

# ORIENTATIONS OF THE VILLAS AT TYLISSOS ON CRETE AND THEIR RELATIONSHIPS TO THE MINOAN CALENDAR

Göran Henriksson, Mary Blomberg

**Abstract:** The two Late Minoan I villas at Tyliossos and an unknown earlier building at the site show similar relationships to the celestial bodies that we have encountered at all of the Minoan buildings that we have studied. They had orientations to celestial events relevant to the calendar, such as sunrise or sunset at the equinoxes and the solstices, and the heliacal risings and settings of bright stars. We also re-encountered the phenomenon that different places marked the beginning of one or more solar months, which suggests that certain months had special relevance for specific places, as if to honor a god or goddess or some other special event for that particular place. In addition, the orientations of the two Late Minoan I villas at Tyliossos share the same complexity that we have met at two other sites, where diagonal lines were used to create shadows when marking the parts of the calendar that were specific for Tyliossos. It now seems clear that an element of Minoan cosmology insisted on a close connection between their places on earth and the celestial sphere. It was the custom for the Mycenaeans and the Greeks, who later inhabited the island, to honor their deities in special months, and we may find the roots of this custom among the Minoans.

**Keywords:** *Archaeoastronomy, Bronze Age Crete, Minoan calendar, Minoan orientations, Tyliossos, Minoan cosmology.*

## Introduction

This study of the Minoan villas at Tyliossos is part of the Uppsala archaeoastronomical project of Bronze Age Crete, which was conceived as a pilot project. The goal was twofold: the first was to understand something of the astronomy of the Minoans, since we thought it unlikely that they had not made strides like those of their neighbors, the Babylonians and the Egyptians. The Minoans, however, are at a distinct disadvantage in revealing their history since their script has not been deciphered. Our archaeoastronomical approach, however, has produced surprising discoveries. The second goal was to discover if Minoan astronomy could have been a source for Mycenaean and Greek astronomy. This goal was dependent, of course, on the positive outcome of the first. Before our project very little was known of the relationship of Minoan and Mycenaean buildings in Crete to the celestial bodies.

We chose 23 buildings from the typical types on the island – palaces, peak sanctuaries, villas, attached houses, shrines (Figure 1).

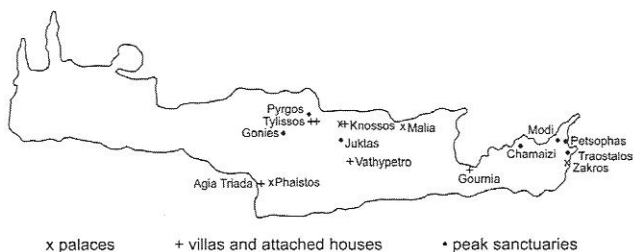


Figure 1. Map of Crete with the sites in the Uppsala Project.

We did not realize at the time the differences between those built for Minoans and those built for Mycenaeans. The distinction between the two cultures in Crete has been a problem since the first excavations on the island (Evans 1912; Driessen and Macdonald 1997). A major discovery of our project was that structures built for Mycenaeans could be distinguished by their orientations, which were always

to a significant celestial event in the west, whereas those built for Minoans always had an orientation to a significant celestial event in the east. A few Minoan buildings also had orientations to the west, such as heliacal settings of bright stars and sunsets at the equinoxes, but these all had eastern orientations as well. The two villas at Tyliossos are among the five villas that we chose from this category and they are about one fourth of those known in the island.

## Methods

We used the classical methods of archaeoastronomy for investigating the astronomy of ancient cultures without scripts (Blomberg and Henriksson 2001; Schlosser and Cierny 1997): measuring the orientations of walls and landscape horizons using a total station (an optical instrument that combines an electronic theodolite, an electronic distance measuring device and software running on an internal computer), evaluating the measurements by appropriate statistical calculations and, using our own computer programs, comparing the results with the positions of the celestial bodies as they were in the Bronze Age, which is the construction period for the buildings in our project. We also studied Minoan iconography and any other evidence that contained information about the celestial bodies in that culture. These methods reveal the celestial objects of observation and, since the positions of the objects change over time due to precession – except, in the case of the sun at the equinoxes – the study of orientations can also reveal the history of ancient sky watching.

