

On “Observational Instruments” composed of Stones No. 12, 13 and 14 of “Zorats Qarer” Monument

H.A. Malkhasyan *

NAS RA V. Ambartsumian Byurakan Astrophysical Observatory (BAO), Armenia

*With inexpressible longing,
I dedicate this to my father
Andranik Malkhasyan’s blessed memory*

Abstract

The work is dedicated to the discussion of some of the stones of the “Zorats Qarer” megalithic monument (No. 12, 13 and 14) in terms of Astronomy. The methods of their use for observational purposes are revealed. Particularly, it has been shown that the stone No. 14 most likely served as a “seating platform” for the observer looking towards the observation angle of the stone No. 13. The other application method has been the formation of the exact direction by the principle of combining the angles of the stones No. 12 and 13. As a result of the usage of the aforementioned methods, three definite directions emerge. The examination of these directions has been performed for the possible date (9000 BC) which is crucial in terms of the origin of the ancient Armenian calendar (Protohaykian), as well as the results of the study of the monument gained so far. The results of the comprehensive examination have been combined with archeological material, Armenian ethnography and folklore. Comparisons have been drawn between days of observing the celestial bodies and important structural units of Protohaykian calendar. At the same time, the observation conditions and the mythological images of the observed stars have been discussed in the context of the most important stages of the cereal cultivation (sowing, harvesting, etc.). Parallels have been drawn with the Armenian religious beliefs (also of other nations), as well as with the results, already known from the study of this monument.

The study of the mentioned stones has revealed that the stars (up to $2^m.50$ apparent magnitude), observable in 9000 BC, their mythological perceptions, observation conditions and days, are in complete harmony with the structure and content of the Protohaykian calendar (as well as of the ornament-calendar of the early Bronze Age vessel from Ketik), and they are closely related to the worship of the Mother Goddess. Links between the observation positions and the definite stages of the cereal cultivation culture (autumn and spring sowing) reappear. There is no contradiction between previously and currently obtained results of the study of the monument. Moreover, the results obtained so far are complementary.

Keywords: *Zorats Qarer: Archaeoastronomy: Ancient Observatories: Megalithic Monuments: Armenian Calendar History: Protohaykian Calendar: Cultural Astronomy: Armenian Folklore:*

1. Introduction

In the present work an attempt is made to discover other “observational instruments” aside from the observational platforms, described in recent studies of “Zorats Qarer” Monument. First, let us remember some principles of using observational platforms. Thus: Platform 1 with the stones No. 60, 62, 64 and 66, were intended for observing the celestial bodies, rising on the eastern horizon (Broutian & Malkhasyan, 2021), and Platform 2 (with the stones No. 158 and 160) was intended to serve for observing the transitions of circumpolar stars (closer to the North Pole) over the horizon (Malkhasyan, 2021b). The important common trait of the platforms is that, as a matter of fact,

*malxasyann@mail.ru

they are “observational instruments”, composed of several stones. There has been an opinion about the existence of such a complex in the past. There is also a hypothesis (Herouni (2006), pp. 64-67) that the stones No. 60, 62 and 63 could be used as a complex. Particularly, from the holes of the stones No. 60 and 62, towards the highest point at the top of the stone No. 63¹ and the directions, stretching to South, could serve as instruments for observing the transitions (upper culminations) of southern celestial bodies along the southern high points. Another peculiar type of “observational instruments” are “angular stones”. In some cases, they (stones No. 197 and 198) have been used as separate stone instruments, indicating quite high directions from the horizon, in other cases, a stone (No. 158) has been used as a guiding stone for the platform (Platform 2). It should also be mentioned that a stone has been used as an instrument, indicating several directions, as with the stone No. 158 (Malkhasyan, 2021b). Aside from the existence of two observational angles, the top of the same stone, with Platform 2, also comprises the third direction. Thus, **the stones of the monument have been adjusted in the most various ways, for the purposes of observation, for example, “complex observational instruments”, composed of several stones, have been used.** Such a usage emerges as a result of the joint examination of the stones No. 12, 13 and 14 as well. Let’s find out what function the trio of these stones has and how it has been used for the purposes of observation. Let’s start with their description.

2. The description of stones No. 12, 13 and 14

First, let’s notice that the above-mentioned stones are located in the middle of the monument and are part of the central circle of the stones in a rhombus arrangement, more precisely, are located on the southeastern side of the rhombus. They follow each other in the row of stones, and are shown in Figure 1, from North-East to South-West, respectively in numbers 12, 13 and 14 (Figure 1). Stones No. 12 and 13 stand vertically with rather wide bases.



Figure 1. The location of the stones No. 12, 13 and 14 in the central rhombus arrangement of stones. Photographed from a height of 150 m.

The stone No. 14, although is a part of the row, stands out by both its shape and position. It has a shape of an irregular parallelepiped, and its upper horizontal side reminds a somewhat flat surface. No cut, angles or holes have been found while examining the visible part of the stone. The case is, however, different with the shapes of stones No. 12 and 13. At the top of them there are clearly cut angles, which make them different from other stones of the monument. Stones No. 12 and 13 differ from each other as well. The difference is that the stone No. 12 has two angular cuts at the top of it, and the stone No. 13 has only one (Figure 2). Moreover, the angle of No. 13 is directed to a quite high point in the sky, while the directions of the angles of the stone No. 12 are not clear. To put it simply, if the angles of the stones No. 158, 197, 198 and 13 can be compared to a firearm’s iron sights (Malkhasyan, 2021b), then the angles of the stone No. 12 can be compared to the structure of the slingshot. This means that **the angles of the stone No. 12 can be subjected to a study only if an**

¹Since the stone No. 63 has a certain deviation from its initial position, the problem of addressing it separately remains up to date. This stone, standing out due to the peculiarities of its shape, differs from all the other stones, composing this monument. According to one of the locals, for some reason this stone has moved about its vertical axis approximately 50 years ago, but its position hasn’t changed. As a result of a detailed examination, we also got the impression of an additional reinforcement at the base of the stone. However, a late 19th century photograph clearly shows it standing solidly in its current position.

additional guiding circumstance emerges. And this additional guiding circumstance, as it has been revealed as a result of a detailed examination of the monument, is the angle of the stone No. 13. Due to its examination, it has been revealed that the cut of its upper distant point is two-sided, i.e., the vertex of the upper angle by two sides of the stone is hewn. This makes sense only if the angle has been used as an observational instrument from both sides. However, observing from the other side, the direction is not clear as well, as with **the angles of the stone No. 12. Thus, this angle also needs an additional guiding circumstance.**

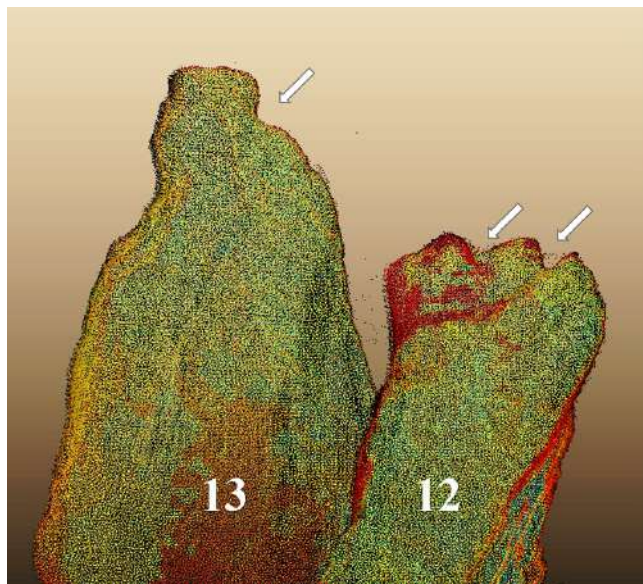


Figure 2. The digital point clouds of stones No. 12 and 13 (view from the East). The arrows show the angles of the stones.

that 2 different stars could have been observed from the two angles of the stone No. 12 at the same moment. Such a phenomenon has already been discovered by the examination of the stone No. 158 (Malkhasyan, 2021b). Different stars have simultaneously been observed from the two angles of this stone. Thus, it may be possible, we have to deal with the same observational principle in case of the two angles of the stone No. 12.

Let's view the description of the stone No. 14 in more detail. As it has been mentioned this stone doesn't have any special cuts. It's only noticeable that its upper surface is flat. Let's also mention that the stone No. 14 is located quite near the stone No. 13. More precisely, it's located in a way, that when I made an attempt to look at the direction of the stone No. 13, I found myself sitting on the stone No. 14. So, by continuing the direction of the angle of the stone No. 13 in the opposite direction, it pretty accurately coincides with the eye of the observer⁵, sitting on the edge of the stone No. 14 (Figure 3). It's worth mentioning that it's difficult to attribute another function to the stone No. 14, as long as, a) it doesn't have any special cuts, b) is located quite near the stone No. 13 and c) it is quite uncomfortable for the observer in the direction of the stone No. 13 to do it, without sitting on the above-mentioned stone, e.g., from a standing position.

²In fact, if the angle of the stone No. 13 is observed from the opening of the southern angle of the stone No. 12, i.e., by changing the position of the eye, the tops of the two angles coincide, then we get a single-valued direction, which can already become a subject for an examination.

³The deviation is less than 1 arc degree, which, in this case, taking into account the small distance between the tops, can be neglected.

