Indian Journal of History of Science (2023) 58:103–110
https://doi.org/10.1007/s43539-023-00085-1

ARTICLE

A brief study on history and evolution of time

Udhaya Sankar Ganesamoorthy[1] · **Chinnadurai Ganesa Moorthy**[2]

Received: 2 February 2023 / Accepted: 17 April 2023 / Published online: 5 May 2023

Abstract
Time is a phenomenon of periodic changes in our Earth, solar system, and universe. In our Earth, a day has 24 h; 1 h has 60 min and 1 min has 60 s. These all are well known things. One systematic arrangement of time in history is based upon base 60 or Sexagesimal system. If time of Earth is based on the angle of inclination 60° of the plane for solar system with the plane for Milky Way, then the resultant should be based on base number 60 for formation of a calendar of the years. The astrophysical science and mathematical calculations led to the development of time concept year by year with predictions of all events. Those calculations are done with the help of base 60 number system. More specifically, 60 years is the number of years required for Saturn and Jupiter to regain same positions in the solar plane. The cultural festivals and agricultural operations are also based on base 60 system. At finally, human biological clocks subject to the facts are considered.

Keywords Base 60 numbers · Human biological clock · 60 years in Tamil calendar · Time · Time-calendar concept · Scientific phenomena

1 Introduction

The concept of time is a subject of philosophical and scientific study. Philosophers and scientists have been seeking procedures to understand its nature and role in the universe. The concept of time has a long and fascinating history, and it has undergone many changes and developments over the course of human history (Tegmark et al., 1998). The earliest known systems for the measurement of time were based on the cycles of the sun, the moon, and the stars; they were used by ancient civilizations to keep track of the passing of days, weeks, months, and years. Human societies developed more complex systems for measurement of time, including the use of calendars, clocks, and other devices. These systems allowed for more precise measurement of time and synchronization of activities across long distances. The development of timekeeping devices such as clocks and watches played a significant role in the evolution of time. These devices made it possible to measure time more accurately and to synchronize activities across long distances (Lanford, 1975). Philosophers have grappled with the nature of time and its relationship to the universe, and scientists have sought to understand the fundamental laws that govern the passage of time (Tegmark et al., 1998).

A calendar is a system of organizing days for social, religious, commercial, or administrative purposes. This is done by giving names to periods of time, typically days, weeks, months, and years. A date, which specifies a particular day within a calendar, is the designation of a single, specific day within such a system. Calendars can be based on a variety of different systems, including lunar, solar, and lunisolar (Sharlach, 2013). A lunar calendar is based on the cycles of the moon, with each month beginning on the new moon and lasting for 29 or 30 days. A solar calendar is based on the Earth's orbit around the sun, with the year being divided into 12 months of varying lengths (Foster, 2008; Sharlach, 2013). A lunisolar calendar combines the elements of both lunar and solar calendars; with the months being based on the cycles of the moon and the years being based on the orbit of the Earth around the sun. Time is a fundamental concept that underlies many aspects of our lives and our understanding of the world around us (Foster, 2008). It is a measure of the duration of events, and is a fundamental element of the way we experience the world. The concept of time has been studied and debated by philosophers, scientists, and theologians

✉ Udhaya Sankar Ganesamoorthy
udhayasankar20@outlook.com;
udhayasankar@ntscchennai.onmicrosoft.com

[1] National Small Industries Corporation, Chennai, Tamilnadu 600032, India

[2] Department of Mathematics, Alagappa University, Karaikudi, Tamilnadu 630002, India

for centuries. Time is closely related to the concept of causation, which is the idea that events are connected in a logical sequence (Depuydt, 1997). The concept of causation is closely tied to the concept of time, as the changes that occur over time create the causal relationships between events.

In the physical sciences, time is often defined as the measure of the duration of events. This definition is closely related to the concept of space, as the two are often considered to be two sides of the same coin. In physics, time and space are considered to be fundamental elements of the universe, and they are often referred to as space–time. The study of time has led to a number of important discoveries and theories, including the theory of relativity, which was developed by Albert Einstein. According to the theory of relativity, time is not a fixed and universal concept, but rather it is relative to the observer and their movement through space. In addition to its scientific and philosophical significance, time is also a practical one and everyday concern for most people. We use time to measure the duration of events, to schedule our activities, and to plan for the future. The concept of time is also closely tied to our understanding of aging and the passing of life, and it is an important element in many cultural and religious traditions (Depuydt, 1997; Foster, 2008).

