



## On the origins of the modern star map

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### **Abstract**

*During the last few years there have been some papers dealing with the astronomical knowledge of the Minoans on Crete around 2000 BC and also of later cultures on Crete and the surrounding Greek-speaking areas. These works not only deal with possible observation lines but also show that the Minoans had built structures that could be used for determining the time of the equinoxes and solstices, for developing stellar navigation as well as finding the seasons suitable for sailing and agriculture. There have also been some papers presenting an astronomical iconography seen in Minoan figurines and seals. This paper discusses these suggested symbols of celestial bodies and some uses of them. It is also shown that there are links between the Minoan-Mycenaean period and Hellenistic times, i.e. from the 3rd/2nd millennium BC down to around 200 BC. This leads to the hypothesis that the western map of constellations has its roots on Crete during the Minoan period around 2000 BC.*

**Keywords:** *History of astronomy, Constellations, Minoan culture, Petsophas, Knossos.*

### **Astronomical knowledge reflected in Minoan Palaces and buildings**

Mary Blomberg and Göran Henriksson have shown that the peak sanctuary on the hill Petsophas in eastern Crete could be used to study the movements of the stars and to learn how to navigate during the dark hours, especially to the neighbouring islands of Kos, Karpathos, and further east, as well as towards Attica and the delta of the Nile river (Henriksson and Blomberg 1996; 1997-1998; Blomberg and Henriksson 1999). They showed also that there were walls

oriented to the heliacal rising and setting of the important star Arkturus at the time of the construction, the early Middle Bronze Age (Middle Minoan I) or about 2000 BC (Fig. 1).

They have also found that the three of the four major palaces and most other buildings have orientations towards the rising sun or other major celestial event. In these Proceedings they present their investigation of the fourth palace, Phaistos, which evidently also is oriented towards a major star (Blomberg and Henriksson, these *Proceedings*). Especially of interest is the Palace at Knossos where the autumn equinox can be

determined as well as the time to intercalate a month in order to keep the luni-solar year commensurate with the solar year (Blomberg and Henriksson 2000; 2002) (see fig. 2 for the reflection in the corridor at the autumn equinox).

The reflection of the rising sun will only be seen the eleven days before the spring equinox and the eleven days after the autumn equinox. If a new moon appears during the eleven days following the autumn equinox, it is time to intercalate a month. Please observe also that the shadow cast by the sun at sunrise on the equinoxes just touches the sign of the double axe on the southern wall of the corridor. Our con-

We can conclude from their work that there is very clear evidence that the Minoans studied and used the stars and the rising of the sun for keeping the calendar correct as well as for navigation and similar purposes. From the illuminated wall at Knossos we may also say that it seems that there was a constellation composed from Sirius and our Orion that represented the double axe, the most important Minoan symbol.

These buildings are dated to: Early Middle Minoan period down to Late Minoan IB i.e. from about 2000 to about 1450 BC.

### Minoan figurines representing constellations

In their first analysis of the small structure on the peak sanctuary of Petsophas Mary Blomberg and Göran Henriksson suggested that the standing male terracotta figurines found on that hill were symbols for the star Arkturus (Henriksson and Blomberg 1996: 113). At that time, about 1870 BC, Arkturus rose and set about 38,4° east and west of North, directions important for navigation and also for indicating harvest time and the end of the sailing season (fig. 1). The heliacal rising of the star also indicated that there was exactly one moon month left to the autumn equinox, a great aid in determining when to intercalate a month in the Minoan lunisolar calendar.

Later, MacGillivray, in his book on the *Palaikastro kouros*, discussed the splendid male figurine found in the Palaikastro excavation, just downhill from the peak of Petsophas (MacGillivray et al. 2000: 123-130). He and his colleagues Driessen and Sackett comment upon Blomberg and Henriksson's interpretation of the standing man and its possible connection with the interest in the celestial bodies found on eastern Crete. They accept the importance of the star Arkturus, but MacGillivray is inclined to Egyptian influence and says "I believe that the ancient Cretans understood Arkturus the way the Egyptians did, as the figure holding the 'Ox-haunch', which, they believed, held the sky in place". MacGillivray continues by suggesting that the Palaikastro kouros represents Orion, with reference to

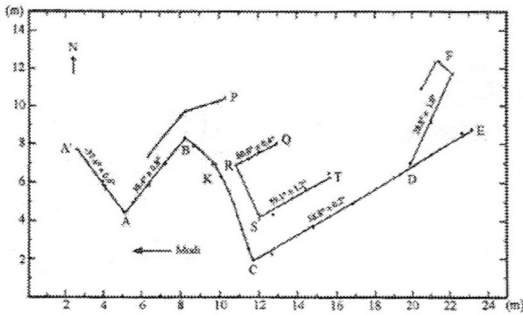


Fig.1: The walls and their direction on the hill Petsophas.

stellation Orion, which looks very much like the double axe if the line of the belt is extended to the brightest Sirius, dominated the eastern sky at the autumn equinox (Blomberg and Henriksson these Proceedings).

