The Tal-Qadi Stone: A Moon Calendar or Star Map

Chris Micallef[1]

1. 'Casa Micallef', 9, Triq il-Bwieraq, N/H 2 Santa Lucia. PLA 10

INTRODUCTION
The Tal-Qadi stone has always been an archaeological enigma amongst scholars. It has always been thought that this broken fan-shaped artefact has representations of stars and the crescent moon. The objective of this paper is to question these interpretations and investigate further by analysing possible scenarios that may help decipher the code of the Tal-Qadi stone.

Keywords: crescent, gibbous, first / last quarter, alignment, azimuth, astronomy, declination.

I. Introduction

At a small temple at Tal-Qadi (GR 478772), near Burmarrad (Malta) a broken fan-shaped stone (TQ/S.1) was found, with very interesting features (Plate 1). Measuring 29 cm by 24cm, this stone is 5cm thick. This broken fan-shaped stone has carved radiating lines on one of its sides, which have been interpreted as representing stars and a crescent moon (Ridley 1971: 71). There are five sectors on the Tal-Qadi stone. The first sector, which is only preserved in part, has three short lines and one symbol interpreted as a representation of a star. The second sector has seven stars, and three short lines. A crescent moon or first quarter moon is represented on the third segment while the fourth segment has nine stars and 2 lines in the shape of the letter I. The fifth segment has eight stars (Plate 1).

It is difficult to give an interpretation of the short lines and what look like a letter "I". Probably these represent the initial stages in the carving of the star symbol, which were subsequently left unfinished for unknown reasons. This possibility, however, remains open to discussion.

Amongst scholars who investigated and attempted to give an interpretation of the Tal-Qadi stone is Richard

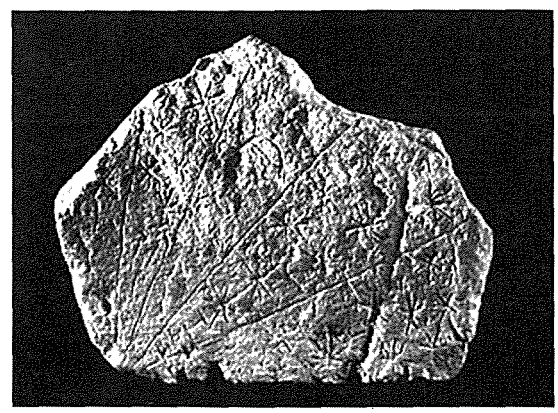

Plate 1: The Tal-Qadi stone (reproduced courtesy of "The Megalithic Temples of Malta" Website – Cilia 2000)

England, Malta's leading architect. Inspired by research in Northern Europe, he had studied the possible use of notches in the hills around the temples as horizon markers for observation of the moon and stars by Neolithic sky-watchers.

II. History of the Site

According to Sir Themistocles Zammit, the remains at Tal-Qadi were first brought to light by Mr. Henry Sant who worked as a Government civil engineer (M.A.R. 1916-1917: 8). The Tal-Qadi temple (Figure 1) is situated on the right-hand side of the Mdawra road to Salina Bay. Although the land on which the temple stands is Government property, Zammit had persuaded the Government of the time to buy a couple of fields, which adjoined this land to the west. This was done because Zammit had noticed that some standing stones seemed to form an entrance to a building at a higher level (M.A.R. 1927-1928: II-III).

Excavations were carried out on this site between 11th May and 15th September 1927. These were first supervised by L. Upton Way and later directed by Temi Zammit. The shallow soil and lack of megaliths made it quite difficult to follow the ground plan of the temple. Zammit recorded the results of this excavation in the Museum Annual Report 1927-28, and a plan of the remains was made in 1952 (Evans 1971: Plan 13).

Architecture and orientation characteristics of the Tal-Qadi Temple

The main features of the remains are the outline of two apses to a temple, the main axis of which evidently ran from east to west. According to Evans the temple was of the four-apse type. He arrived at this conclusion because remains of a corridor, probably leading to a second pair, were found to the east of the two surviving apses. However nothing remains of these apses except for four horizontal slabs which lie about four metres to the east of the corridor, and which may be the remains of the temple's paving (Evans 1971: 42). One of the main problems is to determine whether the temple faced west or east. According to the excavation reports, Zammit believed that the temple was oriented towards the west (M.A.R. 1927-1928: III).

