

Can archaeoastronomy inform archaeology on the building chronology of the Mnajdra Neolithic Temple in Malta?

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The Maltese Temple Period is reckoned to be from around 4,100 BCE to 2,500 BCE whereas Mnajdra itself is listed to be constructed in Ggantija (3,600–3,000 BCE) and Tarxien (3,000–2,500 BCE) phases with a short intermediate Saflieni Phase (3,300–3,000 BCE). Archaeology does not seem to produce clear evidence of the building sequence for the Mnajdra complex which consists of three distinct structures. Arguments are mainly based on typology, not stratigraphic evidence, which makes chronology precarious. Archaeologists in general seem to agree that the small trefoil temple is the oldest and the middle temple the most recent. The intricate south temple, or parts of it seem to have been constructed sometime in between the two other temples; however, there is no clear evidence of a definite building sequence for the various rooms within the temple itself. Part of its construction may be contemporary with the small trefoil temple or even before it.

The Mnajdra Temples, especially the south one with its clearly defined eastern orientation, have created much enthusiasm since the 1970s for astronomical and archaeoastronomical research by both scholars and laymen as it gives an impression of being intentionally constructed to establish time and season through the oscillation of the sun's yearly cycle along its apparent horizon. Papers on the astronomy or archaeoastronomy of the site seem less concerned about the architectural building sequences. Based on Mnajdra's archaeological evidence, its architecture, field observations and horizon astronomy, this paper proposes a redefined building sequence for the lower and middle temples, which were conceived and built over a period of about one and a half millennium. Where archaeology alone does not provide conclusive evidence or indication, archaeoastronomy may provide supplementary data to help establish a possible building chronology.

Introduction

Mnajdra is probably the most atmospheric of all the temples on Malta (Trump 2002, 148). It is situated in a gentle depression formed by converging hill slopes on the southern cliffs

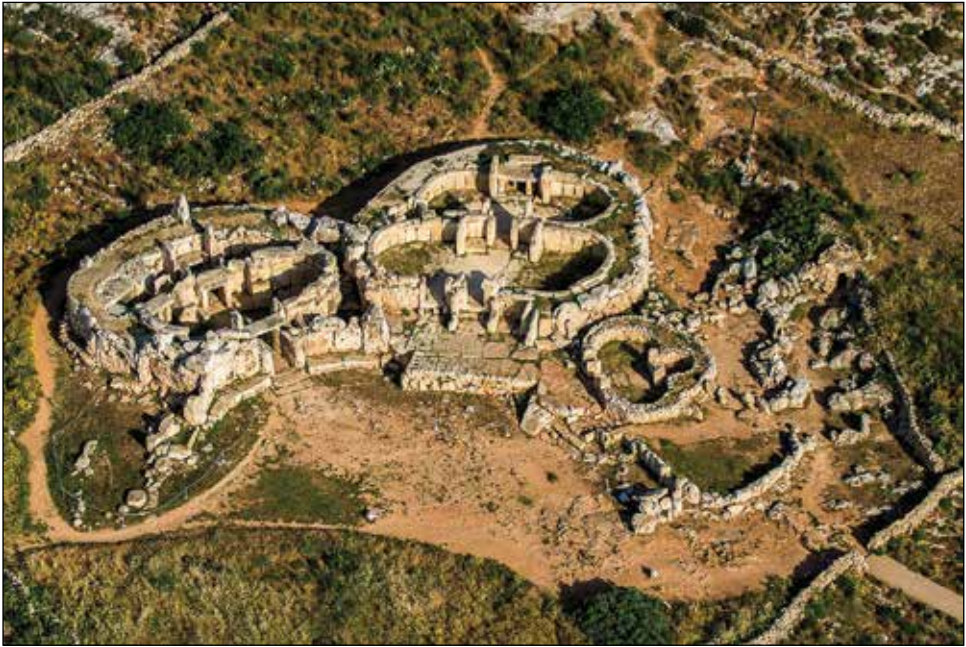


Fig. 6.1: Aerial view of the Mnajdra complex with the small trefoil temple at the right, the north temple at the top, and the south temple in the bottom-left. By courtesy of Daniel Cilia.

in the south-eastern coastal area. There are no modern buildings or structures in sight and it has a scenic view over the sea and the rocky islet of Filfla. At first sight the landscape where Mnajdra is built appears barren and inhospitable; however, it offered all the resources necessary for a community 5,500 years ago (Stroud 2010, 5). The temples are built from both the harder Lower Coralline Limestone which one finds on nearby cliffs dropping into the sea and the softer Globigerina Limestone which is available less than 200 meters from the site. Mnajdra, like the nearby Hagar Qim temple, has never disappeared since the time it went out of use in prehistory, though old photos and drawings show that the temple has suffered disorder and damage, however, the core structure seems to be archaic. Mnajdra has gone through considerable restoration work since the first known excavations at the beginning of the 20th century. However, its central features are fundamentally well-preserved and the overall feeling to a visitor is of an archaic structure (Evans 1971, 96). Pace (2004b) also concludes, referring to the south temple that, it is highly probable that much of the original Ggantija Phase construction still stands intact.

The Temple Period in Malta goes from the Early Neolithic (4,100 BCE) until the Early Bronze Age (2,500 BCE); for the Mnajdra complex the core time frame is the Ggantija (3,600–3,000 BCE) and the Tarxien (3,000–2,500 BCE) phases (Trump 2004, 230). The Mnajdra temple complex consists of three distinct temples or structures, as seen in Figure 6.1.