One of the earliest known uses of the base 60 system was in the measurement of time. The ancient Sumerians used a base 60 system to divide the day into smaller units, with 60 s in a minute, 60 min in an hour, and so on. This system was later adopted by the ancient Babylonians, who used it to create their own system of time measurement. The base 60 system was also used by the ancient Egyptians and the ancient Greeks for the measurement of angles (Thomson, 1943; Conway et al., 1998). The 360-degree circle, which is used to measure angles, is based on the base 60 system, with each degree being divided into 60 min and each minute being divided into 60 s. The ancient Babylonians used the base 60 system in their calculations, and it was later adopted by the ancient Greeks, who used it in their own mathematical and scientific work. Today, the base 60 system is still used for the measurement of time and angles (Conway et al., 1998).

Thus, further discussions presented in this manuscript are related to history and evolution of time, calendars (Mayan, Babylonian, Tamil etc.), base 60 system use, method for discoveries of time, discussions on base 60 calendars, the resultant magical number base 60, and influence on biological clocks of human beings.

2 History and evolution of time

A calendar is a system for organizing and displaying the passage of time. It is used to mark the passage of days, weeks, months, and years, and it is an important part of many cultures and societies (Depuydt, 1997). The first known calendars were based on the cycles of the sun, the moon, and the stars, they were used by ancient civilizations to keep track of the passing of the days, weeks, months, and years. As human societies developed, more complex calendars were developed, including the use of calendars that were based on the solar year and the lunar month (Depuydt, 1997). These calendars were used to mark the passage of time, to track the seasons, and to mark important events and festivals.

The history of calendars stretches back thousands of years, with the earliest known examples dating back to the Neolithic period (Greengus, 2001). The development of calendars was closely tied to the development of agriculture and the needed to track the passage of seasons for planting and harvesting crops. One of the oldest known calendars was the lunar calendar, which was based on the phases of the moon (Greengus, 2001). The lunar calendar was used by many ancient cultures, including the Babylonians and the ancient Egyptians (Stern, 2008). The lunar calendar was not very precise, however, as the length of a month (the time between one full moon and the next) varies from 29 to 31 days. The solar calendar, which was based on the movement of the Earth around the sun, was developed by the ancient Egyptians (Sharlach, 2013). The solar calendar was more precise than the lunar calendar, as it was based on the predictable movement of the Earth around the sun (Sharlach, 2013). The solar calendar was used by the ancient Greeks and the Romans, and it is the basis for the calendars that are used today in much of the world (Thomson, 1943). Over time, calendars have undergone a number of changes and adjustments. For example, the Roman calendar originally had 10 months (Gray et al., 2009), with the year beginning in March and ending in December. However, the Roman calendar was not very precise, and it was eventually reformatted to include 12 months and to start the year on January 1st. In the sixteenth century, the Catholic Church introduced the Gregorian calendar, which is the calendar that is used in most parts of the world today (Gray et al., 2009). The Gregorian calendar made a number of adjustments to the solar calendar, including the addition of a leap year (an extra day added to February every four years) to ensure that the calendar remained in synchronizing with the Earth's orbit around the sun.

There are a wide variety of calendars in use around the world today, each with its own unique set of rules and traditions. The most widely used calendar is the Gregorian calendar, which is the de facto standard in much of the world

(Gray et al., 2009). The Gregorian calendar was introduced by Pope Gregory XIII in the sixteenth century and is based on the solar year (Gray et al., 2009). It is a solar calendar with a leap year that occurs every four years to account for the extra quarter day that the Earth takes to orbit the sun. In addition to the Gregorian calendar, there are many other calendars that are still in use today, such as the Islamic calendar, the Chinese calendar, and the Tamil calendar (Fuller, 1980; Kelly et al., 1999), and (Sivin, 2011). Each of these calendars has its own set of rules and traditions, and they are used for a variety of different purposes, including religious observances, cultural festivals, and national holidays. In addition to the use of calendars for the measurement of time, calendars are also used for a variety of other purposes, including the calculation of taxes and other financial obligations, the coordination of activities, and the organization of social and cultural events (Gray et al., 2009). Calendars are now an integral part of modern life, and they are used in many parts of the world for a variety of purposes. There are many different types of calendars, including solar calendars, lunar calendars, and mixed calendars, and each type of calendar has its own unique features and characteristics.