According to Zammit's field notes, work started in the lower field called *ic-cens tas-Sinistru.* In his description it appears that he had established the existence of a path or avenue leading to the eastern ruins at a higher level. One must also mention at this point that Zammit was not entirely convinced by this assertion, since one can still notice a question-mark after his statement in the notebook (Evans 1971: 42). Zammit's report describes the passage as consisting of a few blocks of coralline limestone aligned in the lower field. Zammit states explicitly that the corridor formed by these megaliths was 3.66 metres wide. These led to the main entrance of the building facing due west. According to Zammit, it seems that there might have been steps leading from the lower field to the temple's entrance, which he measured as being 1.53 metres above that of the lower field. He cites no evidence for the use of these steps to bridge this height. The steps that now lead into the eastern remains have been built following the excavations for the convenience of visitors.

The four flat slabs to the east of the corridor at the back of the two surviving apses, challenge the hypothesis that the main entrance of the temple faced west. It seems that these represent the paving of another corridor, and if one had to take the geometric plan of

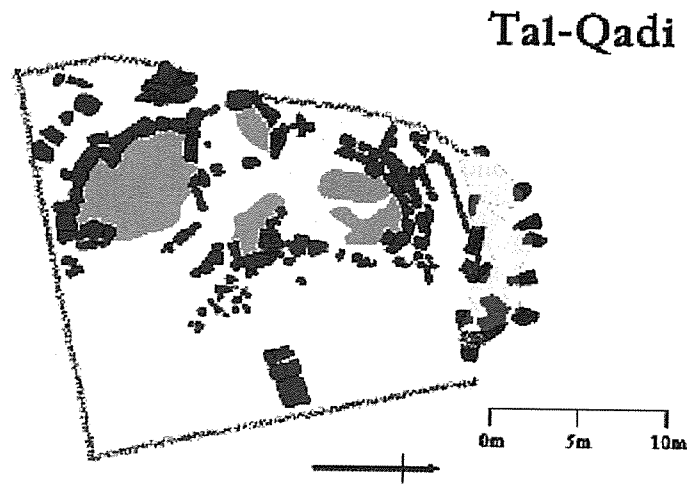

Figure 1: Tal-Qadi Temple (reproduced courtesy of The Megalithic Temples of Malta Website – Cilia 2000)

the temple consisting of four apses, then one will conclude that this was the entrance to the temple. A reconsideration of Zammit's hypothesis, namely that the remains of the stones on the west disclose the main width of the corridor, reveals that such width of four metres is too wide to be considered as the width of the corridor. Such corridor widths (between two pairs of apses) are usually under 2 metres, as other megalithic structures around the Maltese Islands reveal.

Notwithstanding, there are still further arguments, which support Zammit's hypothesis. If the temple entrance faced east, then it must have been facing up hill, which would certainly make it unique when compared with other megalithic sites in the Maltese Islands. The second pair of apses is missing and therefore it is not possible to compare the size of the apses with that of the surviving pair. Another difficulty in determining the orientation of the temple comes from the absence of remains consistent with those of the temple's façade. In view of the above, Evans concludes that the temple's entrance faced west, (Evans 1971: 42).

The original size of the temple at Tal-Qadi (Figure 1) is also problematic, as is the paving to the east. The latter might have been part of a corridor leading to some eastward extension, or even to another building. Evans remarked that its orientation appears to be slightly different from that of the two surviving apses and the corridor on the eastern side of these remains (Evans 1971: 42).

If we are to consider the western entrance, there are very little remains. One can find three stones, now level with the ground on the southern side, which were probably uprights. Two of these stand back to back and project into the apse. The broken stumps of two uprights represent the northern side of the temple. It seems that they were placed there quite recently, but perhaps they rest on ancient foundations.

The central space between the temple's apses, and the demolished walls further east is quite well marked by the position of the corridor. One of the paving slabs which measures 1.6 metres in length and 0.8 metres in width lies lengthways across the corridor, and its length probably gives the original breadth of the corridor. The remains of a small upright flanks the northern part whereas the remains of two stone uprights are on the southern part.

