

Archaeoastronomy at Kanda geoglyph, Macedonia

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Abstract

This paper extends our previous research of an artificial mound in Kanda (Macedonia) from an archaeoastronomical point of view. In two previous papers, SB Research Group explained its archaeoacoustic research and established the existence of several cavities, likely burial chambers, inside the mound. This mound is essentially a massive earthwork, which, on its top contains two concentric - approximately oval frames and a large geoglyph in the center which resembles the mirror image of the Constellation of Cassiopeia. Through analyzing the symbolism of the Macedonian royal dynasty and through dating by the method of the precession of equinoxes, we established that the geoglyph is precisely pointing to Alexander's birthday in the calendar. The precise alignment of the rising Sun, Cassiopeia and geoglyph on Alexander's birthday in 356 B.C. suggests that geoglyph contains something related to him, possibly his tomb or the tomb of a close relative.

Keywords: geoglyph, Alexander the Great, archaeoastronomy, archaeoacoustics

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Introduction

Archaeoastronomy is a consolidated complementary discipline of archaeology which expands our understanding of how ancient populations merged the phenomena in the sky with their culture to better express their values. It explains how they used these phenomena and what role the sky played in their customs. The role that astronomical phenomena have played in human societies extends from the applied (such as the basis for calendrics and orientations) to the ceremonial (the significance given the "ritual landscape" of the sky) (Fountain & Sinclair, 2003).

Archaeoastronomy can be applied to all cultures and all time periods. While the meanings given to phenomena in the sky may vary from culture to culture, there are scientific methods that can be applied across cultures when examining ancient beliefs (McCluskey, 2000). Another important aspect of archaeoastronomy is its usefulness in dating the origin of a structure by the position of the stars relative to a point of observation in a perpetual calendar. Setting symbolically a significant moment of a civilization's history on a particular structure by combining the position of the sky with the structure on the ground was a practice widely used in antiquity. There are a lot of examples in architecture in every epoch that used such sky-ground mirroring.

The dating methodology utilizes the mechanism of the precession of the equinoxes, the motion of the equinoxes along the ecliptic plane of Earth's orbit, caused by the cyclic precession of Earth's axis of rotation. Once this message from the past is properly understood, it frequently sheds new light on archaeological and anthropological research. The purpose of this paper is to add the correct calendrical interpretation to the large geoglyph discovered in the Balkans in 2011.

It is important to remember that the geoglyph found in Kanda (Republic of Macedonia) is a “negative geoglyph”, that is a large design or motif produced on the ground and formed by clastic durable elements of the landscape, such as stones, stone fragments or gravel, with the soils surface carved out to expose ground in a manner akin to petroglyphs.

In 2013, Domagoj Nikolić, a member of SBRG, formed a hypothesis that the mound likely covers the tomb of a very important person from the Macedonian history, possibly of Alexander the Great or someone from his family. This hypothesis is based on numerous indications including historical, linguistical, ethnological and astronomical components (Debertolis, Tentov, Nikolić, Marjanović, Savolainen, & Earl, 2014).

The Kanda Geoglyph

In the village of Kanda near Sveti Nikole, Macedonia, there is a ritual mound known as a geoglyph which SB Research Group (SBRG) researched between 2011 to 2015. It is made of soil, oval shaped and perfectly aligned with the North – South axis (the Meridian Line). The examination from infrared cameras and soil analysis established that the mound is artificial. (Debertolis, Tentov, Nikolić, Marjanović, Savolainen, & Earl, 2014).



Fig. 1: The geoglyph in Kanda during an aerial survey using an infrared camera: the vegetation is deleted by the photograph making more evident the different aspects of soil (Debertolis, Tentov, Nikolić, Marjanović, Savolainen, & Earl, 2014)

An initial approach to study this new and unrecognized archaeological site was conducted using extensive archaeoacoustic methods to explore if the geoglyph contained something inside. To this end we used natural electromagnetic and environmental vibrations, and established a very high probability that several cavities may exist within the mound. The soil and infrared camera analysis indicate the mound is artificial, lending weight to the argument that these are most likely artificial cavities, and quite possibly burial chambers. Since the cavities appear to be not placed very deeply, we speculated that a building complex may have been built and afterwards covered with soil. Strong and emphasized magnetic components of the recorded emissions also indicate the presence of a longitudinal electro-dynamic vibration (standing waves) within the geoglyph interior.

This points to a high probability that resonant cavities (regularly shaped structures) exist inside of the geoglyph. The infrasound vibrations we detected could indicate the existence of an underground water stream, deeper than the cavities complex. This is only a hypothesis which should be confirmed by using geophysical survey techniques such as a Ground Penetrating Radar (Debertolis *et al.*, 2015).



