
SCIENTIFIC CONCEPTS IN THE PATHINENKEEZHKANAKKU TEXTS

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ABSTRACT

Tamil classical literature is broadly classified into the Melkanakku (Major Anthologies) and the Keezhkanakku (Minor Anthologies). The Pathinenkeezhkanakku corpus not only emphasizes moral and ethical values but also embodies a wide range of scientific concepts, including mathematics, medicine, environmental science, hydrology, agriculture, family studies, nutrition, and principles of healthy living. Literary works such as the Thirukkural, Naladiyar, Iniyavai Narpathu, Inna Narpathu, Acharakovai, Sirupanchamoolam, Elathi, and Thirikadugam present profound ideas that promote a systematic and scientific approach to human life.

This study examines the scientific ideas embedded in the ethical texts of the Pathinenkeezhkanakku corpus through an interdisciplinary scientific perspective. It analyzes literary evidence relating to mathematics, medicine, water management, environmental science, family well-being, physical health, nutrition, and life sciences. The primary objective of this research is to demonstrate that the scientific outlook of the ancient Tamils, as reflected in these literary works, laid a strong intellectual foundation for several principles that continue to influence modern scientific thought and human well-being.

KEYWORDS: Pathinenkeezhkanakku, Ethical Literature, Scientific Thought, Mathematics, Medicine, Environmental Science, Lifestyle Studies, Ancient Tamils, Thirukkural.

INTRODUCTION

Scientific knowledge permeated every aspect of the lives of the ancient Tamils, extending from the concept of the atom to that of the universe. Tamil literature is not merely a source of aesthetic pleasure; rather, it is a harmonious blend of experience, wisdom, and scientific insight. Many of the ideas envisioned by the ancient Tamils have gradually become realities in the modern scientific world. It is therefore not an exaggeration to state that the scientific advancements of the present day have their intellectual roots in the life and thought of the ancient Tamils. This scientific outlook is reflected in numerous works of Tamil literature. While extolling the greatness of the Thirukkural, the celebrated poetess Avvaiyar remarks:

"Splitting the atom, compressing the seven seas within it, Thus was the Kural composed in concise form."

This poetic expression suggests an extraordinary perception of the minuteness of the atom and the immense depth of the Thirukkural. Modern science defines the atom as an extremely minute particle invisible to the naked eye. Remarkably, Avvaiyar, who lived many centuries ago, employed the concept of the atom and even metaphorically referred to its division, a notion that appears striking when viewed in the light of contemporary scientific discoveries. Likewise, the nationalist poet Subramania Bharati alludes to the dynamic nature of atoms in the following verse:

"We have heard the scholars of natural science proclaim That all atoms move incessantly without interruption."

Through this poetic expression, Bharati reflects the scientific understanding that atoms are in continuous motion, demonstrating how Tamil literary thought embraced and celebrated scientific ideas. Such examples reveal that Tamil literature has long served not only as a repository of ethical and cultural values but also as a medium for articulating profound scientific concepts that resonate with modern scientific perspectives.

Ethical Literature in Tamil

The scope of human knowledge has expanded immeasurably in the modern era, extending to the study of the universe itself. Scholars observe that the arts originated from the creative expressions of human intellect and imagination. In ancient times, scientific ideas were not treated as an isolated discipline; rather, they were seamlessly integrated with literature and

the arts. Consequently, Tamil classical literature embodies not only aesthetic excellence but also profound scientific thought.

Classical Tamil literature is broadly classified into the Melkanakku (Major Anthologies) and the Keezhkanakku (Minor Anthologies). Among these, the ethical works included in the Pathinenkeezhkanakku corpus are particularly significant from a scientific perspective. These texts, while primarily devoted to moral and ethical principles, also preserve valuable insights into various branches of practical knowledge.

Of the eighteen works constituting the Pathinenkeezhkanakku, eleven are devoted principally to ethical teachings, while three works employ medicinal substances and herbal formulations as literary metaphors to convey moral values. Collectively, these ethical texts reflect a wide spectrum of scientific concepts relating to mathematics, medicine, lifestyle, water management, family well-being, and environmental science. These ideas demonstrate that the ancient Tamils possessed a practical and systematic understanding of scientific principles, integrating them into everyday life through literary expression.

Accordingly, the present study aims to examine the scientific concepts embedded in the ethical literature of the Pathinenkeezhkanakku corpus and to analyse how these texts embody practical scientific knowledge within their moral and literary framework.

Structure of the Tamil Language

The Greek mathematician Pythagoras is traditionally associated with the idea that “the universe is governed by numbers.” Likewise, the intellectual tradition of the Tamils demonstrates a profound awareness of numerical order and classification. In the *Tolkāppiyam*, the earliest extant work on Tamil grammar, the world is described as being composed of five fundamental elements—earth, fire, water, air, and space (*nilam*, *thee*, *neer*, *vali*, and *visumbu*). This classification of the natural world into five elements reflects an early scientific approach based on systematic enumeration.

Mathematics has always occupied a central place in Tamil thought. One may choose not to study epics or poetry, but it is impossible to live without acquiring the knowledge of numbers. Recognizing this, the ancient Tamils regarded numbers and letters as the two eyes of human life and emphasized the importance of numerical literacy. This idea finds its finest expression in the *Thirukkural*:

**"Numbers are one eye, letters the other; Together they are the eyes of all living beings."
(Thirukkural, 392)**

By placing numbers (eṇ) before letters (eḷuttu), Tiruvalluvar underscores the indispensable role of mathematics in human existence. This ordering illustrates the prominence accorded to numerical knowledge in Tamil intellectual and educational traditions.