⁴Even due to a detailed examination, we didn't succeed in discovering a mutual connection between this angle and another stone. In this case, we have nothing to do but answer the following question: how is this angle connected to the southern angle of the same stone No. 12 and the angle at the top of the stone No. 13?

⁵We'll discuss the calculation details of this direction and the observation point in the further text.

It turns out that the angles of stones No. 12 and 13 are guiding circumstances² for each other. The two angles of the stone No. 12 will be further referred to as “northern” and “southern”, depending on their positions about each other and geographical orientations. It should also be mentioned that the tops of these two angles are located approximately³ on the meridian. The northern angle of the stone No. 12, in contrast to the southern one, doesn't coincide with the angle of the stone No. 13 from any point⁴. So, if we can determine from what point the observations have been made, combining the vertex of the southern angle of the stone No. 12 and the vertex of the angle of the stone No. 13, then the same observation point will become an additional guiding circumstance for the northern angle of the stone No. 12. Thus, it turns out that an observer from a certain point, combining the southern angle of the stone No. 12 with the angle of the stone No. 13, can simultaneously observe the celestial bodies visible from the northern angle of the stone No. 12. Therefore, there is a certain possibility



Figure 3. The mutual positions of the observer, sitting on the stone No. 14 and the angle of the stone No. 13. The photograph depicts the author of this article. The date of the photograph is July 4, 2021.

So, three directions have been distinguished in the monument, which are formed with the help of the stones No. 12, 13 and 14. In order to make the further text clear, let's give these directions the number of the corresponding stone and, taking into account the nearest point to the direction, let's distinguish them by Latin letters (*P-platform*, *S-southern*, *N-northern*). We get the following directions.

- 1) The direction of the stone No. 13 for the observer on the “seating platform” of the stone No. 14 (13_P).
- 2) The direction passing through the tops of the southern angle of the stone No. 12 and the angle of the stone No. 13 (12_S).
- 3) The direction of the northern angle of the stone No. 12 from the observation point, which is also an observation point for the direction, mentioned in Point 2 (12_N).

The first two (13_P and 12_S) of the mentioned three directions, in fact, are single-valued and are obtained due to measurement, and the third one (12_N) can change, depending the distance and the height of the observer's eye. Thus, let us see what these directions are, and determine the observation point, which is considered to be a guiding point for the direction 12_N .

3. The directions of the angles of the stones No. 12 and 13

As it has been mentioned, the directions 13_P and 12_S are precise (Table 2). The stone No. 14 has probably served as a “seating platform” for the observer in the direction 13_P . **In order to see what function the direction 12_N has had, let's learn from what position it is possible to observe in the direction of 12_S . Otherwise, the northern angle of the stone No. 12 would make no sense.** In order to find the observation point (i.e., the point that serves as an additional guide for the direction 12_N), let's first introduce a simplified drawing (Figure 4) and denote some points in it with Latin letters (Table 1).

Figure 4 clearly shows that it is possible to look at the direction 12_S (SK) from the point S of the stone No. 12 to the mark of the ground from any point of the line, stretching in that direction. However, we'll discuss the possible conditions of observation from only two points (D_1 and D_2), taking into account the sound assumption that the observer was likely to make observations from kneeling or standing positions. The already known fact that in case of Platforms 1 and 2 of the monument the observations have been made from a standing position (Broutian & Malkhasyan, 2021, Malkhasyan, 2021b), breed ground for such an assumption. On the other hand, we also see the stone No. 14, the role of which is so far explained as just having been used as a “seating platform”. Since there is no

such seating platform⁶ in the direction 12_S we have to assume that observations could be made from a kneeling (squatting) position (it's rather uncomfortable, while sitting on the ground) (Figure 4). At the same time, making observations from a bowing or some other inconvenient position, can be considered way too uncomfortable and unlikely, as long as they are rather unstable positions, compared to that of the kneeling one.

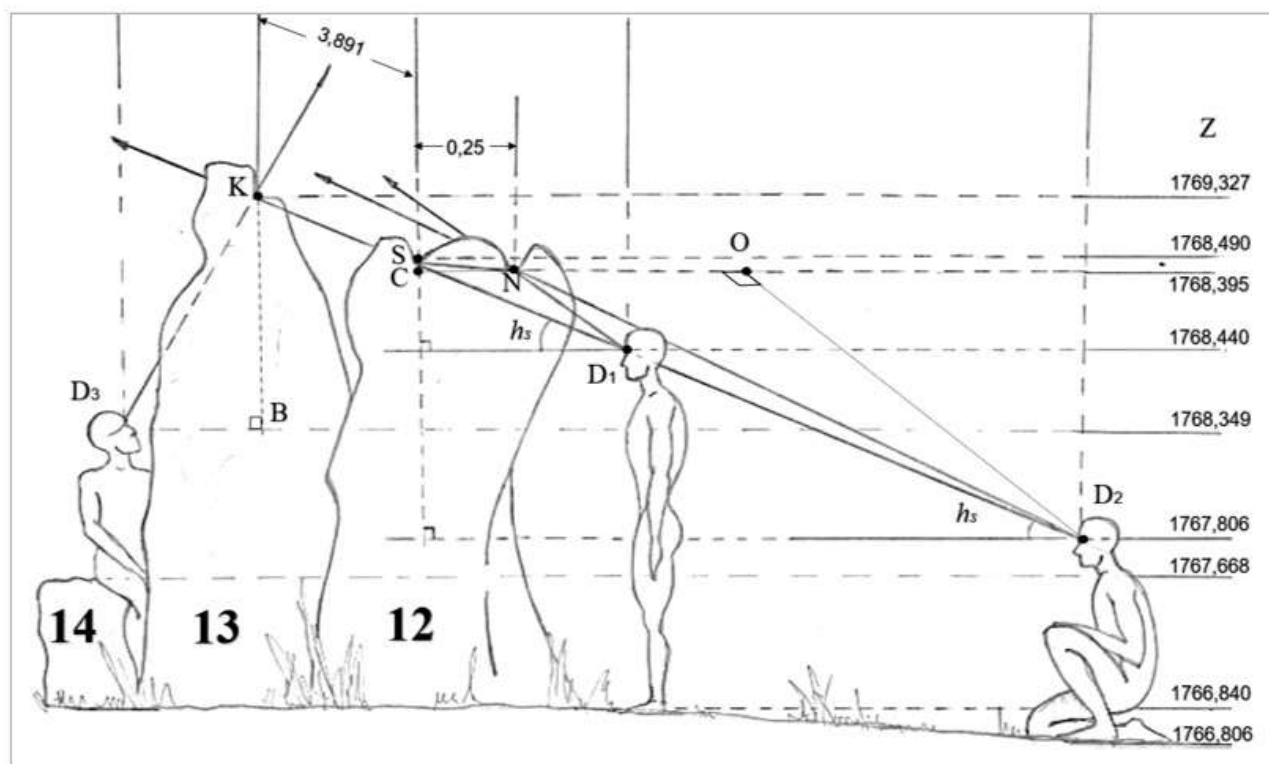


Figure 4. The simplified drawing of the possible observation points and stones with Latin letter denotations (Table 1). The drawing is made according to the author of this article. Metrical data are given.

Let's first mention some starting points that are of crucial importance in further calculations.

- 160 cm is considered the altitude of an average height man's eye in a standing position in our calculations. The same value has also been taken into account in the past, while examining observational platforms.
- 1 m will be taken as the height of the observer's eyes in a kneeling position⁷.
- Segments SN and CN pretty precisely coincide with the plane, passing through the points of North, South and the Zenith (the plain of meridian). That is to say, these lines are oriented from North to South⁸. This means that the perpendicular D_2O must coincide with the parallel plain, namely be directed from East to West.
- The absolute altitudes of all points above sea level (Z) are given in Figure4.

⁶For an observer in a kneeling position the distance from the stone No. 12 is approximately 3 m to North-East. Here the nearest stone is No. 11, which is lying or is horizontally stuck in the ground. This circumstance makes it impossible to find any connection between the primary function of the stone No. 11 with the observation point of the kneeling observer, as well as to exclude such a connection.

⁷This measure has been taken after determining the height of several kneeling men's (of average height) eyes from the ground mark and averaging it.

⁸The deviation is less than 1°. In case of such problems, taking into account the roughness of angle cuts, such a deviation can be neglected.

- The distances are measured with an accuracy of 1 mm (Malkhasyan, 2021a): $SN=0,25m$; $SK=3,891m$.

Thus, let us see what picture we get from the examination of the two mentioned positions.

The letter	The description
S	Vertex of the southern angle of the stone No. 12
N	Vertex of the northern angle of the stone No. 12
K	Vertex of the upper cut of the angle of the stone No. 14
C	Intersection point of the perpendicular, lowered from point S, on the horizontal plane, passing through point N
O	Intersection point of a the perpendicular, lowered on the line CN from the assumed observation point D_2
D_1	A standing observer’s observation point on the line CK
D_2	A kneeling observer’s observation point on the line CK
D_3	The observation point of the observer on the “seating platform” No. 14
D_3B	The projection distance of points D_3 and K in a horizontal plane and is equal to 1 m
A	Azimuth
h	The elevation from the mathematical horizon
Z	The absolute altitude above sea level

Table 1. The table presents the Latin letters, shown in Figure 4, their meanings, as well as some data.