This field research program was conducted over a period of nearly three years with on-and-off visits to the site. Observations at equinoctial and solstitial periods were prioritised as the question of whether the temple was intentionally aligned and oriented

towards celestial bodies, especially the arc of the sun's movements throughout the year on its eastern horizon, was chief topic of investigation. In this context the question of chronology and building sequence was investigated, both from an archaeological and an astronomical standpoint. However, to be clear, it was the archaeology of the monument that first sparked the idea of astronomical considerations as supporting elements for a redefined sequence of building chronology. Excavation reports and other material from archaeological investigations give an impression of consistency on a larger scale when it comes to the three distinct temple structures. Treating each building separately, there seems to be a lack of agreement regarding the building sequence.

On the other hand, astronomical and archaeoastronomical investigators in general, seem less inclined to consider chronology and more easily accept temple architecture as it presents itself in modern times. This is paradoxical, since their work does note the differences between the positions of the stars and planets during the Temple Period and their present placement.'

From this stance, this paper aims to investigate whether archaeoastronomy can provide supplementary data to aid the establishment of a possible building sequence for the Maltese Mnajdra south temple where archaeological excavations and observations seemingly fail to provide clear chronological evidence. The question of whether Mnajdra was intentionally constructed to face specific predetermined natural objects or aligned to celestial bodies is addressed. The study is based on archaeoastronomical fieldwork and photographic documentation. Distances were measured via a hand-held GPS (Garmin 12); given azimuths and horizon altitudes were measured using a Suunto compass and clinometer tandem. Naked-eye astronomy at certain times throughout the year, close to the equinoxes and solstices, proved to be of special importance throughout this study.

The first decision that the prehistoric builders would have made was the orientation of the axis along which the portal structures were to be erected (Torpiano 2004, 360). As it seems the builders put considerable work, effort and skill into the axis of orientation of their still enduring megalithic temples, it could indicate a directional intentionality; Torpiano concludes that the concave façade present in most temples confirms the importance of the axis of orientation. Evans (1959, 125) on the other hand, claims that orientation seems not to be an important factor to the temple builders, although he maintains that 'mostly the entrances face in some direction between south-east and south-west.' Evans further concludes that exceptions could be found and 'that it seems that orientation was not important.' When it comes to Mnajdra South, Trump (2002, 148–151) agrees with Evans' point of view on temple orientations and only goes as far as stating that an 'astronomical alignment has been suggested'. Nevertheless, from personal communication with the author of this paper, Trump seems not to reject alignments towards the equinox and the winter solstice sunrise, however,

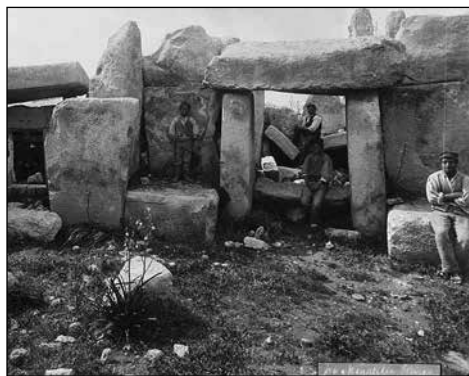


Fig. 6.2: Photo of Mnajdra South assumed to be from the last decades of the 19th Century, before restoration work (Ellis 2011, photo 8, pp. 12-3, with the courtesy of "The Richard Ellis Archive – Malta").

he finds the summer solstice sunrise alignment less convincing as the illumination on the vertical orthostat is wider than on its counterpart for the winter solstice sunrise (Trump 2013).

Vance (1842, 232) who attributed the temples to the Phoenicians, is the first to associate the temples with a celestial relationship, and believed the temples were not roofed and therefore appropriate to the worship of the heavenly bodies and for paying homage to the sun, moon and the stars. Vance (1842, 233) further suggests one particular high stone at the Hagar Qim Temple, Mnajdra's next door neighbour, was 'raised for the purpose of tracing with greater accuracy the motions of the different planets'. Zammit and Singer (1924, 68) suggest that 'No definite rule of orientation seems to have governed the construction of these buildings, nevertheless, Zammit (1929b, 13) relates the temples to astronomy when he suggested that the pits dug out of a recumbent slab at the entrance to the Tarxien Temple represented the image of the constellation of the Southern Cross; according to Agius and Ventura (1980, 20) it was easily seen in this hemisphere during the Temple Period. Ugolini (1934, 128) proposes that the Tal-Qadi Stone which apparently indicates a crescent half-moon and stars, as a possible Neolithic 'la lastra astrologica', presumably meaning a piece, sheet, slab or a chart of astrology or astronomy, (text translated from Italian by the present author). Studies conducted by Agius and Ventura (1980, 9) and later by Cox and Lomsdalen (2010) concluded that the orientation of most temples range from south-east to south-west and show consistency of bearing, suggesting that some temples were intentionally constructed to face particular directions. In a survey of 14 orientations, Fodera' Serio *et al.* (1992) found them all within the range 125.5° to 204°, less than a quarter of a circle, and concluded that, 'such a concentration of axes cannot have come about by chance.' In the Mnajdra complex this author (2011) argued that the three temples seem to have a well-defined orientation along their central axes. The small trefoil, or East temple, has a south-west orientation, whereas the five-lobed middle, or North, temple is orientated towards south-east. The five-lobed lower, or South temple, is oriented towards an eastern horizon that slopes down towards the sea which is about 500 meters away (as estimated by the present author's GPS readings). The South temple is atypical in that it is the only extant temple on Malta with a well-defined orientation towards the east.

