



Scientific Thought in Epics

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DOI: <https://doi.org/10.51583/IJLTEMAS.2026.150800084>

Received: 14 September 2026; Accepted: 26 September 2026; Published: 16 September 2026

ABSTRACT

Tamil epics are not merely literary works that expound the principles of life such as virtue, wealth, love, and spiritual liberation; they also serve as repositories of knowledge that record the scientific thoughts of the ancient Tamils. In particular, epics such as Silappathikaram and Civaka Cintamani contain subtle references to concepts related to chemistry and astronomy. Observations concerning the natural properties of gems, the emission of light, the arrangement of celestial bodies, and the relationship between the Moon and Jupiter reveal the scientific perspective of the people of that period. This study aims to examine the scientific thoughts found in Tamil epics and to explain their relationship with modern scientific knowledge.

Keywords: Astronomy; Chemistry; Medicine; Engineering; Architecture; Maritime Technology; Shipbuilding; Navigation; Lighthouse; Urban Planning; Water Management; Theatre Architecture;

INTRODUCTION

Tamil literature constitutes a vast repository of knowledge encompassing all dimensions of human life. Like Sangam literature, Tamil epic literature has also recorded diverse scientific ideas related to social life, politics, economics, medicine, natural sciences, astronomy, chemistry, and other fields of knowledge. The ancient Tamils closely observed nature, examined its phenomena, and preserved their observations in literary form.

Epics such as Silappathikaram, Manimekalai, and Civaka Cintamani express scientific facts not merely in a direct manner, but also through similes, descriptions, and various events depicted in the narratives. When these ideas are examined in comparison with the developments of modern science, they reveal the keen scientific outlook and spirit of inquiry possessed by the ancient Tamils. Through Tamil literary works, it can be understood that the ancient Tamils reflected not only on love and valour but also on science and the natural world. The subtlety and depth of knowledge constitute the foundation of scientific thought, and such intellectual dimensions are also prominently manifested in Tamil epics.

Through the diverse forms of classical Tamil literature, one can clearly understand various dimensions of human life, including virtue, wealth, love, ways of living, art, culture, civilization, environmental preservation, and scientific thought. There is no doubt that the scientific ideas and principles widely dispersed throughout ancient Tamil literature have, in several respects, anticipated or served as precursors to developments in modern scientific discoveries. In this context, the objective of this article is to examine the extent to which scientific knowledge was developed and represented in Silappathikaram.

Definition of Science

The pursuit of scientific truth continues to advance day by day. However, no field of science has yet arrived at a final and absolute understanding of all truths. The quest for truth remains an ongoing process of investigation and discovery. This principle applies to various disciplines such as physics, chemistry, geology, and other branches of science.

Science is closely interwoven with human life, and language and literature communicate various forms of scientific knowledge associated with human experience. The ancient Tamils possessed the ability to stimulate their senses intellectually, observe the external natural world carefully, and examine its subtle phenomena. Through their keen powers of observation and dedicated efforts, they employed scientific knowledge to understand the nature and properties of various objects.

Poets are capable of expressing not only their imaginative creativity but also their observations of reality through their literary works. When we encounter the remarkable ideas and scientific insights recorded in Sangam literature, we are filled with a profound sense of wonder. The scientific concepts expressed by the Tamils, the objects they created, and the technologies they employed in producing them continue to astonish scholars even today.

Chemistry

Elements of chemical knowledge can be identified in Silappathikaram. Gems were given different names based on their distinctive properties, particularly their ability to emit or reflect light. Ilango Adigal states in the Ur Kaan Kaathai that the basic substance or origin of the different varieties of gems is essentially the same. He observes:

“The precious and beautiful gems, though of one common origin, possess five different forms of beauty and emit radiant rays of light.” (Silappathikaram, Ur Kaan Kaathai, 191–192)

The observations concerning the common material basis of gems may be viewed in relation to modern scientific attempts to understand their chemical composition. While modern scientists have identified the specific chemical constituents and structural characteristics of different mineral substances, Ilango Adigal had already drawn attention to the fundamental relationship among different varieties of gems. Thus, the observation recorded in Silappathikaram demonstrates an early attempt to understand the material nature and classification of gems.

