

Rudi Čop¹
Tadeja Jere Jakulin
Franc Šturm
Vlado Rosa

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UNVEILING THE IMPACT OF THE ETERNAL LUNAR CALENDAR ON QUALITY OF LIFE

Abstract: *The lunar calendar is the first one established in history. The lunar calendar gives nature's weekly and monthly changes more precisely than the solar one. In restoring such a calendar, we distinguished between proven facts and hypotheses and legends, which were preserved with the help of records based on the testimony of individuals who lived in northwestern Slovenia during the first part of the 20th century. Their eternal lunar calendar is said to be over 300 years old. Its users believed in the initial force, which, according to them, governs everything that exists in this world. Considering the natural cycles increases the quality of our life and ensures its longest possible length.*

Keywords: *time measurement; base-sixty number system; eternal lunar calendar; Nature Worship in the Western Slovenia;*

1. Introduction

Literary texts and historical records from the eleventh century to the sixteenth century extensively mention carols and carolling, indicating that Western European people widely recognised and participated in this cultural practice (Eustace, 2022). However, contemporary researchers need help studying this cultural experience's widespread nature. Carolling, the custom of visiting from house to house at the end of the year, is still present in some places in Slovenia. Carolling was first mentioned by Primož Trubar in his 'Catechism with two explanations' ('Katekizem z dvema izlagama', 1575), and more than a hundred years later, this custom was also described by Janez Vajkard Valvasor in his 'Fame' ('Slava', 1689) (Klobčar, 2010). The custom dates to pre-Christian times and the accepted explanation for its name is that it is derived from the

Latin word to call (lat. calare). In ancient Rome, the beginning of the month was announced by five or seven consecutive calls. The word calendar is also derived from the Latin word for the first day of the month (lat. calendae) (Snoj, 2016). In this paper, we will present the features of the lunar calendar that impact the quality of life of anyone who knows its meaning and use. Although much has been written about calendars, most of the knowledge presented in this paper has been passed down orally by the Nature Worshipers from the Western Slovenia.

2. Calendar and Timekeeping

A calendar contains a sequence of time units: years, months, weeks, and days. The dates used to describe the individual days of the year are based on the movement of the celestial bodies. The most established are the Sun and the Moon. A lunar synodic month is between two consecutive Full Moons

¹ Corresponding author: Rudi Čop
Email: rudi@artal.si

observed from the Earth's surface. It lasts about 29.5 mean solar days and covers four lunar months or four weeks. The mean solar day is the time between two consecutive passages of the Sun across the same meridian calculated from measurements in a tropical year. It is divided into 24 hours, each hour into 60 minutes and each minute into 60 seconds. A tropical year is the time between two consecutive vernal equinoxes. Its length changes slowly, and an approximation of 365.2422 mean solar days is sufficient to set the calendar. This deviates by one day from the true value in 100,000 years (Prosen, 2001/2002; Richards, 2012). Since the lunar month cannot be expressed by a tropical year in a fraction, it is also impossible to construct an ideal calendar based on the movement of these two celestial bodies. Today's concept of time, used in physics, comes from observations of the connections between the Earth and the celestial bodies, which people began in ancient times. In 1832, C.F. Gauss (1777–1855) added the physical quantity of time, the second, to the decimal metric system of units from 1799, which established the standard of meter and kilogram. The second had only been used in astronomy until then. The second is included in today's SI system of units (International System of Units) (Geršak & Drnovšek, 2018) and is measured by atomic clocks. It is measured with an uncertainty of around 5×10^{-15} , which was further reduced with the new generation of atomic clocks (Gill, 2011).

3. The Base-sixty Number System

At the end of the last glaciations, a significant change in people's way of life occurred in South Asia, North Africa and Southern Europe, as well as in present-day Slovenia and the entire Balkans. They gradually stopped their nomadic journeys to find food, water and shelter. They changed the previously passive attitude towards nature into an active one. People began to build more permanent houses that protected

them from weather changes and enemies. Simple agriculture was followed by crafts: pottery, weaving (Grömer, 2016) and carpentry. They invented the potter's wheel and the wheel (Velušček et al., 2009) and began to smelt and work copper and bronze (Velušček & Čufar, 2014). Trading and, thus, exchanging ideas in a wider area flourished (Flego & Rupel, 1993). The development of consciousness accelerated, the discovery of the unknown, and the method of communication was perfected. They developed the use of symbols, which is most visible in the development of paintings in karst caves in different parts of Europe and from different periods of early human history (Ghemis et al., 2011; Mihevc, 2022).