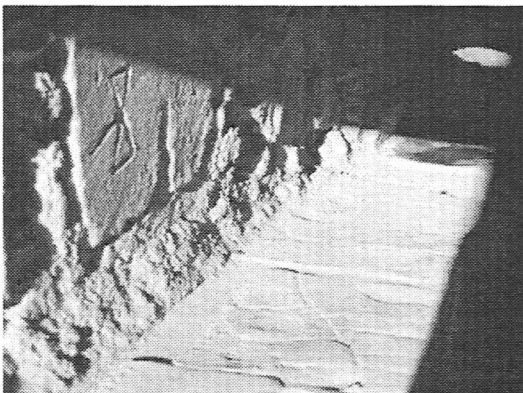


Fig.2: The reflection of the rising sun in the corridor of the house tablets in the palace of Knossos.

that constellation's importance in Egypt and, according to MacGillivray, it marks the beginning of the harvest season in Crete and thus must have been of great importance. A festival at that time would have taken place when, and I quote: "Rigel, the brightest star of Orion, did its heliacal rising from the sea before the dawn 'at the year's wend'". We have a chronological problem here. The Palaikastro Kouros was found in a late Minoan IB context, ca 1530-1475 BC, but the terracotta standing men found on Petsophas are normally dated to a broader time span, Middle Minoan I and later, i.e. from around 2000-1450 BCE. This means that the form of the standing man is probably older than the Palaikastro Kouros and also earlier than the Egyptian dynasty and the parallels that MacGillivray uses. He also suggests that the Cretans started the New Year with the first new moon after the summer solstice when Orion would just have appeared a month earlier. This New Year assumption is based on the later Athenian tradition. Blomberg and Henriksson (2000; 2002) have shown, however, the importance of the autumn equinox on Crete at the Knossos palace, at the peak sanctuary on Mt. Juktas, and, at this conference, at the palace of Phaistos. It seems also that Orion is more likely to be connected to the double axe symbol so frequent in Minoan iconography, as we showed above in connection with the autumn equinox in the corridor of the house tablets. That the Ox leg may be connected with our Big Dipper seems logical, but it is very rare as a terracotta figurine (one example was found amongst the 2400 figurines studied), while the standing man is very common. The form of the Minoan standing man agrees very well with the constellation Boötes, but not to the constellation Orion. We will return to this iconographical problem when looking at rings and seals.

I do not share MacGillivray's interpretation of the Palaikastro kouros as representing Orion but see it instead as a representation of Boötes or as Arkturus, the bright star in that constellation. Still, it is of interest that he discusses several other celestial relations and sees a clear Minoan interest in the sky and its events in the Middle Bronze Age.

## The terracotta figurines from peak sanctuaries

Earlier it has been shown that almost all of the 2450 figurines found on the hilltops of Petsophas and Traostalos that I have been able to study can be understood as depicting constellations. (Blomberg 2006; Blomberg 2000). Amongst the most common ones we find the standing man and oxen. The constellation Boötes fits very well as the standing man (Fig. 3). I have also discussed the constellation Ursa Major and its background and found that the understanding of it as a bear is much later than Minoan times (Blomberg in press) and we should thus not expect to find any bear from these hilltops, and we don't. It seems more likely that the Minoans saw the Big Dipper as a number of Oxen or oxen and a wagon, which later was the normal interpretation in the eastern Mediterranean area and one which explains the large number of oxen found on the two hill tops (Rutkowski 1991).

It is however not only animals but also the Wagon, found just below Petsophas (Fig. 5), an arm and a model of a crater (Fig. 4).

## Representations of constellations on seals

In 2005, Kyriakidis published an article entitled "Unidentified floating objects on Minoan seals" where he discusses several objects shown on Minoan gold rings and suggests that they depict celestial constellations. The majority of the engravings has been understood as showing religious scenes and are treated in many publications on Minoan/Mycenaean religion (e.g. Marinatos 1993; Kyriakidis 2005). Kyriakidis' study takes up about 20 such rings or impressions of them. These rings are normally dated to Late Minoan I and II, i.e. about 1650 to 1400 BC and are thus important items for the continuation of the astronomical tradition. Some rings with similar motifs were most probably made on the mainland, indicating a spread of knowledge into the Mycenaean culture.