3.1. In case of a standing observer

Since the task is to understand from what point the northern angle of the stone No. 12 has been observed, first, we must determine the distance of a standing observer’s observation point (D_1) from the point S (D_1S), based on which we can calculate the components of the vector D_1N .

$$D_1S = KD_1 - SK$$

$$KD_1 = \frac{Z_K - Z_{D_1}}{\sin h_S}$$

Where h_S is the elevation from the mathematical horizon of the direction 12_S for standing observer and is known from the measurement ($h_S=12^\circ 48'$).

Thus:

$$KD_1 = \frac{1769,327 - 1768,44}{0,2215485} \approx 4,004m$$

$$D_1S \approx 4,004 - 3,891 \approx 0,113m$$

It turns out that a standing man of average height can combine points S and K by the eye, being at only 11 cm from the point S. An attempt has been made in the monument to watch this direction from such a distance. It has been found that simultaneously seeing the northern angle as well is impossible. Besides, in case of such a small distance we obtain quite a large value of visual parallax⁹ for the point S.

$$D_1S_{(parallax)} = 2 \arctan \frac{0,03}{D_1S} \approx 30^\circ$$

Aside from this, if we consider the absolute altitudes of points D_1 and N above sea level, it becomes clear that the direction from the point D_1 to the point N is directed lower than the mathematical horizon.

⁹The pupillary distance is taken as 6 cm.

$$Z_N - Z_{D_1} = 1768,395 - 1768,44 = -0,045m$$

As we see, **the observations could not have been implemented in a standing position.** So, let us see what picture we get in case of observing from a kneeling position.

3.2. In case of a kneeling observer

As in the previous case, here as well, we firstly need to determine the distance between the points D_2 and S .

$$\begin{aligned} D_2S &= KD_2 - SK \\ KD_2 &= \frac{Z_K - Z_{D_2}}{\sin h_S} \\ KD_2 &= \frac{1769,327 - 1767,806}{0,2215485} \approx 6,865m \\ D_2S &\approx 6,865 - 3,891 \approx 2,974m \end{aligned}$$

The next step is to determine the length of CN , in order to remove the vertical component of the direction SN and as a result get the precise azimuth¹⁰ of the direction D_2N .

$$\begin{aligned} CN &= \sqrt{SN^2 - (Z_S - Z_N)^2} \\ CN &= \sqrt{0,0625 - 0,009025} = 0,231m \end{aligned}$$

To make it simple, let's plot the right triangle D_2CO (Figure 5), from where we can determine:

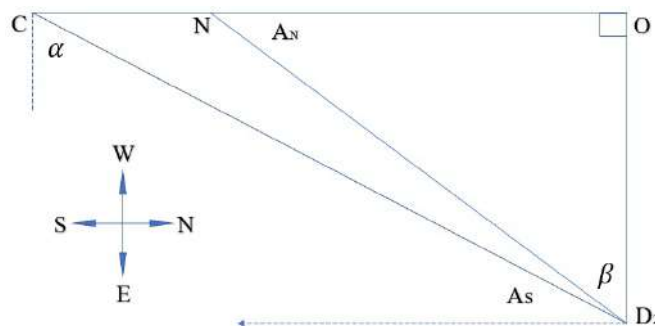


Figure 5. Position of the right triangle D_2CO with respect to geographical directions and the calculated angles in horizontal plain.

$$D_2O = \sqrt{D_2C^2 - CO^2}$$

If we assume that $D_2C \approx D_2S$ (there is a difference of just a few millimeters), and as a result of measurements we have obtained $A_S = 67.5^\circ$, calculated from the South point, then the angle α (with the vertex D_2) of the triangle CD_2O will be:

$$\alpha = 90^\circ - A_S = 22,5^\circ$$

Since, as mentioned above, the horizontal component of the direction D_2O is directed to the West then:

$$\begin{aligned} \sin \alpha &= \frac{CO}{D_2C} \\ CO &= D_2C \times \sin \alpha \end{aligned}$$

¹⁰All the azimuths, presented in the article, are calculated from the South point, as it is accepted in astronomy.

$$CO \approx D_2S \times \sin \alpha$$

$$CO \approx 2,974 \times \sin 22,5^\circ \approx 1,138m$$

Thus, we can determine:

$$NO = CO - SN \approx 1,138 - 0,231 = 0,907m$$

As long as the main purpose of our calculation is to determine A_N , then it is equal to:

$$A_N = 90^\circ - \beta$$

$$\tan \beta = \frac{NO}{D_2O} = \frac{0,907}{\sqrt{2,974^2 - 1,138^2}} = 0,3301$$

$$\beta = \arctan 0,3301 = 18,27^\circ$$

$$A_N = 90^\circ - 18,27^\circ = 71,73^\circ = 71^\circ 44'$$

The vertical component h_N of the direction D_2N (12_N) remains to be calculated:

$$\sin h_N = \frac{Z_N - Z_{D_2}}{D_2N}$$

$$D_2N = \frac{NO}{\sin \beta} = \frac{0,907}{0,313495} = 2,893m$$

$$\sin h_N = \frac{1768,395 - 1767,806}{2,893} = 0,203595$$

$$h_N = \arcsin (0,203595) = 11,75^\circ = 11^\circ 45'$$

Here we also need to calculate the visual parallax of the direction 12_N for a kneeling observer:

$$12_{N(parallax)} = 2 \arctan \frac{0,03}{D_2N} \approx 1^\circ 11'$$

So, let's present the data¹¹, obtained for three directions in Table 2:

Direction	Azimuth	Elevation	Deviation
13_P	$232^\circ 51'$	$44^\circ 22'$	$30'$
12_S	$67^\circ 30'$	$12^\circ 48'$	$30'$
12_N	$71^\circ 44'$	$11^\circ 45'$	$1^\circ 11'$

Table 2. The horizontal and vertical components of the three directions under study are presented. The last column contains acceptable angular deviations for the celestial bodies, observed in the corresponding directions.

3.3. On the “seating platform” No. 14

Although it's obvious that for the observer, sitting on the stone No. 14, the direction 13_P quite precisely coincides with the position of his eye (Figure 3 and 4), it's necessary to make sure in it by numerical values (the distance D_3B is given in Table 1).

$$\tan h_K = \frac{Z_K - Z_{D_3}}{D_3B}$$

$$Z_{D_3} = Z_K - D_3B \times \tan h_K = 1769,327 - 1 \times 0,97813 = 1768,349m$$

¹¹The mentioned error of 30 arc minutes doesn't refer to the measurement data but is taken as a permissible deviation for the celestial bodies, visible from those directions. Since the visual parallax for the direction 12_N is $1^\circ 11'$, then this very value is taken as a permissible azimuth deviation for the stars, observable in that direction.

Thus, that the altitude of the sitting observer’s eyes from the surface of the stone No. 14 must be equal to $1768,349 - 1767,668 = 0,681\text{m}$ (Figure 4), which mostly corresponds to the average height man’s eyes from the level of the sitting point. So, we can surely claim that **the stone No. 14 has, in fact, served as a “seating platform” for an observer in the direction 13_P**.

As a result of such considerations, we can consider that there is a substantial possibility that observations could have been made in sitting and kneeling positions, using these three stones. **It could be a manifestation of ritual worship as well.** However, this circumstance will be clear when the celestial bodies, observed in the mentioned directions, and their mythological significance become known. Thus, let’s see what celestial bodies could be observed in these directions **in epochs, important for Ancient Armenian calendars.**

4. The observable celestial bodies

As in the previous articles on the monument “Zorats Qarer” (Broutian & Malkhasyan, 2021, Malkhasyan, 2021b), here as well we’ll consider three important dates for Ancient Armenian calendars. Main Armenian Date (Haykian Calendar, 2341 BC) (Broutian, 1985a,b, 1997), 5800 BC, when, as a result of the latest research, some considerable changes have been made in the monument “Zorats Qarer” (Broutian & Malkhasyan, 2021, Malkhasyan, 2020, 2021a) and the beginning of the Proto-haykian calendar (9000 BC) (Broutian, 2016, 2017). First, it should be mentioned that only star transitions can be observed in the direction 13_P. The Sun, the Moon and visible planets never pass through this point of the sky. It can also be expected that the two angles of the stone No. 12 have also been intended for observing stars. This assumption is based on several provisions:

- They are directed to quite high points from the real horizon, as the already known angles of the stones¹² No. 197, 198 and 158 (Broutian & Malkhasyan, 2021, Malkhasyan, 2021b).
- The observations of the Sun and the Moon at the points¹³, significantly above the horizon, are not calendar-critical.
- The Sun will appear in the direction of the southern and northern angles of the stone No. 12 respectively 25 and 15 days before vernal equinox (VE) and 25 and 15 days after the autumn equinox (AE). The essential events, connected to these days in the calendars, we are familiar with, are still unknown. So, it’s more possible that the observations refer to bright stars and especially their transitions right before sunrise (apparent disappearance) and right after sunset (apparent appearance) (Malkhasyan, 2021b).

So, let’s see which stars of apparent magnitude¹⁴ up to $2.^m50$ (Tables 3, 4 and 5)¹⁵ have been observable in the three directions, mentioned in Table 2.

Since it’s obvious that there is a mutual connection between the stones No. 12, 13 and 14, it’s necessary to study these three directions simultaneously. Let us innumerate several principals which will guide us in the dating of the observable stars.

