, be compared with the water instruments described by Śrīharṣa. Additionally, the chariots mentioned in the text can be compared to military trucks, jeeps, and aircraft (like *Puṣpaka*), which can have a partial resemblance to the modern airplanes or jet fighters such as Jaguar, MiG-15, Mirage-2000, and Sukhoi.⁵² The description of *malla-yuddha* (wrestling combat) prevalent in ancient times has also been included by Śrīharṣa in the *Naiṣadha Mahākāvya*.⁵³ The reference to the naval army by the Śrīharṣa is still relevant today.⁵⁴ The description of the *hasti-senā* (elephant army)⁵⁵ and *aśva-senā* (horse army)⁵⁶ by the Śrīharṣa was valid up to the ancient and medieval periods. However, in contemporary times, elephants are now limited to processions and decorative uses, whereas horses (*aśva-senā*) are still partly used by the police forces, showing that the practical relevance and partial equivalence of *aśva-senā* can still be seen in modern life.

ĀYURVEDIC SCIENCE OR THE SCIENCE OF MEDICINE IN NAIṢADHĪYACARITAM

In *Naishadhīyacaritam* Śrīharṣa has presented certain references to *Āyurveda*, which are to be observed in the context of Nala's state of sexual distress, Damayantī's feverish condition, descriptions of kings, and the mention of *Sandhyā* by Nala and Damayantī. Śrīharṣa, having acknowledged the Aśvinīkumāras as the celestial physicians of *Āyurveda*, did not forget to mention the names of Caraka and Suśruta.⁵⁷ Śrīharṣa has even depicted the Aśvinīkumāras as physicians who can rejoin severed heads, as indicated by the words of Damayantī. As follows:

*smarasakhau rucibhiḥ smaravairiṇā makhamṛgasya yathā dalitaṃ śiraḥ /
sapadi sandadhaturbhiṣajau divaḥ sakhi ! tathātamaso'pi karotu kaḥ //*⁵⁸

In the *Naiṣadha Mahākāvya*, the description of “infectious diseases” can be observed in the third canto, in the context of Nala's condition of sexual distress. The indication of *pāṇḍu* disease (jaundice or *Kāmala* or Icterus) is found in the fourth canto of *Naiṣadha*, where Damayantī, while reproaching Kāmadeva, says that the worship (or shelter) of you (Kāmadeva) brings about blindness, weakness (in the form of untimely death), and *pāṇḍutā* (in the form of *pāṇḍu* disease), while worship of the Sun god alleviates all these ailments. As follows:

*ṛgapahatyapamṛtyuvirūpatāḥ śamayate paranirjarasevitā /
atiśayāndhyavapuḥ kṣatipāṇḍutāḥ smara ! bhavanti bhavantamupāsitaḥ //*⁵⁹

Śrīharṣa has described the medicinal herb *Samjīvanī* in the twenty-first canto in the context of Nala's worship of the deities.⁶⁰

RASĀYANA ŚĀSTRA (CHEMISTRY) IN NAIṢADHĪYACARITAM

Some elements related to Chemistry are described in the *Naiṣadhīyacaritam*. The description of rock salt, as a result of the combination of various chemicals, is also provided by the author of *Naiṣadhīyacaritam* in the nineteenth canto, during the praise of Nala by the bards.⁶¹ The removal of stains or marks from clothes, etc., is only possible with the help of chemicals. A reference to this fact is also found in *Naiṣadhīyacaritam* in the context of Nala's description of evening, where Nala tells Damayantī: “*Kṛśodari*, look, the night, in the form of a washerwoman, has removed the stain of darkness (*kājala*) from the garment of the sky with the milk-like stream of moonlight in a moment.”⁶² The mention of Touchstone, used to test the metal known as gold, is also referenced in the context of the evening description, as given by Śrīharṣa.⁶³

PRĀṆISĀSTRA ANIMAL SCIENCE IN NAIṢADHĪYACARITAM

In the *Naiṣadhīyacaritam*, Śrīharṣa has described several living beings, including animals, birds, and aquatic creatures, related to the science of life (*prāṇisāstra*). In his work, Śrīharṣa mentions the 'Cakora' (*Chātaka*) bird, which, according to Kāmandaka, serves as a poison tester.⁶⁴ He also describes the *Cakravāka* pair of birds as the knowers of the mysteries of *kāmaśāstra* (science of love), explaining how these birds live separately at night and together during the day.⁶⁵ In the case of serpents, Śrīharṣa provides a detailed description of the thousand-headed *Śeṣanāga*, clarifying that the snake's eyes function as ears, meaning that snakes hear through their eyes as they lack actual ears; therefore, they are also called *caṣuśrava* (having eyes as ears). He further mentions that the hiss of a serpent is a high-pitched sound.⁶⁶ The Wagtail bird (*Khajjana*) is mentioned in the description of Damayantī's eyes, which is worth noting.⁶⁷ In the context of the praise of Nala by the *Cāraṇas*, Śrīharṣa describes the *Ulūka* (owl), mentioning that it cannot see during the day, as its eyes are small and unattractive.⁶⁸ Śrīharṣa also provides a complete description of the *Aśva* (horse). From this analysis of *prāṇisāstra* in the *Naiṣadhamahākāvya*, it is evident that Śrīharṣa focused primarily on the literary descriptions of various animals and birds.