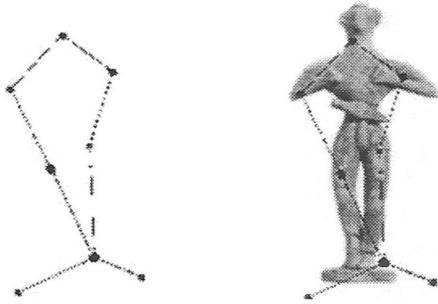
They mainly show scenes with figures at ground level and objects above, in the sky, referred to as floating objects. Some of these floating objects are human-

like, interpreted as gods appearing i.e. representing divine epiphanies in the sky. Other floating objects seen on these rings are, for example, the double axe, objects considered to be sacred in Minoan religion, and also objects clearly understood to be celestial, such

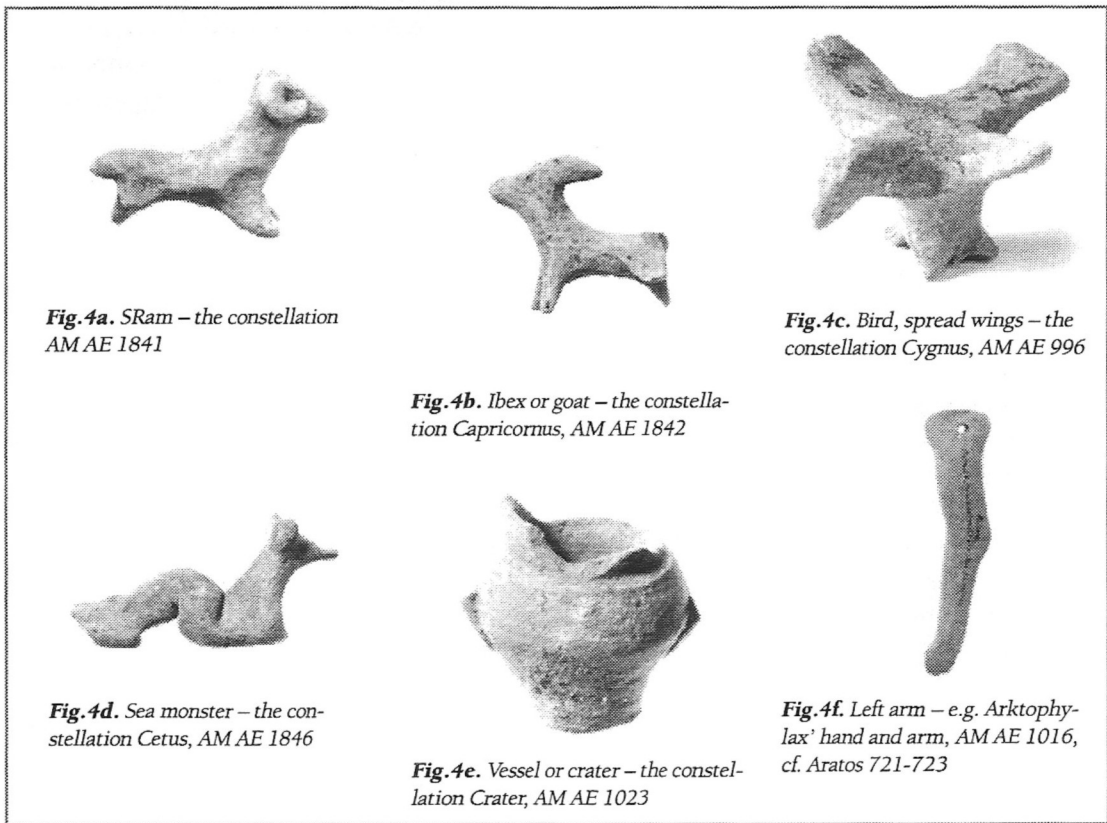
as the sun and the moon.

Kyriakidis finds it logical that the floating object found in a position similar to the moon and sun also could represent stellar bodies such as constellations. After a convincing discussion of the possible Minoan knowledge of stars and the movements of stars, he suggests identification of some constellations such as Orion on the Ashmolean Museum ring 1919.56, Hydra shown as a snake-like object on the same ring, Hyades, maybe Taurus as a cluster of dots, and also a loose leg as the Big Dipper in parallel to the Egyptian iconography (fig. 8). Boötes seems to be represented by a floating person with Corona Borealis nearby (Kyriakidis 2005:fig. 23).