Archaeological excavation history

Abela (1647, 145) is the first known person to have written about the Maltese temples, suggesting that they were built by giants. Until Zammit and Singer (1924, 67–68) rightly suggest that the temples 'are all of neolithic age' based on the theory that no metal had reached the island at the time when they were raised, it was commonly accepted that the temples were Phoenicians or Roman antiquities (Caruana 1882). The Frenchman Lenormant was the first to excavate Mnajdra in 1840, with no published report (Zammit and Singer 1924, 71). The Mnajdra remains were generally only cited in passing and usually in connection with their next door neighbour, The Hagar Qim temple, until Fergusson (1872, 418–21) gave a fuller description with a small-scale plan of the site. Caruana (1882, 14–17) reported the state of the monument in early 1880's, but according to Evans (1971, 95) the illustrations were simply a reproduction of Fergusson's. Whether Mnajdra was actually excavated or merely cleared during the earliest archaeological works, is not clear, however, both Fergusson (1872,

418–422) and Caruana (1882, 14–7) reports seem to give a more illustrative description of the site. The first adequate descriptions of Mnajdra were given by Mayr (1901, 654–664) who also made a satisfactory plan which, nevertheless, did not mention or indicate the small trefoil east temple. In 1910 Ashby (1913, 90–105) devoted about 10 days to Mnajdra and as Evans sustains (1971, 95), ‘excavated those parts which had not been completely ransacked by the original excavators’. Zammit (1929a, 52–56) a key figure in all work concerning Maltese antiquities, did some work retrieving clay figures of human form at the Mnajdra site. From then on, there was little or no archaeological work done on the site until after the Second world War, when the National Museum at the beginning of the 1950’s undertook major cleaning, tidying and restoration work of the monument; this led to the excavation survey of 1954 with the purpose of establishing the chronology of the various buildings on the site, (as reported in Evans’ publication, *The Prehistoric Antiquities of the Maltese Islands* (Evans 1971, 103–103)). Trump (1972) who has published numerous articles and books on Mediterranean prehistory and has conducted several excavations on Maltese megaliths in the 1950’s assisted Evans in his excavation work.

Archaeological Chronology

Firstly one should emphasise that the chronology of Mnajdra is, according to Grima (2012), ‘on shaky ground’. Its construction chronology is mostly based on typological observations rather than stratigraphic trench excavations (e.g. Evans (1971, 102)). The first person to have considered chronology was Fergusson (1872, 41) who maintained that the middle, or North temple, was the earliest due to its simple architecture and the fact that it was placed on higher ground than the other two. Mayr (1901, 663) agreed with Fergusson that the Mnajdra complex was not constructed with a single architectural layout, but instead claimed the lower building, the South temple, to be the oldest.

Ashby (1913, 93) agreed with Mayr that the North temple is younger than the South temple as the foundation of the former piles up against the northern external wall of the latter and is thus structurally supported by the South temple. This strong argument is fully in accord with Evans (1971, 102–103) who stated that the North temple was clearly added later in the Tarxien phase, constructed all at once and not subsequently altered. Evans dug only a single trench in room 7 of the North temple, where a large number of pottery shards, all of advanced Tarxien type, were recovered. This indicates that the temple was being used during the Tarxien Phase and, since no pottery from previous phases was found, suggests that it would have been built in the same period. That the North temple is the most recent and that it was built and used in the Tarxien Phase thus agrees with archaeological observations since the beginning of the 20th Century; as Evans (1971, 102) claims, ‘It is so evidently homogeneous throughout that one cannot doubt that it was all constructed at once and not subsequently altered.’

The small trefoil temple is not featured in these chronological debates until well into the 20th century, after Ashby (1913, 91) re-erected the western temple’s fallen pitted central pillar and reconstructed part of the temple wall (Ashby *et al.* 1913). Extensive restoration work was also completed by the Museum department in 1952 and 1953 (Pace 2004b, 129). According to Evans (1971, 101) as the monument stands today, it gives an impression of a

trefoil temple, but it might have originally consisted of two pairs of apsidal rooms, of which the front has completely disappeared. The whole area around the trefoil temple seems to be part of a non-standard building layout with an irregular collection of rooms for which an overall plan is difficult to establish. Nevertheless, Evans (1971, 103) suggests that the small trefoil temple was the earliest to be constructed; this point is generally acknowledged by scholars today (Trump 2002, 148). Evans retrieved Ggantija-type pottery from a trench excavated in front of this temple (1971, 103). However, it must be noted that this does not constitute clear evidence that the trefoil temple was the first to be built. Shards from the earlier Zebbug and Mgarr periods (4,000–3,600 BCE), in addition to Ggantija pottery, were found in the vicinity of room 3 of the South temple which, following the same reasoning, would suggest an even earlier building stage for this temple (Evans 1971, 102).

The most complex temple for which to assess the chronology is the lower South temple as it shows sign of more than one building phase (Evans 1971, 102). However, on a site visit on 05 May 2013, Trump (2013) in personal communication suggests the whole South Temple to have been completed within one building stage, except for room 3 and room 5. Mayr (1901, 663) claims that ‘the south building is the most important and so the oldest’ (translated from German by the present author). Pottery shards from the Neolithic Zebbug (4,100–3,800 BCE) up to the Bronze Age Borg in-Nadur (1,400–800 BCE) phase periods have been retrieved there (Evans 1971, 102). According to this author, this does not necessarily mean that the temple was constructed during the Zebbug phase, nor that it was completed about 2,500 years later in the Borg in-Nadur phase. The earlier pottery might indicate that the site was used as a dwelling or religious site prior to the temple’s construction, much like the ‘shrine’ at Skorba from the Red Skorba phase (4,400–4,100 BCE). This was in use as a sacred hut within a village compound prior to the erection of the temple itself (Trump 1966, 50–1). The later Bronze Age pottery suggests that the site was still in use, or reused, in this period. No bronze materials have ever been found at Mnajdra and there are no indications of metal items being applied or implemented in the temple construction; this suggests that the temple was completed before the Bronze Age. According to Pace (2004b, 129) ‘the current version of the Lower Mnajdra was built during the Ggantija phase’. Evans (1971, 103) on the other hand estimates, ‘Space 1 seems to have been made in its present form at the very beginning of the Tarxien phase’.