BHAUTIKA ŚĀSTRA (PHYSICS) IN NAIṢADHĪYACARITAM

Some points related to the science of physics are also explored by the poet of *Naiṣadhīyacaritam*. In the twenty-second canto, during the conversation between Nala and Damayanti about the description of twilight, Damayanti tells Nala, “Dear (Lord)! When looking at distant red and blue objects, only blue appear visible. According to this principle, even the red color of the distant moon's rabbit's back is appearing black to us.”⁶⁹ The poet's above description is related to the scattering of light principle in physics.

The principle of sound in physics is reflected in Nala's statement, where he tells Damayanti, “Beloved! The sweet sound of your song travels as far as the night does, but it does not reach so far in the day, because at night, the moon's (*Sudhāṇśu's*) nectar rays strengthen it, and it receives the coolness of the forest of darkness. During the day, due to the heat (sunlight) and sweat, even walking a short distance becomes difficult. Nevertheless, the moon has tasted the highest sweetness of your song, and therefore, despite the nectar-like rays, it has become indifferent and, disregarding them, is letting them fall down.”⁷⁰ According to the principles of physics, sound does not travel far during the day because there are various obstructive elements in its path, whereas at night, the stillness of the environment and the increase in moisture enhance the velocity of sound, which is why travels farther sound or is heard farther at night.

GAṆITA ŚĀSTRA (MATHEMATICS) IN NAIṢADHĪYACARITAM

In the *Naiṣadha Mahākāvya*, a subtle reference to the facts of mathematics can be found. This discipline generally includes three subjects: arithmetic, algebra, and geometry. The poet of *Naiṣadha* has specifically pointed out the principles of arithmetic in his work, the *Naiṣadhīyacaritam*, and has acknowledged them in an authoritative form.⁷¹

In *Naiṣadha*, the details of the mathematical principles compiled under this science are alluded to in the words of the heroine Damayantī, where she says that in mathematics, the period of time of human beings, gods, and Brahmā is constructed in such a way that the moment of one is equivalent to the era of another. In the same way, why cannot the period of separation be made equal to the moment of union?⁷²

Śrīharṣa mentions in the context of the wedding feast that during the time, the use of fingers for calculations was also prevalent, a practice that is still observable in contemporary life.⁷³ Another mathematical principle, *bhāṇḍapratibhāṇḍa* (exchange or substitution), is hinted at in the twentieth canto of the *Naiṣadha Mahākāvya*, where the friend of Damayantī, Kalā, mentions the humorous incident involving Damayantī herself.⁷⁴ Śrīharṣa also highlighted the significant role of zero in mathematics and deemed the term '*bindu*' (dot) as appropriate for it, representing a round shape.⁷⁵

RĀJANĪTI-ŚĀSTRA (POLITICAL SCIENCE) IN NAIṢADHĪYACARITAM

Some fundamental principles of political science are also found in the *Naiṣadha-Mahākāvya*. In a general sense, the policies adopted by kings are called politics, wherein the king governs his state through various methods such as *sāma* (conciliation), *dāma* (gift), *daṇḍa* (punishment), *bheda* (division), etc. A king who rules by adopting *śāstras* (scriptural) methods is considered the best ruler. Śrīharṣa, while contemplating this fact, writes that Nala, born from the portion of Indra and other *digpālas* (guardians of the directions) and thus the lord of the directions, through his self-discipline or the power to suppress *kāma* (desire), incarnated as Lord Śiva with three eyes, embodying the *trinetra* (three-eyed) form.⁷⁶

The reference to *yuddha-nīti* (military strategy), which is an essential part of a state's or a king's sovereignty, is also indicated by the *Naiṣadhakāvya* in the context of Nala's description of Damayantī's beauty. The author's point is that it is not appropriate for powerful states to invade a weaker one, even if the latter has formidable, dense jungles, mountains, and rugged terrain.⁷⁷

The fourfold policies of *sāma*, *dāma*, *daṇḍa*, *bheda* are of utmost importance in political science. These are extensively discussed in *Manusmṛiti* and *Agnipurāṇa*.⁷⁸ Śrīharṣa also portrays the *haṁsa* (swan) as a politician who, relying on the strategy of *sāmā* (conciliation), praises Nala's virtues before Damayantī, encouraging her to choose Nala as her partner.⁷⁹

Śrīharṣa also points out another aspect of politics, "The enemy of my enemy is my friend," in the context of the Kānci king's episode.⁸⁰ From the above details related to political science, it can be concluded that political science was relevant in ancient (during Nala's time) and medieval society and continues to be relevant today.