Most interesting is that some of these depictions of constellations fit very well into the interpretation of figurines presented above but the seals are later than



**Fig. 3:** Standing man from Petsophas compared with the constellation Boötes.



**Fig. 4a.** SRam – the constellation AM AE 1841

**Fig. 4b.** Ibex or goat – the constellation Capricornus, AM AE 1842

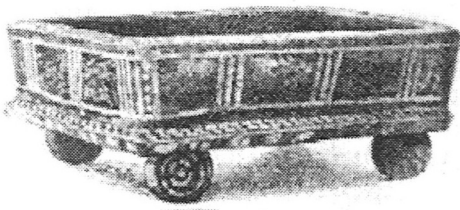
**Fig. 4c.** Bird, spread wings – the constellation Cygnus, AM AE 996

**Fig. 4d.** Sea monster – the constellation Cetus, AM AE 1846

**Fig. 4e.** Vessel or crater – the constellation Crater, AM AE 1023

**Fig. 4f.** Left arm – e.g. Arktophylax' hand and arm, AM AE 1016, cf. Aratos 721-723

**Fig. 4:** Terracotta figurines from Petsophas. (AM AE Ashmolean Museum inventory number, AR Line in Aratos Phainomena see Kidd 1997), I am very grateful to Michael Vickers, Ashmolean Museum, for permission to publish these figurines.

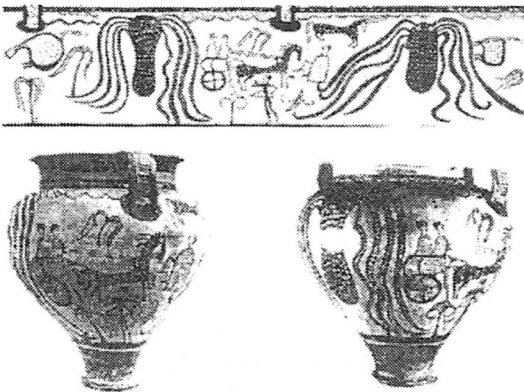


**Fig.5:** Drawings of a wagon found below the hill Petsophas (after Evans)

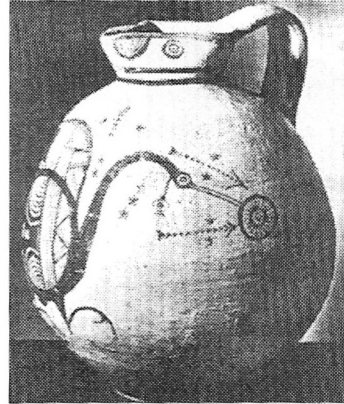
the objects found on the peak sanctuaries of Petsophas and Traostalos.

### Constellations in Mycenaean vase painting

Wiesner (1968) analyses an amphora found on Cyprus in the Swedish excavation of the 1920s (fig. 6). The painting shows two octopuses clearly mating, according to Wiesner, and below the handles, a number of figures. The figures can clearly be identified as the Wagon, Boötes the ox-driver, the Wild-goat Capella and Orion shown as a man with a double axe. Even if Wiesner wanted to see an Egyptian-Sumerian connection, he was fully aware of the many Cretan connections in the iconography. It is very clear from his article that he saw Orion as being pictured with the double axe symbol, and that the circumpolar constellations were pictured as a four wheeled wagon with a man leading the wagon i.e. Boötes. The vase



**Fig.6:** Mycenaean vase and a drawing of the figure scene



**Fig.7:** The Bird vase

is Mycenaean, painted on Cyprus around 1300 BC.

In his paper Wiesner continued with the analysis of another vase from Cyprus, but painted around 700 BC, i.e. at the end of the so called Dark Ages or the Proto-Geometric period and the beginning of the Archaic period, a period from which we have very few figure scenes on any material in the Greek world (Fig. 7).

The main motif is a waterfowl with long neck and long bill and with small swastikas around the bird's neck that are recognizable from Egyptian pictures with constellations and stars; they indicate a constellation. This means that we have a constellation and therefore the bird should be the Swan or, as it was called early, the Bird. The bird's body has a geometric design reminding us of a turtle shell, i.e. it symbolizes the constellation Lyra. Lyra was early represented with the shell of a turtle as the body of actual lyres were made from such a shell. Here we can also see the combination of the Swan and Lyra, both icons indicating connections with Apollon. Arrows also are symbols for Apollon. Wiesner interprets the wheel-like object at the end of the bird's bill as the Crown and the line of swastikas above the bird as Cynosyra, the Dog's tail or to-day's Ursa Minor. He sees the vase as depicting spring, the season for the celebration of Apollon, using celestial bodies for indicating the season. At the end of the discussion of this vase he takes up the question of Egyptian influence and the possibilities of a Hellenic star-map. He finds that the vase-painter has chosen to



Fig. 8: The gold ring from Mycenae.

draw his figures in the archaic Hellenic style and not as in Egypt and finds that there is no dominating influence from Egypt, but he can see connections from all over the eastern Mediterranean area. I would like to point out that the season represented on this vase, springtime, is the same as that which Homeros describes on Achilles' shield and this indicates to me that the Greeks had their own star map recorded in some form at least around 700 BC, even if we have not found it yet. We have a later example in the Hellenistic marble globe in the National Museum in Naples with mainly the same constellations as we already have seen as Minoan and Mycenaean constellations.

