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STUDY AND ORIENTATION OF THE MT. OCHE 'DRAGON HOUSE' IN EUBOEA, GREECE

E. Theodossiou and V.N. Manimanis
Department of Astrophysics, Astronomy and Mechanics, School of Physics, National & Kapodistrian University of Athens, Panepistimiopolis Zographou 157 84 Zographos-Athens, Greece.
E-mail: etheodos@phys.uoa.gr, vmaniman@phys.uoa.gr

M. Katsiotis
National Technical University of Athens, Polytechniopolis Zographou, Athens, Greece.
E-mail: markos@central.ntua.gr

and

D. Papanikolaou
Department of Dynamic, Tectonic & Applied Geology, Faculty of Geology & Geoenvironment, National & Kapodistrian University of Athens, Greece.
E-mail: dpapan@geol.uoa.gr

Abstract: In southern Euboea, Central Greece, there are several megalithic buildings known as 'drakospita' (or dragon houses) whose builders and purpose are unknown. On 22 March 2002 and 4 July 2004 we visited the best-preserved of all drakospita on top of Mt. Oche, measured its dimensions and calculated its orientation based on the azimuth of sunset and moonrise. A Sirius-rise orientation corresponding to *ca* 1100 B.C., not inconsistent with previous archaeological dating based on artefacts found inside the structure, indicates a religious/astronomical purpose for the building. It could probably be argued that at least the famous drakospito at Mt. Oche was not only a place of worship but also an ancient astronomical observatory.

Keywords: Dragon-house, drakospito, Euboea, astronomical observatory

1 INTRODUCTION

The Dryopes were a Prehellenic ancient tribe, mentioned in Greek mythology by both Herodotus and Pausanias. Since their name is Indo-European, Dryopes are thought to belong to the Indo-European part of the Prehellenic racial substrate. Initially, they occupied the area between the mountains Oete and Parnassus, a dry land called Dryopis. They are thought to be related to Leleges, and they have been characterized as a tribe of bandits. The settlements of Leleges and Dryopes lasted until the end of the Neolithic Period, when the first Greek tribes started to appear. Pressed by them, the Dryopes supposedly immigrated to southern Greece, *ca* 1200 B.C. (Papamanoles, 1954), colonizing Euboea and the Cyclades islands. Herodotus (who is not always a reliable source, so the reader must be cautious) writes that during the period of the movements of the Greek tribes, Dryopes from Euboea colonized the island of Kythnos, which took the name Dryopis as a whole (Herodotus: 8, 46). On the island of Euboea the Dryopes settled in the southeast part of the island, mainly in Styra and Karystos (see Figure 1). Styra is a small town situated approximately 30 km to the northwest of Karystos and 90 km to the southeast of Chalkis, the capital of Euboea. The city of Karystos is built on the innermost point of a bay in the southern part of Euboea, under Mt. Oche. This mountain is the tallest mountain in this part of Euboea, and its highest peak, Prophet Elias, reaches an altitude of 1398 m.

Very near the top of Mt. Oche there is a megalithic building which is preserved in good condition (Figure 2) and is known as the 'drakospito' (i.e. house of the dragon). In general, in Euboea, 'drakospita' or 'dragà', are local names assigned to between twenty-three and twenty-six such stone buildings (depending on who you believe), or remnants of them. Their presence is restricted to the southeast third of the island, with about a dozen in the area around Styra. According to the local tradition, these structures were built by dragons and the king of the Cyclops resided here. The reason is simple: only giants, dragons or Cyclops were capable of transporting these huge rocks (Politis, 1904: I, 220-222).

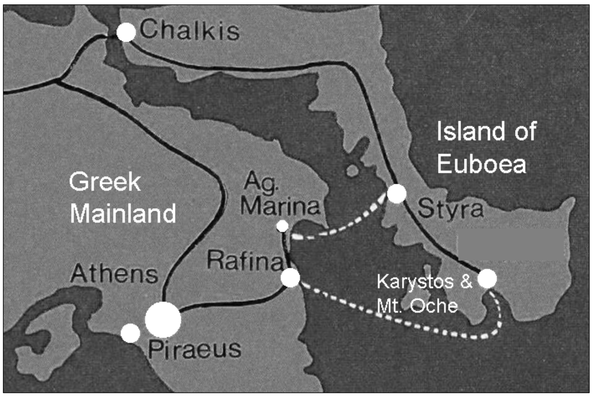

Figure 1: Localities mentioned in the text.