## The Villas at Tyliossos

The site was excavated in 1909-1912 by Joseph Hazzidakis (1934). It lies seven kilometers west of Knossos, on an important east-west cross-island route. The height of the horizon to the east is between 0° and 0.5°. To the west are the slopes of the mountain with the peak sanctuary Pyrgos, which we published earlier (Blomberg and Henriksson

2003). The gray walls in Figure 2 belong to buildings from the Middle Minoan period, before 1600 BC. The walls in black are from the late Minoan I period, the period of the grandest architectural construction in Crete (Figure 2).

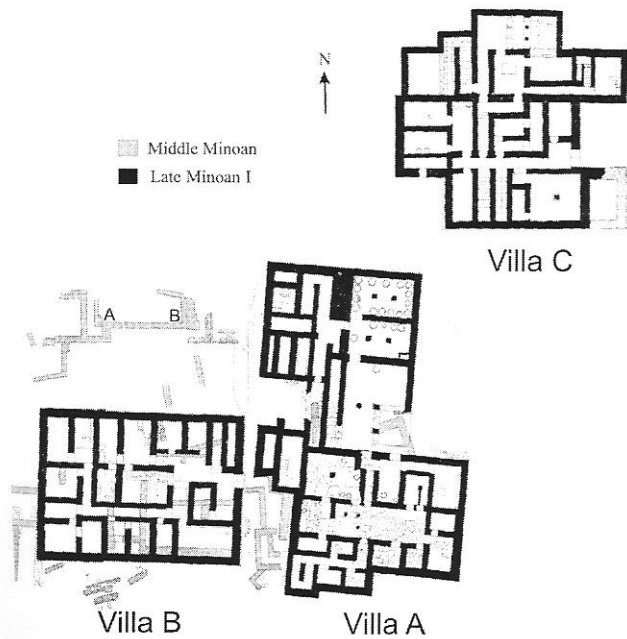


Figure 2. Plan of the villas at Tyliisos. Adapted from Hazzidakis (1934).

Building B was probably not a villa but a storage or industrial facility of some kind, a typical complement of large villas; so we did not include it. Villas A and C are the dominant buildings in the settlement which has a history going back into the Early Minoan period (before 2000 BC).

The villas belong to those for which the type and arrangement of rooms and complex building techniques were adapted from Minoan palace architecture. The most important rooms of such villas are pillared halls and pillar crypts, which are easy to recognize. Pillar crypts, in many cases, seem to have been used as cult areas. The orientations that we have found in these villas are near a pillar crypt. We also measured the walls of an earlier building from the Middle Minoan period.

### The Orientations from Tyliisos

In the cult area, we measured the directions of all the walls, the alignments formed by the entrances together with other architectural features such as pillars and interior doorways, and the horizons opposite the buildings. We looked for orientations to significant dates in the Minoan calendar known from other places, such as 1) sunrise at the equinoxes and the solstices 2) dates defining the beginning of the solar months and 3) important days to regulate the intercalation of an extra month in the lunar calendar. These important events may be defined as the first time the sun's light reaches a corner in a room or is reflected in a bowl filled with water or hits a wall in alignment with a pillar or a distant foresight. It may have illuminated a cult object. The unidentified building from the Middle Minoan period

has an exact orientation to sunrise at the equinoxes (Figure 2, wall AB). We mention this since it is the most frequent orientation that we have found in Crete. The early strata at Tyliisos are difficult to interpret so we don't know what this building was or where its outer doors and windows were. Only the foundation stones are left.

The later villas A and C have orientations that we have encountered in two buildings at Knossos, the palace and the villa known as the South-East house, where oblique orientations to sunrise at the equinoxes cause dramatic effects with shadows and reflections that marked the beginnings of the Minoan lunar and solar years in the autumn, and we could recapture them at the palace of Knossos (Henriksson and Blomberg 2011). The orientations of villas A and B seem to serve the same purpose.