- 1) **The observations of stars in all three directions are more probable if they refer to the same date.** We witness such a coincidence for two dates: 5800 BC and 9000 BC.
- 2) **The observations of stars are more plausible if they refer to the period when other angular stones have been studied** (stones No. 158 and 198 refer to 9000 BC).

¹²The research has shown that the angles of these stones have been intended for observing stars.

¹³More than 10° above the mathematical horizon.

¹⁴During the previous research of the monument “Zorats Qarer” $2.^m50$ has been taken as the minimum apparent magnitude. This article also exclusively discusses stars of such brightness.

¹⁵The data and coordinates of all the stars, presented in this article, are taken from the computer package Stellarium v0.20.4 (<http://www.stellarium.org>).

Date	2341 BC	5800 BC	5800 BC	9000 BC
The star	-	α Ursae Minoris	β Ursae Majoris	α Cygni
Apparent magnitude (m)	-	$1^m.95$	$2^m.30$	$1^m.25$
Declination (δ)	-	$50^\circ 38'$	$52^\circ 00'$	$50^\circ 51'$
Right ascension (α)	-	$20^h 36^m$	$0^h 20^m$	$14^h 41^m$
Azimuth (A)	-	$233^\circ 21'$	$231^\circ 31'$	$233^\circ 07'$
Elevation (h)	-	$43^\circ 47'$	$44^\circ 16'$	$44^\circ 08'$
Apparent disappearance	-	VE - 36 days	SS - 34 days	WS - 35 days
Apparent appearance	-	SS + 36 days	AE + 37 days	SS - 44 days

Table 3. The stars of apparent magnitude up to $2^m.50$, which have been observable in the direction 13_P for the observer on the seating platform No. 14.

Date	2341 BC	2341 BC	5800 BC	9000 BC
The star	γ Orionis	α Scorpii	θ Scorpii	β Geminorum
Apparent magnitude (m)	$1^m.60$	$1^m.05$	$1^m.85$	$1^m.15$
Declination (δ)	$- 7^\circ 45'$	$- 7^\circ 36'$	$- 8^\circ 32'$	$- 8^\circ 10'$
Right ascension (α)	$4^h 25^m$	$12^h 29^m$	$10^h 12^m$	$21^h 38^m$
Azimuth (A)	$68^\circ 07'$	$68^\circ 07'$	$67^\circ 30'$	$67^\circ 30'$
Elevation (h)	$13^\circ 09'$	$13^\circ 21'$	$12^\circ 38'$	$13^\circ 10'$
Apparent disappearance	AE + 5 days	VE - 23 days	WS + 23 days	SS + 48 days
Apparent appearance	VE - 4 days	AE - 38 days	SS + 8 days	WS + 42 days

Table 4. The stars of apparent magnitude up to $2^m.50$, which have been observable in the direction 12_S .

3) **There is a substantial possibility that different stars have been observed from the two angles of the stone No. 12 on the same day or at the same moment** ¹⁶ (we witness something similar in case of the two angles of the stone No. 158). It's evident that in 9000 BC some stars were observable on the same day and at the same moment. Moreover, **there are two such coincidences:**

a) The apparent disappearance of **the main stars of the constellation Gemini have been observable simultaneously in the directions of the two angles of the stone No. 12**, 47-48 days after summer solstice (SS).

b) The apparent appearance of the stars α Lupi and α Cygni have been observable in directions 12_N and 13_P respectively 44 and 47 days before summer solstice and 35 days before winter solstice (WS). At the same time, as it is known (Malkhasyan, 2021b), 48 days before summer solstice the apparent appearance of the star η Ursae Majoris has been observable from Platform 2 at the top of the stone No. 160. It's obvious that the described observations can be attributed to the same moment or the same day. Here emerges a new connection among the guiding stone No. 160 of Platform 2 and the stones No. 12, 13 and 14, described here.

4) **Observations are possible if the observing conditions of the stars (the days before sunrise and after sunset) are in harmony with the structure and content of the well-known ancient calendars.** If the function of the stones in question is somehow connected to Platform 2 and the day, 47-48 days before summer solstice (see the previous subpoint), then it is connected to one of the important days of the Protohaykian calendar, when before the holiday

¹⁶By saying “at the same time”, we mean that the stars have been observable simultaneously with a difference of no more than 5 minutes or 1 day. Such an error is a result of a permissible deviation of up to 30 arc minutes, taken beforehand for the observations of stars. Such a deviation is also explained by the difference in the brightness of stars, since the visibility of stars of various apparent magnitudes under the same lighting conditions, is different. It may also be explained by the current angular distances of the stars of different brightness from the Sun. For instance, before sunrise the visibility of stars on the eastern horizon is much weaker than that of the stars of the same brightness on the western horizon.

Date	5800 BC	5800 BC	9000 BC	9000 BC
The star	α Hydrae	β Tauri	α Lupi	α Geminorum
Apparent magnitude (m)	1 ^m .95	1 ^m .65	2 ^m .30	1 ^m .90
Declination (δ)	- 6°38′	- 5°20′	- 5°04′	- 6°31′
Right ascension (α)	3 ^h 01 ^m	4 ^h 40 ^m	5 ^h 37 ^m	21 ^h 18 ^m
Azimuth (A)	71°23′	72°27′	72°44′	71°35′
Elevation (h)	11°23′	12°10′	12°15′	11°24′
Apparent disappearance	AE + 25 days	AE - 30 days	WS - 35 days	SS + 47 days
Apparent appearance	VE + 15 days	VE - 42 days	SS - 47 days	WS + 33 days

Table 5. The stars of apparent magnitude up to 2^m.50, which have been observable for a kneeling observer in the direction 12_N. 1 arc degree is taken as a possible deviation for this direction. No bright stars have been observable in this direction in 2341 BC.

of Navasard the 40-day period of fasting-bans begins, which we have analyzed in the previous article (Malkhasyan, 2021b).

- 5) **The stars observed, using the stones No. 12 and 13, must have some connection to each other.** A connection like this is beyond doubt in case of observing the main stars of the constellation Gemini.
- 6) **The placement of the stones in the structure of the monument should also be taken into account.** The positions of the stones in question and similarities in content clearly correspond to the features of the structure of the Protohaykian calendar.

Let’s now see in what points we have a discrepancy for 5800 BC. It’s evident that the content of Points 2, 3 and 6 and the mentioned observations are incompatible, and the compliance with Point 5 can be accepted with some reservation. It turns out that at least 3 out of 6 provisions do not correspond to the mentioned observations¹⁷. The discrepancy for 2341 BC is more obvious in all 6 points. So here we’ll discuss only 9000 BC, which as we witnessed, corresponds to all 6 provisions, listed above.

5. The discussion of 9000 BC (The beginning of the Protohaykian calendar)

As we have witnessed the most possible date for observations is 9000 BC, i.e., the beginning of the Protohaykian calendar. Thus, the stars and their observing conditions must be considered in the already known content of this calendar. So, for 9000 BC we obtain probable observations of 4 bright stars (Tables 3, 4 and 5). They are the stars α Geminorum and β Geminorum as well as the star α Cygni (constellation Angegh-Vulture-Swan) and the star α Lupi. Since the connection of the monument with the star α Cygni is known (Malkhasyan, 2020), let’s start with the discussion of the observing conditions of this star.

5.1. The observing conditions of the brightest star of the constellation Cygnus (Angegh-Vulture-Swan)

If we take into account the similarity of the main structure of the monument with the configuration of this constellation (Malkhasyan, 2020), then it is clear that the ones who have built and used the monument, have had a special attitude towards the primary brightest star (α Cygni) of the constellation. This is traditionally considered to be the tail of the celestial Swan and its name Deneb means “tail” (Allen (1963), p. 195). However, on another occasion (Malkhasyan, 2020), while discussing the monument, it has been specially mentioned that **it is more correct to consider this star the head of the celestial Angegh (Vulture) and not the tail.** The basis for such

¹⁷A comprehensive analysis is required to discuss 5800 BC. That’s why we’ll analyze it in detail in future publications.

an assumption is a low-relief of a vulture on the pillar 43, excavated in archeological site Portasar (Göbekli Tepe), which clearly shows the coincidence of the vulture’s head and Deneb (Vahradyan & Vahradyan, 2010), moreover, it also clearly shows that the vulture’s beak identifies with the stars α_1 and α_2 Cygni (Malkhasyan, 2020). On the other hand, Deneb is the brightest star of the constellation, the primary one, and it’s logical that it has been thought to be the “head”. In a word, it’s **more convenient and correct to regard the star α Cygni as the head of the celestial Angegh (Vulture) in further considerations**. It should also be mentioned that the stone No. 13 is a part of the central cromlech and is bigger and higher than all the other stones. On the other hand, the angle of the stone No. 13 is hewn right at the top of the stone, i.e., at the “head”.

Let’s now discuss the day of observing this star. There is a difference of 4 days from the day of heliacal setting of the star Spica (α Virginis) of the constellation Virgo. As it has been shown (Malkhasyan, 2021b), the heliacal setting of Spica, 48 days before the summer solstice is related to the Median day of Great Lent, which Armenians call “Mijink”. If we pay attention to the observation details of the apparent appearance of the star α Cygni (Table 3) in the direction 13 P , when observed from the point D₃ (Figures 4 and 6a), we’ll see that at the same time it has been at 45° (44°08’) height from the mathematical horizon. This circumstance corresponds to the sacrament of the day, i.e., splitting into two equal parts. On the other hand, the observing day is the median day of the astronomical spring, which also expresses the idea of splitting into two equal parts. What comes to the difference of 4 days, it has a separate explanation, which, however, will not be discussed here¹⁸.