Astronomy

Ancient Tamil literature also contains several observations relating to astronomy and natural phenomena. Purananuru refers to the existence of regions in the sky where there is an absence or scarcity of air through the expression, “வறிது நிலைஇய காயமும்” (Purananuru, Poem 20). Similarly, Pattinappalai describes the process by which water is taken up from the sea and subsequently falls upon the land as rain:

“The water drawn up by the sky falls upon the mountains as rain.”(Pattinappalai, 125)

These descriptions indicate that the ancient Tamils carefully observed atmospheric and natural phenomena. They also investigated the celestial bodies moving across the sky. References to planets and their positions can be found in Civaka Cintamani, composed by Tiruttakkatevar.

Describing Gandharvathathai, Tiruttakkatevar compares her face to the Moon and states that the kundalam (ear ornament) she wore resembled the planet Jupiter positioned near the Moon (Civaka Cintamani, 618). The identification of Jupiter as a planet located near the Moon reflects an interesting astronomical observation. Although modern astronomy established such celestial relationships through systematic scientific observation and calculation, Tiruttakkatevar had incorporated this observation into his literary work as early as the ninth century. These references from Tamil epics demonstrate that ancient Tamil poets possessed a keen interest in observing celestial bodies and natural phenomena and incorporated such observations into their literary imagination.

Astronomical Observations of the Sun and the Moon

The ancient Tamils observed and studied the Sun and the Moon with considerable interest. It is remarkable that their scientific understanding extended from the microscopic level of the atom to the vast dimensions of

the universe. Because sunlight travels a very long distance and interacts with the atmosphere, the shorter blue wavelengths are scattered in different directions. When the Sun approaches the horizon, particularly near the sea, atmospheric particles and salt-laden aerosols contribute to the reddish appearance of the Sun. During both sunrise and sunset, sunlight passes through a greater thickness of the atmosphere. Since much of the blue light is scattered away, the remaining light appears predominantly in shades of red, orange, and yellow. This phenomenon is poetically represented in the following verse from Chulamani:

**“Raising his radiant rays like a bow before his eyes,
the Sun, resting upon the hand of his rays,
grasped the tip of the branch of the earthly tree,
and gradually withdrew from sight, assuming another form.”** (Chulamani, 1026)

The verse presents the setting Sun through an evocative description of its rays and gradual disappearance from the visible sky.

Recognizing the Sun as the primary source of energy for the living world and the natural environment, Ilango Adigal celebrates it in Silappathikaram: **“Let us praise the Sun; let us praise the Sun!”** The apparent northward and southward movement of the Sun during the year is associated with the occurrence of seasonal changes. When the Sun appears to move towards the south, rainfall decreases and the cooler season begins. Ilango Adigal describes this phenomenon in Silappathikaram:

**“When the radiant orb of the Sun moves towards the south,
the season of white clouds and rain appears only rarely.”**

Similarly, Civaka Cintamani associates the northward movement of the Sun with the occurrence of subsequent seasons such as the post-monsoon cold season, early summer, and late summer:

**“The radiant Sun, moving across the spotless sky,
advances on its northern course.”**(Civaka Cintamani, 851)

Tamil literary works also contain references to solar and lunar eclipses. The solar eclipse is described through the imagery of a serpent obscuring the radiant Sun:

“He resembled the radiant orb whose light was obscured by a serpent from the destined direction.”(Civaka Cintamani, 1138)

Similarly, the lunar eclipse is described as resembling the Moon being joined or covered by a serpent:

“It resembled the Moon obscured by a serpent in the distant sky.”(Civaka Cintamani, 2461)

The apparent obscuration and alteration of the Sun during an eclipse are also poetically represented in Silappathikaram:

**“As the fierce-rayed king, the Sun, together with the lord of summer,
twists away from its own brilliance, its radiance gradually diminishes.”**

Furthermore, Civaka Cintamani records an interesting astronomical observation in its description of Gandharvathathai. Her face is compared to the Moon, while the kundalam (ear ornament) she wears is compared to Jupiter, which appears near the Moon. This literary comparison suggests that ancient Tamil poets were familiar with the relative appearance and positioning of celestial bodies in the night sky.