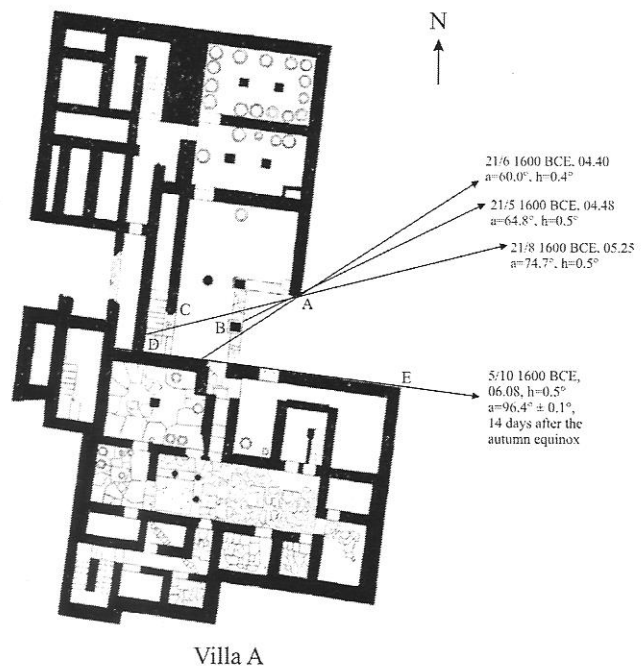


Figure 3. Villa A at Tyliisos. Adapted from Hazzidakis (1934).



Figure 4. Vestibule of villa A. Photo by Blomberg 2011.

At Villa A (Figures 3 and 4) we have the orientation that touches the southeast corner of the vestibule wall at A and also the southeast corner of the pillar B. This orientation

was to the summer solstice.

The peak sanctuary on Mt Pyrgos, just to the west of Tyliossos, is also oriented to the summer solstice. We have here a similar case to that at Palaikastro on the eastern coast of Crete. An important cult building there was oriented to the summer solstice and so was the peak sanctuary on the nearby mountain of Petsophas (Henriksson and Blomberg 1997-1998; Cunningham and Sachett 2009, 86). There is another orientation from the same corner A and the northeastern corner of pillar B. It is to sunrise on the 21st of May in our calendar. There is also a third orientation from the same corner A that touches the southern part of the pillar east of the stairs. It is to sunrise on the 21st of August, or one month before the autumn equinox. These orientations would have marked the beginnings of the eighth, ninth, tenth, eleventh and twelfth solar months, if the year began at the autumn equinox, which we maintain (Figure 5; Henriksson and Blomberg 2011). The southern wall in Villa C is aligned with sunrise 5 days after the autumn equinox. This day may be the first day in the solar calendar with twelve 30-day months ending at autumn equinox + 5 extra days = 365 days (Figure 5).

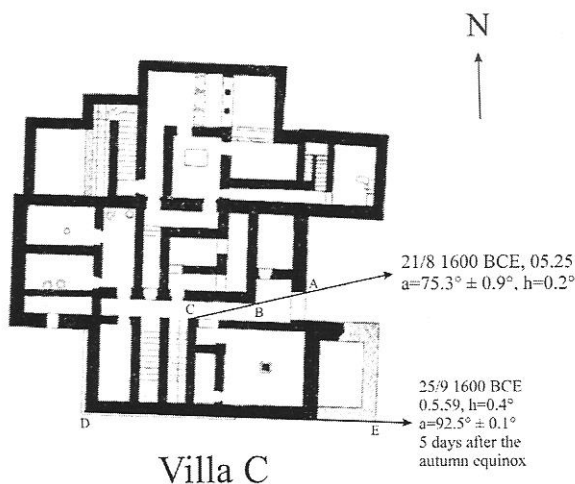


Figure 5. Villa C at Tyliossos. Adapted from Hazzidakis (1934).

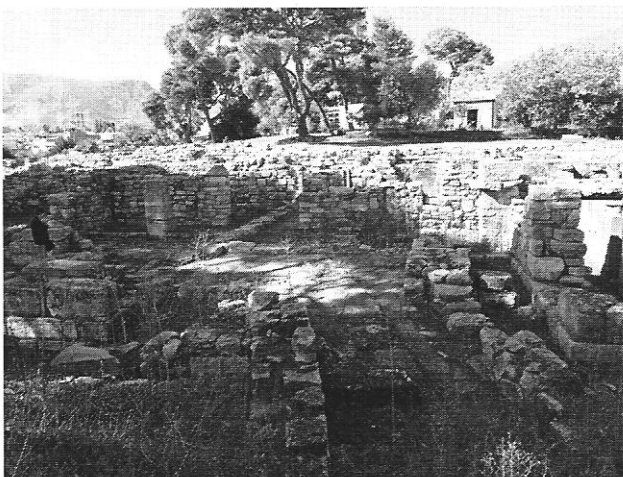


Figure 6. Entrance to villa C. Photo by Blomberg 2011.