2.1 Mayan calendar

The Mayan calendar is a traditional calendar that was used by the Maya civilization, which was a Mesoamerican civilization that flourished in what is now Mexico, Belize, Guatemala, Honduras, and El Salvador from about 2000 BCE to 1500 CE (Valencia, 2019). The Mayan calendar is a complex system that includes three different calendars: the tzolk'in, the haab, and the Long Count. The tzolk'in is a 260-day calendar (Rice, 2001) that is based on the cycles of the moon, and it is used for divination and the tracking of important events and festivals. The haab is a 365-day calendar that is based on the solar year, and it is used for the tracking of seasons and the calculation of taxes and other financial obligations (Rice, 2001). The Long Count is a calendar that is used to track longer periods of time, and it is based on a cycle of 394 years (Rice, 2001). The Mayan calendar was an important part of Mayan culture and tradition, and it was used for a variety of purposes, including the measurement of time, the tracking of important events and festivals, and the calculation of taxes and other financial obligations. The Mayan calendar is still in use today by some Maya communities, and it is an important part of Maya culture and identity (Vondrák et al., 2022).

2.2 Tamil calendar

The Tamil calendar is a traditional calendar used by the Tamil people, who are native to the state of Tamil Nadu in India and parts of Sri Lanka. The Tamil calendar is a solar calendar, with the year being divided into 12 months (Fuller, 1980). The Tamil calendar follows a 60-year cycle (Fuller, 1980), with each year being assigned a unique name based on the combination of the year and the cycle. The Tamil calendar also includes a number of important festivals and holidays, many of which are based on the cycles of the moon and the seasons. One of the most important festivals in the Tamil calendar is Pongal, which is a four-day festival that celebrates the harvest season (Fuller, 1980). Pongal is celebrated on the first day of the Tamil month Thai, which exactly coincides with the day on which the Sun begins its six-month inclination-journey from south to north. It is typically held in January and is a time of thanksgiving and celebration for the Tamil people. In addition, to its cultural and religious significance, the Tamil calendar is also used for administrative purposes in Tamil Nadu (Fuller, 1980; Palanithurai, 2005). The Tamil calendar is used to determine the dates of public holidays and other important events, and it is also used in the calculation of taxes and other financial obligations (Palanithurai, 2005). The Tamil calendar has a long and rich history, and it is an important part of Tamil culture and identity. Despite the adoption of the Gregorian calendar in many parts of the world, the Tamil calendar remains in use and is an important part of the daily lives of the Tamil people.

In Tamil calendar, the 60 year cycle is based on the sun, along with all the other stars in the Milky Way galaxy, orbits the centre of the galaxy. This process is known as galactic rotation. The Milky Way galaxy is a barred spiral galaxy, which means that it has a central bar-shaped region and a number of spiral arms. The sun is located in one of the spiral arms of the Milky Way galaxy, about 21,600 light-years from the centre (Hari, 2007). The sun and all the other stars in the Milky Way galaxy are held in place by the gravitational pull of the galaxy's central region, which contains a large concentration of mass. As a result, the sun and other stars are constantly in motion, orbiting the centre of the galaxy. The process of galactic rotation is important because it helps to rectify the 60 year cycle prediction from Tamil calendar.

2.3 Chinese calendar

The Chinese calendar is a traditional calendar used in China and other parts of East Asia. The Chinese calendar is a lunisolar calendar, which means that it is based on both the cycle of the moon and the orbit of the Earth around the sun. The Chinese calendar is divided into 12 months, with each month being based on the cycles of the moon. The Chinese calendar also includes a system of leap months, which are inserted into the calendar to keep it synchronize with the orbit of the Earth around the sun (Kelly, 1999). One of the most important features of the Chinese calendar is the system

of 12 animal signs, which are used to represent the years. The 12 animal signs are rat, ox, tiger, rabbit, dragon, snake, horse, goat, monkey, rooster, dog, and pig (Sivin, 2011). Each animal sign is associated with certain personality traits and characteristics, and people believed to have certain traits based on the year in which they were born (Sivin, 2011). In addition to its use for timekeeping and astrology, the Chinese calendar is also an important part of Chinese culture and tradition. The Chinese calendar is used to determine the dates of important festivals and holidays, and it is also used in the calculation of taxes and other financial obligations. The Chinese calendar has a long and rich history, and it is an important part of Chinese culture and identity (Sivin, 2011). Despite the adoption of the Gregorian calendar in many parts of the world, the Chinese calendar remains in use and is an important part of the daily lives of the Chinese people (Kelly, 1999).