These literary references demonstrate that ancient Tamil scholars closely observed the Sun, Moon, planets, eclipses, seasons, rainfall, and other natural phenomena. Their scientific understanding was not merely theoretical; rather, it developed through direct observation and experience of the natural world surrounding them. The evidence found in Tamil literary works therefore reveals the remarkable observational and analytical abilities of the ancient Tamils and their attempt to understand natural phenomena through an early form of scientific thought.

Epics and Aeronautic

Epic poets, who had keenly observed that birds fly with the support of their wings and the movement of air, incorporated imaginative descriptions of aerial vehicles into their epics. Such vehicles are referred to through expressions such as Mayir Porri, Pushpaka Vimana, and Vaan Oorthi (aerial vehicle). These descriptions reveal the imaginative engagement of ancient Tamil literature with the idea of human flight.

In the Madurai Kanda of Silappathikaram, the hill-dwellers describe the scene in which Kannagi ascends into the sky in an aerial vehicle that descended before their eyes:

**“As an abundant shower of unfading flowers descended,
while the attendants of the king of the immortals came to praise her,
she ascended into the aerial vehicle
together with Kovalan, who had departed from the royal city.”** (Silappathikaram, 23.196–199)

The passage describes Kannagi ascending into an aerial vehicle in the presence of the celestial beings who came to honour her. The construction of an aerial vehicle is described in Civaka Cintamani:

**“Using several pieces of cloth and fine threads,
together with good-quality lacquer, wax, and other suitable materials,
he fashioned a magnificent peacock-like craft
capable of travelling through the air for seven days.”** (Civaka Cintamani, 235)

The passage describes a craftsman constructing a large peacock-shaped aerial vehicle using several pieces of cloth, fine threads, high-quality lacquer, wax, and other suitable materials, with the claim that it could travel through the air for several days. The description reflects an imaginative conception of the materials, structure, and functioning of an aerial craft.

Similarly, the Udayana Kumara Kaviyam records that Udayana travelled through the sky using a chariot. Kamba Ramayanam also contains a description in which Rama and Lakshmana, while searching for Sita, observe the wheel marks of an aerial vehicle. These literary references indicate that the idea of aerial travel had a significant place in Tamil epic imagination. The ancient Tamils did not merely observe the celestial bodies moving across the sky; they also imagined and explored possible means of travelling through the air. Purananuru refers to an aerial vehicle in the expression:

“An aerial vehicle that moves without being driven by a charioteer.”(Purananuru, 27)

Civaka Cintamani also refers to the movement of a person through the air using a Mayir Porri. The epic Manimekalai describes Manimekalai travelling through the sky and reaching different lands. Kambhar, in particular, presents an interesting conception concerning the mechanism of aerial travel.

In the Jatayu episode of Kamba Ramayanam, Rama and Lakshmana travel in search of Sita. They observe wheel marks on the ground and follow them. After travelling for some distance, the marks suddenly

disappear. They then speculate with sorrow that the aerial vehicle may have risen into the sky (Jatayu Uyir Neetha Padalam, 23).

This description is particularly noteworthy because it presents the idea that an aerial vehicle might initially travel along the ground for a short distance before ascending into the air. Although expressed within a literary and imaginative framework, such descriptions demonstrate the ancient Tamil poets' attempts to conceptualize the principles and mechanisms of flight.

Thus, Tamil literature and epics contain numerous imaginative concepts concerning aerial travel, celestial movement, and flying machines. These literary ideas demonstrate the creative scientific imagination of ancient Tamil thinkers and their interest in understanding and conceptualizing the possibilities of human flight. However, these descriptions should be understood primarily as literary and technological imagination rather than direct evidence of modern aircraft technology. Nevertheless, they provide valuable evidence of the intellectual curiosity, observational ability, and technological imagination reflected in ancient Tamil literature.

Engineering

The ancient Tamils possessed considerable knowledge of engineering and mechanical technology. An example of this can be found in Purananuru, which mentions the use of machines for extracting sugarcane juice (Purananuru, 322). This reference indicates that mechanical devices were employed in agricultural and food-processing activities.

Civaka Cintamani also refers to a curtain operated by a mechanical device. Tiruttakkatevar states that, after Gandharvathathai was defeated by Civakan in a musical contest, the curtain of the pavilion in which she had been seated was closed by means of a mechanical mechanism (Civaka Cintamani, 740). This description provides an interesting indication of the use of mechanical technology in everyday architectural spaces.