In the case of Villa C (Figure 5), there is an orientation from corner A to corner B, ending at C, beside the door into the pillar crypt. This orientation is to sunrise one lunar

month before the autumn equinox, our 21st of August, and also after the spring equinox, the 21st of April. This orientation is repeated at Villa A and it would have marked the beginnings of the eighth and twelfth solar months. This same orientation exists at both of the two cult houses at Gournia (Henriksson and Blomberg 2009). We have drawn in the orientation of the wall CD, which is five days after the autumn equinox. Its closeness to the equinoxes is suggestive and there may have been some impediment towards the eastern horizon that could account for it, but we do not know.

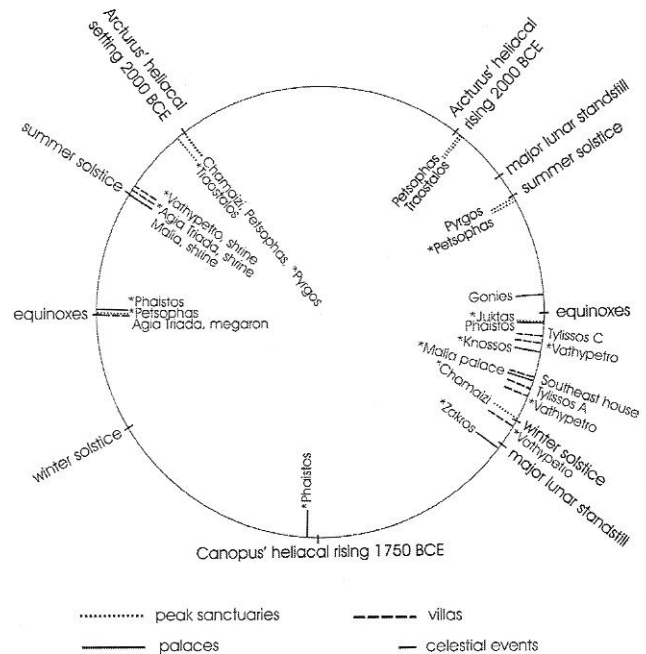


Figure 7. Monuments in the Uppsala project. An asterisk indicates a foresight.

### The Minoan Calendar

We have found good evidence for a solar calendar and a lunisolar calendar in our investigations of Minoan sites (Henriksson and Blomberg 2011). The months of the solar calendar began at intervals in the year marked by orientations to sunrise or sunset at the equinoxes, sunrise at the solstices and sunrise at regular intervals in between, giving twelve months. Every site that we have investigated had one or more orientations to the celestial events marking these important days of the solar calendar (Figure 7). The orientations at Tyliossos supplement our findings, and the two villas together have more links to the calendar than any other site, marking the beginnings of five of the twelve solar months (Figure 8).

The orientations of what seem to be nearly all important Minoan buildings to significant celestial events also established firm bonds between the buildings and the cosmos. This gives us reason to believe that the Minoans had a cosmology with strong physical connections between their earthly sphere and the events of the celestial sphere. All of their settlements seemed to have had a special relationship to one or more months of the year

(Henriksson and Blomberg 2011, Table 1; later articles accepted for publication have shown relationships to all twelve months). They may have had patron deities who were honored with festivals in specific months. This was the custom in the later Greek city states. We know that the Minoan settlements were connected to one another in trade and possibly had communication through fire signals at night from their peak sanctuaries (Gale 1991). The settlements could also have been connected to one another spiritually, with each having a function in reflecting the relationship between heaven and earth through calendar celebrations.