Today, the drakospita stand as a testimony to a distinct cultural phase in Euboean history, with the Dryopes as their most probable builders, provided that the approximate age of their construction is the one inferred by the present study.

2 PREVIOUS STUDIES OF THE DRAKOSPITA

The first modern reference to these buildings dates to 21 October 1797, and was recorded by the British geographer and geologist John Hawkins (1758–1841). He was the first to discover the drakospito on Mt.

Oche, and believed that it was an ancient temple. Other Greek and overseas researchers followed, including H.N. Ulrichs (1842), G. Welcker (1850), L. Ross (1851), M.J. Girard (1851), G. Bursian (1855) and, more recently, Th.G. Papamanoles (1954).

Three drakospita near Styra, known as Pálle-Lákka Dragò, are especially imposing, but most impressive of all is the drakospito on Mt. Oche. None of the others preserves the perfection of its construction.

Some archaeologists (see Ulrichs, 1842) consider the drakospita as sanctuaries of Teleia Hera, the 'legal' wife of Zeus and thus protector of marriage due to her holy union with the Father of the Gods, while others, (see Bursian, 1855), believe that they were places of worship of Hercules. Both these views connect drakospita with worship, and assign to them a well-defined religious importance.

The temple theory is also supported by Theodor Wiegand (1896: 11-17), who

> … was the first to point out that the Dragon-House of Mt. Oche was by no means Mycenaean – despite the similarity between its roof construction and the corbelling systems used at Mycenae and Tyrins. (Carpenter and Boyd, 1977: 1).

Franklin P. Johnson (1925) was the first to postulate a Karian derivation by noting the features shared by the so-called dragon-houses of Euboea and certain even less well-known structures in Karia (Asia Minor). J. Carpenter and D. Boyd (1977) also favour a religious usage.

In 1959 Professor Nikolaos K. Moutsopoulos studied the Mt. Oche drakospito and eleven similar buildings, and excavated the surrounding space in 1960 and 1978-1980. Inside the Mt. Oche building he discovered numerous pots, while outside the building he located an apothetes, i.e. a subterranean construction inside which some utensils and animal bones were found (probably relics of ritual sacrifices), as well as pottery fragments and inscriptions dating from the Preclassical Period to the Hellenistic Period; on one of the potsherds were inscriptions in an unknown kind of writing. These relics are now housed in a small archaeological museum at Karystos (inside the Yokaleio Cultural Foundation), where one can also see a couple of finds from other drakospita near Karystos and Styra.

The study of the Mt. Oche building, together with certain architectural details, persuaded Moutsopoulos that this megalithic monument was a temple of the Dryopes built some time before 700 B.C., a temple where sacrifices had taken place since the Archaic (Preclassical) Period. However, Moutsopoulos (1992) dates the pots found during the drakospito excavation to the early Hellenistic Period, that is third or second centuries B.C. The same dating is proposed by Carpenter and Boyd (*ibid.*). This cannot of course exclude a much older construction age for the building itself.

Carpenter and Boyd (*ibid.*) report the existence of an edifice on the western interior wall of the structure, which they considered probable evidence of sacrifices, together with a 50-cm diameter roof opening, a kind of primitive chimney for the smoke from the sacrifices. They also argue in favour of the existence of an altar in front of the edifice.

Ulrichs (1842) and Bursian (1855) independently reported the existence of a square table-like plate inside the building, probably for placing the offerings on. Moutsopoulos mentions, however, that during the 1960 excavations neither the edifice nor the square table-like plate was found, and during our recent investigations we also did not notice anything like an edifice on the western interior wall.

Figure 2: Photograph of the Mt. Oche drakospito looking northeast before sunset on 4 July 2004.

Most researchers who have studied the Mt. Oche drakospito focus either on the religious character of the building (sanctuary/temple of the Perfect Hera or Hercules), or on its archaeological or architectural significance. Carpenter and Boyd note (1977: 1) as archaeologists that, if the drakospito is regarded as a temple, then the placement of the entrance at the long side and the confinement of sacrifices inside it do not agree with the Greek modes of temple construction and usage, respectively; therefore, they conclude that most probably it was a sanctuary of Leleges or Karian slaves.