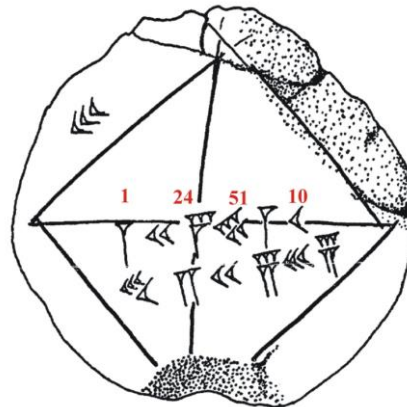


Figure 1. Drawing of the Old Babylonian clay tablet YBC 7289 (1800–1600 BC) with a diagonal in a rectangle and a cuneiform printout of the value of the square root of 2 in the base-sixty number system: $1 + 24/60^1 + 51/60^2 + 10/60^3 = 1.414212\dots$ (Fowler & Robson, 1998).

With the exchange of goods within each community and between communities, expressions for numbers also slowly began to develop. At first, the simplest expressions that are known to Slovenians today were created: one (singular), two (dual) and many (plural). By adding the base two numbers, their set was first increased and then

continued using the fingers, which is the normal procedure in trading. This led to the first base-five method of counting. It was improved by addition and partly also by subtraction. The results were recorded with bundles, notches, knots, or stones arranged in groups. Increasing the basis of counting and grouping led to the use of appropriate signs and the basic form of arithmetic (Struik, 1978).

Beginning in the fifth millennium BC, more advanced organised communities gradually developed, whose economic and social basis was formed by villages. Sophisticated animal farming and intensive agriculture enabled development that rested on surplus goods. Civilisations flourished along the banks of great rivers, facilitated by the successful coordination of state officials. They had to learn about the seasons, the division of land, the collection of taxes and the storage of food supplies. Mathematics was initially developed as an applied science, but it also began to be studied. In all these societies, cycles have arisen due to wars, natural disasters, epidemics of infectious diseases, or the neglect of vital systems. Along the banks of large rivers, there were irrigation systems.

Mesopotamian mathematics reached its highest level of development in the territory between the Euphrates and Tigris rivers, whose sources are in the Armenian highlands and flow into the Persian Gulf. We know it well and reliably because of the durable and extensive inscriptions on clay tablets. Already the oldest records from the Sumerian period, which were created around 2100 BC, show exceptional skill in calculation. These records contain a number in the base-sixty (sexagesimal) number system. They used digit positions in numbers, which gave them a great advantage in calculations. Younger symbolical writings from Mesopotamia prove that arithmetic evolved into basic algebra (Friberg, 2019). The square root of 2 is probably the first irrational algebraic number (Kline, 1953). Its existence is provable because it is the

geometric length of the diagonal of a square with a side of length 1 (Figure 1). The square root of the number 2 cannot be written as a fraction a/b , where a and b are integers, and b is different from zero, so it is not the result of simple counting.

An adapted base-sixty number system is still used to measure time, geometric angles, and geographic coordinates. A position of digits in numbers is also commonly used, with positions increasing in value from right to left. For the notation itself, today, we use Arabic symbols for numbers, which are as many as the most used number base, i.e., ten. These symbols began to develop in the Indus River Valley and were brought to Europe by the Arabs at the end of the first millennium AD. We need names and symbols for numbers and the calendar for successful communication. These two groups of names and symbols have changed the least because of their importance in everyday life over time.

4. Eternal Lunar Calendar

Even the most primitive tribes know how to count time and have basic knowledge about the movement of the Sun, Moon, and stars. Some people used the Sun and stars to monitor changes in nature and for orientation in space and navigation. The use of a lunar calendar goes back very far into human history. It was formed after they connected the changes in vegetation in nature with the moon phases. The Moon's phases can be observed with the naked eye, and a permanent observation point is not required. That is why the old nomadic tribes already observed the Moon's changes. Ancient peoples, who were already organised into state formations, developed their philosophy about time, counting the days of the year and adjusting their calendars according to which they acted (Jere Lazanski, 2010).