The eminent Tamil scholar Devaneya Pavanar described Tamil as one of the most natural and primordial languages. The structural organization of the Tamil language itself reflects a remarkable degree of mathematical precision and logical classification. Tamil scholars refer to this systematic arrangement as the Tamil Nedungkanakku (the comprehensive numerical organization of the Tamil alphabet).

The Tamil script consists of 247 letters, systematically classified into 12 vowels (uyir eḷuttu), 18 consonants (mei eḷuttu), 216 compound letters (uyirmei eḷuttu), and one special character (āytam). Furthermore, the consonants are grouped into three phonetic categories: hard consonants (vallinam), soft consonants (mellinam), and medium consonants (idayinam), with six letters in each category. This highly organized numerical structure illustrates the mathematical logic underlying the Tamil writing system and reflects the scientific temperament of ancient Tamil grammarians. Thus, the very architecture of the Tamil language exemplifies a harmonious integration of linguistic science and mathematical reasoning, demonstrating that numerical classification was a fundamental principle in the development of Tamil grammatical thought.

Mathematical Order in Tamil Literary Classification

Classical Tamil literature is traditionally classified into three major divisions—Iyal (literature), Isai (music), and Nāṭakam (drama)—collectively known as Muttamil (the Threefold Tamil). Likewise, Tamil literary themes are broadly categorized into Akam (interior or love) and Puram (exterior or public life), reflecting another systematic binary classification. Such numerical organization demonstrates the logical and analytical spirit that characterizes Tamil literary thought.

Similarly, the corpus of Tamil classical literature is divided into Eighteen Major Texts (Pathinenmelkanakku) and Eighteen Minor Texts (Pathinenkeezhkanakku), revealing a deliberate and balanced numerical framework. This symmetrical arrangement illustrates the importance accorded to order, classification, and enumeration in the Tamil literary tradition.

The distinction between the Melkanakku and Keezhkanakku texts is primarily based on metrical structure. Literary compositions consisting of more than four lines were classified as Melkanakku, whereas works composed of four lines or fewer were grouped under

Keezhkanakku. The eighteen Pathinenkeezhkanakku works were composed predominantly in the concise Venpa metre, a poetic form characterized by precision, brevity, and strict metrical rules.

Within the Venpa tradition, poems were further classified into Neduvenpa (long Venpa) and Kuruvenpa (short Venpa). A standard Venpa consists of four lines, whereas a Kuruvenpa contains two lines. The systematic classification of literary forms according to the number of lines reflects the mathematical precision that underlies Tamil prosody and poetic composition.

The ancient Tamil scholars consistently employed numerical principles in the organization of literature, metre, and grammar, demonstrating their appreciation for mathematical order. In this context, the Tamil scholar Poovannan observes that, in ancient times, teachers were referred to as “Kanakkāyar” (masters of calculation), a title that signifies the high esteem accorded to mathematical knowledge in Tamil society. This historical practice further confirms the close relationship between mathematics and Tamil literary culture, where numerical reasoning served as an essential organizing principle in education, grammar, and literary composition.

Mathematics and the Decimal System in the Pathinenkeezhkanakku

The authors of the Pathinenkeezhkanakku corpus appear to have possessed a remarkable understanding of mathematical principles. This is evident from the very titles of many of these works, which are explicitly based on numerical designations. The term Kural, for example, denotes a two-line poem (Kuruvenpa). Likewise, the titles Naladiyar ("Four-Line Verses"), Nanmanikkadigai, Kar Narpathu ("Forty on the Rainy Season"), Kalavazhi Narpathu, Inna Narpathu, Iniyavai Narpathu, Ainthinai Aimpattu ("Fifty Poems on the Five Landscapes"), Ainthinai Ezhupattu ("Seventy Poems on the Five Landscapes"), Thina Mozhi Aimpattu, Thina Maalai Nootraimbattu ("One Hundred and Fifty Garland Poems"), Pazhamozhi Nanuru ("Four Hundred Proverbs"), Sirupanchamoolam, and Thirikadugam derive their names wholly or partly from numerical values. Among the eighteen Pathinenkeezhkanakku works, fourteen bear titles incorporating numbers, illustrating the prominence of mathematical thinking in Tamil literary tradition.

One of the most significant developments in modern mathematics is the decimal (base-ten) system, which is widely recognized for its simplicity, consistency, and efficiency in numerical computation. Interestingly, the concept of organizing knowledge in groups of ten is reflected in the Tamil ethical text *Muthumozhi Kanchi*. This work contains thematic sections such as *Sirandha Pathu* (The Excellent Ten), *Arivup Pathu* (The Ten on Wisdom), *Pazhiyaap Pathu* (The Ten on Blamelessness), *Thuvvaap Pathu*, *Alla Pathu*, *Illai Pathu*, *Poyppathu* (The Ten on Falsehood), *Eliya Pathu*, *Nalkoorndha Pathu*, and *Thandaap Pathu*. Such an arrangement demonstrates a systematic decimal organization that resembles the logic of the modern base-ten system.