Architectural Engineering

The ancient Tamil people did not design and construct their cities arbitrarily. Kings and ministers appear to have followed established architectural principles and technical traditions in planning urban spaces. The reference in Silappathikaram to “நூலோர் சிறப்பின் மாடம்” suggests that buildings may have been constructed in accordance with principles prescribed in architectural and sculptural treatises.

The submerged city of Puhar (Poompuhar) provides an important example in discussions of ancient Tamil architecture. Its broad streets, structural remains, and areas associated with the berthing of large ships have attracted considerable archaeological interest. Silappathikaram provides a detailed description of the magnificence of Puhar, particularly in its accounts of Maruvurppakkam and Pattinappakkam during the Indra festival. The celebrated expression,

“Let us praise Puhar; let us praise Puhar!”

reflects the poet's admiration for the city's grandeur.

The descriptions in Silappathikaram also provide information about multi-storeyed buildings and their architectural features. After being separated from Kovalan, Madhavi is described as suffering in a multi-storeyed mansion. Kosikamani's account states:

“Her body grew pale and she was overcome by spreading sorrow;

within the lofty multi-storeyed mansion,

she fell upon a well-arranged bed placed on the floor.”(Silappathikaram, 13.68–70)

These lines indicate the existence of multi-storeyed buildings (nedunilai maadangal) with intermediate floors or levels. The description of Madhavi lying on a bed placed on an intermediate level of such a building provides literary evidence concerning the vertical organization of residential architecture. Silappathikaram further describes the multi-storeyed structure as having:

“The small openings of the beautifully ornamented windows.”(Silappathikaram, 2.23)

This expression suggests the presence of ornamental windows with small openings, indicating attention to both architectural design and aesthetic features.

The epic also refers to residences associated with the Yavanas, describing architectural elements such as “An open terrace and a spacious stone-built seat or platform,” and “A magnificent mansion with spacious, well-designed windows.” The term “An open and unroofed terrace.” may be understood as an open or unroofed upper terrace, comparable in a broad sense to what is now called a terrace or rooftop. Another architectural description occurs in the expression:

“A spacious courtyard or open area in the elevated mansion.”(Silappathikaram, 2.27)

This reference suggests that the multi-storeyed structure possessed spacious architectural areas or halls. Taken together, these literary descriptions reveal that ancient Tamil society possessed knowledge of mechanical devices, urban planning, multi-storeyed architecture, windows, terraces, spacious halls, and specialized building structures. Although literary descriptions cannot by themselves establish the precise engineering techniques used, they provide valuable evidence for understanding the technological and architectural imagination of ancient Tamil society.

The term “Moonlit courtyard” (Aramiyam) refers to a moonlit courtyard or open terrace (Nilā Mutram). After being separated from her husband Kovalan, Kannagi did not go to the moonlit courtyard that had been specially designed for the early summer season. Instead, she stayed in a part of the mansion that had been arranged for the cold season. There, she closed the windows so that the gentle breeze and moonlight would not enter and cause her discomfort.

“She did not go to the moonlit courtyard that had been designed for the early summer season. Instead, she stayed in a part of the mansion arranged for the cold season. There, she closed the windows so that the gentle breeze and the moonlight would not enter and cause her discomfort.”(Silappathikaram, 2.60–62)

This description indicates that a single multi-storeyed mansion (Nedunilai Mādam) could contain different architectural spaces designed to provide comfort according to the changing seasons. The arrangement of specific spaces for particular climatic conditions suggests an awareness of climate-responsive architecture, including the controlled use of ventilation, moonlight, and enclosed spaces.

Thus, this passage from Silappathikaram provides another significant example of the architectural and engineering knowledge reflected in ancient Tamil literature. It demonstrates that residential architecture was conceived not merely for shelter but also with attention to seasonal comfort, environmental conditions, ventilation, and spatial functionality.

Medicine

The ancient Tamils possessed knowledge of medicine from a very early period, long before the emergence of modern medical science. Tamil epics and religious narratives also contain references to medical practices and concepts. Periyapuram, particularly the Kannappa Nayanar Purana, provides an important example.