Zammit records the discovery of Bronze-Age material pertaining to the Tarxien Cemetery phase at the south-west corner of this corridor, which occurred just above the remains of these stones. These consisted of one large and some smaller pots, an amulet and an object resembling a spindle-whorl.

Zammit states that the latter might have been the fragment of a small figurine of the Tarxien Cemetery type, which could have been easily mistaken for part of a spindle-whorl.

It seems that to the east of the corridor the only recognizable remains are the four slabs mentioned above, which could have resulted from two horizontal slabs that were pulled down and eventually broken. Alternatively these may be the paving of a further corridor. The orientation of this corridor must have been east north-east. According to Evans, Zammit was uncertain whether these could have any direct relation with the remains further south, (M.A.R. 1927-28: III). However it seems that when one compares these remains with the Bugibba temple, these slabs could have been the outer façade of the temple. In his diary Zammit recalls that in a conversation he had with Giovanni Stivala, who was the tenant of the land where the temple was found, Stivala stated that he had destroyed a group of globigerina uprights in the north-west corner of the field years before (Evans 1971: 43). These might have been further remains of the outer casing of the temple or indeed the missing façade.

Archaeological finds at Tal-Qadi temple

The archaeological finds from Tal-Qadi temple include a fragment of a statuette (seemingly representing the abdomen of a human figurine) and another fragment of a figurine of lightly baked grey-buff ware. A pestle and a whetstone were also found. Of particular importance is a decorated broken slab of globigerina limestone, roughly worked but with a rather uneven decorated surface. According to Evans, the whole slab, of which the surviving piece probably represents a part adjoining the centre, was probably circular, and divided by various incised radial lines into numerous segments (Evans 1971: 43)

III. The observational data and method of data analysis.

Determination of azimuth and declination

The orientation from true north or south is an accepted means of measuring the azimuth of a temple. The objective of this investigation is to correlate the orientation of the main axis of the Tal-Qadi temple

with celestial objects. It is for this reason that azimuths were converted to declinations, that is to positions on the celestial sphere. The azimuths quoted in this paper were measured north through east.

A work published by Ventura and Agius in 1980 gave the azimuth of the Tal-Qadi temple as 76°. A theodolite measuring with an accuracy of one minute of an arc (Ventura and Agius 1980: 7) was used. Several sources of error could have effected the precise determination of azimuths. The errors could have arisen from weathering and erosion on the main portal entrances of the Tal-Qadi temple. On the other hand, one should note that the position of the temple eliminates the refraction at the moment of sunrise, thus making the calculations more precise.

The latitude of the Tal-Qadi temple was taken from an Ordinance Survey Map (Ventura and Agius 1980: 7). The latitude makes an appreciable difference on the declination corresponding to a particular azimuth (Roy & Clarke 1977: 36-67). Looking from inside the temple along its main axis, the horizon opposite the main entrance can be below, at, or above eye level. This also plays an important role on the declination at which the sun would appear to rise from inside the temple.

The unique engravings, showing the crescent moon and groups of stars enclosed in sectors by carved lines, on one side of the Tal-Qadi stone (Ridley 1971: 71) show that the megalithic builders might have shown interest towards the heavenly skies. Although interpreted as symbols for stars, one can never be sure that this is a correct interpretation. It is only with adequate analysis and investigation that we will eventually determine the interpretation of the Tal-Qadi stone. The objective of this paper remains to determine the interpretation of the symbols on the Tal-Qadi stone.

The apparent interest in the stars during the temple building period may serve us with an objective to investigate whether in fact any alignments did take place along the main axis of the Tal-Qadi temple. One should not overlook the fact that during the rising and setting of stars, these may appear much fainter due to atmospheric extinction. Furthermore, certain stars can easily be missed due to hazy conditions and moonlight. However one must state that the hill profile and altitude of the temple, helps to minimize such effects (Hawkins 1974: 160).

Although the stars seem to be fixed year after year, on closer observation, one will observe that some are rising to higher declinations whilst others are going to lower declinations in the sky. Over hundreds of years such movements become evident, a phenomenon referred to as precession. Every 25,800 years the Earth's axis precesses at a slow rate. The Earth's poles revolve with reference to the celestial sphere of fixed stars. Thus stars that are presently visible from a particular latitude may be invisible in a few hundred years and vice-versa.