There is evidence that the South temple was not built all at once but in phases or that, at least, changes were made throughout its usage history. According to Evans (1971, 102), Fergusson had already noticed that an apse had previously been altered to make space for room 3 with its niches (Fig. 6.3). Mayr (1901, 663) agrees with Fergusson on this point and further suggests that the back central room (room 2) with its original two apses (3 and 4) are the remains of an earlier structure. Room 3 would not only have been refurbished later but, due to similarity of style and the presence of the same drilled and pitted decoration, this would have occurred at the same time that the front apse (room 1) was added on. Ashby largely agrees with Mayr’s claims, but suggests that the back wall of the rear and left-hand apse (room 3, β and γ) still stood and formed the back wall of the rear left-hand niche (Ashby *et al.* 1913, 97). Based on this, it may be argued that room 3 could belong to the very earliest part of the temple. During Evans’ 1954 campaign he dug a total of ten trenches in various parts of the lower temple and according to his account, ‘with varying successes’ (Evans 1971, 102). He claims to have cut an important trench in front of the threshold of

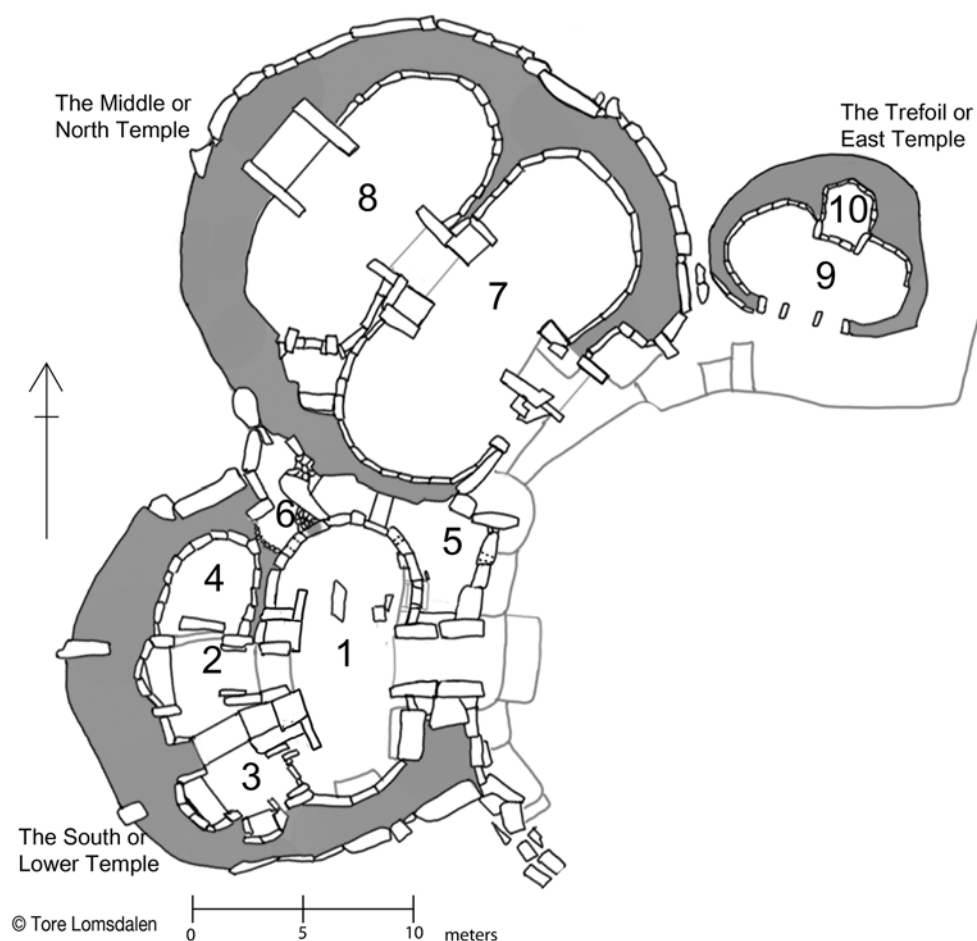


Fig. 6.3: Plan of the Mnajdra temple complex. By T. Lomsdalen.

room 3 running to the south wall of room 1 which contained a mixture of shards, some of the Ggantija type and others appeared to belong to an underdeveloped stage of the Tarxien period (Evans 1971, 102). He further suggests that the front apse (room 1) was constructed in an early Tarxien phase and that rooms 2 and 3 are probably the oldest part; 'though now, unfortunately, unprovable,' he concludes that the presence of Ggantija type pottery 'seems to show that there was a building on the site in the previous phase' (1971, 103).

Pace (2004b, 131) claims that the L-shaped room 5 is from the Tarxien period, that the room was fashioned out of the wall of lower Mnajdra and that megaliths from the older building were used to structurally support the middle temple. This paper's author observes that the wall that separates room 5 from room 1 appears to be a dressed outer wall of room 1 following the curves of the wall itself. If the builders' intention was to have the apse wall as part of an area filled with earth, it may be assumed that less labour would have been put

into aesthetic work on that side of the wall; thus, the south temple gives no impression of being a supporting foundation for the middle temple (Fig. 6.4).