Fig. 2: The geoglyph in spring 2016 from a drone (photo Nikola Ristveski)

Astronomical Alignment of the Kanda geoglyph with Cassiopeia

The key to determine the astronomical aspect of the mound is the large symbol – geoglyph in the center which resembles the Constellation of Cassiopeia. Judging from the symbolism appearing on royal Macedonian coins and names of the dynasty members (the last Macedonian king was Perseus), the myth of Cassiopeia was an important element of this culture. Aside from the shape of the Constellation of Cassiopeia, the symbol also contains a line aligned with the Meridian that resembles the line connecting the star Schedar in Cassiopeia with the Pole Star. This line may well indicate the rotational axis of Cassiopeia around the Pole Star (Debertolis *et al.*, 2014).

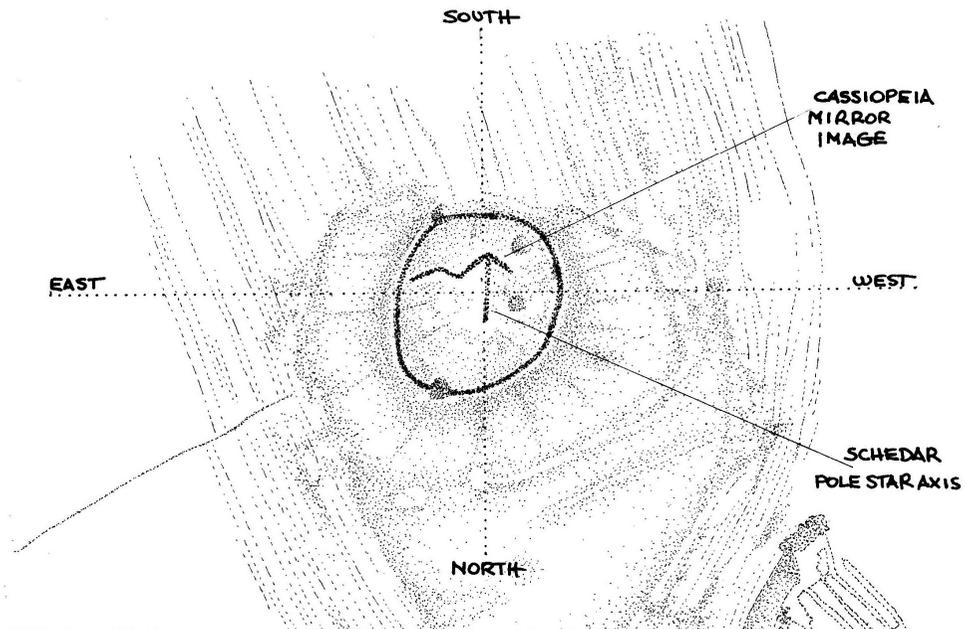


Fig. 3 - Geoglyph in Kanda

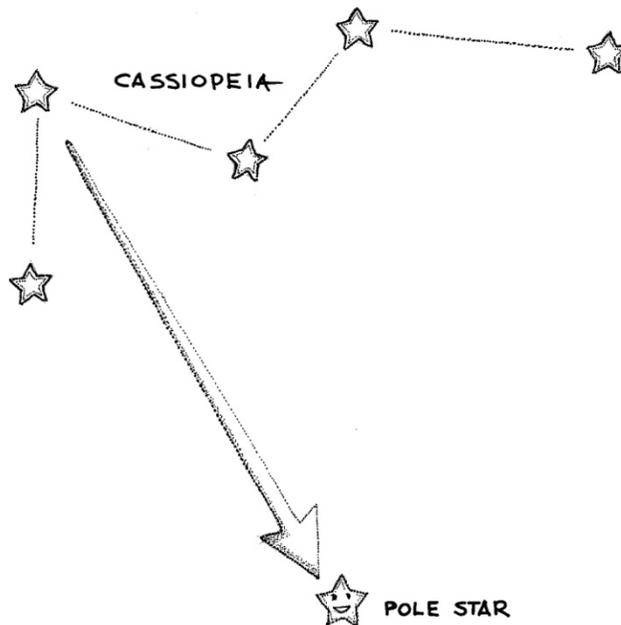


Fig. 4: Cassiopeia and Pole Star

It is a well established fact that the use of a combination of celestial objects and constructions on the ground to mark important events was a widely followed practice in antiquity (Hancock & Faiia, 1998). Therefore, since the geoglyph contains a symbol resembling the mirror image of Cassiopeia and its rotational axis around the Pole Star, it is reasonable to reconcile the celestial movement of Cassiopeia with the geoglyph in order to establish the purpose of why this mound was built. Cassiopeia changes its time of rising above the eastern horizon daily which in turn results in a slight change of its position at the specific time of day during the year. It takes Cassiopeia precisely a full year to complete a full circle and return to the same position at sunrise (Fig. 5).