The rate of precession is well known and considering the real motion of the stars, their exact positions in the

Date	Constellation	Remarks
January 2650 BC	Sagittarius - Capricornus	Star observations difficult since magnitude was low.
February 2650 BC	Capricornus-Aquarius	Mars and Venus could be seen. Star observations difficult since magnitude was low.
March 2650 BC	Aquarius - Pisces	The constellation of Pisces was in a straight line. Star observations difficult since magnitude was low.
April 2650 BC	Pisces-Cetus-Taurus	Star observations difficult since magnitude was low.
May 2650 BC	Cetus-Taurus	Star observations difficult since magnitude was low.
June 2650 BC	Taurus-Gemini	Star observations difficult since magnitude was low. At the end of June the main axis of the temple was aligned with the crescent moon.
June – July 2650 BC	Gemini-Auriga	**In the beginning of July, the main passage of the temple was aligned with the crescent moon. It could be that the Tal-Qadi stone is a representation of these constellations.**
August 2650 BC	Cancer-Leo (in the beginning of the month) Virgo-Leo (at the end of the month)	Star observations difficult since magnitude was low.
September 2650 BC	Virgo-Libra	Star observations difficult since magnitude was low. Mercury could have been observed easily.
October 2650 BC	Virgo-Libra-Scorpius	The main axis of the temple was aligned with the moon There is no indication that these stars are represented on the Tal-Qadi stone.
November - December 2650 BC	Ophiuchius-Sagittarrius	Star observations difficult since magnitude was low. The planet Mars could have been easily observed.

Table 1: Rising stars at Tal-Qadi temple during all possible crescent and first quarter moon days (Source: Author's derived data of rising stars along the main passage of the Tal-Qadi temple).

sky could be calculated relative to the direction in space of the Earth's polar axis and to the equinox positions for any age. The values of the relative longitude (35.84°) and latitude (14.4°) of the Tal-Qadi temple were entered into the computer astronomical program RedShift II, together with the azimuth of 76° (considering the eastern orientation) and 256° (considering the western orientation) and respective declination of 11.3° and –11.3°. The base year that was investigated was 2650 BC, which pertains to the Tarxien phase (3000BC-2500BC), and which is logical to investigate as most pottery found was of this period. The base year 2650 BC was chosen as the year representative of the Tarxien phase. The results for the night sky derived for this particular year would not be much different for ± 100 years.

IV. Results-Correlation with the moon and sun along the Tal-Qadi temple axis.

Research was conducted to correlate the temple's declinations with significant celestial bodies alignments. The computer astronomical programme was used to investigate whether any alignments existed with the temple's main passage. The latitude of Tal-Qadi temple was taken as 35.84°N, its longitude as 14.4°E, its azimuth as 76°, and declination of 11.3°. Considering the representations on the Tal-Qadi stone, the motion of the crescent/first quarter moon and stars were studied taking into account these four temple features. All possible crescent moon days (2-5 moon days and 24-27 moon days old) were investigated. No alignments were found with rising planets for the year 2650 BC. Remarks on constellations that could have been observed (i.e. visible magnitude) were noted in relation to the respective crescent moon days (Table 1).

Since the exact orientation of the temple is subject to discussion, it was again necessary to study the motion of the crescent/first quarter moon and stars using the Tal-Qadi longitude and latitude, declination and azimuth, but this time considering the other orientation (azimuth of 256° and declination of -11.3°). The investigation yielded the following constellations in the respective crescent and first quarter moon days (2-5 moon days and 24-27 moon days old) (Table 2). No alignments for setting planets were found for the year 2650BC. Observations on the stars that were listed are once again those that were close to the crescent/first quarter moon for the year 2650 BC and with a visible