The Tamil scholar Dr. R. Mathivanan argues that the decimal method, including multiples such as 10 and 100, which were known among the people of the Indus Valley Civilization, may have originated from or been influenced by the ancient Tamils of South India. Although this proposition remains a subject of scholarly debate, it highlights the possibility of an early and sophisticated mathematical tradition within Tamil civilization.

Supporting the antiquity of Tamil scientific thought, Dr. K. T. Thirunavukkarasu observes that ancient maxims (*Muthumozhigal* or *Muthuraigal*) often served as the foundations of scientific literature. His observation reinforces the view that mathematical reasoning and scientific organization were deeply embedded in Tamil intellectual traditions, where ethical instruction, literary expression, and numerical classification were closely interconnected.

Ethical Thought and Medical Science

Truth and empirical observation occupy a central position in scientific inquiry, whereas imagination, symbolism, and artistic expression are characteristic features of literature. Nevertheless, in the Tamil tradition, literary works often serve as a medium for transmitting practical knowledge, including medical and ethical principles. This integration of science and literature is particularly evident in the ethical texts *Thirikadugam*, *Elathi*, and *Sirupanchamoolam*, whose titles are derived from well-known medicinal formulations in the Siddha medical system.

Thirikadugam derives its name from a traditional herbal preparation consisting of dry ginger (*sukku*), black pepper (*milagu*), and long pepper (*thippili*). These three ingredients are widely recognized in Siddha medicine for their therapeutic properties, particularly in treating digestive and respiratory disorders. In the literary work *Thirikadugam*, each verse presents three ethical principles, analogous to the three medicinal ingredients of the herbal

formulation. Just as the medicinal preparation alleviates physical ailments, the ethical teachings are portrayed as remedies for the moral and psychological afflictions of human beings. Thus, the text employs medical metaphor as an effective literary device to communicate ethical values.

Human beings are susceptible to numerous diseases, and modern medical science recognizes ageing as a natural biological process that requires specialized healthcare. The branch of medicine devoted to the health and well-being of older adults is known as Geriatric Medicine. Contemporary geriatric research seeks to promote healthy ageing by delaying age-related decline and improving the quality of life among the elderly.

A comparable idea is reflected in Thirikadugam, where individuals who perform their duties voluntarily, without requiring constant instruction, are metaphorically compared to a medicine that protects one from the disease of old age. This concept is echoed in the traditional Tamil proverb, “**Ēvā makkaḷ mūvā marundhu**” (“Children who act without being prompted are the medicine against old age”). The proverb emphasizes that responsible and self-motivated children provide emotional security and support to their parents, thereby contributing to their well-being in later life. Although expressed metaphorically, this insight corresponds to modern observations regarding the positive relationship between social support, psychological health, and healthy ageing.

Thus, the ethical literature of the Pathinenkeezhkanakku corpus extends beyond moral instruction by incorporating concepts that resonate with contemporary medical and behavioural sciences. Since ethical principles constitute the very life of ethical literature, these texts may also be viewed as repositories of practical scientific wisdom, where literary expression and empirical understanding coexist in a mutually enriching manner.

Science

Science is a systematic discipline that generates, organizes, and validates knowledge through observation, reasoning, and evidence. It may be understood as humanity's continuous quest to explore, interpret, and explain the natural world. From the earliest stages of civilization, when human beings began to express their thoughts through cave paintings, carvings, and symbolic representations, the foundations of scientific thinking were laid. The desire to observe, record, and understand nature marked the beginning of scientific inquiry.

The practices of diagnosing and treating diseases, observing seasonal and environmental changes, measuring the movements of celestial bodies, and developing methods for

agriculture and water management all testify to the scientific knowledge possessed by ancient societies. These activities, grounded in experience and observation, formed the basis of early scientific thought. Thus, many aspects of everyday life in ancient civilizations were inherently scientific in nature.

Science is fundamentally empirical, relying on observation, experimentation, and evidence rather than personal preferences or subjective beliefs. It follows a systematic methodology, proceeds in a logical and organized manner, and seeks to communicate its findings with clarity and precision. Rational inquiry and critical thinking are therefore the essential characteristics of scientific investigation.

Before examining the scientific concepts reflected in Tamil ethical literature, it is essential to recognize that scientific perspectives were already embedded within literary traditions. Classical Tamil literature does not merely serve as a vehicle for aesthetic expression; it also preserves observations on nature, health, ethics, society, and the environment that reflect a rational and analytical understanding of the world. Appreciating this scientific outlook provides the necessary foundation for interpreting the scientific ideas embodied in the Pathinenkeezhkanakku corpus.