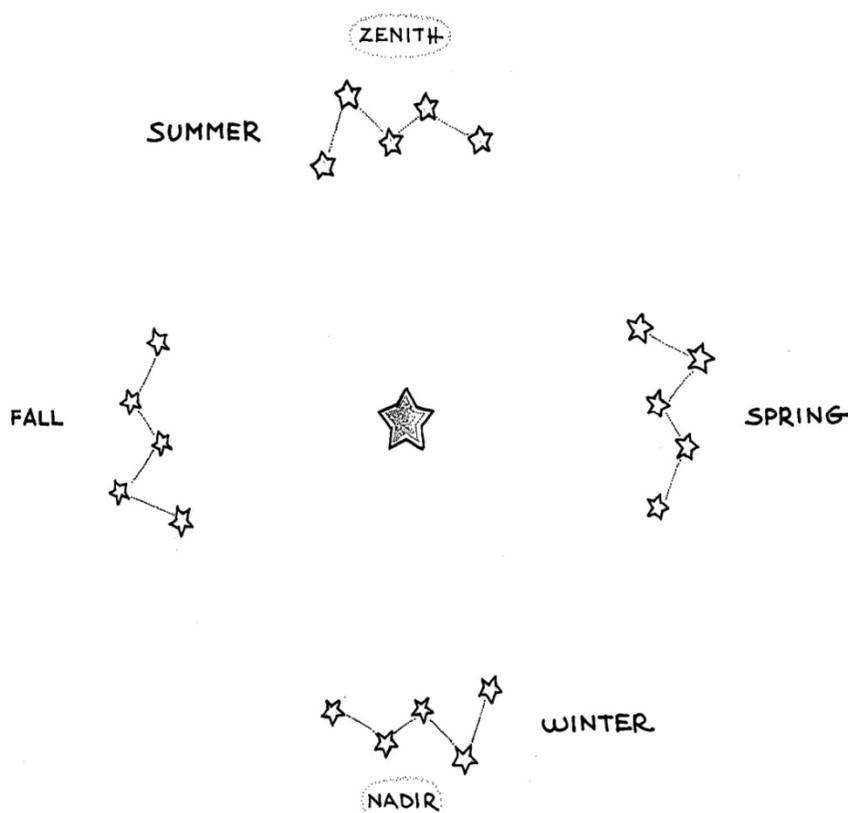


Fig. 5: Seasonal change of the position of Cassiopeia at Sunrise in respect to the Pole Star

For only a few days at the midpoint of summer at sunrise, Cassiopeia stands in the Zenith vertically above the Earthly plane on the latitude and longitude of Sveti Nikole (41.8656 ° N, 21.9373 E). During this alignment, Cassiopeia and its mirror image on the Geoglyph perfectly mirror each other, while “the Schedar – Pole Star Axis” (Fig 3) mirrors the Meridian and the Schedar - Pole Star axis in the sky (Fig. 4). It is simple to verify this alignment by the use of astronomical computer program Stellarium.

This alignment is very significant for the hypothesis, because according to Plutarch’s *Life of Alexander*, Alexander the Great was born on the “sixth of Hecatombaion” which falls in the period from 21 to 23 July. Since the Sun is an ancient metaphor of a king, (Biedermann, 1998) sunrise is the metaphor of his birth.

As the Sun ingresses into Leo from Cancer in the period from 21 – 23 July, the symbolism of Alexander wearing the lion’s scalp (as portrayed on Macedonian coins and royal symbols), seems justified. The problem with this metaphor is that in our present day and age, “the cusp (first degree) of Leo” mentioned by astrologers happens in the constellation of Cancer (Fig. 4). For example, on 22 July 2016, at the moment of sunrise at 5:24 AM (one hour added due to daylight savings time), the Sun is in the constellation of Cancer.

The star rising approximately with the Sun is X-Canceri (X-Cnc) with the azimuth of 55°35’, while the Sun’s azimuth is 62°41’. The discrepancy between astrological narrative and astronomical measuring resulted from the precessional movement of Earth’s rotational axis which creates a phenomenon known as the precession of the equinox, which causes the gradual shift in the orientation of Earth’s rotational axis with a cycle of around 26,000 years.