Site	Months
Petsophas, Phaistos, Knossos, Juktas, Vathypetro	first (autumn equinox)
Malia, Vathypetro	second
Modi	third
Chamaizi, Vathypetro	fourth (winter solstice)
Modi	fifth
Malia, Vathypetro	sixth
Petsophas, Phaistos, Knossos, Juktas, Vathypetro	seventh (spring equinox)
Gournia, Tyliisos Villas A and C	eighth
Tyliisos Villa A	ninth
Gonies, Petsophas, Pyrgos, Tyliisos Villa A	tenth (summer solstice)
Tyliisos Villa A	eleventh
Gournia, Tyliisos Villas A and C	twelfth

Figure 8. Orientations of monuments to the beginnings of the twelve months of the solar year.

Our archaeoastronomical study of Bronze Age Crete has supplied important information about the achievements of Minoan society that have not been suspected before. Since some of the celestial bodies move very slowly, and the Minoans demonstrate acquaintance with this, those very clever people had been observing the heavens for a very long time. They had acquired the knowledge that enabled them to construct and regulate a lunar and a solar calendar and they most likely used their knowledge also to structure the vital activities of agriculture and navigation (Henriksson and Blomberg 2000). It most certainly influenced the formation of their religion and cosmology.

## References

- Blomberg, M. and Henriksson, G. 2001. Archaeoastronomy: new trends in the field, with methods and results from studies in Minoan Crete. *Journal of Radioanalytical and Nuclear Chemistry* 247, 609-619.
- Blomberg, M. and Henriksson, G. 2003. The Minoan peak sanctuary on Pyrgos and its context. In M. Blomberg, P. E. Blomberg and G. Henriksson (eds.), *Calendars, symbols, and orientations: legacies of astronomy in culture*. Proceedings of the 9<sup>th</sup> meeting of the European Society for Astronomy in Culture, 27-30 August 2001 (Uppsala Astronomical Observatory Report No. 59), 127-134. Uppsala, Uppsala University Press.
- Cunningham, T. F. and Sachett, L. H. 2009. Does the widespread cult activity at Palaikastro call for a special explanation? In A. L. D'Agata and A. Van de Moortel (eds.), *Archaeologies of Cult. Essays on ritual and cult in Crete in honor of Gerandine C. Gesell*, 79-97. Princeton, American School of Classical Studies at Athens.
- Driessen, J. and Macdonald, C. (1997). *The Troubled Island. Minoan Crete before and after the Santorini eruption* (Aegaeum 17) Liège,

Université de Liège.

Evans, A. J. 1912. The Minoan and Mycenaean element in Hellenic life. *Journal of Hellenic Studies* 32, 277-297.

Gale, N. H. (ed.) 1991. *Bronze Age Trade in the Mediterranean* (*Studies in Mediterranean Archaeology* 90). Jonsered, Paul Åström Förlag.

Hazzidakis, J. (1934) *Les villes minoennes de Tyliisos* (Études crétoise 3). Paris.

Henriksson, G. and Blomberg, M. 2000. New arguments for the Minoan origin of the stellar positions in Aratos' *Phainomena*. In C. Esteban and J. A. Belmonte (eds.), *Astronomy and cultural diversity, Proceedings of the International Conference «Oxford VI and SEAC 99», La Laguna, 21-29 June 1999*, 303-310. Tenerife: Organismo autónomo de Museos del Cabildo,

Henriksson, G. and Blomberg, M. 1997-1998. Petsophas and the summer solstice. *Opuscula Atheniensia* 22-23, 147-151.

Henriksson, G. and Blomberg, M. 2009. Solar Orientations of Bronze Age Shrines in Gournia, Crete. In J. A. Rubiño-Martín, J. A. Belmonte, F. Prada and A. Alberdi (eds.), *Cosmology Across Cultures*, Proceedings of a workshop held at Parque de las Ciencias, Granada, Spain 8-12 September 2008. *Astronomical Society of the Pacific Conference Series* 409, 430-435.

Henriksson, G. and Blomberg, M. 2011. The evidence from Knossos on the Minoan calendar. *Mediterranean Archaeology & Archaeometry* 11, 59-68.

Schlosser, W. and Cierny, J. 1997. *Sterne und Steine: eine praktische Astronomie der Vorzeit*. Stuttgart, Theiss.

## Acknowledgements

We would like to thank the Greek Archaeological Service for permission to study the villas at Tyliisos. For efforts on our behalf we have been indebted to the late Berit Wells, former director, and also to Bodil Nordström, secretary, at the Swedish Institute in Athens.