Date	Constellation	Remarks
December 2650 BC	Aquarius-Pisces	Star observations difficult since magnitude was low.
January – February 2650 BC	Cetus-Pisces-Taurus	Star observations difficult since magnitude was low. Although there was an alignment with the main axis of the temple, there is no indication that the stars that could have been observed are those indicated on the Tal-Qadi stone. The planet Jupiter could have been observed
February – March 2650 BC	Taurus-Orion-Gemini	Although there was an alignment with the main axis of the temple, there is no indication that the stars that could have been observed are those indicated on the Tal-Qadi stone. The planet Jupiter could have been observed In February the planets Mars and Jupiter could have been observed whereas in March the planets Mars and Saturn could have been observed. Star observations were difficult since magnitude was low.
April 2650 BC	Cancer-Leo-Gemini	The planets Mars, Saturn and Mercury could have been observed. Star observations difficult since magnitude was low.
May 2650 BC	Leo-Virgo	Star observations difficult since magnitude was low. The planet Mars could have been observed.
June 2650 BC	Virgo	Star observations difficult since magnitude was low.
July 2650 BC	Libra-Virgo	Star observations difficult since magnitude was low.
August 2650 BC	Scorpius-Libra	Although there was an alignment with the main axis of the temple, there is no indication that the stars that could have been observed are those indicated on the Tal-Qadi stone. The planet Jupiter could have been observed. Star observations difficult since magnitude was low.
September 2650 BC	Sagittarius-Ophiuchius	Star observations difficult since magnitude was low. The planet Venus could have been observed.
October 2650 BC	Capricornus-Sagittarrius	Star observations difficult since magnitude was low. The planet Venus could have been observed.
November 2650 BC	Capricornus-Aquarius Cetus-Pisces	Star observations difficult since magnitude was low. The planet Venus could have been observed. The planet Venus could have been observed at the end of the month.

Table 2: Setting stars at Tal-Qadi temple during all possible crescent and first quarter moon days.
(Source: Author's derived data of setting stars along the main passage of the Tal-Qadi temple).

magnitude.

V. Discussion of results and alternative approaches.

From the results obtained above, it is difficult to compare the symbols represented on the Tal-Qadi stone with a rising or setting constellation that used to be seen in the year examined. The only stars that seem to resemble the pattern on the Tal-Qadi stone are the stars of the constellation Gemini and Auriga. These could have been observed in the period June-July 2650 BC (00h 58min) (Figure 2).

The symbols found on this stone have been subject to debate amongst scholars. Graham Hancock in his book "The Mars Mystery" shows rock carvings of comets from Easter Island (Hancock 1998: 278). The sun is here represented like the 'star' symbol found on the Tal-Qadi stone. Since the symbol of the moon is incised on the Tal-Qadi stone, what has been always thought of as symbols for stars may well represent the number of days between one phase of the moon to the next Considering the more complete sectors, we may argue that the first sector represents seven days, the following sector shows the crescent moon or first quarter moon, while the fourth and fifth sectors represent nine days and eight days respectively.

One way to decipher this enigma is to reconstruct the night sky during the period of use of the Tal-Qadi temple and observe the movement of the moon, looking for a pattern that fits the above hypothesis. In these calculations, the latitude of the temple was taken at 35.84°, with a longitude of 14.4°, azimuth of 256°, and a declination of -11.3°. After a thorough investigation of the setting moon for the year 2650 BC, the number of days appearing between one phase of the moon and another was determined (Table 3).

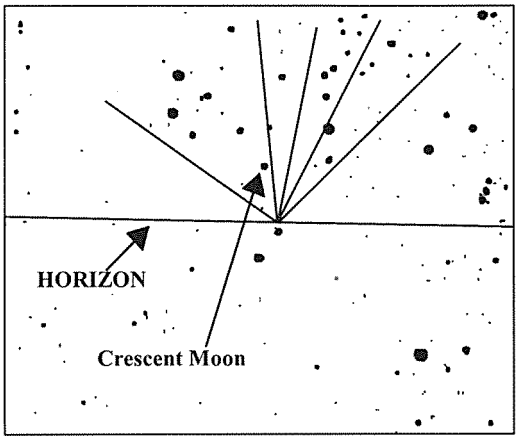

Figure 2: Representation of the constellations Gemini and Auriga as seen from the Tal-Qadi temple. (Source: Derived data from computer astronomical programme).

If the purpose of the Tal-Qadi stone was to read off the movements of the setting moon, then it was the intention of its users to count the number of days between one phase of the moon and another. One must not forget, that the number of days between two successive phases of the setting moon is not constant.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crescent[1] (2-5days)	4	3	4	4	4	4	4	4	4	3	4	3
First quarter[2]	2	3	3	3	3	3	2	3	3	4	2	2
Gibbous[3] (9-12 days)	4	4	4	3	4	3	4	3	2	2	3	4
Full[4]	5	5	4	5	4	4	4	4	5	4	5	5
Gibbous[4] (17-20 days)	4	4	4	3	3	4	3	3	3	4	4	4
Last quarter[5]	4	3	3	3	4	3	4	4	4	4	4	4
Crescent (24-27 days)	3	3	4	4	3	4	3	4	4	4	3	3
New[6]	3	3	3	3	4	4	4	4	4	3	4	3

Notes

[1] Crescent-A phase of the moon when less than half the disc is illuminated.