When Kannappar observed blood flowing from the eyes of Kalathinathar, he attempted to stop the bleeding by crushing and applying medicinal leaves. When he found that the bleeding continued even after this

treatment, Kannappar realized that an affected organ might be treated through another organ. Sekkizhar expresses this idea in the following verse:

“He realized beforehand the saying that an affliction affecting one part of the body could be relieved by using flesh from another part.”(Periyapuram, 177)

The expression “One bodily part replacing another.” has sometimes been interpreted by some commentators metaphorically as “flesh for flesh” or “an eye for an eye.” However, in the context of the narrative, it may also be understood as conveying the idea that when one organ is damaged, another organ may be used to restore or compensate for its function.

Kannappar subsequently removes his own right eye and places it upon the right eye of the deity. The episode is therefore often interpreted in discussions of Tamil literary traditions as an imaginative representation resembling the concept of organ transplantation.

A similar idea is expressed in another version of the passage:

“He understood the saying that an affliction within the body could be relieved by using flesh from another part of the body.”— Periyapuram

From a modern perspective, the episode may be compared conceptually with organ transplantation, although it should be recognized as a religious and literary narrative rather than as historical evidence of a medically performed transplant procedure.

Kamba Ramayanam also contains descriptions that can be interpreted in relation to surgical treatment. In the Kumbakarna Vadha Padalam, surgical procedures are mentioned. One passage describes the treatment of a wound or swelling by cutting it open, removing the blood or affected material, exposing it to heat, and subsequently applying medicine:

**“When a growth appears upon the body,
they cut it open and drain its blood;
they cauterize it with heat,
and relieve the suffering by applying another medicine.”**(Kamba Ramayanam, 7417)

The passage may be interpreted as describing a procedure involving incision, drainage, cauterization, and the application of medicine. In the context of the history of medicine, it provides an interesting literary reference to therapeutic procedures resembling certain forms of surgical treatment.

Tamil literary works also contain references to concepts concerning the structure and divisibility of matter. Kambar states:

**“He exists even in a particle as small as a speck of dust;
He exists even within an atom divided into a hundred parts.”**(Kamba Ramayanam, Hiranyavadhya Padalam, 37)

This verse is sometimes discussed in relation to the atomic concept, particularly the idea that matter can be divided into extremely minute particles. Such interpretations demonstrate the philosophical and scientific imagination found in medieval Tamil literature. However, these literary references should not be equated directly with the experimentally established theories of modern atomic physics.

Silappathikaram also contains an interesting account concerning the Pandyan king. According to the narrative, the king cuts off his own hand as an act of punishment after an incident involving the knocking on

a door. He subsequently has a golden hand made and attached, and is therefore remembered as the “Por-kai Pandyan” (Golden-Hand Pandyan):

**“The Pandyan king, whose fame shone throughout the land,
having cut off his broad, rain-like arm in accordance with justice,
thereafter bore a golden hand,
he of the fragrant garland and splendid chariot.”— Silappathikaram**

The reference to the replacement of the severed hand with a golden hand may be interpreted as an early literary representation of prosthetic replacement. It demonstrates an imaginative understanding of replacing a lost body part with an artificial substitute

Thus, Tamil literary and epic traditions contain several remarkable references to medicinal treatment, wound management, surgical procedures, organ replacement, prosthetic devices, and concepts concerning the nature of matter. These accounts demonstrate the rich medical and scientific imagination of Tamil literature. Nevertheless, for academic accuracy, such literary descriptions should be treated as evidence of historical medical imagination and conceptual thought, rather than as direct proof that modern organ transplantation, atomic physics, or advanced surgery had been scientifically practiced in ancient Tamil society.

Shipbuilding and Maritime Technology

Ships were used for water-based transportation in ancient Tamil society, and literary sources indicate that people travelled considerable distances by sea. Ancient Tamil seafarers crossed the Bay of Bengal and sailed towards the islands now associated with Southeast Asia and Indonesia, including the island region historically known as Java (Sāvakam). The ability of the Tamils to undertake long-distance maritime voyages nearly two thousand years ago, without the sophisticated instruments and navigational equipment available today, is particularly noteworthy.

