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## ASTRONOMICAL ASPECTS OF THE ROCK SANCTUARY NEAR THE POPOVO LAKE, PIRIN MOUNTAIN AND POTENTIAL VECTORS FOR AZIMUTHAL OBSERVATIONS OF THE SUN IN PREHISTORY

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**Abstract:** The report examines the spatio-temporal organization of the architectural-symbolic elements of the Popovo Lake rock sanctuary. The morphometric features of the monument and its adjacent sacred territory are noted. Within the framework of the general evidence, an archaeoastronomical hypothesis related to observations of solar sunrises and culminations during equinoxes and solstices is defined. A projective system model of solar culminations observed by optical reflections in the Popovo Lake surface and with the use of a screening function of the Kilimiavka rock island is discussed. The report discusses the problems of observational practice in the space of the sacred territory. Based on the measurements made so far, observation vectors directed to characteristic points of the horizon related to the diurnal and annual solar cycle, as well as their calendar meaning within the tropical year, have been assumed. The report indicates the dominant elements of the spatial orientation of the monument and its connections with specific points of the surrounding relief.

**Keywords:** rock-cut monument, archaeoastronomy, vernal equinox, winter solstice, Great Mother Goddess

### Introduction

The Popovo Lake is one of the eleven lakes located at the bottom of the largest circus in the Pirin Mountain (6x3 km in size) (Dautov, 2017). The lake is enclosed by the peaks of Sivria, Chengelchal, Dzhano, Kralev Dvor, Momin Dvor and Dzhangal (Dushkov, 1972).

Popovo Lake is the largest in area and volume, and the deepest one in the Pirin Mountains. The lake has an area of nearly 123.6 hectares and its length and width are 480 and 336 m respectively. Its water volume

is estimated at 1 270000 cubic meters. It is located at altitude of 2234 m (Pirin, Popovo ezero, 2008). The lake collects water from surface precipitation, as well as from two small streams that flow into its southern part. The largest amount of water in the Popovo Lake is collected in late spring. This is mainly due to the melting of the snow, which lingered until then on the slopes of the peaks surrounding the lake. The Popovo Lake looks like an irregular pentagon. There is a small rocky, circular island (35-30 m) in the lake, covered with a *Pinus mugo*, called by the population Kilimyavkata (Fig. 1).



Fig. 1. General view of the circus and Popovo lake with the Kilimyavkata rocky island.

### Geographic data

The Popovo lake occupies a central position in the circus of the same name. It is located on the border of the lands of the villages of Kremen and Obidim. In older literary sources and maps it is also noted with the name Papaz göl. It gives the beginning of the lush Retizhe river. The lake bed is dug into the bedrock, and is blocked to the north by a rock sill. From the west and east it is pressed by the slopes of the Momini Dvori and Dzhangal peaks (Geography of Bulgaria, 1989). Its shores are too diverse.

Predominantly they are steep and stony, and in separate sections grassy. In places, individual squat specimens grow on them. Along its south, north-west and north-east shores there are several flat grassy meadows. The bottom of the lake near the shores is steep, and with increasing depth the slope decreases. In its large part it is stony, in some areas it is silty-sandy. The number of plant and animal species living in it is relatively small. The lake is artificially stocked. The small rocky island is located at the northern part of the Popovo lake (Fig. 2).



Fig. 2. Popovo Lake with a view from its northern shores to the south towards the ridges and mountain peaks that surround it.

### Legends

Until 1942, the lake was named Papazgöl, which is a literal translation of its present name (the lake of the priest - “пoп” in Bulgarian) from Turkish. At least two legends are associated with it (Megalithic sanctuary...2021). According to the more popular one, it is called after a priest who has thrown himself into the water because of grief. The reason was that the Turks raped his daughter. When the priest sank, his hat floated to form the islet in the middle of the lake, bearing the same name (Popova kapa - the priest's hat). According to another legend, after the Bulgarians were baptized in the ninth century, a priest went up to Pirin mountain to banish the reigning there Perun – the Slavic pagan God. He has found it, but Perun God became so angry with his audacity that he threw him into the lake to drown (Bulgarian folk...1983). And again the hat floated to the surface and became an islet. Another legend has to do with the sacred area of the Popovo Lake Circus: The God of Storms and Lightning had a daughter who lived in the Fairy gardens near the lake (Kyulev, 1977). In the neighborhood lived the Bess god, who liked the girl and

abducted her. The beauty's brother, named Dzhungal, learned what the Bess God had done and collected the evil spirits with the help of which he caught up the kidnapper and, after defeating him, piled him up with stones. The large pile of stones on Mount Bezbog reminds of this ancient legend.

According to V. Markov (Markov, 2020), many of the beliefs related to the Popovo Lake inherit even more ancient traditions. In addition, the area of the Popovo Lake Circus and the valley of the river Retizhe was sacralised already in Ancient Thrace.