It should be noted that apart from southeast Euboea no other places in Greece have drakospita, if we exclude some markedly smaller similar constructions in Mane (southern Peloponnese) or, according to Carpenter and Boyd (*ibid*.), a solitary example on Mt. Hymettos in Attica. However, from a geological point of view we assert that the Hymettos construction can in no way be associated with the Mt. Oche drakospito.

In the Greek folklore, the drákoi (plural of drákos, the common Greek form of the word dragon) are large legendary monsters with the general form of a serpent, usually winged and gifted with supernatural powers. Such mythical monsters are to be found, with some variations, in all the mythologies or folklore of the world. However, in Greek the word drákoi means also humanoid creatures of larger-than-normal height, with muscular power exceeding the human measures. These creatures are thought to live inside caves on the mountains. Probably the legends about the humanoid drákoi are the succession of the Greek myths about Giants, Titans, Cyclops and Centaurs (Politis, 1904, II, 994-995). Out of these dragon legends much topographic nomenclature was created, and is used up to this day: drakotrypa (dragon hole), drakospelia (dragon cave), drakovouni (dragon mountain), drakolimne (dragon lake), etc.

3 OUR STUDY OF THE MT. OCHE DRAKOSPITO AND ITS ORIENTATION

We visited the Mt. Oche drakospito at both the time of the vernal equinox (22 March 2002) and around the time of the summer solstice (4 July 2004). We noticed the presence of ancient quarries on the slopes of the mountain, the source of the well-known marbles that secured wealth for ancient Karystos, the third largest city on ancient Euboea. According to some literature, the entrances of drakospita look towards the ancient quarries. In Kylindroi, in the vicinity of Karystos, one can see imposing marble columns from that period. In the Styra area there is an equally-impressive ancient quarry near Ai-Nikolas, and two others in the area of Kapsala (a village 2 km to the south of Styra). The southern Euboea area was known in antiquity for its quarries, as mentioned by Strabo (X 16). So, although the drakospita themselves are not made of marble, some researchers have hypothesized that they were the residences of the local quarry workers. Maybe the smaller ones could have been erected, or simply used, by such people, but this hypothesis seems improbable for the largest one of all, on Mt. Oche, because of its position on the very top of the mountain, a hard-to-reach and cold place.

The Mt. Oche drakospito lies at an altitude of 1386 m (4547 feet), on the tiny plateau formed between the twin peaks of the mountain. Access is rather difficult and requires some mountaineering ability, but not special climbing skills.

The geographical coordinates of the building, determined by using a hand-held GPS, are: latitude 38° 03′ 06″ North and longitude 24° 27′ 10″ East in the World Geodetic Reference System (WGS '84). The area of the peaks is bare and precipitous.

The ancient building is an approximate rectangular parallelogram made of large blocks of rock, weighing up to 10 tons each, and the way in which the blocks fit together and the overall quality of the construction is impressive. We carefully measured the dimensions of the main building. The largest of the stone blocks is 4.0 × 2.0 × 0.4 m. All of the blocks of rock seem to have been extracted from the same area, and geologically they are amphibolites, rocks composed of silicate minerals. From the inside we could testify to the excellent state of preservation. Indeed, the strength of the construction and the feeling of safety offered by this megalithic monument prompted the people to think of it as the creation of supernaturally-strong beings, dragons or Cyclops. The lowest blocks are fitted into the natural rock substrate, while—where needed—cavities were filled with smaller stones. No trace of any connecting mortar, such as mud, was detected.

The entrance of the drakospito, visible in Figure 2, is made of three slate blocks (a trilithon) forming a Π shape, a common feature of all 'dragon houses'.[1] It may be noticed that at least the entrance of the Mt. Oche dragon house resembles the dolmens of the Atlantic coast. The circular dolmens with corridors in Bretagne and Poitou date from the end of the fifth millennium B.C. (such as the 'Table of the Merchants' at Locmarie), or the beginning of the fourth millennium.