The ethnographic material collected in the second half of the 20th century from isolated farms in the northwestern part of Slovenia is very diverse in content. The material

collection consists of over 800 ritual and everyday objects. The most important part is the testimonies of the existence of this secret community of people. Its members said they were of our religion or natural believers, while the rest were heretics, pagans, or snake fans (kačarji). More than a religion, it was a way of life characterised by a close connection with nature (Toplak, 2022; Toplak, 2023). Their ideology was based on an initial creative force called Nikermana. Their religion included all that is

characteristic of indigenous cultures: animism, ancestor worship, worship of sacred riverbeds, hilltops and underground caves, sacred trees, and sacred animals. Because of their good knowledge of nature and its laws, they controlled the entire landscape in which they lived (Pleterski, 2014; Čop, 2022). However, they had to survive only with what the scarce land offered them and, simultaneously, take care of tolerant relations with their majority Catholic neighbours.



Figure 2. Replica of the eternal lunar calendar carved into a linden board, measuring 19 cm by 26.5 cm (after Medvešček – Klančar, 2015b).

The Earth and the celestial bodies were believed to be connected by invisible connections, which they called spider threads (Medvešek – Klančar, 2015a). They knew the influence of the Moon on people, animals, and plants, but above all, on water, which is the source of life. For them, the first five days after the Full Moon were the time for gathering and eating medicinal herbs and transplanting seedlings. The days before the New Moon were unfavourable for all tasks. They drank only spring water and ate fruits and vegetables during this time. They also did not go on errands during the New Moon. For constant and reliable monitoring of the lunar months, they used a wall lunar calendar, the eternal lunar calendar. This is based on thoroughly documented ethnographic material created over three hundred years ago (Medvešek – Klančar, 2015b).

In the eternal lunar calendar (Figure 2), each month begins in the upper left corner with the Full Moon, after which the First Moon occurs seven days later and the New Moon another seven days later. It follows the same path until the Full Moon when the next month begins. According to this calendar, all months are 29 days long and indicated on the right side of the calendar in Arabic numerals. One missing day is added after the Full Moon in the months marked with a dot in the eternal lunar calendar. For this lunar calendar to have the necessary 354 days divided into 12 months, one day must also be added in the initial first month, which is not specifically marked in the calendar. In the upper corner of this calendar is the sign of the house (Čop, 1973) to which the calendar belonged, and in the lower left corner, there are two holes for both pins when the calendar is at rest. The pins are on the top: pin on the right indicates the months from 1 to 12, and pin on the left indicates the Moon's position in the current month.

According to the eternal lunar calendar, each lunar month is divided equally into four parts, running from Full Moon to new Moon and back to Full Moon. Each such part

affects the development of vegetation in nature, which depends on the period of the year. This is divided into two parts in the month of May. In the month of May, the dependence of survival on food supplies from the previous year ends. It is the month of the year when decisions are made in nature about the harvest in the field and in the orchard and about the success of mowing the meadows.

5. Solar Calendar

Today, the officially established and most widely used calendar in the world is the Gregorian calendar, a solar calendar. It evolved from the ancient Roman calendar, used during the Roman Kingdom and the Roman Republic (753–27 BC). The original calendar had ten months, starting with March. The months in this calendar had 30 or 31 days and were divided into eight-day weeks. Immediately after the establishment of the Roman Empire, the first reform of the calendar took place, in which it was given two additional months in the wintertime (Vramec & Mandelc, 1578). This calendar reform, as well as all subsequent ones, was not only political but necessary. The next two reforms were made during the Roman Empire (27 BC–395), first under Emperor Julius Caesar and then under Emperor Augustus. The sixth and seventh months were named after them, and the calendar itself was longer than the length of the tropical year (Hewitt, 1875). Over the centuries, it began to deviate significantly from the spring solstice, by which the date of Easter is determined. According to the command of the Christian churches, this is celebrated every year on the Sunday after the first spring Full Moon. That is why in the 16th century, by order of Pope Gregory XIII, his last reform was carried out so far (Dutka, 1988). With the spread of Christianity, the Gregorian calendar was established worldwide. Namely, the development and use of the calendar is strongly influenced by teaching society's religious and political

principles (Navarroro, 2021).

The Gregorian calendar makes it possible to measure and record periods based on the repeated orbit of the Earth around the Sun relative to the vernal equinox. It has 365 days divided into 12 months, starting with the first winter month. There is an unchanged number of days in each month. The exception is the second month of the year, which is shorter than the others and extended by one day in a leap year. By convention, a leap year is divisible by four without a remainder and not by 100 unless it is divisible by 400. The Gregorian calendar considers the approximation for a tropical year of 365.2425 mean solar days, so it deviates from the tropical year by one day in about 3300 years. The Gregorian calendar could be better, so after its adoption, there were suggestions for its improvement (Belenkiy & Vila-Echague, 2005; Achelis, 1959). All its further reforms have been postponed because this calendar has such a tradition that eliminating it would be very difficult.