It was probably reached from the Mesta river valley along the Retizhe river, which originates from the circus. Several significant megalithic sanctuaries have been registered along its banks. Among them, the Babini Vidini Koshari rock sanctuary, located on the left (northern) bank of the river, deserves special attention.



Fig. 3. A megalithic altar shaped like an inverted truncated pyramid. Two gutters lead the holy liquid to a lower platform, marked by two elliptical and one circular excavation.

A monumental rock, located next to an imposing waterfall at the confluence of the Parikovets and Retizhe creeks, was sacralized. Particularly noteworthy is the sanctuary in the Kalinova Zatoka locality, which is also located on the left bank of Retizhe. A rock site showered with shallow circular excavations, an incised semi-circle on adjacent sheer rock, and a significant

amount of hand-made Thracian pottery were also registered. Located right at the ford crossing the Retizhe at the eastern entrance to the sacralized territory of the Pope's Circus, this shrine can be interpreted as a shrine to access the sacred territory from the top of the cosmic mountain. On the eastern shore of the Popovo Lake, an imposing megalithic altar with the shape of an inverted truncated pyramid was recorded. Two gutters lead the holy liquid from here to a lower platform marked by two elliptical and one circular excavation (Fig. 3).

The pottery found next door is hand-made and generally dates from the end of the second half of the 2nd millennium BCE. A few fragments of Late Antique pottery were also found (Markov, 2019).

In the northern periphery of the circus, near the Lower Polezhan Lake, at the very foot of the Manger Tepe (Polezhan), an imposing stone throne was found, oriented exactly to the west (Fig. 4). Next to it, round excavations - altars - can be seen on large stone blocks. Directly in front of the stone throne are the hearths, which functioned until the middle of the 19th century, where rams were sacrificed. According to legendary data, the traditional cult practices were maintained by pilgrims - Christians and Muslims from the entire south-eastern part of the Balkan Peninsula. The shrines were visited and supported by the belief that all who were here, like their fathers and grandfathers, became "hajjis". A fact that suggests the existence of a particularly significant cult center, which left lasting traces in traditional memory and cult actions, the beginning of which, as the archaeological materials unequivocally indicate, as well as the ancient traces in the extremely rich legendary material, must be sought in Thracian antiquity (Markov, Gotsev, Yankov 2003).



Fig. 4. A stone throne carved into the bedrock and oriented exactly west.

This is also supported by the fact that the sanctuary is located on the territory where the Thracian tribes of “satri” and “besi” lived - the independent Thracians known in antiquity, who were the most jealous guardians of the Thracian religion of that era (Markov, 2007).

#### Archaeoastronomical data

As mentioned, on the northern shore of the lake, on two rock terraces, numerous cuttings have been found.



Fig. 5. Map of the rock-cut monument with a rock sanctuary near the Popovo Lake, Pirin mountain.

They form an area, from which a wonderful view to the eastern and southern parts of the local horizon is revealed for an observer standing there. Due to the short distance from the altar to the surrounding high mountain peaks, the rising disc of the sun appears  $15^\circ - 30^\circ$  above the mathematical horizon. Dominating the territory is a horizontally leveled platform with dimensions of 3x2 m, which we assumed was the main observational point of the rock-cut monument (Fig. 5).

The geodetic survey of the monument showed that the orientation of the long side of the site coincides with the line of the local meridian (north-south). The line of sight of an observer standing on the rock platform and facing the south direction crosses the local horizon in the lowest point (Demir kapiya) of the rocky passage between the peaks of Chengelchal and Demirkapiyski chuki. It has been also found that an observer located on the rocky platform can see the reflected from the lake surface image of the Sun in culmination, during the winter solstice (Fig. 6).



Fig. 6. Southern horizon of the rock-cut monument with the peaks Chengelchal (left) and Demirkapiyski chuki (right) and the lowest point (Demir kapiya) of the rock passage between them.

The eastern viewing vector allows to observe the sunrise during the equinoxes between the peaks of Bezbog and Sivria (height above the mathematical horizon  $0^\circ$ ), where the river valley of the Retizhe river (the largest tributary of the Mesta river) begins (Fig. 7). On the other hand, the play of shadows and penumbras of the surrounding peaks, at sunrise and sunset, onto the calm lake waters, in combination with additional rock benchmarks, makes it possible their use for time measuring within the light part of the day (Maglova et al., 2010).

### **Territorial distribution of the sacral territory**

We can symbolically limit the designated sacred territory of the Popovo lake circus into three inscribed concentric circles, with a maximum diameter of 5 km. The outermost circle consists of the imposing mountain peaks surrounding the circus, which in local legends are represented as petrified deities and heroes. The Sun rises above them on certain days of the tropical year, related to the cult-ritual calendar of the local prehistoric population.



Fig. 7. Eastern horizon where the sunrise during the equinoxes is observed between the peaks of Bezbog (left) and Sivria (right).