2.4 Tamil calendar vs. Chinese calendar

The Tamil calendar and the Chinese calendar are two traditional calendars that are used in different parts of the world. While both calendars are used for timekeeping and determination of important festivals and holidays, there are some key differences between the two calendars. One of the main differences between the Tamil and the Chinese calendar is the way in which they measure the year (Fuller, 1980; Kelly, 1999). The Tamil calendar is a solar calendar, which means that it is based on the orbit of the Earth around the sun. The Chinese calendar, on the other hand, is a lunisolar calendar, which means that it is based on both the cycles of the moon and the orbit of the Earth around the sun. Another difference between the Tamil calendar and the Chinese calendar is the way in which they divide the year into months. The Tamil calendar is divided into 12 months, with each month being based on the cycles of the moon (Fuller, 1980). The Chinese calendar is also divided into 12 months (Kelly, 1999) and (Sivin, 2011)) which are used to represent the years and are believed to be associated with certain personality traits, it includes a system of leap months that are inserted into the calendar to keep it synchronize with the orbit of the Earth around the sun. The Tamil calendar, on the other hand, has a 60-year cycle, with each year being assigned a unique name based on the combination of the year and the cycle (Fuller, 1980).

2.5 Babylonian calendar

The Babylonian calendar was a lunar calendar that was used in ancient Mesopotamia, an area that corresponds to present-day Iraq (Barton, 1911). The Babylonian calendar was based on the cycles of the moon, with each month beginning on the new moon and lasting for 29 or 30 days. The Babylonian calendar was not very precise, as the length of a lunar month varies from 29 to 31 days (Hartner, 1979). This led to needs for frequent adjustments to the calendar, which were made by the addition of intercalary months (extra months inserted into the calendar to keep it in synchronize with the cycles of the moon). Despite of its imprecision, the Babylonian calendar was an important tool for the ancient Babylonians, who used it to track the passage of time for agricultural and religious purposes (Barton, 1911). The Babylonian calendar was also used for the measurement of time, with each day being divided into 24 h and each hour being divided into 60 min (Hartner, 1979). The Babylonian calendar was later adopted by other cultures, including the ancient Persians and the ancient Greeks. The Greek philosopher Meton of Athens used the Babylonian calendar as the basis for his own system of time measurement, which was based on the cycles of the sun. Today, the Babylonian calendar is no longer in use, but it remains an important part of the history of calendars and time measurement (Greengus, 2001). The legacy of the Babylonian calendar can still be seen in the modern world, as many of the concepts and principles that were developed by the ancient Babylonians continue to be used in the calendars and systems of time measurement that are used today.

The seven-day week is believed to have originated in ancient Mesopotamia, possibly among the Babylonians (Fotheringham, 1909). The Babylonians, who lived in what is now Iraq, divided the month into four weeks of seven days each, with the seven days being named after the celestial bodies that were believed to influence the lives of humans (Fotheringham, 1909). The seven-day week spread to other cultures and civilizations, including the ancient Egyptians, the ancient Greeks, and the Romans, who also used a seven-day week (Barton, 1911; Greengus, 2001). The seven-day week is now used in many parts of the world, and it is an important part of modern life. There are a number of theories as to why the seven-day week became the standard length for a week. One theory is that the seven-day week is based on the phases of the moon, with each week representing a quarter of the lunar month (Fotheringham, 1909). Another theory is that the seven-day week is based on the four phases of the moon (new moon, first quarter, full moon, and third quarter) plus three "in-between" days. Another theory is that the seven-day week is based on the seven celestial bodies that were believed to influence the lives of humans in ancient Mesopotamia (Hartner, 1979). These celestial bodies were Sun, Moon, Mars, Mercury, Jupiter, Venus, and Saturn.