The peculiar shape of the top of the stone No. 13 should also be mentioned, as long as it’s known that special significance has been given to the shapes of the tops of the stones in the monument (Broutian & Malkhasyan, 2021, Malkhasyan, 2021b). The shape of the top of the stone No. 13 (Figures 2, 3, 4 and 6a) reminds of an ideogram from the Armenian “Nshanagirk Imastnots” (“The Sings on Meanings”) (these and all other ideograms presented in this article are shown in Table 6), which means “temple” (Martirosyan (1978) pp. 85-89), “tower” (Abrahamyan (1973), p. 234) or [hasarak] (equal, half, midpoint) (Abrahamyan (1973), p. 240). It’s interesting that the meaning of the word [hasarak] (equal, half, midpoint) is splitting into two equal parts (Malkhasiants (1944), p. 57), which coincides with the observing conditions of the star. The Mother Goddess (Martirosyan (1978), pp. 59-78) is depicted in a similar way, which corresponds to the idea of temple (church). So, **the importance of the cut of this stone is emphasized and beyond doubt**. At the same time the constellation Cygnus is perceived as a cross (Northern Cross) (Broutian, 2020a) and the observation of this cross at the top of the stone, “symbolizing a church” (Figure 6a) is a solid argument that such an observation is a fact. We should remember another ideogram here. It’s the ideogram “summer” (Abrahamyan (1973), p. 236), which reminds of a “rising cross”. The bottom part of this ideogram symbolizes a bird (“two birds” is the ideogram of “spring” (Abrahamyan (1973), pp. 231-239). Thus, it’s obvious that we have to deal with the spring-summer period of the year, as well as with the ideology of a bird, which is clearly reflected in the functional-structural content of the stone, discussed here.







Ideogram	Meaning	Ideogram	Meaning	Ideogram	Meaning
	Temple, tower		[hasarak] equal		Mother Goddess
	Summer		Spring		Bird

Table 6. The Ideograms and their meanings. Petroglyph (the first in last column) of Geghama mountains (Armenia) symbolizing the Mother Goddess (Martirosyan (1978), tab. VI, VII, pp. 85-89).

¹⁸In order to explain the difference of 4 days in the calendar content, we need to analyze in detail some structural aspects of the Protohaykian calendar, which is a pretty extensive topic and is subject to a separate discussion.

5.2. The observing conditions of the brightest star of the constellations Lupus (Wolf)

The apparent appearance of the star α Lupi has been observable 48 days before summer solstice. As it has already mentioned (Subtitle 5.1), the heliacal setting of the star Spica of the constellation Virgo is on this day (Malkhasyan, 2021b). Similarities with the Werewolf (Wolf-girl) are also presented in the same article. There the parallels of the constellations Cassiopeia and Virgo, as well as wolf-headed dragons have been discussed. Here we already witness the possible observation of the brightest star of the constellation Lupus and the heliacal setting of the brightest star of the constellation Virgo, at the same time. It's interesting that the main stars of the constellation Cassiopeia have been visible on the north-eastern horizon at that moment (their acronical rising (rising right after sunset)). Thus, here as well we can surely discuss the myth of “werewolf transformation”. It's noteworthy that in the well-known content of the Protohaykian calendar the small part of 24 days of the out of the year period, dedicated to the Mother Goddess ends on this day (Broutian, 2022). Parallely, we have the heliacal setting of the brightest star of the constellation Virgo, the observation of the apparent appearance of the brightest star of the constellation Lupus and the acronical rising¹⁹ of the main stars of the constellation Cassiopeia, all at the same time. Here we should remember that in 9000 BC the facts of observing the constellations Cassiopeia (in the direction of the large angle of the stone No. 158, possibly also in the direction of the angle of the stone No. 197 (Malkhasyan, 2021b)) and Virgo (in the direction of the angle of the stone No. 198 (Broutian & Malkhasyan, 2021, Malkhasyan, 2021a)) have been discovered. Thus, **it's quite logical to perceive the observation of the star α Lupi as a probable reality as well.**

5.3. The observing conditions of the main stars of the constellation Gemini (Twins)

As a matter of fact, the apparent disappearance²⁰ of the star β Geminorum (Pollux) has been observable in the direction 12_S and that of the star α Geminorum (Castor) has been observable from the same observing point (D_2) in the direction 12_N (Figure 6b). It's 47 days after summer solstice. Why is this day important? First of all, this is the midpoint of the astronomical summer²¹, furthermore, this day rather precisely corresponds to the time of the spring grain harvest. And we are discussing the date of the beginning of the Protohaykian calendar, and this calendar, as it has been already shown, is closely connected to the culture of breadmaking (sowing, harvesting, breadmaking etc.). This turns out to be the second harvest of the year and it somehow has an idea of doubling, just like Twins. However, if we deal with the harvest day, then we should remember that for the harvest day of the autumn grains, in the same monument the observation of the apparent appearance of the star α Boötis (constellation Boötes (the Herdsman) (“Tsorenkagh Mshak” (in Armenian) - “The Wheat Harvester”) has been observable at the top of the stone No. 158 from Platform 2 (nearly at its lower culmination)) (Malkhasyan, 2021b) has been described. Thus, for the mentioned day we also need to find out in what position the star α Boötis has appeared 47 days after summer solstice right at the moment when the stars of the constellation Gemini have been observable in the discussed directions. We see that the star α Boötis has nearly appeared at its highest point (upper culmination) at the same moment. This means that **such observations undoubtedly have a connection with spring grain harvest.**

In order to clearly understand what importance the constellation Gemini has had in the Armenian highlands in the mentioned millennium, let's remember some of its manifestations. The depicting of the constellation Gemini in the low-reliefs of Armenian “Vishapakars” (Figure 7a) (Petrosyan & Bobokhyan (2015), p. 85) and some petroglyphs (Figure 7b) (Sardaryan (2010), pp. 235-238) is more interesting. The constellation Gemini is depicted as a pair of birds, storks, on “Vishapakars” (Broutian, 2020a). We witness the same in case of the petroglyphs as well. The identification of two brothers with storks is especially emphasized in one of the Armenian Folk Tales (“AFT” (1968), pp. 143-145), where the life of twin storks is directly compared to the trouble, the twin brothers (the

¹⁹The acronical rising of a star is its rising on the horizon right after sunset.

²⁰The last moment of being seen in that direction, immediately before sunrise.

²¹The period between summer solstice and autumn equinox.

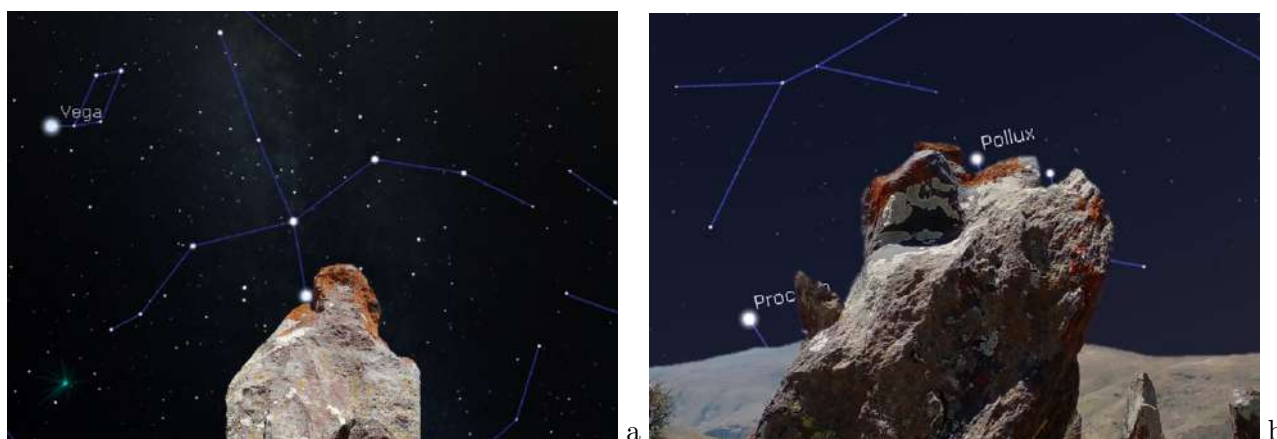


Figure 6. a) The position of the constellation Cygnus with respect to the angle of the stone No. 13 for the observer on the “seating platform” No. 14. b) The brightest stars of the constellation Gemini being seen simultaneously in the directions of the angles of the stone No. 12 from the observing point D₂. Reconstructed in Stellarium v0.20.4 (<http://www.stellarium.org>)