(Hohenkerk, Yallop, Smith, & Sinclair, 2005) This phenomenon causes the line of equinoxes to move westward along the Ecliptic relative to the fixed stars, opposite the yearly motion of the Sun along the Ecliptic. This means that in approximately 2,200 years the line of equinoxes gradually moves backwards from one constellation of the Zodiac into the other.

The discrepancy between our official calendar and the astronomical calendar exists because our civilization sees the calendar as a social contract rather than a scientific matter. Although the literature on calendars is vast, it is hard to find authoritative sources (Doggett, 2012) However, by measuring that our horoscopy corresponds to the position of the Sun relative to the Zodiac from around the time of Alexander the Great.

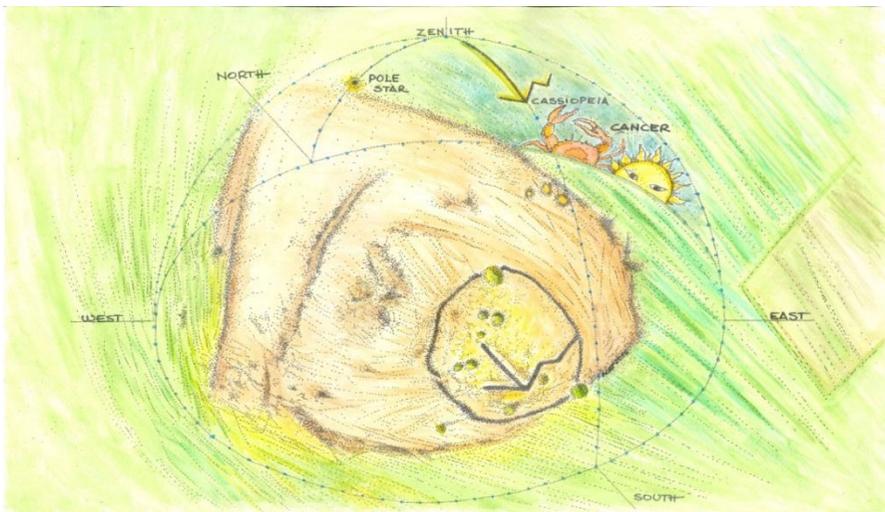


Fig. 6: Sun raising in Cancer on the birthday of Alexander the Great, July 22, 2016

As the movement of the Sun through the Zodiac makes a perfect astronomical calendar, we can investigate that the sunrise situation on the birthday of Alexander the Great, 22 June 356 BC.

With the use of Stellarium planetarium software, the Sun on Alexander's birthday was rising in Leo, which exactly corresponds to the symbolism of Alexander with the lion's head. The first star rising in the Constellation of Leo is Mu (μ) Leonis also known as Rasalas, abbreviations of Ras al Asad al Shamaliyy, from the Arabic *رأس الشمالي الأسد* *ra's al-'asad aš-šamālī* "the northern (star) of the lion's head". At the approximate moment of sunrise (around 4:14 AM), the azimuth of Rasalas was $53^{\circ} 21'$, while the Sun's azimuth was $60^{\circ} 36'$. An appropriate poetical interpretation of this astronomical situation is that the Sun rises from the Lion's Head. This means that the geoglyph points to Alexander's birthday in the calendar. The precise alignment of the rising Sun, Cassiopeia and geoglyph on Alexander's birthday in 356 B.C. suggests that the geoglyph directly relates to him, possibly his tomb.