Evans (1971) on the other hand, does not mention any possible refashioning of the wall of room 5. Evans (1971, 102) cut two trenches (E and F) in room 5; both contained Tarxien type pottery, whereas in one of them (E) Ggantija potshards were found at a deeper, black level. This author suggests that as: i) room 1 was built sometime in the Ggantija period; ii) the Ggantija pottery was found in room 5 close to the outer wall of room 1; and iii) the room itself is most probably from the Tarxien period (as stated by Pace) this could indicate that the Ggantija pottery was there before the floor of room 5 – and consequently the façade wall – was constructed. Evans (1971, 103) further suggests, due to the presence of Ggantija pottery in the black level in trench E that there was a ‘building on this site in the previous phase’. The question of the construction of the L-shaped room 5 may be relevant to when and how the front façade of the south temple was constructed.

To investigate the chronology of the South Temple’s building stages, a closer inspection of the main entrance was conducted in December 2012 to search for signs of its having been extended. The shaft of the entrance is about 3 meters long, 1.8 meters wide and about 2 meters high. At about 1.9 meters from the outside are clear visible signs of a constructional split in both the threshold and side panels (Fig. 6.5). The outer vertical slabs are 1.9 meters long and 65–70 cm wide and consist of the harder Coralline limestone (Grima has suggested that they might even be the hardest of all the limestone, the Lower Coralline on which Mnajdra is built); the inner walls are 1.1 meters long and 25–30 cm wide and the softer Globigerina limestone has been used of which the apses in room 1 have also been constructed. These observations give the impression of a second phase extension of the entrance towards the forecourt, and that the inner part may have been the original entrance to room 1, before the concave facade was erected, nevertheless closer archaeological examination should be undertaken to evaluate such an allegation. The rear part (room 8) of the North Temple might have been constructed during the same time period or shortly after, all in an early Tarxien phase. This author has been unable to find any archaeological documentation which would prove or refute this construction theory. Due to the uncertainty, a guided and comprehensive analysis of the excavation data is needed before any conclusions can be drawn.

Although the precise dating of the Mnajdra building is not free of difficulties (Pace 2004b, 128), the excavations, reports and opinions of the archaeologists referred to above suggest the following chronology for the construction of the Mnajdra complex:

1. the small trefoil temple was probably built in the Ggantija period as suggested by Evans;
2. rooms 2, 3 and 4 of the South temple were built at some point in the Ggantija period (it is unknown whether this occurred before, during or after the small trefoil temple was constructed);
3. the apses of room 1 may have been completed in later Ggantija or early Tarxien period and room 3 may also have been refurbished at that time. Room 6, however, could have been constructed in the first stage, and room 5 in a later stage, concurrent with the building of the North temple in the Tarxien period, contemporaneous with the concave façade of the South temple;
4. the North temple was completed sometime into the Tarxien period.

Archaeoastronomy and Building Chronology

As the Mnajdra complex architecture stands today, it is primarily the South temple with its eastern orientation which has attracted most astronomical interest and speculation on whether it was intentionally constructed to face celestial bodies, especially the equinox, winter and summer solstices sunrises (Fodera Serio *et al.* 1992). Since the 1980's scholars, authors and enthusiasts have addressed the possibility that the temple was intentionally built as a calendar (Micallef 1990), an astronomical observatory (Micallef 2000, 3) or a device to keep track of the timing of religious festivals and other events throughout the year (Cox and Lomsdalen 2010; Lomsdalen 2011). Astronomical alignments of the North temple have been investigated by Vassallo (2000) and Albrecht (2004, 50–59). However, more extensive investigations were conducted by Ventura *et al.* (1993) regarding the two tally stones centrally placed in the small trefoil temple, which may have been used as a calendar to mark the heliacal rising of the Pleiades and other stars and asterisms, registering significant astronomical sequences of annually occurring events. An astronomical factor that must be kept in mind when comparing alignments towards celestial bodies in the Temple Period and today is that the stars have changed positions due to precession, and due to changes in the tilt of the Earth's axis, the Sun rise and set horizon range was about 3/4 of a degree further north and south than it is today (Agius and Ventura 1980, 16).

The small trefoil temple

As this temple stands today it has a central axis of about 210°; however, due to heavy reconstruction and refurbishment, it is dubious whether this azimuth accurately reflects its original axis. It is too wide for a true south alignment, but could indicate an orientation towards the small islet of Filfla, which can be seen from within the main apsis of this temple at about 220°. That Filfla probably was a sacred island is indicated by the finds of pottery, jars, bones of animals and a possible sailor's 'shrine' belonging to Temple Period (Farrugia Randon 2006, 43). In 1343 a chapel dedicated to the Assumption of Our Lady was erected after a fierce storm that caused much damage on the mainland (Farrugia Randon 2006, 41). During a 2011 survey conducted by this author and Dr. Fabio Silva, it was found that one of the chambers of the nearby temple Hagar Qim is also oriented towards Filfla, a fact also noted by Tilley (2004, 130).

Assuming that the tally marks previously mentioned are from the Temple Period, this further indicates an awareness of heavenly events and their importance to human actions and behaviour on Earth. Further evidence comes from what is tentatively called a 'solar wheel': a small pottery shard retrieved at nearby Hagar Qim (Ventura 2004, 312). Another example may be the tal-Qadi Stone found at the temple site of the same name, suggesting stars and a crescent moon (Micallef 2001). The orientation of the small trefoil temple may probably be seen more as a cosmological orientation than an astronomical one. England (2004, 413) claims that the altar-like shape or bulls' horns profile of the islet attracted the attention of the temple builders and acted as a pivotal horizon point where sea, land and heavens meet, and further to Grima, (2001, 56) all important components in an islanders' cosmology.

The middle, or North, temple

The middle temple is oriented towards south-east, with a central axis of about 140°, which



Fig. 6.4: Room 5 seen from the east-north corner indicating an outer dressed wall of room 1, the oracle hole, a porthole entrance with rope holes and a clear distance between the south and the middle temple. Between the two temple walls are the remains of a collapsed of niche or an altar. (Photo T. Lomsdalen).



