A THRACIAN LUNISOLAR CALENDAR

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Introduction

In antiquity, astronomy was closely related to the measuring of time. The first calendars based on the movement of the Moon and the Sun date back to the Paleolithic and Neolithic ages [1]. In the course of the centuries the lunar calendars developed into lunisolar and, in order to measure more precisely long periods of time, information about other astronomical objects such as planets and stars was used as well [2]. Except for the everyday practical needs of a society, calendars serve also other social needs – religious, ideological, and philosophical. By establishing a specific bond between Man and Nature, between Man and Cosmos, they become practically involved in building up of the people's worldview – a notion, which in ancient times was mainly mythological in character [3].

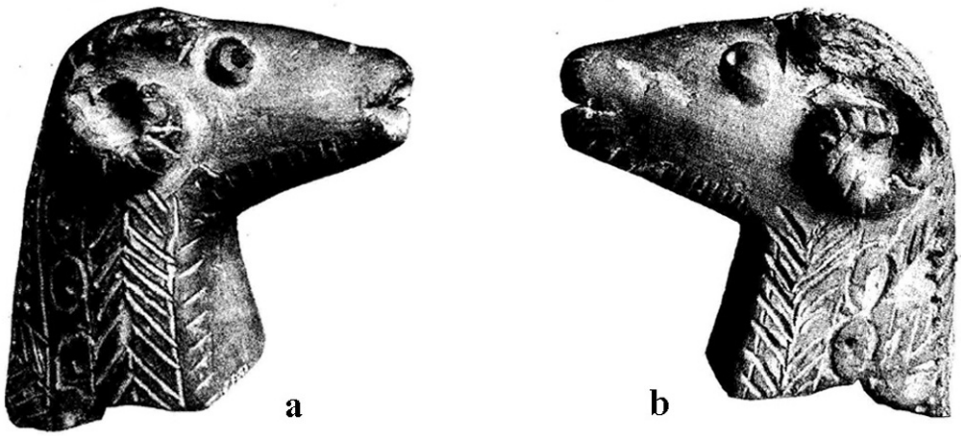


Figure 1.

On the outskirts of the village of Bosnek, Pernik Region, Western Bulgaria, a clay ram head (*prothome*) has been found, dated to the late antiquity (I-III cc) [4]. Its height is 19 cm, and the length at the base is 13 cm. The origin of this artifact is questionable. The ram- and horse-shaped figures made of clay and stone, and found in southern Bulgaria along the

Struma River (defined as the westernmost area where they are to be found) are usually considered monuments of the Celtic culture [5]. According to some authors, however, similar figures are also found in places where there are no traces of Celts, and for that reason they associate them with the culture of Thracians [6].

Interpretation

As a whole, the object is well preserved, except for some minor damages, and represents a completed statuette (Fig. 1 – a, b). The artifact's structure allows for its interpretation as a zoomorphic model of the world (World Tree) reflecting the Thracians' worldview. The image of the ram (a hoof animal) is the basis of this model which is complemented with therio- and ornithomorphic images. We suppose that the pragmatic function of the object is to serve as a time-measuring device, and the calendar information could be presented through the groups of notches and dents on the body of the prothome. As a calendar this object could be used in two aspects: for practical purposes – for time-reckoning in everyday and agricultural life (civic calendar), and in the cult practice – for religious rite purposes (cultic calendar). Some typologically similar objects confirm such multifunctionality, for example the Dacian sanctuary in Muncelulu, Romania [7]. In the first case (in the everyday time-reckoning), the "parapegma" (indents for movable pegs serving as markers) could be used (Fig.2). In the second case (for cultic purposes), the notches on the prothome body could be the main bearer of information.

The total number of sings on the head of the ram is 265 and is equal to the number of days in 9 lunar months (29.53 x 9 =265.77 days) or the so-called "Apollo" part of the year according to Plutarch [8].

The signs are grouped into 4 clusters.