Science in the Thirukkural: A Rational Perspective

Science seeks to answer questions such as why, how, and by what means through systematic observation, logical reasoning, and evidence. The origins of science may be traced to the earliest stages of human civilization, when human beings began to express their experiences and ideas through cave paintings, carvings, and symbolic representations. These acts of observation, recording, and interpretation represent the beginnings of scientific thought. Science is inherently empirical, objective, systematic, and free from personal bias. It aims to explain phenomena with clarity, precision, and logical consistency. Likewise, literature, as the expression of human emotion and experience, complements scientific knowledge. A harmonious balance between science, the expression of intellect, and literature, the expression of emotion, is essential for the progress and sustainability of human civilization. This rational outlook is clearly reflected in the Thirukkural. Tiruvalluvar defines true knowledge as the ability to discern reality irrespective of appearances or authority:

**"Whatever the nature of a thing may be, wisdom is to perceive its true essence."
(Thirukkural,355)**

He further emphasizes that truth should be accepted regardless of its source:

**"Whatever is heard, and whoever may speak it, wisdom is to discern the truth therein."
(Thirukkural,423)**

These couplets advocate an evidence-based approach to knowledge, encouraging critical inquiry and impartial evaluation. Such principles closely resemble the scientific method, which values observation, verification, and objectivity over prejudice or personal preference.

Scientific awareness is also reflected in the Tamil conception of the physical world. The Tamil word *ulagu* (world) is etymologically associated with the idea of movement or rotation, while *ñālam* is connected with the notion of suspension or hanging. Classical Tamil thought describes the universe as being composed of the five fundamental elements—earth, water, fire (heat), air, and space. This classification represents an early attempt to explain the composition of the natural world through systematic observation. The Thirukkural also contains references that have often been interpreted as reflecting an awareness of the Earth's cyclical processes. For example:

"Though the world revolves, it follows the plough; therefore, agriculture remains the foremost occupation." (Thirukkural,1033)

The expression "the world revolves" (*Suzhandrum ulagam*) has led some Tamil scholars to suggest that Tiruvalluvar recognized the Earth's rotational nature. However, in contemporary scholarship, this interpretation is generally regarded as a literary or metaphorical expression rather than definitive evidence of knowledge of the Earth's spherical shape or rotation. The primary emphasis of the couplet is the indispensable role of agriculture in sustaining human life. Similarly, Tiruvalluvar demonstrates keen observational insight in his reference to the moon:

"O Moon! If you could shine like the face of my beloved, you too would deserve my love." (Thirukkural, 1118)

This verse poetically contrasts the radiance of the beloved's face with that of the moon. Some scholars interpret it as reflecting an awareness that the moon does not possess its own light but shines by reflected light, unlike the sun. While this interpretation is intellectually stimulating, the couplet is fundamentally a poetic expression, and it should not be treated as direct scientific evidence. Nevertheless, it illustrates how careful observation of natural phenomena was interwoven with literary imagination in classical Tamil thought.

Taken together, these examples demonstrate that the Thirukkural encourages rational inquiry, critical thinking, and close observation of the natural world. Although its primary purpose is ethical instruction, many of its insights resonate with scientific attitudes, revealing the intellectual depth of classical Tamil civilization.

Scientific Thought in Literary Expression

Classical Tamil literature frequently employs scientific knowledge and medical concepts as literary devices to communicate ethical and philosophical ideas. Rather than treating science and literature as separate domains, Tamil intellectual tradition integrates them in a manner that enriches both moral instruction and practical knowledge. The Tirumantiram of Tirumular emphasizes the intimate relationship between the body and life:

"If the body perishes, life itself declines."

According to Tirumular, understanding the proper methods of preserving the body enables one to sustain both physical health and spiritual well-being. This holistic view reflects the principles of traditional Tamil medicine, particularly the Siddha system, which regards the body and mind as inseparable aspects of human existence.

Tamil ethical literature also extends the concept of disease beyond physical illness to include moral and psychological disorders. Just as ignorance is cured through education, ethical failings such as falsehood, violence, meat consumption, and theft are portrayed as diseases of the soul. Their corresponding remedies are virtues such as compassion, truthfulness, non-violence, abstinence from meat, and honesty. Through such analogies, ethical conduct is presented as a form of preventive and restorative medicine for human life.

A striking example of this literary technique is found in Sirupanchamoolam, whose title refers to a traditional Siddha herbal formulation prepared from the roots of five medicinal plants. These roots are valued for their therapeutic properties in treating physical ailments. Drawing upon this medical concept, each verse of Sirupanchamoolam presents five ethical teachings, symbolically comparing them to the five medicinal roots. Just as herbal medicine heals bodily diseases, these moral principles are intended to cure the "disease" of ignorance and guide individuals toward righteous living.

This literary strategy demonstrates how ancient Tamil authors transformed medical knowledge into an ethical metaphor, making scientific concepts accessible through poetry. Consequently, the Pathinenkeezhkanakku texts illustrate not only the presence of scientific ideas within literature but also the reciprocal influence of literary imagination on the

presentation of scientific knowledge. The integration of medicine, ethics, and literature in these works reveals the interdisciplinary character of classical Tamil intellectual tradition, where scientific understanding and moral philosophy coexist in a unified framework.

Hydrological Science in Tamil Ethical Literature

Water is the fundamental basis of all life, and the survival of every living organism depends upon it. Ancient Tamil thinkers clearly recognized the indispensable role of water in sustaining life and regarded it as the foundation of the natural world. This scientific awareness is succinctly expressed by Tiruvalluvar, who emphasizes that without water, life cannot exist, and that the availability of water depends ultimately on rainfall.

The importance of rain is celebrated in the Thirukkural, particularly in the chapter "The Excellence of Rain" (Vāṇ Sīrappu), where rainfall is described as the source of agricultural prosperity, economic stability, and the continuity of life. These observations reveal the ecological understanding of the ancient Tamils regarding the interdependence of water, agriculture, and human survival.