The top block on the Mt Oche drakospito measures 1.2 m × 2.3 m × 0.2 m and sits at a height of 2 m. The thickness of the walls is everywhere larger than or equal to 1.40 m (for comparison, one member of the Pálle-Lákka Dragò trilithon has average wall thickness of 1.17 m, and another one 1.05 m). The interior comprises just one room, which measures 9.80 m long and 4.90 m wide,[2] i.e. a 2:1 ratio, forming a space of about 48 m^2. The height of the walls is 3.45 m and that of the building approximately 4.5 m. The only wall with windows is the southern one, where two small windows exist, approximately 40 cm wide, one to each side of the door opening, allowing a small amount of light to enter the building (as is the case in most temples and churches, in order to create a proper atmosphere).

The construction method of the whole building appears to have solved serious structural problems. The construction of the roof follows the ecphoric method on all four sides, and not only on two sides, as is the case with the Mycenae megalithic monuments.

In order to construct a roof with this method or system, one needs both accurate calculations and good craftsmen. First, a large piece of slate is placed on the top of the wall, protruding a little towards the interior of the room. Upon this slate, a second one is placed, which extends towards the interior a little further than the first one, then a third piece of slate extends over the second, etc., until the uppermost slate supported by the one wall meets the uppermost slate supported by the opposite wall, thus closing the roof. The structural study must be accurate, because if the weights of the slates is not calculated correctly, the barycenter of the whole pile will exceed the edge of the supporting wall, and the roof will collapse. The unknown constructors of the ancient building, thinking cleverly, not only made very thick walls, but also used large rocks as counterweights placed upon the first slates on the parts that were resting on the thick wall. Also, the slates are not horizontal, but were slightly inclined, for the draining of rainwater.

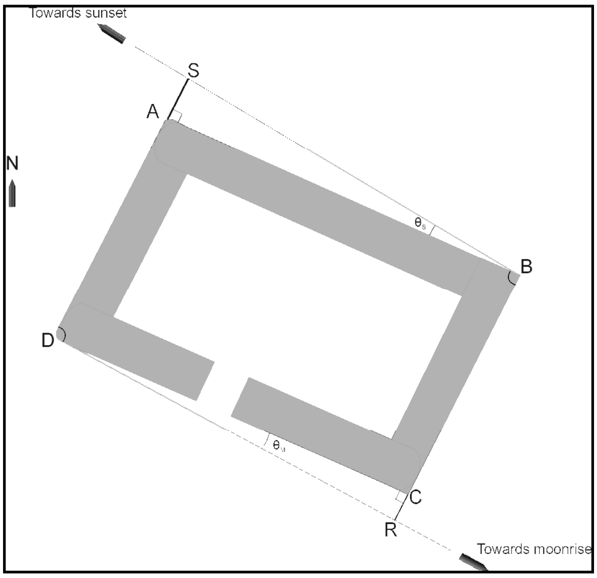

Figure 3: Diagram showing the method used to determine the orientation of the Mt. Oche drakospito.

The lengths of the exterior walls are: 12.70 m (north), 7.70 m (east), 12.60 m (south) and 7.75 m (west). It should be stressed that the structure and texture of the walls is such that the accuracy of the measurements can be no better than approximately 5 cm. The structure should be further studied in respect to its mathematical analogies, since the ratio of length to width (1.64) is very close to the 'golden ratio' or 'divine analogy' of $\Phi \approx 1.618:1$, a ratio that appears during the Classical Period mainly in the vertical plane to increase the aesthetic appeal to an external viewer.

During the 4 July 2004 expedition, measurements of the angle between the northern wall and the Sun's azimuth at sunset were obtained. The instrumentation used was a measuring tape and portable marking signs. The sunset is clearly visible from the northern side of the building at around the time of the summer solstice, and clearly visible from the southern side at the time of the vernal equinox: the altitude of the natural horizon as seen from the northeastern corner of the building is zero, i.e. the natural horizon from that point coincides with the mathematical horizon at the azimuth of the 4 July sunset. The situation is the same with the south wall, as the Moon was seen from the southwestern corner rising over the sea. This way it was possible to calculate the angles between the lines of the walls and the setting and rising azimuths by simply measuring the lengths (AS) and (CR) respectively in Figure 3 and using the length of the longer walls mentioned earlier.