king’s sons) were in. So, we can assume that they have also been considered king’s sons. The analysis of the Protohaykian calendar, in accordance with the ornaments on the early Bronze Age vessel (an example of the Black Polished Ware) excavated in the archeological site Ketī (Broutian, 2022) also emphasizes the relation of the king’s sons with the image of a bird and the position of its days is placed in the period after summer solstice. This also thoroughly corresponds to the dating of the discussed observations. First, the day of possible observations is the midpoint of the astronomical summer, the observable stars have been perceived as birds and king’s sons at the same time, and the months dedicated to king’s sons are summer months. Aside from this, the shape of the top of the stone No. 12 (Figures 2 and 6b) reminds of the ideogram “bird” (Abrahamyan (1973), p. 239). Here let us remember that we have discussed the observation of the brightest star of the constellation Cygnus in the direction 13_P, and that constellation is also a bird²² and one of the most important deities of the Armenian mythology (Davtyan (2004), pp. 207-222), the primary deity of Hayasa, U.GUR=Nergal (Ghapantsian (1956), pp. 88-89). This constellation is to some extent directly related to cross worship, and the twin brothers in the Armenian Epic were worshipers of the cross and bore the “heavenly cross” on their right hand (Broutian, 2020b, 2021). In Armenian fairy tales there are many episodes where a bird is set free while choosing a new king, and the bird always chooses the king’s younger son, sitting on his head (“AFT” (1959), pp. 277-283)²³. Here let’s again go back to the angle of the stone No. 13 and its position in the cut of the stone. While observing in the direction of the angle of this stone, the cut is seen on the right of the stone (we can also say on its right shoulder, if we accept that the stone “faces” the observer (Figure 6a)). At the same time in Armenian thinking, especially in the Epic “Sasnay Tsrer” (“Daredevils of Sassoun”) the twin brothers Sanasar and Baghdasar are born when Mother Tsovinar gets pregnant from “one and a half handful of water” (“Sasountsi Davit” (1961), pp. 10-11). In other words, there is a size difference between them. The same ideas are evident in “Zorats Qarer”. The stone No. 13 (Pollux has been observable) is bigger in size²⁴ than the stone No. 12 (Castor has been observable). Let us mention another significant fact: Pollux is a brighter star (the apparent magnitudes of the stars are presented in Tables 4 and 5). In accordance with this logic, the brightest star of the constellation Cygnus has been observed on “Sanasar’s head”²⁵ (Broutian, 2020a). It should be mentioned²⁶ that the star β Ursae Majoris has been observable in this same direction in 5800 BC (Table 3). This star is associated with “Khachastgh” (cross star) (Broutian (1997), p. 489) in Armenian sources. On the other hand, the twin brothers to a certain extent complete each other in the episodes of the Epic. In the “Land of Kajants” 40 pahlevans out of 60 are defeated by

²²See Subtitle 5.1.

²³Two storks are emphasized in this tale as well.

²⁴This stone differs from the other stones of the monument by its size.

²⁵Although Sanasar is described as bigger in size, he is the younger brother.

²⁶See Subtitle 4.

Sanasar and the other 20 are defeated only with the help of Baghdasar (“*Sasountsi Davit*” (1961), pp. 75-79). In the monument we also see (see the discussion of the angles, Subtitle 3) that the stones No. 12 and 13 act together, and considering them separately gives way to problems. In other words, observations could be implemented here only by using the two stones simultaneously. The number of the defeated pahlevans is also worth paying attention to. If we consider them to be 60 days then these two brothers together get two months of 30 days, just as each of the Father God’s (Hayk) sons. The division of these two months into 40 and 20-day parts emphasizes the difference of the brothers’ powers (sizes). To complete the abovesaid, let’s *take* the example of the two storks (Figure 8a), depicted on the T-shaped pillar 33 of “Portasar” (Göbekli Tepe) (Peters & Schmidt (2004), fig. 9, p. 191), which nearly repeat the Armenian petroglyphs (Sardaryan (2010), pp. 235-238) (Figure 8b). **The presence of storks in “Portasar” is also important, since it dates back to the time of the beginning of the Protohaykian calendar, i.e., the time of the observations, discussed here.** Although the authors (Peters & Schmidt, 2004) associate them with cranes, the two birds are quite similar by their appearance and lifestyle. What’s more, unlike storks, the tails of cranes are more expressive. On the stone we see that the tails of the birds are short and not emphasized. So, it’s quite acceptable to consider them storks and not cranes²⁷. We can continue this line of these parallels by discussing some additional information²⁸, however, this is enough for making sure that **the observations of the brightest stars of the constellation Gemini have been important at the mentioned period (9000 BC).**

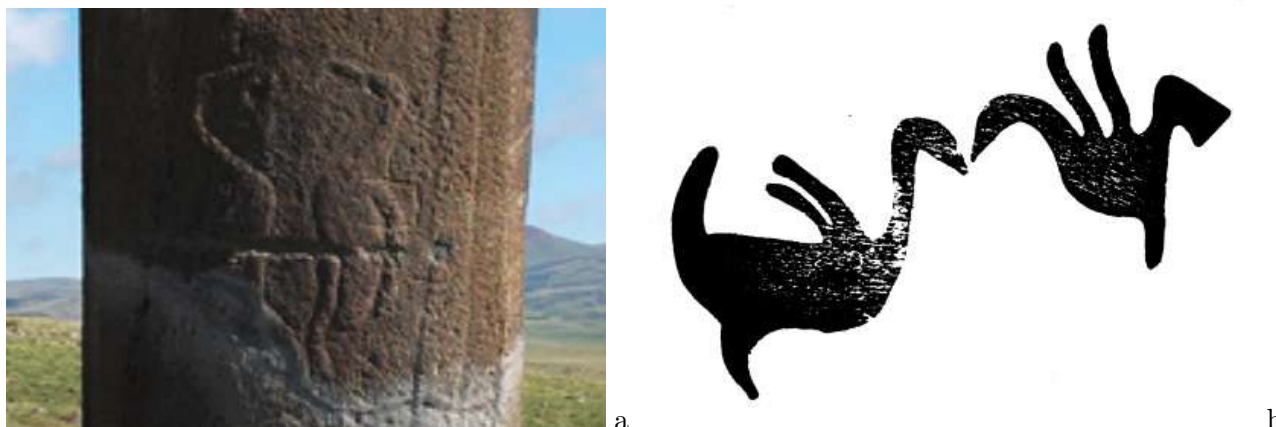


Figure 7. a) The low-relief of a pair of storks on the “Vishapakar” (“Vanki lich”), b) Petroglyph of a pair of birds (Armenia).

As we have seen, the possible observations refer to the day, 47 days before summer solstice till the day, 48 days after summer solstice. There are 95 days between them, and these two days quite accurately coincide with the midpoints of astronomical spring and summer, respectively. Here we should also remember that three parts of 95 days are separated in a year by the analysis of the ornament-calendar (Protohaykian calendar) of the early Bronze Age vessel from Ketī. It’s rather tempting to attribute this 95-day period to one of the 95-day parts of the year depicted on vessel (probably to the image of bird) (Figure 12). Let’s just mention that there is an inconsistency in the identification of the 95-day parts of a year, found out here and by the analysis of the calendar on the vessel, thus this question is a subject to a separate study. **Here there are other similarities as well in the structure of the monument “Zorats Qarer” and the ornaments of the vessel from Ketī²⁹,** which can be discussed in line with the study of the positions of the mentioned stones.

²⁷In Armenian folklore, especially in fairy tales, cranes and storks frequently appear in similar episodes and have the same function. So, here there are no contradictions at all.

²⁸There are other circumstances, found in the monument, which confirm the obtained results. Their study is, however, quite a separate problem, which we’ll discuss in future publications.

²⁹See more on the similarities between the calendar of vessel from Ketī and the monument in Subtitle 6.



Figure 8. a) Portasar (Göbekli Tepe), encloser D, pillar 33 (10-9th millennia BC). The photo taken by I. Wagner, b) Petroglyph of a pair of birds (Armenia).

6. The positions of the stones in the structure of the monument

As it has been mentioned in the description of the stones (Subtitle 2), they are located on the south-eastern side of the central rhombus cromlech. That is to say, they are part of that cromlech. There are 40 stones in the central rhombus cromlech, evidently it is connected to the period of the 40-day fasting and bans on female origin (Malkhasyan, 2021b). These 40 days begin 48 days before summer solstice, i.e., 40 days before the holiday of Navasard. These are the 40 days, during which in 9000 BC the star Spica of the constellation Virgo was not visible in the geographic latitude of the monument and was below the horizon at night (from heliacal setting to heliacal rising period).

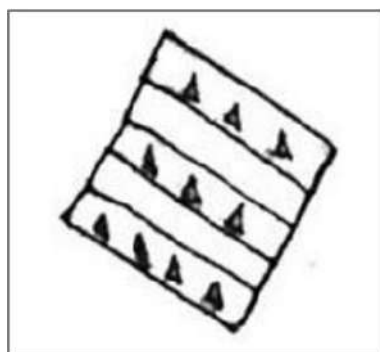


Figure 9. A part, from the ornament on Side A (Figure 11b) of the vessel from Ketik. Small rhombus. End of 4th millennium BC.