Modern hydrology explains the hydrological (water) cycle, in which water from oceans, rivers, and lakes evaporates due to solar heat, condenses in the atmosphere to form clouds, and subsequently returns to the earth as precipitation. This continuous process of evaporation, condensation, and rainfall sustains freshwater resources and maintains ecological balance.

A comparable understanding is reflected in Tamil ethical literature through metaphorical expression. One ethical text explains that saline seawater rises through evaporation, forms clouds, and returns to the earth as pure rainwater. This natural transformation is compared to the conduct of virtuous people, who remove undesirable qualities from within themselves and become beneficial to society. Thus, the hydrological process serves as an ethical metaphor illustrating moral purification and social responsibility.

Although the primary purpose of this literary passage is moral instruction, it demonstrates a clear awareness that rainwater originates through the transformation of seawater, a concept broadly consistent with the modern scientific understanding of the water cycle. Rather than presenting a technical explanation, the text employs an observable natural phenomenon to communicate ethical values. This integration of environmental observation with moral philosophy illustrates how the Pathinenkeezhkanakku corpus incorporates practical scientific knowledge within its literary framework.

Consequently, Tamil ethical literature not only underscores the significance of water as the source of life but also reflects an early appreciation of natural hydrological processes. These

works reveal that environmental awareness and scientific observation formed an integral part of the intellectual tradition of ancient Tamil society.

Measurement in Ethical Literature

Measurement is one of the fundamental principles of science. Accurate observation, quantification, and proportion are indispensable to scientific investigation, particularly in disciplines such as medicine, chemistry, and pharmacology. Classical Tamil ethical literature demonstrates an awareness of these principles by incorporating concepts of measurement into its moral teachings.

A notable example is found in Elathi, one of the Pathinenkeezhkanakku texts. The title Elathi refers to a traditional Siddha medicinal preparation composed of six herbal ingredients mixed in carefully prescribed proportions. According to traditional medical texts, the formulation consists of one part cardamom (elam), two parts cinnamon (ilavangappattai), three parts nagakesaram, four parts black pepper (milagu), five parts long pepper (thippili), and six parts dry ginger (sukku). The efficacy of the medicine depends not merely on the ingredients themselves but on the precise proportions in which they are combined.

Drawing upon this medical formulation, the literary work Elathi employs the medicinal mixture as a metaphor for ethical living. Just as a balanced combination of herbs produces an effective medicine, a harmonious combination of moral virtues promotes the well-being of human life. This analogy illustrates an appreciation of measurement, proportion, and systematic formulation, which are essential characteristics of scientific methodology. Although presented in a literary context, the metaphor reflects the importance of quantitative precision in traditional Tamil medical knowledge.

The Concept of Temporal Reality

Scientific knowledge is based upon the observation of phenomena across time. Understanding the past, interpreting the present, and anticipating the future are essential aspects of scientific inquiry. Observations that remain consistent over time eventually become recognized as natural principles or scientific laws.

Tamil ethical literature likewise records enduring truths concerning nature and human society. These texts observe that virtuous individuals arise in every community; birth is inevitably followed by death; celestial bodies such as the stars, the moon, and the sun continue their regular existence; diseases and their remedies coexist; generosity and those

who receive assistance will always exist; and the cycle of birth and death is an unchanging feature of human life.

These observations are not presented as experimental laws in the modern scientific sense but as universal patterns derived from long-term human experience and careful observation of nature. Their permanence reflects the empirical outlook of ancient Tamil thinkers, who recognized recurring phenomena in both the natural world and human society.

Accordingly, the Pathinenkeezhkanakku texts reveal that ethical instruction was frequently grounded in systematic observation and practical experience. By integrating concepts such as measurement, proportion, regularity, and temporal continuity, these works demonstrate how scientific reasoning and moral philosophy were closely intertwined in classical Tamil intellectual tradition.

Environmental Science in Tamil Ethical Literature

The ancient Tamils lived in close harmony with nature, and their way of life was fundamentally shaped by ecological awareness. Their understanding of the relationship between human beings and the environment is reflected in the Thinaï (ecological landscape) system, which classified human life, occupations, and cultural practices according to distinct geographical and ecological regions. Contemporary environmental scholars have observed that the ecological ethics and sustainable livelihood practices embodied in the Thinaï tradition offer valuable insights for addressing present-day environmental challenges.

Tamil ethical literature likewise emphasizes the inseparable relationship between human morality and environmental well-being. These texts suggest that ethical conduct and the order of nature are closely interconnected. A verse from Thirikadugam expresses the idea that when rulers and citizens deviate from righteousness, the natural order itself is disturbed. It further states that a kingdom in which a ruler oppresses the people through unjust taxation or where falsehood prevails will not receive rain. Such statements symbolically express the belief that social justice, ethical governance, and environmental prosperity are mutually dependent.

Although these assertions should not be interpreted as literal scientific explanations for climatic phenomena, they reveal an early ecological philosophy in which human actions are believed to influence environmental balance. In contemporary terms, this idea resonates with the concept that unsustainable human activities—such as exploitation, injustice, and environmental degradation—can adversely affect ecosystems and climate. A similar environmental concern is reflected in the traditional Tamil maxim:

"It is most virtuous to establish groves and dig public ponds."