Fig. 6.5: Visible signs of a constructional split in both the threshold and the wall panelling about 2/3 inside the main entrance of the south temple. (Photo T. Lomsdalen).

could indicate that the builders intended to align it halfway between the central axis of the trefoil temple (210°) and the lower temple (92°). As stated above, there are many indications that the middle temple is the last to be constructed and belongs to the Tarxien phase. Evans (1971, 102) claims that this temple was constructed all at once, based on its thoroughly homogeneous architecture. Nevertheless, it is here suggested that it could have been built in two stages: the first consisting of the back apses (room 8), which was subsequently extended at a later stage. This was a procedure that was commonly used by the temple builders (Evans 1959, 125–6). Room 8 has two altars, a small one at the left-hand apse reachable through a porthole entrance in the temple wall with a central axis about 0° (true north) which is confirmed by Albrecht (2007, 29). The other, apparently the main altar, is the back niche of room 8. Standing at the south edge of this altar, two orientations were measured through the one-meter wide entrance (Fig. 6.3). Following an imaginary line through the north side of the entrance gives an azimuth of about 118° (declination of -22.4°). Following a line through the south side of the entrance gives an azimuth of about 126° (declination -29.1°). These azimuths indicate that winter solstice sunrise would be framed by the temple's entrance, as seen from the niche in room 8. In the same way, the major lunar standstill moonrise would be seen to rise close to the south side of this entrance. Cox (2009) made observations of the 'Far-Southerly Moonrise' of three Maltese temples from 2005 to 2007 but did not include Mnajdra in his research programme; however, in private correspondence with Cox in 2010, this possibility was proposed and was investigated as just explained. Consequently, the present author's hypothesis cannot be observed and validated before around the years 2023 to 2025 when the far-southerly moonrise will again be visible. However, cross-jamb illumination of an altar seems to have been a commonly desired feature used by the temple builders (Cox and Lomsdalen 2010). According to research by Vasallo (2007), a left-hand cross-jamb illumination of demarcated areas inside the temples at winter solstice sunrise seems to be prevalent in megalithic Malta: a total of twenty-one out of twenty-four (or 88%) investigated sites show an alignment with the winter solstice sunrise.

When the temple was extended with the front apses, it would consequently block the illumination of the back altar, especially if the temple was roofed (Trump 2002, 150). With the new apses, the major lunar standstill alignment continues through the north side of the 1.25 by 1.60 meter wide main porthole entrance to room 7 (now partly destroyed). On either side of the entrance to the passage leading from room 7 to room 8 there are the usual altar-like arrangements (Evans 1971, 99). The present author can confirm that, at winter solstice sunrise, the altar on the left-hand side of the passage is illuminated (Fig. 6.4), a fact already noted by Vassallo (2000) and Albrecht (2007, 26). Based on archaeoastronomical considerations, it may be suggested that the builders started with the back apses and at a later period extended the temple. In doing so, they would have intentionally kept the original astronomical alignments towards the sun and the moon intact, which would certainly suggest intentionality of directionality.

The lower, or South, temple

Most literature on astronomical alignments regarding the South temple seems to assume that the building was constructed all at once and only takes its present architecture and layout into consideration. There are archaeological indications, as previously mentioned, that this temple might have been expanded from the rear apses outwards. The question is which part

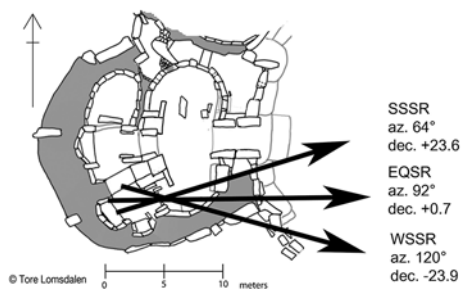


Fig. 6.6: Room 3 of Mnajdra South. The three arrows indicate alignments to the Summer Solstice sunrise (SSSR), Equinoctial sunrise (EQSR) and Winter Solstice sunrise (WSSR), measured by me in situ.

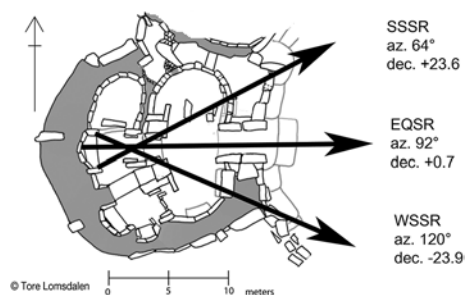


Fig. 6.7: Equinoctial and solstitial alignments in room 2 of the south temple, measured by me in situ.

of the back apse was the very first to be erected. This paper argues that room 3 might have been the first freestanding structure and the rest of the temple consequently was expanded from there. This hypothesis finds archaeological support from the trenches excavated by Evans, as discussed above. Furthermore, Ashby suggests that the back walls of the niches of this room are original and not refurbished. From this author's point of view, this structure has all the elements of a free-standing Maltese prehistoric temple in its own right: it has its own porthole entrance with rope holes for door closure, three niches, dressed altar stones for ritual purposes and receives cross-jamb illumination during sunrise at the Solstices.

Astronomically, room 3 has alignments to the equinox (EQSR), the winter (WSSR) and summer solstice sunrise (SSSR), during which specific areas inside would be illuminated (Fig. 6.6). These alignments are not as precise and demarcated as later parts of the South temple and may indicate an earlier period of horizon astronomy knowledge. The extension of this temple might have first been towards room 2 and 4. Astronomically room 4 seems to be of little interest; however, room 2 is highly central to the temple's overall axis of about 92° (declination +0.7°) which aligns with the spring and autumn equinoxes, fully illuminating the altar at its back niche (Campion and Malville 2011, Lomsdalen 2011). However, Ventura *et al.* (1992, 118) suggest the temple might have been aligned to the rising of the Pleiades and not the equinoctial sunrise. The altar of room 2 is also aligned to both summer and winter solstice and would receive cross-jamb illumination from both the summer and winter solstice if room 1 was not yet constructed (Fig. 6.7).