Since (AS) = 1.45 ± 0.01 m and (AB) = 12.70 ± 0.04 m, the angle $\theta_S = 6° 31' \pm 5'$ (due again to the structure and texture of the walls, the error of the angles calculated is approximately 5′). Therefore, the azimuth of the northern wall was calculated to be 293° 25′ ± 5′, or 113° 25′ ± 5′ facing towards the east, as the azimuth of the setting Sun, derived from the *Cartes du Ciel 2.75* planetarium program, was 299° 56′ for the specific date and geographical position. Diffraction and altitude effects were taken into consideration. Figure 4 shows the azimuths obtained.

For the southern wall we have (CR) = 0.88 ± 0.01 m, thus the angle θ_M equals 3° 59′ ± 5′. Therefore, the azimuth of the southern wall, facing towards the east, was calculated to be 113° 09′, as the azimuth of the rising Moon, derived from the *Cartes du Ciel 2.75* planetarium program, was 117° 08′ for the specific date and geographical position. This represents a difference of just 16′ from the azimuth of the northern wall.

Trigonometric calculations based on the measured lengths of the walls yielded an angle for the north-western corner of the building equal to 94° 27′; that of the south-western corner 85° 17′; the angle of the south-eastern corner 95° 29′ and of the north-eastern corner 84° 47′. The length of the exterior southeast-northwest diagonal was 14.25 m.

The habit of giving an astronomical alignment to religious buildings is common in Greece, both in ancient and mediaeval times, with the sunrise and sunset at certain dates being especially favoured, as reported by Pantazis et.al. (2004). Having excluded the sunrise and sunset at solstices and equinoxes, an obvious first choice was to check for possible astronomical alignments among the brightest stars, and especially Sirius, since the orientation towards the southeast was compelling. Indeed, by using two separate astronomical planetarium programs, *Redshift 5.1* and *Cartes du Ciel 2.75*, we discovered a rise of Sirius orientation of the southern wall for 1060 B.C. ± 30 years and of the northern wall for 1150 B.C. ± 30 years, the average for both walls being 1105 B.C. (the uncertainties correspond to the 5′ error mentioned above). The dating of the construction of the building at that time is not at odds with the archaeological evidence, as Moutsopoulos (1960) assigned this drakospito an eighth century B.C. date based upon artefacts found inside the building.

4 POSSIBLE USES OF THE OCHE DRAKOSPITO

If the Mt Oche drakospito does indeed date to the eighth century B.C., it may have been a watch-tower and residence of the observer, who from that height was observing the Aegean Sea and could use smoke signals to notify administrators in the nearby city of what he was seeing. However, it is unlikely that a squat building like this would have been constructed solely as a watch-tower. A more plausible hypothesis is that it served as a temple of Hera and at the same time as a 'watch-tower of the skies', i.e. an ancient astronomical observatory. The view had it had a religious function is supported by Girard (1851), Bursian (1855), Baumeister (1864) and Moutsopoulos (1992).

We know that many megalithic monuments in Europe were constructed for exactly this purpose. In the case of the Mt. Oche drakospito, an architecturalconstructional element supporting this view is, as was mentioned before, the 1.64 ratio of length to width in the case of the dimensions of the exterior walls, very close to the 'golden ratio'.

Moreover, if this drakospito was dedicated to the goddess Hera, which is most probable, this leads to certain connotations. The continuous quarrels of the goddess with Zeus, according to Greek mythology, gave rise to the view that Hera was the symbolic personification of celestial/atmospheric disturbances. This view connects Hera with celestial phenomena. In accordance with the first view, since Hera had to do with celestial phenomena, we hypothesize that the so-called Mt. Oche drakospito was not only a place of worship, but in addition it was a Prehellenic observatory devoted to the stars and celestial phenomena.

Another line of argument comes from etymology. The ancient word 'drakon' (modern Greek: 'drakos', from which the modern term 'drakospito' was derived) can be traced back to the ancient Greek verb δέρκομαι, which means to see clearly, to watch, to observe. Indeed, the tenses of the verb are: δέρκομαι, εδρακόμην, δρέξομαι, έδρακον, δέδορκα and εδεδόρκην. We see that the root of the past tense (drak-) gives us the word dragon (δράκων), which in Greek means "… the one who observes"! A dragon is a creature with excellent vision … Therefore, the name drakospito is a paretymological term (i.e. where the word takes on a new meaning), and a substantial use of these megalithic monuments, as suggested by the ancient Greek verb δέρκομαι, was that of an 'observatory': either a watch-tower (for observing the Aegean Sea) or an astronomical observatory (for observing celestial phenomena and heavenly bodies). This seems especially true for the largest and best-preserved structure of this kind, the Mt. Oche drakospito.