ŚILPAŚĀSTRA AND VĀSTUŚĀSTRA (SCIENCE OF SCULPTURE AND ARCHITECTURE) IN NAIṢADHĪYACARITAM

The author of *Naiṣadha* has also mentioned *śilpaśāstra* (the science of sculpture) in the text. In the context of *śilpaśāstra*, there is a discussion regarding the application of *aṅgarāga* (cosmetic preparations) for beautifying women and men. The author of *Naiṣadha* has provided an extensive description of this. In the *svayambara* of Damayantī, it is narrated in the tenth canto that all the kings adorned themselves and arrived at the assembly hall. The kings, after consulting one another about their physical appearance and looking at their reflections in mirrors, would reapply their cosmetics. However, despite all their efforts, they continued to strive to match the beauty of Nala. Nala, by nature, was the very embodiment of beauty, and adorned with the finest ornaments like *kuṅkuma*, *candan* (sandalwood), and other *aṅgarāga* preparations, he entered the *svayambara* hall with respect.⁸¹

While describing the enhancement of a woman's beauty, Śrīharṣa writes that Damayantī appeared exceedingly beautiful due to the various ornaments and the fragrant unguents applied to her. Her beauty was further accentuated by her friends, who were skilled in the art of adornment. The effects of the *gorocana* (red ochre), *candan*, *kuṅkuma*, and *kastūrī* (musk) unguents were made evident as they enhanced the radiance of her jewels.⁸² The tradition of beautifying women was also confirmed by the words of King Bhīma, as seen in the following verse:

srjantu pāṇigrahamamgalocitā mṛgīdrśaḥ ! strīsamayasprśaḥ kriyāḥ /
*śrutismṛtīnām tu vayaṁ vidadhmahe vidhāniti smāha ca niryayau ca saḥ //*⁸³

From the above-mentioned facts, it is clear that Śrīharṣa was well-versed in *śilpaśāstra*. Additionally, it is evident from the text that Nala and Damayantī were also knowledgeable in various disciplines of *śilpaśāstra*. Therefore, an analysis of this science is found in *Naiṣadha*.

In *Naiṣadha*, the eminent poet Śrīharṣa demonstrated his expertise in *Vāstuśāstra* in the context of describing the palace of King Bhīma (situated in Kuṇḍinapura) and the palace of the *Niṣādādhirāja* Nala.⁸⁴ From the descriptions of the palace and the city of Kuṇḍinapura in the *Naiṣadhakāvya*, it is evident that Śrīharṣa possessed a comprehensive knowledge of the five primary principles of *Vāstuśāstra*. It is clear that both Nala and Śrīharṣa had knowledge of these principles, as Śrīharṣa specifically mentioned that Nala performed worship and rituals in a dedicated temple situated within his palace.⁸⁵

CONCLUSION:

Śrīharṣa's *Naiṣadhīyacaritam* exemplifies the profound integration of applied sciences within the framework of classical Sanskrit literature, reflecting the multidimensional intellectual landscape of ancient and medieval India. Through its vivid descriptions and allusions, the text offers insights into a wide range of traditional knowledge systems, including *Mantra-śāstra*, *Āyurveda*, *Āyudhaśāstra*, *Rasāyana-śāstra*, *Prāṇi-śāstra*, *Bhautika-śāstra*, *Gaṇita-śāstra*, *Rājanīti-śāstra*, *Śilpa-śāstra*, and *Vāstu-śāstra*. The depiction of esoteric sciences like *mṛtasañjīvanī vidyā* and the *tāraka mantra* demonstrates the significance of *Mantra-śāstra* in spiritual and philosophical contexts. Similarly, Śrīharṣa's references to weaponry, naval forces, and combat reveal an understanding of military sciences relevant to both ancient and contemporary warfare. The subtle observations of physical phenomena, such as light scattering and sound propagation, and the nuanced application of mathematical principles underscore the sophistication of natural and exact sciences in Śrīharṣa's era. Additionally, the poet's exploration of medicine and chemistry, through references to the *Aśvinikumāras*, infectious diseases, and chemical reactions, highlights the practical utility of traditional sciences in health and daily life. Descriptions of fauna, their unique characteristics, and their symbolic representations enrich the domain of animal science, while the principles of architecture and sculpture illustrate the aesthetic and functional considerations in urban planning and artistic expressions.

This interdisciplinary tapestry not only showcases Śrīharṣa's erudition but also reaffirms the relevance of these sciences in understanding historical, cultural, and intellectual paradigms. By bridging literary artistry and applied sciences, *Naiṣadhīyacaritam* serves as a testament to the holistic approach of classical Indian scholarship, where art and science coexist harmoniously to reflect a comprehensive worldview. Future research can further explore how these traditional knowledge systems inform modern scientific practices, emphasizing their enduring value in contemporary contexts. Through such studies, the wealth of wisdom preserved in texts like *Naiṣadhīyacaritam* can continue to inspire and contribute to global intellectual traditions.

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