Room 1 is similar to the later built room 7 in which there is an altar on each side of the passage into the back room. At summer and winter solstice sunrise, the two altars in room 1 would receive a cross-jamb illumination before the extension of the main entrance and the building of the concave façade, as previously mentioned (Fig. 6.8). This is also when the rear part (room 8) of the North temple might have been constructed.

With the building of room 5, completion of the North temple (room 7), setting up the concave façade of the South temple and elongating and narrowing its main entrance, the two altars just mentioned would be closed off from sunlight at time of the solstice (Fig 6.9). It is here suggested that this was when the two vertical orthostats were placed on each side of

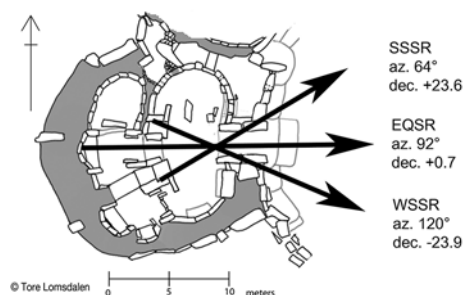


Fig. 6.8: Equinoctial and solstitial alignments from the two altars in room 1 through the first building stage of the main entrance of south temple, measured by me in situ.

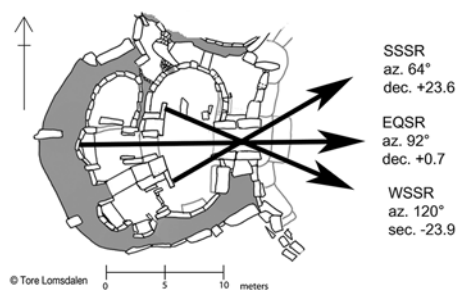


Fig. 6.9: Equinoctial and solstitial alignments of the central corridor and from the two vertical orthostats as being observed today in a cross-jamb illumination, measured by me in situ.

the altars in order to receive the cross-jamb illumination at the summer and winter solstices that can be observed today (Lomsdalen 2011).

Contrary to this author's suggestion, Pace (2004b, 131) maintains that room 5 was 'fashioned out of the wall of the Lower Mnajdra' with the former external megaliths of the older building used as the supporting wall of the middle temple. This would then have been done in the Tarxien Phase. By this it seems Pace assumes that the south temple was completed before the builders started to erect the middle temple. On the other hand, this paper's hypothesis is sustained by Evans' (1971, 103) findings of pre-Tarxien types of pottery under the floor of room 5, and his suggestion that there was a building on this site in the previous Ggantija Phase. Based on Evans' indications this may suggest that this area was not filled with wall packing before room 5 was built and consequently could have been created through extension of the façade.

Based on the above-mentioned hypothesis, the suggested chronology may be visualised in the following sequence:

Conclusion

The research question behind this paper was to investigate whether archaeoastronomical features embedded in individual rooms and sections of the Mnajdra complex can support and further the hypotheses of archaeologists regarding the chronology and building sequence of the three temples. As the architecture of the temple stands today, solar alignments at equinox and solstices do seem to be an integral purpose of the structure and may have been a means of calibrating time and seasons for particular earthly events influenced by celestial events. Whether this was an intention of the temple builders cannot be proved; it should not, however, be disregarded. Therefore, in search of architectural intentionality based on positions of heavenly bodies and especially the sun's movements along the eastern horizon of Mnajdra, a redefined chronology has been researched. The reason for this is to investigate whether a continuous consideration of the sun's position in relation to the temple structure throughout the various building sequences may be expected. Evidence for such a purpose

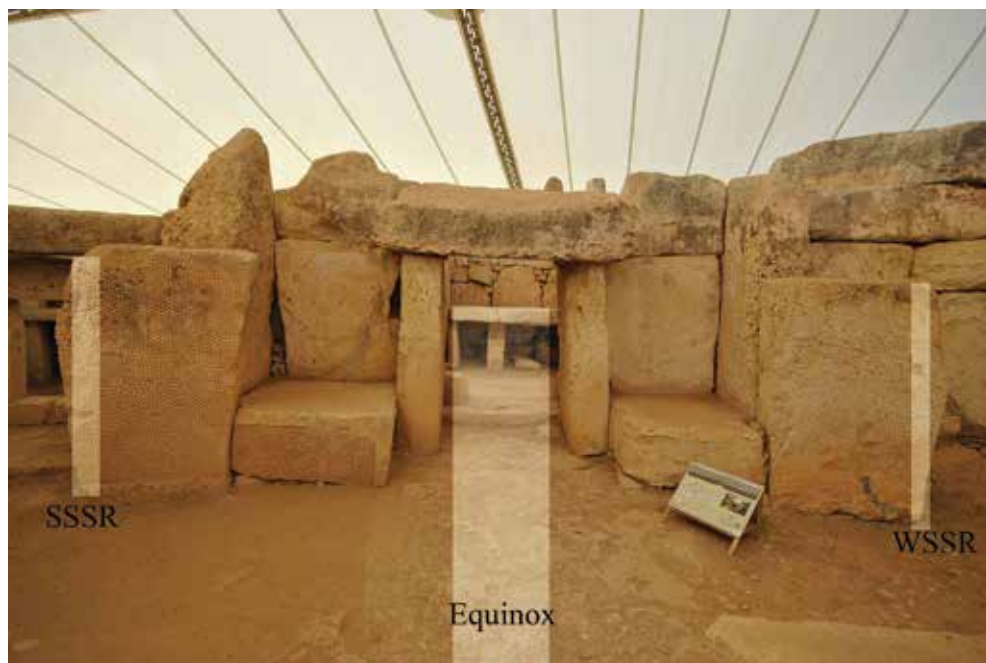


Fig. 6.10: A slit image indicating equinoctial and solstitial (SSSR, WSSR) sunrise illumination in the South Temple. (see Fig. 6.9). (Photo Lomsdalen).