In general, when speaking of the connection of the Protohaykian calendar to the monument, we should remember that the star of prime importance of this calendar is Spica (Broutian, 2016), that is, the analysis of the “small rhombus” in the ornament-calendar of the vessel of IV millennium BC closely connects it to the constellation Virgo (Broutian, 2007). The “small rhombus” (Figure 9) contains 10 dots, which are in a separate 4+3+3 arrangement (Broutian, 2022). The author reasonably gives 4 out of 10 numbers to the Virgin. We see the numbers 10 and 4, attributed to the Virgin, the product of which is the number of the 40 stones in the “cromlech”. At the same time, each of the 4 sides of the rhombus of the monument contains 10 stones, if accepted, that in the initial structure there has been a symmetrical distribution of stones on the sides of the rhombus. Aside from this, the rhombus in the monument has somewhat curved (swollen outside) sides (Figure 1). Let us also mention that Grigor Broutian explains this by the analogy to the [vilhan] (analogy to the reel, on which the thread is wound), which is a part of the spinning wheel and has the shape of convex square, and spinning wheel symbolizes female

features as well (Broutian, 2022), especially in many of the Armenian Folk Tales (“AFT” (1979), pp. 442-443). The 3+3 dots of the “small rhombus” of the vessel, which symbolize twin brothers, are also worth paying attention to. The fact that these signs are inside the “small rhombus” of the vessel is important as well. It is explained by the circumstance that the Virgin (Virgo) is pregnant, that is, she carries twin sons (number 3 is odd, and the odd number indicates male). Returning to the 3 stones of the monument, under discussion, we see that they are also part of the rhombus. And the most important and peculiar coincidence is that the angles of the stones were directed to the brightest stars of the constellation Gemini in 9000 BC, i.e., the date of beginning of the Protohaykian calendar (also the calendar of the vessel). Let’s also discuss the shape of the top of the stone No. 12. As it has been mentioned above³⁰, the shape of the stone No. 13 refers to Mother Goddess. It turns out that the shape of the top of the stone No. 12 is also a symbol of Mother Goddess. This shape reminds of the female stone figures, excavated in “Karmir Blur” (Martirosyan (1978), pp. 71-72) (Figure 10). The same ideas are known from “Harich”, “Shengavit” and “Moxrablur”, which already refer to the early Bronze Age (Figure 11) (Yesayan (1992), pp. 144-145). There is also another similarity between the structure of the stone No. 12 and the mentioned figures. The point is that on some of them there is a special emphasis on mother’s breast (a pair of breasts is either bulging or concave, sometimes perforated) (Yesayan (1992), fig. 31(2;3;4;5;10), p. 144). This can also go in line with the two angles of the stone No. 12. These figures (Figure 10 and 11) symbolize Mother Goddess, which has an emphasized belly, showing pregnancy, and the hands, held up, often stand out by the ornaments of plants, which is closely related to agriculture (Martirosyan (1978), pp. 59-78). Here we should also discuss the stone No. 158, which refers to Mother Goddess and cereal cultivation. In the direction of the large angle of this stone in the same date, 9000 BC the apparent disappearance of the brightest stars of the constellation Cassiopeia have been observable nearly at summer solstice. As it has been shown (Malkhasyan, 2021b), these observations refer to the autumn grains harvest. If we compare the shapes of the stones No. 12, 13, 158 and 198, we’ll see obvious similarities. Especially, stones No. 12 and 158 both have two angles and refer to the grains harvest (12-spring grains, 158-autumn grains). On the other hand, in case of the stone No. 12 we have Mother Goddess and Twins (Gemini), and in case of the stone No. 158 there are the king’s younger son and his stepmother (Cassiopeia). There are also obvious similarities in the shapes of the stones No. 13 and 198 (158 as well)(Figure 11).



Figure 10. The stone figures from Karmir Blur (Teyshebain) (Martirosyan 1978, p. 72). The photograph is taken in the museum of Karmir Blur.

Summarizing the discussed content parallels, we can claim that the stones No. 12 and 13 (also the 40 stones, arranged in a rhombus, in the centre) by their shape and position refer to Mother Goddess, who carries the “twin birds” in her belly, and the stars corresponding to them have been observable in the direction of the angles of the same stones.

Taking into account the above-mentioned similarities of the ornament of the vessel from Ketı and the monument “Zorats Qarer”, there is a necessity to make comparisons between the general structure of the monument and the structure of the mentioned ornament. The general structure of arrangement of the stones in the monument and the positions of the discussed stones are presented in Figure 12a, and the ornament-calendar on Side A of the vessel from Ketı can be found in Figure 12b.

³⁰See Subtitle 5.3.

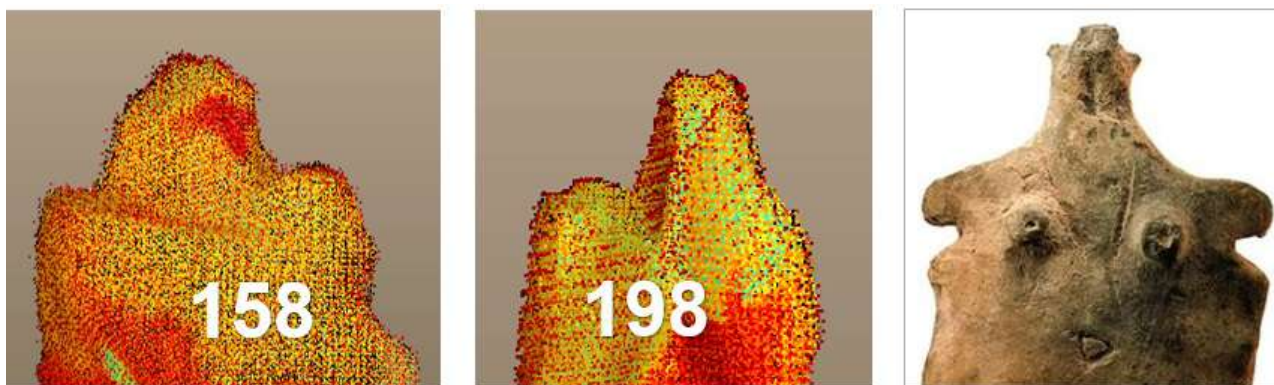


Figure 11. The shapes of the stones No. 158 and 198 (digital point clouds). A statue of a female idol from the early Bronze Age (IV-III millennia BC) (Yesayan (1992), fig. 31.5, p. 144).

Let's present some similarities:

- 1) The rhombus arrangement of stones has a central position in the monument. The same may be witnessed on the ornament in case of the “small rhombus”. At the same time the direction of the line of the stones No. 12, 13 and 14 coincides with the arrangement of the dots in rhombuses.
- 2) The “small rhombus”, as it has been mentioned, expresses the Virgin Goddess, such a position has the stone No. 198 in the monument (Figure 12a), the star Spica (constellation Virgo) has been observable in the direction of its angle (Malkhasyan, 2021a).
- 3) The “big rhombus”, which symbolizes Mother Goddess (Broutian, 2007, 2022), is directed towards the first fracture of “Vishap” (dragon), “on the right” (Figure 12b). The stone No. 158 is located in the corresponding place in the monument (Figure 12a), and in the direction of its large angle the stars of the constellation Cassiopeia (this is directly connected to Mother Goddess (Malkhasyan, 2021b)) have been observable.
- 4) As we'll see next, the 24 points of the “large rhombus” in the monument correspond to the “Chord”³¹ (Herouni (2006), pp. 20-23), which is included in the stone arrangement of the rhombus.

The similarity mentioned in Point 5, must be discussed in more detail. The thing is that the “seating platform” No. 14, together with the stone No. 13, is located in one of the “**junction points**”. The stone arrangement of the rhombus and the row of stones of the “Chord” intersect in this part of the monument. If we again remember the calendar of the vessel from Ketī, we'll see that the number of the dots in the big rhombus, dedicated to Mother Goddess, is 24, and these 24 days end the very day, when the 40-day fasting begins. That is to say, the day when the apparent appearance of the brightest star of the constellation Cygnus has been observable from the “seating platform” No. 14. This circumstance perfectly corresponds to the structure of the Protohaykian calendar. Firstly, the 19 stones of the “Chord” (No. 41 - 59) are close in number to that of the dots of the “big rhombus”³² (Broutian (2022), Capt. 2(4; 5), 3(5)), and besides, these days correspond to the first small part of the out of the year period, after which the larger part of it begins (40 days). On the other hand, the 19 stones of the Chord are evidently also part of the central cromlech, cross the rhombus cromlech at its two (northern and southern) vertices and have a somewhat arc-shaped arrangement, like the sides of the rhombus. By this logic, if we add up the mentioned number of stones of the monument, we'll obtain 40 (cromlech) + 19 (the Chord) = 59 stones (days), which is two lunar months (29,5 + 29,5):

³¹The central rhombus cromlech “is crossed” by a row of 20 (the stones from No. 40 to No. 59), relatively small stones, which has been called Chord by P. Herouni.

³²5 out of these 24 numbers must also be considered as addition to the small rhombus. Therefore, 24-5=19 already clearly corresponds to the quantitative arrangement of the stones of the monument.

And this number corresponds to the 60 days, dedicated to the Twins, about which we have already spoken above. If we also add from 3 to 9 stones³³ of Alley³⁴ (Herouni (2006), pp. 20-23), we'll get 62-68, which in the Protohaykian calendar mostly correspond to the number of the days of the out of the year period (65-70 days) (Broutian (1997), pp. 416-430).