This proverb highlights two important environmental practices: the conservation of forests and the development of water resources. These activities contributed to biodiversity, groundwater recharge, sustainable agriculture, and community welfare. Such recommendations correspond closely with modern principles of environmental conservation and sustainable resource management.

Thus, the Pathinenkeezhkanakku texts demonstrate that environmental awareness formed an integral part of Tamil ethical thought. By linking moral responsibility with ecological stewardship, these works advocate a sustainable relationship between human society and the natural world. Their insights continue to hold relevance for contemporary discussions on environmental ethics and sustainable development.

Medical Science in Classical Tamil Literature

Medical knowledge occupies a significant place in classical Tamil literature, where health is viewed as the foundation of human well-being. Ancient Tamil thinkers emphasized that disease prevention through proper lifestyle and dietary discipline is superior to treating illness after its onset. This preventive approach, which forms the basis of modern public health, is clearly reflected in the Thirukkural. Tiruvalluvar advocates moderation in food intake and proper dietary habits as the primary means of maintaining good health:

**"The body needs no medicine if one eats only after the previous meal has been digested."
(Thirukkural,942)**

This couplet emphasizes that disciplined eating habits can prevent many diseases. Rather than promoting medicine as the first remedy, Tiruvalluvar highlights preventive healthcare, a principle that corresponds with contemporary concepts of nutrition, lifestyle medicine, and preventive medicine. Modern medical science likewise recognizes that balanced nutrition and healthy dietary practices significantly reduce the risk of chronic diseases such as diabetes, obesity, and cardiovascular disorders.

Medical science has advanced remarkably in the modern era, extending from sophisticated surgical procedures to organ transplantation, assisted reproductive technologies, stem-cell research, and cloning experiments. Nevertheless, long before the establishment of formal medical schools, the Tamil Siddhars possessed considerable knowledge of medicine, pharmacology, anatomy, and preventive healthcare. Their medical understanding is preserved in works such as the Tirumantiram. A frequently cited verse from the Tirumantiram states:

"If impurities abound in the mother's womb, the child becomes intellectually weak; if excess fluid prevails, the child becomes mute; if both are excessive, the child is born blind." (Tirumantiram, Verse 481)

This verse reflects the Siddha tradition's concern for maternal health and prenatal care. It suggests that the mother's physical condition during pregnancy influences the health of the developing child. Although the specific physiological explanations given in the verse do not correspond directly with modern medical science and should not be regarded as scientifically validated causes of congenital disorders, the underlying principle—that maternal health plays a crucial role in fetal development—is consistent with contemporary obstetric and prenatal medicine. Modern medicine likewise emphasizes the importance of maternal nutrition, infection control, metabolic health, and regular antenatal care in promoting healthy fetal growth and reducing the risk of congenital abnormalities.

Thus, classical Tamil literature demonstrates an early awareness of preventive medicine, dietary regulation, and maternal well-being. These works reveal that ancient Tamil society attached great importance to maintaining health through disciplined living and careful observation of the human body. While many medical explanations found in classical texts should be understood within their historical and cultural context, they nevertheless testify to a longstanding tradition of medical inquiry and concern for public health.

Organ Transplantation in Tamil Literary Tradition

Organ transplantation is one of the most remarkable achievements of modern medicine. It involves replacing a diseased or damaged organ with a healthy one in order to restore its function. Advances in surgical techniques, immunology, and transplantation medicine have made procedures such as corneal transplantation, kidney transplantation, liver transplantation, and heart transplantation possible, thereby improving the quality of life for millions of patients worldwide.

Although organ transplantation is a modern scientific development, Tamil devotional literature contains narratives that have often been interpreted as symbolically reflecting ideas related to the replacement or donation of body organs. One of the most celebrated examples is found in the Periyapuram, in the episode of Kannappa Nayanar.

According to the narrative, Kannappa Nayanar, an ardent devotee of Lord Shiva, witnessed blood flowing from the eye of the Sivalinga. He first attempted to stop the bleeding by applying medicinal herbs. When these efforts proved unsuccessful, he plucked out one of his

own eyes and placed it upon the bleeding eye of the deity. The Periyapuramam describes this profound act of devotion as follows:

"...Believing that his own eye alone would serve as the remedy for the Lord's wounded eye, he joyfully removed it with an arrow and placed it upon the eye of the Lord..."

(Periyapuramam, Kannappa Nayanar Puranam, Verse 822)

From a literary perspective, this episode symbolizes the devotee's complete self-sacrifice and unwavering devotion. Some modern scholars interpret the episode as demonstrating an imaginative awareness of the possibility of replacing a damaged eye with another, drawing a symbolic parallel to the contemporary concept of corneal transplantation.

Today, corneal transplantation (keratoplasty) enables individuals suffering from corneal blindness to regain vision through the transplantation of donated corneal tissue. However, it is important to recognize that the Kannappa narrative does not describe a medical or surgical procedure in the modern sense. Rather, it is a religious and literary narrative that employs the motif of eye donation to convey supreme devotion.

Nevertheless, the story possesses enduring relevance because it highlights the cultural value of selfless organ donation. In contemporary society, eye donation has become a significant humanitarian practice that restores sight to visually impaired individuals. Viewed from this perspective, the Kannappa legend may be regarded as an inspiring literary metaphor that encourages altruism and sacrifice, values that continue to support modern organ donation programmes.