2.6 Tamil calendar vs. Babylonian calendar

The Tamil calendar and the Babylonian calendar are two traditional calendars that have been used in different parts of the world. While both calendars are used for timekeeping and the determination of important festivals and holidays,

there are some key differences between the two calendars (Greengus, 2001; Palanithurai, 2005). One of the main differences between the Tamil calendar and the Babylonian calendar is the way in which they measure the year. The Tamil calendar is a solar calendar, which means that it is based on the orbit of the Earth around the sun. The Babylonian calendar, on the other hand, was a lunar calendar, which means that it was based on the cycles of the moon. Another difference between the Tamil calendar and the Babylonian calendar is the way in which they divided the year into months. The Tamil calendar is divided into 12 months (Fuller, 1980), with each month being based on the cycles of the moon. The Babylonian calendar was also divided into 12 months (Hartner, 1979), but the length of each month varied from 29 to 31 days. This led to the need for frequent adjustments to the calendar, which were made by the addition of intercalary months (extra months inserted into the calendar to keep it in synchronize with the cycles of the moon). In addition to these differences, the Tamil calendar and the Babylonian calendar also have some unique features that set them apart. For example, the Tamil calendar has a 60-year cycle (Fuller, 1980), with each year being assigned a unique name based on the combination of the year and the cycle. The Babylonian calendar, on the other hand, was used for a variety of purposes, including the measurement of time and the tracking of important festivals and holidays (Fotheringham, 1909).

3 Time evolution

In addition to the development of calendars, the concept of time has also been studied and debated by philosophers, scientists, and theologians. The ancient Greek philosopher Aristotle argued that time was an inherent aspect of the universe, while the medieval philosopher St. Augustine argued that time was a human construct (Thomson, 1943). The theory of relativity, developed by Albert Einstein in the twentieth century, revolutionized our understanding of time, suggesting that it is not a fixed and universal concept, but rather it is relative to the observer and their movement through space. The concept of time has been a subject of study and fascination for people throughout history (Thomson, 1943). Early cultures used various methods to track the passage of time, including the use of sundials, water clocks, and calendars based on the movements of the sun, moon, and stars (Winfree, 1987).

The 24-h time system, also known as the "military time" system, is a method of measuring time in which the day is divided into 24 h rather than the traditional system of 12 h (with a.m. and p.m. periods). The 24-h time system is used in many parts of the world, including most of Europe, Asia, and South America. One of the main advantages of the 24-h time system is that it avoids the need to specify a.m. or p.m. (Winfree, 1987), which can be confusing in some situations. For example, if someone says "meet me at 7:00," it is not clear whether they are referring to 7:00 a.m. or 7:00 p.m. With the 24-h time system, there is no confusion, as "meet me at 19:00" clearly indicates a meeting time of 7:00 p.m.

In addition to its clarity, the 24-h time system is also more efficient, as it avoids the need to specify a.m. or p.m. every time when a time is mentioned. This can be particularly useful in situations where time is of the essence, such as in emergency situations or in military operations. The 24-h time system is also used in many computer systems, as it allows for easy representation of time in a digital format. In computer systems, the 24-h time system is often used in conjunction with the Gregorian calendar, which is the most widely used calendar in the world. While the 24-h time system is used in many parts of the world, it is not used everywhere. In the United States, for example, the traditional 12-h time system is still the most commonly used (Ishida et al., 1999). However, the 24-h time system is gaining popularity in the United States, particularly in military and aviation circles. The 24-h time system is a method of measuring time in which the day is divided into 24 h rather than the traditional system of 12 h. The 24-h time system is used in many parts of the world, including most of Europe, Asia, and South America, and it is known for its clarity and efficiency. While the 24-h time system is not used everywhere, it is gaining popularity in some parts of the world, particularly in military and aviation circles.