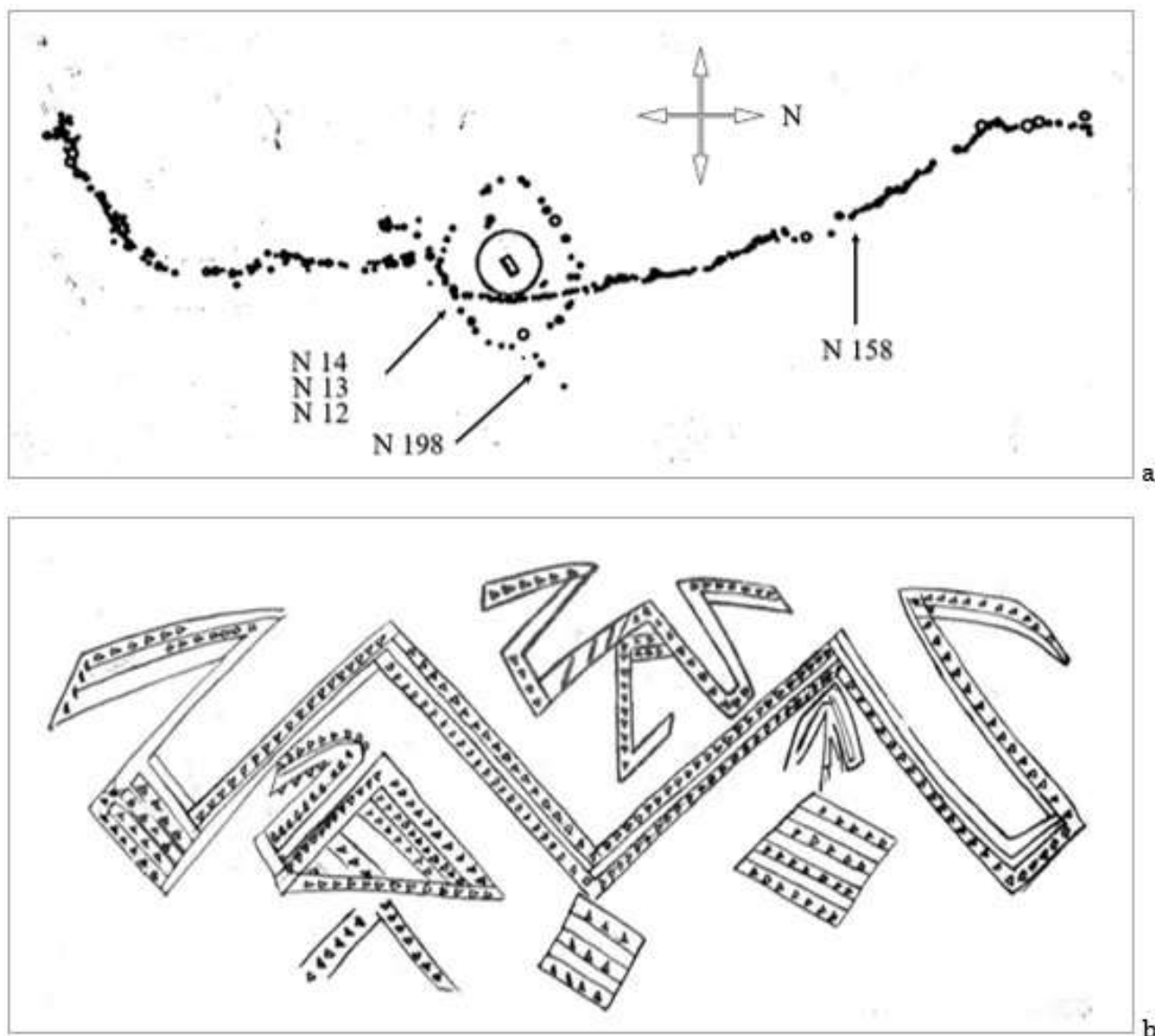


Figure 12. a) The main architectural structure of “Zorats Qarer” in accordance with the measurement, performed by our expedition group in July 2020 (accuracy 1 mm). b) the ornament-calendar on Side A of the vessel from Ketī (Khachatryan, 1998). End of 4th millennium BC. The drawing by Hamazasp Khachatryan.

It's obvious that **the structure of the monument, the arrangement of its stones, their number and the described observing function are undoubtedly connected to the ornament-calendar of the vessel from Ketī**. At the same time, only the future course of studies of the monument and vessel³⁵ and more complete results will help to perform a thorough comparative analysis.

³³In north-eastern Alley only 3 stones (No. 197, 198 and 199) are standing. The rest of them are lying, deviated from their positions or broken. Therefore, a precise calculation is problematic here.

³⁴The arrangement of stones, stretching from the central cromlech to north-east, has earlier been called Alley.

³⁵Only Side A of the ornament on the vessel from Ketī is analyzed. A thorough study of such an ornament on Side B has not been performed yet.

7. The significance of the observer’s positions

As it has been mentioned above³⁶, observations in sitting and kneeling positions could probably have had a religious-ritualistic significance. Therefore, let’s now see what the reason for the observations in such positions is. Since observations from the so far known observational platforms have been performed in a standing position, the observations in sitting and kneeling positions must at least have a logical explanation. So, due to the study of the angles of the stones under discussion, as well as the analysis of the positions of the stones and the features of the cuts, it has been revealed that **in case of the stones No. 12 and 13, we deal with the worship of Mother Goddess**. Moreover, here we come across two different manifestations of Mother Goddess, which has also been revealed by the results, obtained in the past (Malkhasyan, 2021b). Thus, we are dealing with two stones, which symbolize various manifestations of Mother Goddess. Aside from this, these stones are located in a row of 40 stones, arranged in a rhombus, which refers to the 40-day fasting and the days, when the brightest star of the constellation Virgo is not visible³⁷ (Malkhasyan, 2021b). The observation of the brightest star of the constellation Cygnus in the direction 13_P for the observer on the seating platform No. 14³⁸, refers to the same period. It turns out that we can draw parallels³⁹ with the “Chair” of Mother Anahit (Malkhasyan, 2021b). So, the seating platform No. 14 also **corresponds to the discussed observations, to their calendar and mythological content, as an important component (“Chair”) of the character of Mother Goddess (also with the constellation Cassiopeia)**. At the same time, in case of another stone (No. 12), we deal with another manifestation of Mother Goddess. Thus, this stone can be considered the symbol of the Virgin (daughter-in-law, stepdaughter, a virgin, giving birth to twins). It has been mentioned on another occasion, that on “Forty Children’s day” (“Yekeghetsakan Oracuyc” (2022), p. 59) in Mush province (Western Armenia) **single girls (virgins) used to kneel⁴⁰ for 40 times and pray** (Bense (1972), pp. 44-45). It’s obvious that **this traditional prayer, that is connected to the Virgin and children, is performed by kneeling**. In case of the monument, we have an arrangement of stones in a rhombus, the stone No. 12, symbolizing the Virgin and her children and the condition of being in a kneeling position for the purpose of observation. In fact, **it’s thoroughly explainable what the reason for observing in such positions is**.

Summary

The detailed analysis of stones No. 12, 13 and 14 of the monument “Zorats Qarer”, reveals the following circumstances:

1. Except for the standing position, observations have been performed for religious purposes in the monument in sitting and/or kneeling positions as well. It’s also confirmed by the stone No. 14, which we have called a “seating platform”.

2. “Angular stones” have been applied not only as separate observing tools, but also by the principle of **combining the angles of two different stones**. Such a principle has been revealed in case of the angles of the stones No. 12 and 13.

3. Except for aligning with the outline of the horizon (Broutian & Malkhasyan, 2021), the shapes of the tops of the stones have an ideological content as well.

4. There are connections between the structural-functional content of the monument “Zorats Qarer” and the ornament-calendar of the early Bronze Age vessel from Ketī.

Due to the thorough study of the celestial bodies, observable in the directions of the angles of the mentioned stones observing conditions (by the combination of the obtained data, with the results of

³⁶See Subtitle 3.3.

³⁷On this in detail see Subtitle 5.1.

³⁸See Subtitle 5.1.

³⁹This day corresponds to the day when the Virgin “goes to the underworld”. Here we should remember the Greek Demeter, who grieves the abduction of her daughter, sitting on the “sorrow stone” (Kun (1989), pp. 82-90).

⁴⁰It’s rather interesting that the name of one of the stars of the constellation Cassiopeia (δ Cassiopeiae - *Al Rukbah*) means a knee (Allen (1963), p. 148).

the previous studies of the monument, Armenian ethnography, folklore and archaeological material) we have got the following results:

A. The stones No. 12, 13 and 14, which are part of the central rhombus arrangement, were installed in 9000 BC, the date of the beginning of the Protohaykian calendar.

B. The observable stars (α Geminorum, β Geminorum, α Cygni and α Lupi) in 9000 BC, their mythological perceptions, observing conditions and days perfectly correspond to the structure and content of the Protohaykian calendar, as well as to the key motifs of Armenian folklore.

C. There is a single-valued connection between the described observations and their positions in the year circle to the stages of cereal cultivation (spring grains, autumn grains).

D. The obtained results are in line with the data, obtained previously due to the studies of the monument, and complete them.

At the same time, we notice the possible observations of some important celestial bodies in 5800 BC. If the same directions were used in later millennia for observing other celestial bodies, and we have already witnessed such a phenomenon from the examination of the stone No. 197⁴¹ of the same monument (BROUTIAN & MALKHASYAN, 2021, Malkhasyan, 2021b), then it is necessary to study this date separately.

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⁴¹Here we see the application of the stone No. 197 (it refers to 9000 BC) also in 2341 BC, however, with some change in its vertical axis, which is clearly visible by the examination of the position of the stone.

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