Thus, while the Periyapuramam should not be interpreted as evidence that organ transplantation was scientifically practiced in ancient Tamil society, it demonstrates how Tamil literature employed powerful symbolic narratives that resonate with contemporary medical ethics, particularly the ideals of compassion, self-sacrifice, and the gift of life through organ donation.

RAINBOW

The phenomenon of the rainbow is referred to in the Naladiyar as follows:

"Like the rainbow whose appearance in the sky is beyond our knowing, so too are the coming and going of life beyond human comprehension; therefore, we bow to the Divine with steadfast minds, praying that our righteous aspirations may be fulfilled."(Naladiyar, Verse 1)

From the standpoint of modern science, a rainbow is an atmospheric optical phenomenon produced when sunlight enters raindrops, undergoes refraction, internal reflection, and dispersion, and then emerges as the spectrum of visible colours. The rainbow appears only under specific environmental conditions and disappears as soon as those conditions change. It is therefore a transient natural phenomenon governed by the laws of optics.

The poet of the Naladiyar employs this familiar natural phenomenon as a literary metaphor to convey a profound philosophical truth. Just as human beings cannot predict the precise moment at which a rainbow will appear or disappear, they cannot fully comprehend the mysteries surrounding birth, life, and death. The impermanence of the rainbow becomes a symbol of the transient nature of human existence.

Although the poet does not provide a scientific explanation for the formation of the rainbow, the verse demonstrates careful observation of a natural phenomenon and transforms that observation into ethical and philosophical reflection. This illustrates a characteristic feature of classical Tamil literature, where natural events serve as vehicles for communicating universal truths about human life.

The verse further suggests that many events in the universe unfold according to an order that transcends human understanding. Recognizing these limitations, the poet advocates humility, reverence, and righteous conduct. Thus, the rainbow functions simultaneously as an observable natural phenomenon and as a symbol of the uncertainty and impermanence inherent in human life.

From an interdisciplinary perspective, this passage exemplifies the close relationship between scientific observation and literary imagination in Tamil ethical literature. While the scientific explanation of the rainbow emerged through later developments in optics, the Naladiyar reveals that ancient Tamil poets possessed a keen awareness of natural phenomena and skillfully incorporated them into ethical discourse.

Dewdrops and the Transience of Human Life

The Naladiyar employs the natural phenomenon of dew to illustrate the impermanence of human life:

"Knowing that life is as transient as the dew upon the tip of a blade of grass, perform virtuous deeds without delay.

For today one stands, sits, and lies among us, and tomorrow people lament, saying, 'He has departed.'" (Naladiyar, Verse 29)

From the perspective of modern science, dew is formed when the temperature of the ground and surrounding vegetation falls below the dew point, causing water vapour in the atmosphere to condense into tiny droplets on surfaces such as grass leaves. At sunrise, solar radiation warms these surfaces, and the droplets gradually evaporate, disappearing within a short period. Thus, dew is a temporary natural phenomenon governed by the principles of condensation and evaporation.

The poet of the Naladiyar carefully observes this everyday occurrence and transforms it into a profound ethical lesson. The sparkling dewdrops resting on the tips of grass resemble pearls in the early morning, yet they vanish as soon as they are touched by the warmth of the rising sun. Likewise, human life, however vibrant and beautiful, is fragile and uncertain.

Using this observation, the poet urges individuals to recognize the fleeting nature of life and to perform virtuous deeds without postponement. A person who was alive, speaking, and living among family and friends today may unexpectedly pass away tomorrow. Therefore, before death overtakes us, one should engage in righteous actions that benefit both oneself and society.

This passage exemplifies the close relationship between scientific observation and ethical philosophy in Tamil literature. The poet does not merely describe a natural process; rather, he employs an observable scientific phenomenon—the formation and disappearance of dew—to communicate a timeless moral truth concerning the impermanence of life and the urgency of ethical living.

From an interdisciplinary perspective, the verse demonstrates how the authors of the Pathinenkeezhkanakku integrated environmental observation, scientific awareness, and moral instruction into a single literary expression. It reflects the ancient Tamil practice of deriving ethical insights from the careful study of natural phenomena.

Thunder:

The Naladiyar employs the phenomenon of thunder to illustrate the enduring fame earned through generosity:

"The sound of a war drum is heard only by those nearby; the roar of thunder is heard from afar; but the praise that 'the noble have given in charity' resounds through all the three worlds." (Naladiyar, Verse 100)

The poet compares three kinds of sound—the beating of a drum, the rumbling of thunder, and the fame of charitable deeds. While the first two have physical limits, the glory earned through acts of generosity is portrayed as limitless and everlasting. Thus, a natural phenomenon is employed to communicate an ethical ideal.

From the perspective of modern atmospheric science, thunder is produced as a consequence of lightning. During a thunderstorm, electrical charges accumulate within clouds, creating a difference in electrical potential between clouds or between the clouds and the Earth. When this potential difference becomes sufficiently large, an electrical discharge occurs in the form of lightning. The intense heat generated by the lightning rapidly expands the surrounding air, producing shock waves that are heard as thunder. Because sound travels much more slowly than light, lightning is seen before thunder is heard. Depending on atmospheric conditions, the sound of thunder may be audible over distances of several kilometres.