4 Indian philosophy on time

Some important philosophies on time are mentioned in the books like "*A Study of Time in Indian Philosophy*" (Balslev, 2009) and *Understanding Space Time and Causality: Modern Physics and Ancient Indian Traditions* (Sreekantan & Roy, 2020). According to the book of Anindita Niyogi Balslev, Philosophers like Nyāya-Vaiśeṣika, Sāṅkhya and Jaina were widely trying to represent the nature of time in their living centuries. For example, like Nyāya-Vaiśeṣika considered the time at yoga stage to classify the universe having eternal time. Likewise, the concept of time through metaphysics logic was described by Sāṅkhya. Apart from metaphysical, and logical and eternal concept of time, Jaina described the concept of time as the one related to human life (birth, growth and decay). They called that as conventional time/absolute time. Hence, the concept of time was extensively studied and debated in Indian philosophy (Balslev, 2009; Sreekantan, 2001). A complex set of ideas for unsolved mysteries can be solved with the help of modern science in conjunction with the Planck's idea of time taken by light to cover a particular distance (Moorthy and

Sankar, 2009). Time at various scales has been mentioned in modern science. For example, in time at sub atomic level (smaller scale), one can reach to the Planck scale (10^{-43} s) *i.e.* the shortest time scale that exists in this physical universe (Sreekantan & Roy, 2020). The macroscopic and mega scale of time were gently described by Jaina philosophy (Radhakrishnan, 1957; Dasgupta, 1975). The macroscopic and mega scale of time depends upon the natural phenomena of human biological clock, but everything comes under the magical 60 base number system. Thirty years are required for Saturn and twelve years are required for Jupiter for making one round around the sun. The least common multiple of 30 and 12 is 60, which provides the time required for successive alignments of these two big planets, when these two planets are important for some predictions in India.

5 Methods for the discoveries of time

The solar system is located in one of the spiral arms of the Milky Way galaxy, about 21,600 light-years from the centre (Hari, 2007). The sun and all the other objects in the solar system are held in place by the gravitational pull of the galaxy's central region. This is the major phenomena behind the discoveries of time on base 60 number system.

The base 60 numbering system, also known as the sexagesimal system, is a number system that uses 60 as its base. The base 60 system is believed to have originated in ancient Sumeria, where it was used for a variety of purposes, including the measurement of time and angles (Dimitrov et al., 2017). One of the key features of the base 60 system is that it is highly divisible. The number 60 is divisible by 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, and 30, which makes it easy to divide quantities into smaller units (Hayes, 2001). This property made the base 60 system well-suited particularly for the measurement of time and angles, as it allowed for the creation of more precise units of measurement (Dimitrov et al., 2017). In the modern world, the base 60 system is still used for the measurement of time and angles. For example, the 360-degree circle, which is used to measure angles, is based on the base 60 system. Similarly, the system of hours, minutes, and seconds that is used to measure time is also based on the base 60 system, with 60 min in an hour and 60 s in a minute.

5.1 Babylonians calendar of base 60

The Babylonians used a base 60 numbering system, also known as the sexagesimal system, for a variety of purposes, including the measurement of time and angles. The base 60 system is highly divisible, which made it well-suited for these purposes. One of the main advantages of the base 60 system is that it allows for the creation of more precise units of measurement (Hartner, 1979). For example, the base 60 system was used by the Babylonians to divide the day into smaller units, with 60 s in a minute, 60 min in an hour, and so on. The base 60 system was also used by the Babylonians and other ancient cultures for the measurement of angles, with the 360-degree circle being based on the base 60 system (Greengus, 2001). In addition to its precision, the base 60 system was also used by the Babylonians because it was a convenient and an efficient way to represent large numbers. The base 60 system allowed the Babylonians to represent large quantities in a compact format (Fotheringham, 1909), which made it easier to perform calculations and keep track of important information.

5.2 Tamil calendar of base 60

Tamil people used the base 60 number system in their calendar, yet it is not entirely clear why the Tamil people adopted a 60-year cycle for their calendar, apart from a reason that it is a periodically meeting time for Saturn and Jupiter with a shortest distance. However, it is possible that the 60-year cycle was chosen because it is a highly divisible number that allows for the creation of smaller units of measurement (Fuller, 1980; Palanithurai, 2005). In addition to its divisibility, the 60-year cycle may have been chosen by the Tamil people because it was a convenient and efficient way to represent large numbers (Fuller, 1980). The 60-year cycle allowed the Tamil people to represent large quantities of time in a compact format, which made it easier to keep track of important events and festivals. It is also possible that the 60-year cycle was chosen by the Tamil people for cultural or religious reasons (Palanithurai, 2005).