CLUSTER A

This could be the working part of the calendar – the main device for calendar calculations. It consists of three independent groups of signs on the back of the prothome (Fig. 2 b):

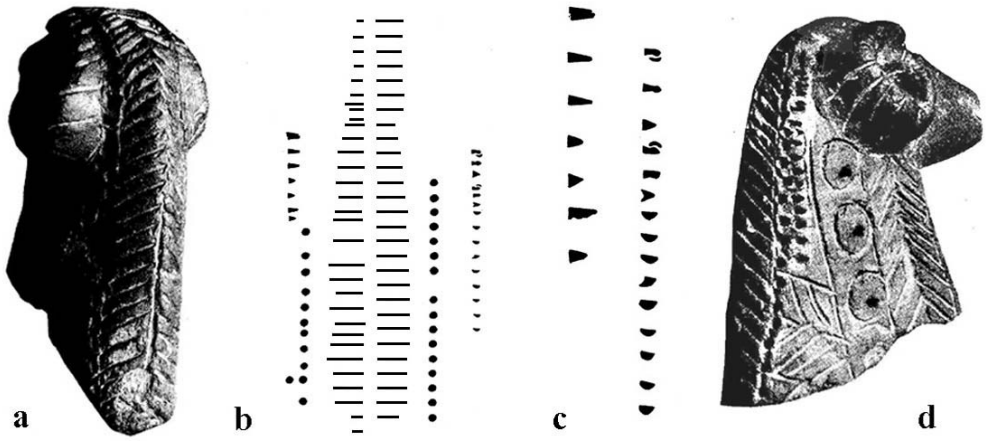


Figure 2.

Fishbone-Notches. In the combination 31 + 28 = 59 signs they could represent two synodic months (29.53 x 2 = 59.06 days) or 1/6 of the lunar year (354 days) (Fig. 2 – a, b);

Big Parapegma. The parapegmatic signs on both sides of the central axis, in the combination (11 + 1) + 16= 28 signs, represent, for example, one sidereal month (27.32 days) (Fig. 2 – b, d).

Lunar Phases. The parapegmatic signs on both sides of the prothome's back in the combination 7(8) + 15 = 22(23) signs are equal to the number of days in a lunar month from new moon to the third phase of the moon, when it starts to wane (Fig. 2 – c, d).

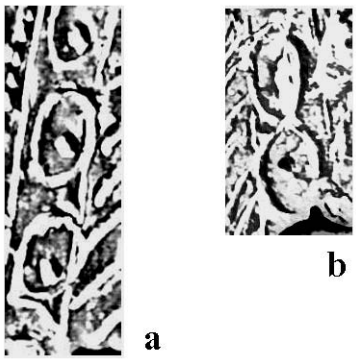
CLUSTER B

There are three independent groups of signs on both sides of the prothome's body:

Small Parapegma. It includes 5 = 3 + 2 indents - three on the right and two on the left side of the prothome (Fig. 3 – a, b), complemented by 4 = 2 + 2 indents at the front – the two eyes and the two nostrils of the ram (Fig. 1). The various combinations of the Small and the Big Parapegma give the number of days in months in a lunar calendar similar to the Roman ones

from VIII-VII cc. BC (28, 30, 31 days) [9]. In the case of a solar calendar, when the year is of the "Egyptian" type (12 months x 30 days = 360 days), which is similar to the year used by the ancient Greeks, these five indents could complete the five missing days in the solar year of 365 days.

Figure 3.



Plant Ornament includes notches on the left and the right side of the ram head, which are grouped as follows: (16+6) + (17+3+3) = 45. The sum is equal to 1.5 synodic months (Fig. 4 – a, b). Since antiquity this number has been related to the measurement of the periods of solar and lunar eclipses [10]. A solar or lunar eclipse can occur only when the Sun and the New respectively the Full Moon are at or near the nodes of the Moon's orbit. In the first case the Sun passes the zone of eclipse for 36 days, and in the second case for 22 days. The number 45 allows precise defining of the instant of the solar eclipses, for example, since it indicates the day of New Moon, if the count of this interval starts at Full Moon.

The numbers 22 and 23 from the Plant Ornament separately correspond to the additional month of 22 (23) days in the lunisolar calendar with a two-year cycle of Numa Pompilius, VII c. BC [11]. They also correspond to the number of signs in the Lunar Phase parapegma.