Although the Naladiyar does not attempt to explain the physical mechanism responsible for thunder, it demonstrates an accurate awareness of its powerful and far-reaching sound. The poet transforms this familiar natural experience into a literary metaphor, suggesting that the reputation of a virtuous person who gives generously extends even farther than the sound of thunder. A similar appreciation of thunder appears in Āṇḍāl's Tiruppāvai, where she prays:

"Flash like the ocean-wide lightning and roar like the sacred conch." (Tiruppāvai, Verse 3)

Here, thunder is poetically compared to the resounding blast of the sacred conch (valampuri), emphasizing its grandeur and majesty. Such imagery illustrates the close observation of natural phenomena by Tamil poets and their ability to incorporate these observations into devotional and ethical literature.

Thus, the Naladiyar and the Tiruppāvai reveal that ancient Tamil literature frequently drew upon observable natural events to convey philosophical, ethical, and spiritual ideas. These works do not present scientific theories in the modern sense; rather, they demonstrate a keen awareness of nature and employ scientific observation as an effective literary device.

The Phases of the Moon

The changing phases of the Moon are among the most carefully observed natural phenomena in both astronomy and classical Tamil literature. Modern astronomy explains that the Moon revolves around the Earth approximately once every 29.5 days. The Moon does not produce its own light; rather, it reflects the light of the Sun. As the Moon moves around the Earth, the

relative positions of the Sun, Earth, and Moon change, causing different portions of the illuminated lunar surface to become visible from Earth. This gives rise to the familiar lunar phases—from the New Moon (Amāvāsai) to the Full Moon (Purnami) and back again.

During the New Moon, the Moon lies approximately between the Earth and the Sun, and the illuminated side faces away from the Earth, making the Moon nearly invisible. As the Moon continues its orbit, an increasing portion of its sunlit surface becomes visible, producing the waxing crescent, first quarter, waxing gibbous, and eventually the Full Moon, when the entire illuminated hemisphere faces the Earth. Thereafter, the illuminated portion gradually decreases through the waning phases, returning to the New Moon and completing the lunar cycle. The poets of the Pathinenkeezhkanakku observed this recurring celestial phenomenon and employed it as a powerful literary metaphor. The Naladiyar states:

"The friendship of the noble grows day by day like the waxing moon; the friendship of the ignoble wanes day by day like the fading moon." (Naladiyar, Verse 125)

The waxing crescent symbolizes the gradual strengthening of friendship with virtuous people, while the waning moon represents the decline and eventual disappearance of friendship with the unwise. Thus, the observable cycle of the Moon is transformed into an ethical lesson concerning the value of noble companionship. A similar comparison appears in the Thirukkural:

"The friendship of the wise is like the waxing moon; the friendship of fools is like the waning moon." (Thirukkural, 782)

Likewise, the Ainthinai Ezhupathu observes:

"The friendship of the virtuous never diminishes; like the waxing moon, it grows stronger and yields lasting benefit." (Ainthinai Ezhupathu, Verse 5)

These literary passages demonstrate that ancient Tamil poets possessed a keen awareness of the cyclic nature of the Moon's appearance. Although their primary purpose was ethical instruction rather than astronomical explanation, they accurately employed the observable phases of the Moon to illustrate the growth and decline of human relationships.

From an interdisciplinary perspective, these verses reveal how astronomical observation became an integral component of Tamil ethical literature. The regularity of the lunar cycle provided an ideal natural analogy through which poets communicated enduring moral truths.

Such examples illustrate the harmonious integration of scientific observation, literary imagination, and ethical philosophy that characterizes the Pathinenkeezhkanakku corpus.

CONCLUSION

The present study demonstrates that scientific ideas are deeply embedded in classical Tamil ethical literature, particularly in the Pathinenkeezhkanakku corpus. These works reveal that ancient Tamil scholars possessed keen powers of observation and systematically recorded their understanding of nature, human life, health, ethics, and the environment through literary expression. Consequently, Tamil ethical literature is not merely a repository of moral instruction but also a valuable source of scientific thought and practical wisdom.

The analysis shows that the Pathinenkeezhkanakku texts incorporate concepts related to mathematics, measurement, medicine, hydrology, environmental science, astronomy, nutrition, preventive healthcare, and social well-being. Although these texts were not intended as scientific treatises in the modern sense, they reflect an empirical outlook based on careful observation of natural phenomena. The authors frequently transformed scientific observations into ethical metaphors, thereby making complex ideas accessible and meaningful within the context of everyday life.

Tamil ethical literature further illustrates the harmonious relationship between science and literature. Science seeks to understand the external world through observation, reasoning, and evidence, whereas literature explores the inner dimensions of human experience through imagination, emotion, and ethical reflection. The Pathinenkeezhkanakku corpus successfully integrates these two modes of inquiry, demonstrating that scientific awareness and literary creativity are complementary rather than contradictory.

Therefore, the enduring relevance of these ethical works lies in their ability to combine scientific observation, moral philosophy, and literary excellence. They continue to provide valuable insights into sustainable living, preventive healthcare, environmental responsibility, and rational thinking. Viewed from an interdisciplinary perspective, the Pathinenkeezhkanakku texts stand as remarkable examples of scientific imagination expressed through literature, contributing significantly to both Tamil intellectual heritage and contemporary discussions on science and the humanities.

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