would strengthen arguments for determination and intent as celestial alignments may have been a core element within an overall master plan carried out over a period of about a millennium and a half for the creation of a sacred site for religious worship, paying respect and obeisance to the power of cosmos. Based on this the following redefined constructional chronology has been proposed:

1. Mnajdra East might have been the first to be constructed, in the early Ggantija Phase (3,600–3,000 BCE). This idea is rooted in typological and archaeological considerations; unfortunately, archaeoastronomy can add little.
2. Mnajdra North could have been built in two separate stages, one in the middle and the other in the late Tarxien Phase (3,000–2,500 BCE). Based on archaeoastronomical observations, its construction could have started with the back apses and later been expanded by adding a new room to the temple.
3. The complex Mnajdra South may have been constructed in four stages:
 - a. Room 3 dates from the early Ggantija Phase and could be contemporary with, even older than, Mnajdra East. It contains several characteristics of a temple in its own right, including the solstitial and equinoctial illumination patterns displayed by the final version of the South temple.
 - b. Rooms 2 and 4 could then have been added in the middle Ggantija Phase. Room 2 again replicates the same archaeoastronomical signature now in its final form (with the central axis oriented towards the East).

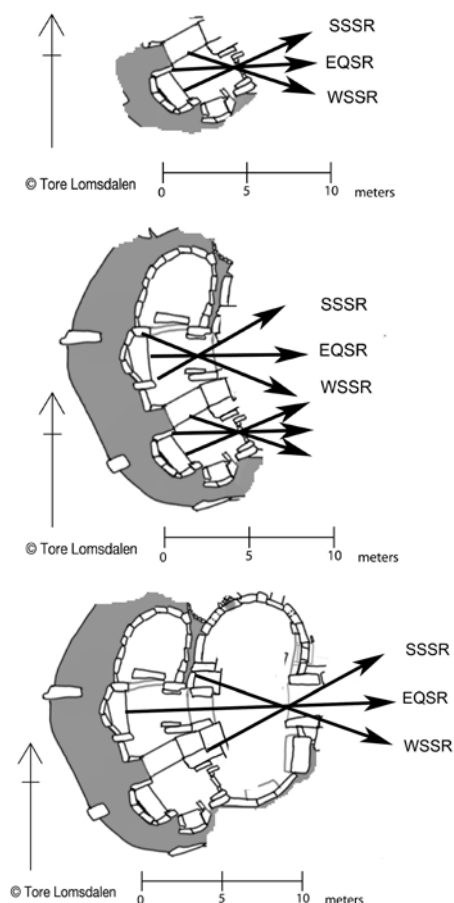


Fig. 6.11: The suggested first three building stages of the south temple. On the left: room 3; centre: adding rooms 2 and 4; on the right: the extension of room 1, all with alignments towards EQSR, SSSR and WSSR.

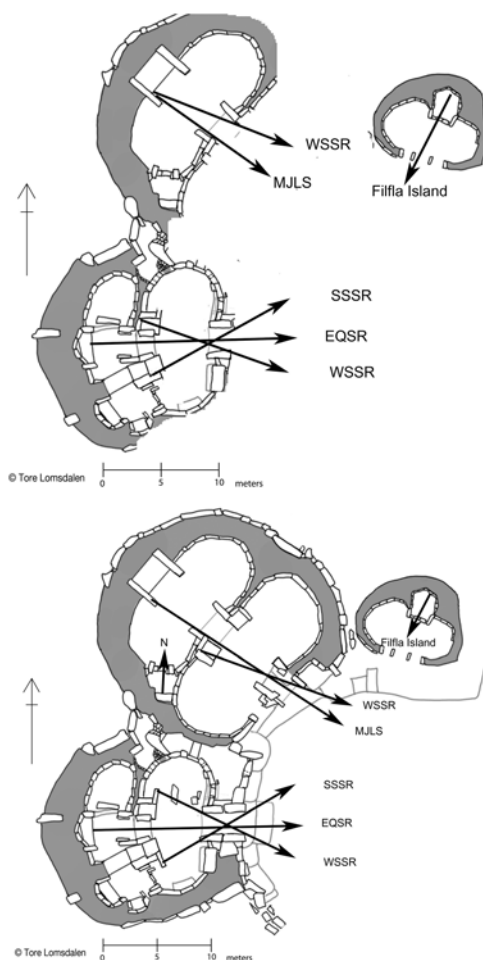


Fig. 6.12: On the left: the suggested fourth building stage adding room 8 of the middle to the south temple. On the right: the completion of the Mnajdra complex as it presents itself today, with alignments.

- c. Extending the temple with the front apses (room 1) seems to have been the third building stage and may have been completed sometime in the late Ggantija or early Tarxien phases.
- d. The fourth and final stage may have been the erection of room 5 as a foundation support for the room 7 extension of Mnajdra North. To maintain architectural uniformity the entrance to the south temple was then elongated and its present concave façade established. In doing this, fifteen hundred years of off-and-on building was concluded, already well into the Tarxien Phase.

It is questionable whether astronomical alignments and orientations towards celestial bodies can provide precise dating evidence. Nevertheless, archaeoastronomy may provide data that supplements the archaeological evidence and thus aid in the formulation and testing of hypotheses.

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