5 CONCLUSIONS

In this paper, arguments have been presented in favour of a religious and/or astronomical function for the Mt. Oche drakospito, and this possibility needs to be carefully considered by any archaeologists or historians who wish to carry out further research on this site. Whatever their actual function, the distribution and the variety of these megalithic monuments is an indication of a certain level of continuity in the construction of cyclopean buildings in Greece. The use of monoliths and the exquisite manner of fitting the stone slabs together were true architectural challenges.

The uniqueness of the drakospita provides a challenge for future researchers who now need to carefully examine the two dozen or so surviving buildings in order to ascertain whether their construction reflects some astronomical orientation or mathematical rules. From houses of dragons and giants, and palaces for the kings of the Cyclops, they were abandoned or became sheep-folds and the residences of shepherds in recent centuries. Our hypothesis that at least one member of this group of monuments was originally used for astronomical observations could give new momentum to research, quite apart from the interest drakospita present from an archaeological and architectural point of view.

6 NOTES

1. Intriguingly, the three Pálle-Lákka Dragò drakospita form a Π shape as viewed from above.
2. By comparison, one of the Pálle-Lákka Dragò drakospita has walls measuring 10.85 m, 3.80 m, 9.90 m and 4.05 m., while in a second one, all four walls are approximately 4 m long.

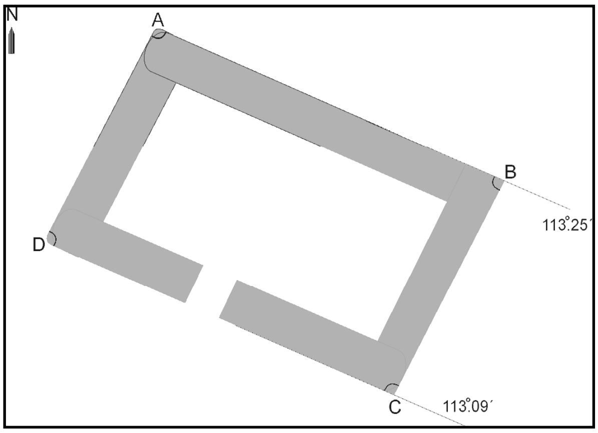

Figure 4: Diagram showing the orientation of the Mt. Oche drakospito.

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Dr Efstratios Theodossiou is an astronomer, and an Associate Professor of History and Philosophy of Astronomy and Physical Sciences in the School of Physics at the University of Athens. His scientific interests include observational astronomy and astrophysics, satellite spectrophotometry of Be stars and the history and philosophy of astronomy. He has published more than 200 scientific papers in international refereed journals and proceedings of astronomical conferences, 300 articles in Greek newspapers and journals and sixteen books on history and philosophy of astronomy and physics. He is member of the IAU Commission 41.

Dr Vassilios N. Manimanis is a post-doctoral researcher in the School of Physics at the University of Athens. His scientific interests include observational astronomy and astrophysics, photometry of cataclysmic variable stars, history and philosophy of astronomy and sciences, popularization of astronomy and bioastronomy. He has published 25 research papers in international refereed journals and many articles in popular magazines.

Markos Katsiotis is an architect. He works as the head of the planning department in the General Directorate of Technical Services at the National Technical University of Athens. He is an expert in accessibility for disabled people and is a member of ministerial committees on accessibility of public spaces, buildings and transport systems. His interests include restoration of listed buildings. He has published many articles in Greek journals.

Dr Dimitrios Papanikolaou is Professor of Dynamic and Tectonic Geology in the School of Geology and Geo-environment at Athens University. His scientific interests include structural geology and tectonics, geodynamics, marine geology and the study of natural disasters. He is teaching and has published a book on *Geology of Greece* and more than 250 scientific papers in international journals and proceedings of conferences. He has been very active in UNESCO/IGCP (International Geological Correlation Program), is a scientific editor of several international journals and has been a Visiting Professor in France (Reims) and in the USA (MIT, Cambridge, Mass.).