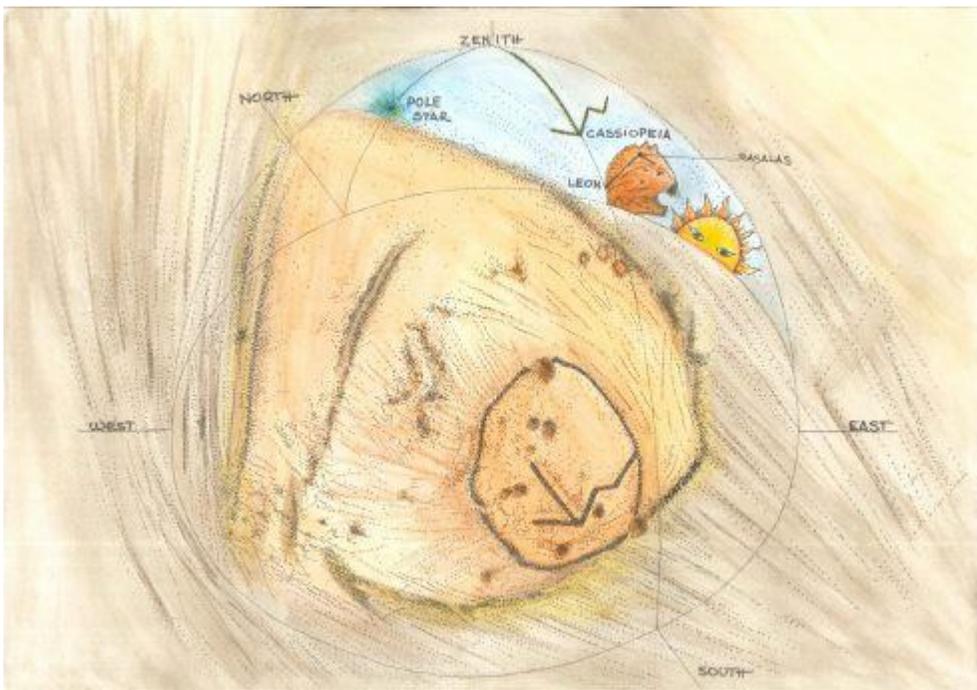


Fig. 7: Sun raising in Leo on the real birthday of Alexander the Great, July 22, 356 B.C.

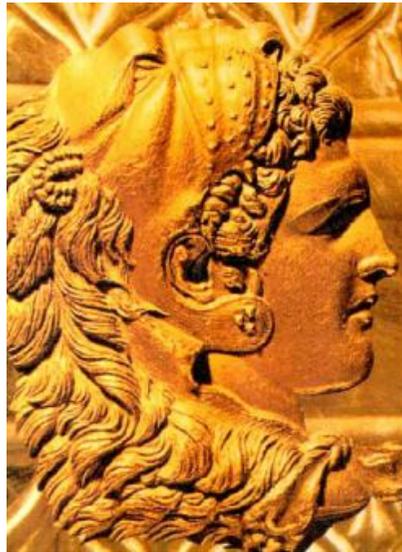


Fig. 8: Alexander the Great coin, with a lion's scalp on his head

Conclusion

As stated in our previous paper in 2014 and 2015 (Debertolis *et al.*, 2014; (Debertolis *et al.*, 2015), the mound below the geoglyph almost certainly has some form of resonance cavities, probably burial chambers. Very clearly the geoglyph shows the image of the Cassiopeia Constellation and its relationship with the Pole Star. Astronomical measuring suggests a very close link between the mound and Alexander the Great, since it is precisely pointing to Alexander's birthday in the calendar.

As we wrote previously this interesting site is not far away from Virginia, modern name of the ancient city of Aigai, where in this place was found the complex of the tomb of king Philip II. The royal tombs were discovered in 1977-8 by the archaeologist Manolis Andronikos. This artificial mound with resonant cavities inside, in conjunction with the geoglyph pointing to Alexander's birthday suggests that an important member of the Macedonian royal family could be buried inside.

Our next step will be a geophysical analysis to discover the entrance of the underground structure. Only once this stage is completed, should any excavations or test pits be carried out.

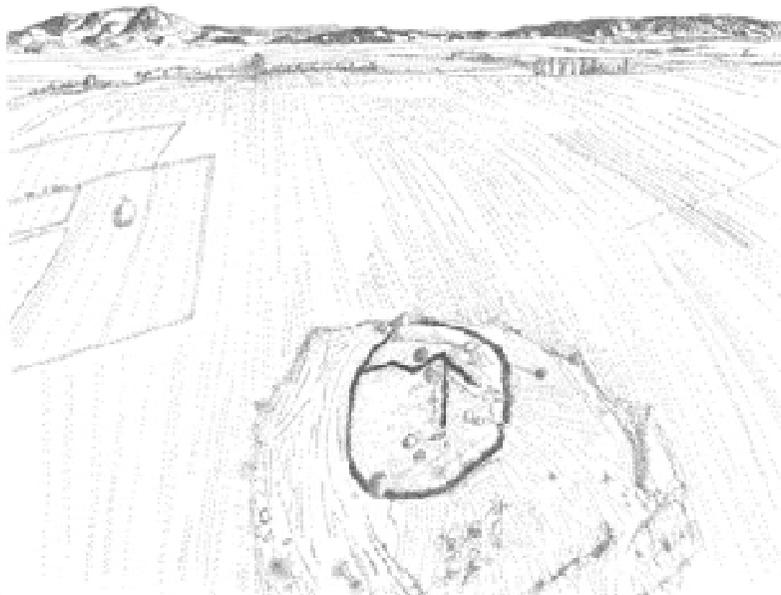


Fig. 9: The forced perspective of the relationship between the geoglyph and the surrounding hills: it is not possible to see the geoglyph from there, but only from the sky

Acknowledgment

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