Successful maritime travel required considerable technical knowledge of shipbuilding, navigation, steering, and the management of vessels at sea. Sangam literature provides evidence that the ancient Tamils possessed knowledge and practical skills associated with these activities. In Silappathikaram, while describing the prosperity of the port city of Puhar, Ilango Adigal refers to the wealth of maritime traders:

**“The great and prosperous city, renowned for its excellence,
enriched by the wealth of the Parathars and filled with maritime people.”(Silappathikaram, 2.1–2)**

The commentator explains the term Seafarers (Parathar) as referring to seafarers or maritime people. This reference indicates that the people who travelled across the sea in search of wealth were not merely traders but were also associated with maritime occupations that required knowledge of vessels, navigation, and the sea.

The prosperity of Puhar and its extensive maritime commerce are further described:

**“Even if the people of the entire world beyond the roaring sea were to come,
the city possessed inexhaustible wealth to meet their needs.
It was filled with rare and precious goods,
with great warehouses containing merchandise gathered together,
brought in through the sea and by land.”(Silappathikaram, 2.3–7)**

These lines portray the warehouses of Puhar as being filled with enormous quantities of merchandise brought from distant lands. Even if people from the entire world beyond the roaring sea were to assemble

there, the city possessed sufficient commercial resources to satisfy their needs. Goods were brought and accumulated through both maritime and land-based trade routes.

The descriptions therefore indicate the existence of a well-developed system of maritime commerce, involving large ships for sea transport and smaller boats for transportation along rivers and inland waterways.

A type of boat known as “Ambi”, which had been used during the Sangam period, appears to have continued into the period represented by Silappathikaram. This is suggested by the expression:

“Together with Madhavi’s mother, [they] joined the wooden raft.”(Silappathikaram, 13.179)The term “Wooden raft” (Marappunai) refers to a wooden float, raft, or boat-like structure. The traditional commentary explains it as a type of constructed wooden support used for crossing water. This provides evidence of the use of simple watercraft in ancient Tamil society. Another type of water-based structure referred to in the literature is “Riverfront structure” (Neerani Maadam). Sangam works contain references such as:

“The people of the city, in rows of lofty mansions, gather to behold the water festival.” (Paripadal, 10.27) and

“In the spacious moonlit courtyard of the water-associated mansion.”(Perumpanarrupadai, 1.40.27)

These references indicate the existence of structures associated with waterways and riverbanks, possibly serving as riverfront platforms, landing structures, or water-access facilities. Silappathikaram also uses the expression “நீரணி மடலம்” in its description of travel along the Kaveri River:

**“Reaching the long river landing at the waterfront structure on the great Kaveri,
the woman, her husband, and Madhavi’s mother
crossed the river and reached its southern bank,
where the waters were clear and pure.”**(Silappathikaram, 10.214–217)

The passage describes the travellers reaching the southern bank of the Kaveri after crossing the river at a long river landing or ferry point. Traditional commentators, including the Arumpadavurai and Adiyarkkunallar, associate “Waterfront Structure” in this context with “Ferry boat”, a type of boat or watercraft used for crossing the river.

These literary references demonstrate that ancient Tamil society possessed a variety of watercraft, river-crossing techniques, maritime trade practices, port facilities, and knowledge of waterways. The references to seafarers, ships, boats, rafts, river landings, and extensive overseas commerce collectively indicate the importance of maritime technology and navigation in ancient Tamil civilization.

Therefore, Tamil literary sources provide valuable evidence for understanding the development of shipbuilding, maritime transportation, riverine transport, navigation, and overseas trade. At the same time, these literary references should be interpreted alongside archaeological, epigraphic, and historical evidence when making specific claims about the technical capabilities of ancient Tamil shipbuildi

Lighthouse

A lighthouse was traditionally used to help ships at sea maintain the correct direction and to indicate the location of a harbour. In ancient Tamil literature, references to such navigational structures can be found. The port of Mamallapuram, referred to in Tamil as “Nīrppāyal Port” (Nīrppāyal Thurai), is described as having a large and prominent lighthouse.

Perumpanarrupadai records the following description:

**“Like a pillar supporting the heavens,
it had a lofty summit difficult to ascend even with a ladder;
upon the open structure that rose almost to the sky,
a brilliant flame shone throughout the night.”**(Perumpanarruppadai, 346–350)

The passage portrays the lighthouse as an exceptionally tall structure, rising almost to the sky. Its height is poetically compared to a structure that appears to support the heavens, much like the roots of a banyan tree supporting a tree whose trunk has been eroded by the shore.