6. Conclusion

The article was created based on our study of the development of calendars and the desire to find the right place for the eternal lunar calendar among them. The development of measurements and thus mathematics and the observation of the sky and thus the development of calendars is an unfinished process that began in the Paleolithic period. The preserved material proves this remains from this initial period, representing over 90% of all human history (Rappenglück, 2012; Vit & Rappenglück, 2016)). Therefore, this ongoing process requires knowledge (Jere Lazanski, 2012).

In Slovenian, we use two names for the Moon: 'Luna' and 'Mesec'. The latter name, written in small letters, is also used in the sense of a time interval from 27 to 31 days. With the eternal lunar calendar from the Slovenian ethnological heritage, you can

track the Moon. The record containing this calendar's description can also be the fruit of the creativity of the recorder and his narrators. However, there is no convincing evidence to support this theory. As described in this article, the correct use of the eternal lunar calendar (Figure 2) refuses to doubt its usefulness. Its planner had a good knowledge of astronomy and nature's cycles.

Therefore, improving this calendar to merely monitor the moon phases in individual seasons and within an individual lunar cycle is no longer necessary.

Since the average synodic lunar month is longer than 29.5 days in a month of the eternal lunar calendar, it deviates from the true length of the lunar year, which is 354.3671 days. For the synodic lunar month to be consistent with the lunar months in the multi-year use of the eternal lunar calendar, every other year should be a leap year. For the secret society that used the eternal lunar calendar to cooperate with the Catholic environment successfully, it used its religious calendar with 12 months. In it, both the years and the months were mainly marked with Roman numerals. Among Roman numerals, however, there is no symbol for zero. Months in the eternal lunar calendar are alternately 30 and 29 days long, marked with Arabic numerals. These also have a symbol for zero in their set. The names of the months in the eternal lunar calendar are unknown to us, whereas the months in the Gregorian calendar have their names. These are the names of some gods that were worshipped during the Roman Empire and are no longer worshipped today, the names of two Roman emperors and ordinal numerals in Latin (lingua Latina).

At the start of the eternal lunar calendar, the first month is 30 days long, not specifically marked on it. It is intended to monitor changes shorter than a year and present in the lives of people, domestic and wild animals, plants in fields and meadows, and the forest. The simultaneous use of the eternal lunar calendar and the Catholic religious calendar on isolated mountain

farms in the northwestern part of Slovenia shows their parallel way of life, their understanding of nothingness, time and eternity, and at the same time, their great dependence and connection with nature. If we were to consider the cycles in nature, our quality of life would also increase.

The eternal lunar calendar is not a calendar based on precise astronomical measurements. It served to its users as a tool for monitoring the lunar months, i.e. as a simple lunar calendar. In addition, it also contains symbolic messages and ideograms that serve as a house guard in the house where it is installed. It symbolically contributes to the spiritual balance between people, animals and plants in its surroundings. The creator of this calendar achieved this symbolism with dimensions and shapes that are in harmony. The width to the height of the wooden board on which the eternal lunar calendar is based is in the ratio

of 1 to the square root of 2 with rounded corners. This symbolism is hidden from the uneducated but constantly in front of their eyes.

Careful daily use of the eternal lunar calendar reminds the user that everything in nature constantly changes. Although these changes are cyclical, these cycles differ from each other in such a way that no two are the same. By considering this, the user can achieve the maximum possible length of his life, which is only possible in harmony with the environment and its changes (Čop & Jere Jakulin, 2022).

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Rudi Čop

Terra Viva Institute Geophysical
Observatory
Sv. Peter 115
Sečovelje
Slovenia
rudi@artal.si
ORCID 0009-0006-5890-6544

Tadeja Jere Jakulin

University of Primorska, Faculty
of Tourism Studies-
TURISTICA,
Portorož
Slovenia
tadeja.jerejakulin@upr.si
ORCID 0000-0003-1849-8444

Franc Šturm

Terra Viva Institute Geophysical
Observatory
Sv. Peter 115
Sečovelje
Slovenia

Vlado Rosa

Terra Viva Institute Geophysical
Observatory
Sv. Peter 115
Sečovelje
Slovenia