6 Discussions

Based on the methods and discoveries of time from the Babylonians and Tamil calendar, it may be concluded that the 60 base number has been chosen to solve the mystery of time evolution (Depuydt, 1997), (Thomson, 1943) and (Dimitrov et al., 2017). On considering the 360° of Milky Way galaxy with a distance about 21,600 light-years (Hari, 2007) from the centre of solar system, there is a need to consider 60° concepts, which is the angle of inclination of solar system plane to Milky Way plane. This could be the formation of time-calendar concept by Tamilan's and Babylonian's (Hartner, 1979), (Fuller, 1980). Whatever done by the ancestors, the time is inter chained with the biological clocks.

The biological clock, also known as the body clock or the circadian clock, is a natural process that regulates the physiological and behavioural patterns of living organisms, including humans (Ishida et al., 1999). It is controlled by the body's internal clock, which is influenced by environmental

cues such as light and temperature. The biological clock helps to regulate a wide range of bodily functions, including sleep, appetite, hormone production, and metabolism. It also plays a role in the synchronization of activities within the body, such as the release of hormones and the production of enzymes. The body clock is influenced by environmental cues such as light and temperature, and it is important for the proper functioning of the body. Disruptions to the body clock, such as those caused by shift work or travel across time zones, can have negative effects on health and well-being. The concept of the biological clock has been studied by scientists for many years, and it is an important area of research in the field of chronobiology (Ishida et al., 1999). Research on the biological clock has led to the development of therapies and treatments for conditions such as insomnia, jet lag, and seasonal affective disorder.

Time is the regulation of daily activities, and the synchronization of biological processes within the body. Human beings have always been fascinated by time and have sought to understand its nature and its role in the universe (Winfree, 1987). This fascination has led to the development of many different theories about time, including the idea that it is a fundamental aspect of reality, a human invention, or a social construct. Despite our fascination with time, we are also limited by it. Time is a finite resource, and we are all subject to the passing of time (Winfree, 1987). This can create a sense of urgency and a desire to make the most of our time, as well as a sense of loss and regret as we age and our time on Earth comes to an end.

7 Conclusion

The concept of time has been studied by philosophers, theologians, and scientists for centuries, and there are many different theories about its nature and role in the universe. Some theories view time as a fundamental aspect of reality, while others see it as a human invention or a social construct. Yet, the history of time– calendar shows the use of the base 60 number system in Tamil calendar as well as Babylonian calendar. The use of the number 60 for the measurement of time is now widespread, and it is used in many parts of the world, including the use of 60 min in an hour and 60 s in a minute. The length of a day is important for a number of reasons. It is used as a measure of time and a way to keep track of the passing of the days, weeks, months, and years. The length of a day is also important for the regulation of daily activities, such as work, school, and leisure, and it is an important factor in synchronization of biological processes within the body.

The Chinese and Mayan calendars do not use a base 60 numbering system, but use a number of complex systems for the measurement of time and the tracking of important events and festivals. These systems include the use of different calendars for different purposes, as well as the use of cycles and periods of time that are based on the lunar and solar cycles.

The seven-day week is believed to have originated in ancient Mesopotamia, and is now used in many parts of the world. There are a number of theories as to why the seven-day week became the standard length for a week, including the phases of the moon, the four phases of the moon plus three “in-between” days, and the influence of celestial bodies on human life.

The length of a day is determined by the time it takes for one rotation of the Earth on its axis. One rotation of the Earth on its axis takes 24 h. The length of a day has remained relatively constant over the course of human history, although there have been small variations due to the gravitational pull of the moon and the sun. The length of a day is also affected by changes in the Earth's rotation rate, which can be influenced by factors such as the Earth's distance from the sun and the distribution of mass within the Earth. At present, we are using base 60 system of calendar from Tamil and Babylonian calendar; 365 days from Mayan calendar; 12 signs and leap year from Chinese calendar.

Acknowledgements Authors like to thank the editors and reviewers of the journal for their suggestions for the improvement and betterment of the manuscript.

Data availability This article is based on predicting the ideas of ancestors in using 60 base system for time measurement. So, no data are used in this paper.

References

Balslev, A. N. (2009). *A study of time in Indian philosophy*. Motilal Bamarsidass publisher.