Wiesner shows several examples of Sirius and connects it to dogs and rabies. Some of his examples show a connection between the double axe and Sirius, i.e. according to Wiesner there is a clear connection between Orion and Sirius. As said above Blomberg and Henriksson (1996:113) arrived at the same conclusion as to the connection between Orion and Sirius, but from very different evidence that is several hundreds year earlier.

## The text analysis

Henriksson and Blomberg (1999) have earlier shown that the information given by Aratos (early 3rd Century BC) shows a tradition from Minoan times down to his time, early 3rd century BC. It is a living tradition as some important parts are changed due to the precession, those positions of stars and constella-

tions used for navigation and for calendar reasons, but less practically useful information remained as it was when the system was formed in Minoan times, when the oral tradition began.

Similar results have been reached by several scholars (see Blomberg 2003, the appendix)

Another indication of the oral transfer of knowledge and interest in the celestial bodies is shown by Wiesner (1968:40,41) in his analysis of a gold ring from Mycenae, which he sees as an illustration of Hesiodos lines 609ff.

Hesiodos (ca 700 BC) wrote:

*"But when Orion and Sirius are come into mid-heaven, and rosy-fingered Dawn sees Arkturus, Then cut off all the grape-clusters, Perses, and bring them home. Show them to the sun ten days and ten nights: then cover them over for five, and on the sixth day draw off into vessels the gifts of joyful Dionysus. But when the Pleiades and Hyades and strong Orion begin to set, then remember to plough in season: and so the completed year will fitly pass beneath the earth".* (Kidd 1997).

The time Hesiodos describes is from September into October and thereby at the beginning of the Minoan year when Sirius and Orion dominate the sky at the autumn equinox. We can compare the passage with the Mycenaean gold ring (see Fig. 8): To the left we recognize wine plants, the sitting lady or goddess with poppy-plants in her hand. Above her we have a new moon and a very radiant star – Sirius. Below Sirius we have the double axe – Orion and to the right of Orion we have Arkturus or Boötes, shown with a shield as on the Mycenaean vase from Cyprus and with his whip to drive his oxen.

We see again the importance of the autumn equinox.

## Conclusion

We have seen a number of interpretations of Minoan, Mycenaean, and Archaic Greek artefacts and of evidence that points to the use of the celestial bodies stretching from the beginning of the 3rd Millennium BC down to the 3rd century BC and also to a continuous oral tradition from that time. Thus we can con-

Ca. Time BC	Period	Object – text information
2200	Early Minoan	Earliest information in Aratos
2100		Information in Aratos
2000	Middle Minoan	Petsophas and the figurines
1900		"
1800		"
1700		"
1600	Late Minoan	Knossos and the rings
1500		The Palaikastro Kouros, Knossos and the Rings
1400	Mycenaean	Updating of star positions in Aratos
1300		
1200		The octopus vase from Cyprus
1100	Sub-Mycenaean	
1000		
900	Proto-Geometric	
800	Archaic	Homeros
700		The bird vase, Hesiodos
600		
500	Classical	
400		Eudoxos
300	Hellenistic	
200		Aratos
100	Roman time	Ursa Major is introduced (Manilius)

**Table 1.** Chronological table with astronomical information.

clude that our western map of the sky seems to have been in use already 2000 BC on Crete. Some constellations have changed name and symbol e.g. Lyra; some have kept the original meaning in peoples mind but changed name on the “official” star map e.g. the Wagon called Ursa Major by astronomers etc; others are still the same, for example the Crater. In the Table 1 above the different artefacts and information on celestial observations are placed according to time. We can see that there seems to be an ongoing display of the same understanding of constellations from Minoan times down into the Hellenistic times, i.e. from ca 2000 BC to 200 BC. From Greek Classical times we have written sources telling that our, western, star map was largely already named and set.

Of course the Minoans and the later Hellenic peoples took ideas from neighbouring cultures, but they

may all have had a similar understanding of the celestial bodies from a very early period, which Minoans used and formed into a star map, which contained much of which we still have in our map.

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