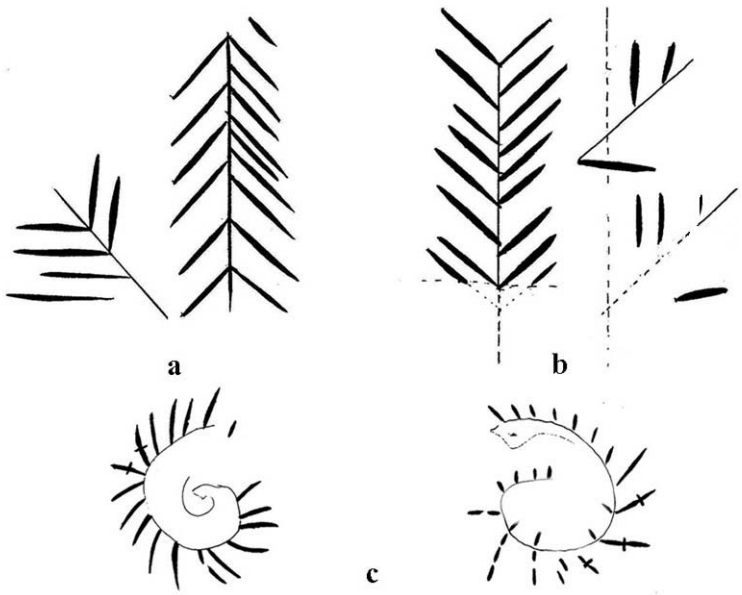


Figure 4.

Notches on the Ram Horns. The notches represent a complex pattern consisting of short lines (Fig. 4 - c). Their sum is 20 + 18 = 38 and the following sums of signs are also possible: 28 + 19 = 47 and 31 + 21 = 52.
Together with the Plant Ornament notches the notches on the horns give number values that can be regarded as “seasons” or “cycles” depending on the context of the particular analysis. For example, the combination of the signs: (38 + 22) x 6 = 60 x 6 = 360 can correspond to the Egyptian year of 360 days, while (38 + 23) x 6 = 61 x 6 =366 – to the leap year in the Julian calendar. The combination of the signs (47 + 23) x 4 = 70 x 4 = 280 can correspond to the cycle of a woman’s pregnancy (280 days).

CLUSTER C

At the front part of the prothome there are two groups of notches which largely differ in shape from those in cluster B. On the right side, along the brim of the prothome's body there are 18(19) notches, and on the left – 12 notches (Fig. 5 – a, b).

The notches could correspond to the number of years in the Metonic cycle (19), where there are 235 synodic months and to the number of months in a lunar year (12), respectively.

The signs on the right side of this block could mark the number of years in one saros (18 years + 10/11 days), the period through which lunar and solar eclipses repeat regularly [12]. The number of these signs could correspond as well to the period of the movement of the lunar nodes – 18.61 tropical years (18 years + 222 days). The interval of 222 days can be measured by using the Big and the Small parapegmas: 37 x 6 = 222 signs.

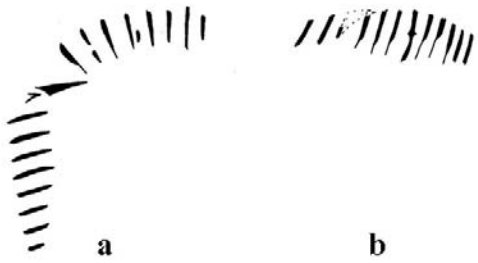


Figure 5.

Figure 6.

CLUSTER D

On the pate of the ram 17 signs are situated like carnivorous bird head (Fig. 6). In aspect of composition they are related to the central group of notches (the body of a dragon?), in aspect of number – to the draconian (eclipse) year (346.62 days). As a separate time interval they could mark the passing of the Sun through the "eclipse zones". For a period of 17 days before it reaches the lunar node, and 17 days after that there is a possibility for solar eclipses. The Sun makes its way from one lunar node to the other for 173.31 days. The sum of the rest of notches on the body of the prothome of the ram, without counting the parapegmas, is 173 in total.

Conclusions

The calendar and astronomical information coded in the system of signs of the ram prothome from the village of Bosnek testify to thorough astronomical knowledge that people in antiquity (the priests, for example) possessed and used in their ritual practices, in agricultural and everyday life. Synodic and siderial month, draconian and tropical year, seasonal and calendar cycles could be represented by specific means and in original ways in this interesting and yet not completely studied artifact.

The different calendar periods are complemented and emphasized by the semantics of the mythological characters, interlaced in the semiotic structure of the prothome. Being a time-measurement device, this lunisolar calendar most probably served mainly the cultic and ritual practices of the Thracian tribes that inhabited these lands.

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