The lighthouse had a high and difficult-to-reach summit, accessible with the aid of a ladder. At the top was a substantial open structure or platform. During the night, a large fire was maintained there using firewood so that its light could be seen by ships travelling at a considerable distance from the shore. The fire was kept burning throughout the night without being allowed to go out.

From the perspective of the history of technology, this description is particularly significant. Modern lighthouses use electrically powered lamps and sophisticated optical systems, whereas the literary account describes an open-flame navigational beacon. The continuous maintenance of a large fire would have required a systematic supply of fuel and personnel responsible for maintaining the flame.

Thus, the description in Perumpanarruppadai may be interpreted as evidence of an early form of maritime navigational technology, in which a prominent elevated structure and a visible night-time fire served to guide ships and identify the location of the port. Silappathikaram also contains a reference suggesting the presence of a lighthouse at Puhar:

“And the lighthouse that shone brightly along the water’s edge.” This expression indicates a lighthouse shining near the water's edge. The reference is significant because it suggests that navigational beacons were associated with major Tamil maritime centres.

Therefore, the descriptions found in Perumpanarruppadai and Silappathikaram provide valuable literary evidence for the existence of coastal navigational structures and maritime signalling practices in ancient Tamil society. They demonstrate an understanding of the practical need to assist ships in identifying harbours and maintaining their direction at night. For academic precision, these references may be described as evidence of ancient beacon or lighthouse technology, rather than equating them directly with the electrically powered optical lighthouses of the modern period.

Telecommunication and Live Transmission

Scientific and technological discoveries have made the world appear increasingly smaller.

Today, through television and other digital communication technologies, people can watch events, programmes, and sporting activities taking place in distant locations through live transmission.

Interestingly, Civaka Cintamani contains a literary episode that may be compared, at a conceptual level, with the idea of remote visual communication, even though such technological devices did not exist during the period.

Nandattan wishes to see Civakan. Gandharvathathai then recites a magical formula. According to the narrative, the formula enables Nandattan to perceive clearly the place where Civakan is present (Civaka Cintamani, 709). At that moment, Civakan is seen while he is with Kanakamālai, adorning a Karpaga garland while seated upon a flower-covered couch. Nandattan is able to perceive this distant scene (Civaka Cintamani, 1710). This episode may be interpreted as a literary imagination of seeing a distant person or event in real time, which bears a conceptual resemblance to the modern idea of live visual transmission.

From the perspective of the history of scientific thought, the episode is significant because it demonstrates the imaginative desire to overcome distance and physical separation through visual communication. However, it should not be regarded as evidence of an actual technological system equivalent to modern television or live-streaming. Rather, it represents a mythological and literary conception of remote visual perception that can be productively compared with modern telecommunication technologies.

The Design and Construction of a Theatre Stage

In the Arangetru Kathai of Silappathikaram, the structure and dimensions of a theatrical stage are described in considerable detail. Even in the modern period, despite the availability of advanced technology and sophisticated mechanical facilities, there is no universally fixed standard specifying the exact length and height of every theatre. Theatre structures are generally designed according to the available space and functional requirements. However, Silappathikaram provides specific measurements for the construction of a theatre stage:

“With the space between the eyes extended by one span,

the theatre was measured according to the established rules of the technical tradition.

The measuring rod was defined as twenty-four finger-breadths;

the stage was seven rods in width, eight rods in length,

and one rod in height.

It was properly constructed with the upper beam and the stage boards,

with the intermediate measuring framework appropriately positioned,

and it appeared splendid with two suitable entrances.” (Silappathikaram, Arangetru Kathai, 95–106)

The passage describes the theatre according to established measurements and construction principles. A kol (measuring rod) is defined in terms of finger-widths, and the stage is specified in terms of its breadth, length, and height. The arrangement of the stage boards, intermediate structural components, supporting elements, and two entranceways is also described.

These details demonstrate the existence of standardized measurements, structural planning, proportional design, and functional organization in the construction of theatrical spaces. From the perspective of architectural engineering, the passage is particularly significant because it indicates that theatre construction was not undertaken arbitrarily but followed an established technical tradition (nool neri marabu). Thus, the description of the theatre in Silappathikaram provides valuable literary evidence for the development of architectural planning and structural engineering principles in ancient Tamil society.