The material evidence for this is the ritual hearths and ceramic fragments from the 1st century BC. The coastline of the Popovo Lake outlines the second sacral circle. On a very large block of rock, resembling a truncated pyramid, is a sizeable in dimensions altar with gutters that lead the sacred liquid into a small cavity formed beneath it. Two small steps are cut in front of the cavity. The latest pottery found again dates back to the 1st century BCE (Markov, Gotsev, Yankov 2003).

In the middle of the Popovo Lake is the round island “Kilimyavkata”, which practically represents the innermost sacral circle and is the centre of the entire sacralised territory of the circus. During a field survey, a megalithic structure reminiscent of a small half-ruined dolmen was registered on the island (Markov, Gotsev, Yankov, 2009).

### **Some interesting archaeoastronomical positions**

The analysis of the archaeoastronomical data allows one more interpretation to be made. On the day of the winter solstice, if we observe the horizon from the central altar, the Sun rises above the eastern horizon and then disappears (hides, sets) behind the visible horizon line delineated by the rock peaks of Dzhangal and Dzhano, sacred in local legends. They surround the circus from the southeast and south. At exactly noon, the Sun reappears (touching the Earth) in the outline of the southern gate (Demir kapiya). Apart from everything else, Demir kapiya is one of the seven entrances to the sacralised territory. From a mythological point of view, this is a situation where the Sun has descended to Earth and enters the sacralised circular area of its own sanctuary through the southern gate of Demir kapiya (when it

culminates at noon). The fact that 100 m to the north under the rock gate are the ruins of a long wall built in prehistoric times, which can be interpreted as a peribolos, separating the most sacred part of the sanctuary from the rest of the world, is also significant. Incredibly, this is also the place where the priest-king meets the Sun deity (Marazov, 1988, 1994). It should be noted that the rock-hewn monument Popovo ezero is a typical sacred space, as defined by Mircea Eliade (Eliade, 1994, 1995).

On the territory of the sanctuary, the four great cosmic elements, earth, air, water and fire, which create the Cosmos, acquire concrete dimensions in symbols. Seen and believed as the core of society as well, they intertwine in the idea of the Great Mother Goddess and Her creative power. Therefore, She, thought of as the Universe herself - the life-giving, self-conceiving, bears her fruit and gives birth to Her Son, the personification of the masculine cosmic action, which is both Sun and Fire. Bearer of these two inexhaustible sources of energy which form the axis of eternal motion, the Son - Sun/Fire ensures the cycle of life through his death and rebirth. It daily ascends to its zenith at the top of the upper hemisphere and descends in the lower one, to find himself at the two ends of the cosmic axis (Fol, 1986).

### **Conclusion**

The lack of sufficient archaeological data does not allow an assessment of the frequency of use of the rock-cut monument near the Popovo lake in the different chronological periods. The so far known rock-cut monuments from the Rhodopes, Strandzha and Sredna Gora mountain suggest the existence of a strong tradition in the construction of similar sanctuaries and oriented rock ensembles from the end of the

3rd millennium BC. The presence of rock sanctuaries of a similar type and purpose in the area of the neighbouring Rila Mountain allows us to believe that their construction was a basic practice on the territory of Ancient Thrace during this and later epochs.

On the other hand, the marked heterogeneity of cult practices and cult architecture in individual parts of the Thrace region is most clearly discernible throughout the Bronze and Early Iron Ages. While in the northern and eastern foothills burials were practiced during this period, in the central parts rock megalithic structures are widespread - rock tombs and graves and rock niches without mounds, and in the south - dolmens covered with low mound embankments. It is also necessary to take into account the importance of the natural features of the various areas, which, without having a determining role, condition the use of one or another type of burial facilities. (Fol, 1986).

Archaeoastronomical research has shown that specific movements of the Sun relative to the visible horizon were observed from the central altar located on the northern shore of the Popovo Lake. The results of the research are remarkable and with good reason strengthened the arguments of the thesis that it is a particularly significant sanctuary located on the top of the Pirin mountain, sacred to the ancient Thracians and dedicated to the Solar God of the Thracians - Dionysus-Sabasius (Fol, 1991, 1994).

Archaeological evidence indicates that the Thracian rock sanctuary from the Popovo Lake in Central Pirin is deeply connected with the cult of the Sun and Fire, as well as with the sacralised water from the top of the cosmic mountain. The monumental nature of the sanctuary, based on the natural code of

the circus - the circle, as well as its structure - composed of three inscribed circles, marked with Thracian cult centres, symbolizes the centre of the world, at the top of the cosmic mountain. The structure and semantics of the sanctuary show that a mythological character is worshiped here, who is the master of the entire universe, of the heavenly, earthly and underground worlds.

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Zaychi vruch (Kabyle), Yambol district. Artificially hewn out of the rock trenches, oriented East–West and North–South, used for observations of the Sun in *its extreme positions on the visible horizon* (solstices and equinoxes) and *culminations* of bright luminaries. An additionally leveled rock, located in the northeast, allows determination of the summer solstice. This device could be used for measuring time intervals longer or shorter than a day.