Barton, G. A. (1911). The Babylonian calendar in the reigns of Lugalanda and Urkagina. *Journal of the American Oriental Society, 31*(1911), 251–271.

Conway, J. H., & Guy, R. (1998). *The book of numbers*. Springer Science & Business Media.

Dasgupta, S. (1975). *A history of Indian philosophy* (Vol. 2). Motilal Banarsidass.

Depuydt, L. (1997). *Civil calendar and lunar calendar in Ancient Egypt* (Vol. 77). Peeters Publishers.

Dimitrov, V., Jullien, G., & Muscedere, R. (2017). *Multiple-base number system: Theory and applications*. CRC Press.

Foster, R. G., & Roenneberg, T. (2008). Human responses to the geophysical daily, annual and lunar cycles. *Current Biology, 18*, 784–794.

Fotheringham, J. K. (1909). The Babylonian calendar. *The Observatory, 32*, 141–141.

Fuller, C. J. (1980). The calendrical system in Tamilnadu (South India). *Journal of the Royal Asiatic Society, 112*(1980), 52–63.

Gray, J. M. K., & Steele, J. M. (2009). Studies on Babylonian goal-year astronomy II: The Babylonian calendar and goal-year methods of prediction. *Archive for History of Exact Sciences, 63*, 611–633.

Greengus, S. (2001). New evidence on the old Babylonian calendar and real estate documents from Sippar. *Journal of the American Oriental Society, 121*(2001), 257–267.
Hari, K. C. (2007). On the origin of the 60 base and the 21600' of a Circle. *Silverbuilders., 4*(2007), 1–8.
Hartner, W. (1979). The young Avestan and Babylonian calendars and the antecedents of precession. *Journal for the History of Astronomy, 10*(1979), 1–22.
Hayes, B. (2001). Third base. *American Scientist, 89*, 490–494.
Ishida, N., Kaneko, M., & Allada, R. Biological clocks. *Proceedings of the National Academy of Sciences, 96*(1999), 8819–8820.
Kelly, M. K., et al. (1999). When days are numbered: Calendar structure and the development of calendar processing in English and Chinese. *Journal of Experimental Child Psychology, 73*, 289–314.
Lanford, O. E. (1975). Time evolution of large classical systems. *Dynamical Systems, Theory and Applications, 7*, 1–111.
Moorthy, C. G., & Sankar, G. U. (2009). Planck's constant and equation for magnetic field waves. *Natural and Engineering Sciences, 4*(2019), 107–113.
Palanithurai, G. (2005). *Ethnic identity and national loyalty of an ethnic group: A case study of Tamil Nadu*. Concept Publishing Company.
Radhakrishnan, S. (1957). *A source book in Indian philosophy*. Princeton University Press.
Rice, P. M. (2001). Maya calendar developments in broader context. *Maya Calendar Origins.* University of Texas Press.
Rivera, V., & Rogelio. (2019). K'awiil and the 819 days Maya calendar. *Estudios De Culturamaya, 53*, 103–138.
Sharlach, T. (2013). *Calendars and counting: The Sumerian world*. Routledge.
Sivin, N. (2011). Mathematical astronomy and the Chinese calendar. *Calendars and Years II: Astronomy and Time in the Ancient and Medieval World, 12*(2011), 39–51.
Sreekantan, B. V. (2001). *Philosophy of science*. Gandhi Centre for Science and Human Values.
Sreekantan, B. V., & Roy, S. (2020). *Understanding space, time and causality: Modern physics and ancient Indian Traditions*. Taylor & Francis.
Stern, S. (2008). The Babylonian month and the new moon: Sighting and prediction. *Journal for the History of Astronomy, 39*, 19–42.
Tegmark, M., & Peebles, P. J. E. (1998). The Time evolution of bias. *The Astrophysical Journal, 500*, 58–79.
Thomson, G. (1943). The Greek calendar. *The Journal of Hellenic Studies, 63*(1943), 52–65.
Vondrák, J., Böhm, V., & Böhm, B. (2022). Did old Maya observe Mercury? *Serbian Astronomical Journal, 204*(2022), 1–8.
Winfree, A. T. (1987). *The timing of biological clocks* (Vol. 19). Macmillan.