Urban Planning and Drainage System

Whether a settlement consisted of simple dwellings or large monumental structures, cleanliness and sanitation were essential requirements of urban life

. One of the most important facilities associated with urban sanitation is an efficiently designed underground drainage system.

Silappathikaram contains descriptions that may be interpreted in relation to such organized urban infrastructure. When Kovalan leaves the outskirts of Madurai after entrusting Kannagi to the care of Kavundhi Adigal, he and his companions approach the city. The city is described as being surrounded by defensive structures, a protected forest area, and a broad moat containing flowing water.

The epic states:

“Along the street where the Surungai passage carries away the water that flows in with the great elephants.”(Silappathikaram, 14.64–65)The term “Concealed drainage conduit” (Surungai) is explained in the traditional commentary as a concealed passage through which water could flow, with its entrance constructed in such a way that its function would not be readily visible:

“A concealed passageway or street entrance through which flowing water enters, constructed in such a manner that it remains unknown to others.”(Silappathikaram, 14.65)

This description suggests the existence of an intentionally concealed water passage or drainage channel associated with the city's streets.

The organization of Madurai described in the epic is particularly noteworthy. The city appears to have been structured through a sequence of outer settlements, guarded areas, protective forests, moats, bridges, fortifications, the inner city, broad streets, and the royal palace. Such a description indicates a systematic approach to urban organization and defensive planning.

The reference to a “surungai”, a concealed water passage, is especially relevant to the study of ancient urban engineering. It suggests that water management and drainage were incorporated into the planning of the city.

Silappathikaram also records the presence of various mechanical war devices installed on the walls of the fortifications of Madurai. In addition to references to military mechanisms, the epic contains descriptions relating to mechanical devices and mirrors (aadi).

Taken together, these descriptions demonstrate that ancient Tamil urban planning involved not only residential and defensive structures but also drainage, water management, road organization, fortification, mechanical devices, and functional spatial planning.

From a modern engineering perspective, these literary references should be interpreted as evidence of urban engineering concepts and technological imagination reflected in Tamil literature. Archaeological and historical evidence would be necessary to establish the exact construction techniques and technical specifications of these systems.

CONCLUSION

Tamil epics are not merely works of imaginative literature; they also constitute valuable records of an intellectual tradition that embodies various forms of scientific thought. Silappathikaram, for instance, presents observations related to the properties and nature of precious stones, thereby reflecting ideas that may be associated with the study of materials and chemistry. Civaka Cintamani contains descriptions concerning the arrangement of celestial bodies and observations of the heavens. Such references demonstrate the keen interest of the ancient Tamils in observing nature and the universe and in expressing their understanding through literary imagination.

Therefore, Tamil epics should be studied not only from a literary perspective but also from the perspective of the history of scientific thought and technology. Such interdisciplinary studies can reveal the multifaceted intellectual dimensions of Tamil literature and contribute to a wider understanding of the scientific and technological traditions reflected in ancient Tamil society.

Terms such as Parathar, Kalam, Marappunai, Nīraṇi Mādam, Parimukathumbi, and Kalangarai Vilakkam provide valuable literary evidence for examining ancient Tamil knowledge of maritime activities, watercraft, navigation, and ship-related technology. The descriptions of the prosperity of Puhar and the architectural arrangements of the mansions in which Kannagi and Madhavi stayed also reveal significant aspects of ancient Tamil architectural practice.

The description of the theatre stage in Silappathikaram is particularly noteworthy because its dimensions and structural arrangements are presented according to prescribed measurements and established principles. This suggests that even spaces constructed for entertainment and cultural performances were subject to systematic planning and measurement.

The mechanical devices and defensive mechanisms installed on the fortifications of Madurai further reflect the technological imagination represented in the epic. These references demonstrate that Tamil literary traditions contain substantial material for studying ancient ideas relating to engineering, architecture, maritime technology, urban planning, water management, medicine, astronomy, and mechanical technology.

In conclusion, the scientific references found in Tamil epics should be understood primarily as literary evidence of observation, knowledge, technological imagination, and intellectual traditions. They provide a valuable basis for interdisciplinary research connecting Tamil literary studies with the history of science and technology.

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