[2] First quarter- The phase of the moon when half the visible disc is illuminated and the moon is waxing towards full. First quarter occurs when the celestial longitude of the moon is 90° greater than the sun's.

[3] Gibbous-An adjective used to describe the phase of illumination of a body shining by reflected sunlight such as the moon when it is between half and full.

[4] Full-The phase of the moon when its celestial magnitude is 180° greater than the sun's and its disc appears fully illuminated.

[5] Last quarter-The phase of the moon when it is waning towards new moon and appears as an illuminated semi-circle. Last quarter is formally defined as the time when the moon's celestial longitude is 270° greater than the sun's It occurs about 7 days after full moon.

[6] New-The Moon's phase when it is at the same celestial longitude as the sun and thus totally unilluminated as seen from the Earth.

Table 3: Number of days between successive setting moon phases for the year 2650 BC
(Source: Author's derived data between one phase and another of the setting moon for the year 2650 BC).

In view of the above, the author is forwarding three proposals for investigation:-

Proposal 1: During the Temple period, observations and records of the following setting moon phases due West, namely crescent, gibbous, gibbous and then crescent were observed and the number of days between each phase recorded (Table 4).

Proposal 2: During the Temple period, observations and records of the following setting moon phases due West, namely first quarter, full, last quarter, and new were observed and the number of days between each phase recorded (Table 5).

Proposal 3: During the Temple period, observations and records of the alignment of the setting moon along the Tal-Qadi temple main passageway were kept and the number of days between each alignment recorded (Table 6).

After analysis using the astronomical program, Table 4 was drawn up for the first proposal while Table 5 resulted by studying the second proposal.

During each and every lunation the moon sets opposite the temple. This occurs once or twice every month. For the third proposal the alignments of the setting moon along the main passage of the temple with a declination of -11.3° and azimuth of 256° for the year 2650 BC was determined. The intervals between alignments of the moon along the main axis of the temple were calculated as shown in Table 6. As one can observe from the table, the number of days between each alignment is constant that is nine and seventeen days, except for five occasions only, where there are eight, ten and eighteen days between consecutive alignments. When these numbers are compared to those on the Tal-Qadi stone, one concludes that this was not used to observe and record the setting moon alignments along the main passage of the temple.

Once again, whether the Tal-Qadi stone was used to record the intervals between the first quarter, full, last quarter and new setting moon or else the crescent and gibbous setting moon, one may never know. It seems, that the observations were made by skipping a moon phase, that is either first quarter, full, last quarter and new, or crescent, gibbous, gibbous, crescent. It is interesting to note, however, that the number of days revealed on the Tal-Qadi stone match closely parts of proposal number 2. Thus it seems that during the Temple period a study of the number of days between one phase of the moon and the other was undertaken. Since this is not always constant a note was taken between the different segments between one phase of the moon and the other. Using this information one may tentatively reconstruct a representation of the original stone (Figure 3).

A similar investigation was also performed to determine whether the Tal-Qadi stone was used to observe and record the movements of the rising moon. Results that were derived are very similar to those presented for setting moon. It seems more likely, however, that the temple is aligned towards the setting moon rather than the rising moon. One must mention certain features, for example, the Wardija hill opposite the temple, and the valley between the temple and the hill. If one considers that the temple was aligned towards the rising moon than it must have been looking up-hill, which is unlikely.

TYPE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crescent (2-5 days) to Gibbous (9-12 days)	6	6	7	7	7	7	6	7	7	7	6	6
Gibbous (9-12 days) to Gibbous (17-20 days)	9	9	8	8	8	7	8	7	7	6	8	9
Gibbous (17-20 days) to Crescent (24-27 days)	8	7	7	6	7	7	7	7	7	8	8	8
Crescent (24-27 days) to Crescent (2-5 days)	6	6	7	7	7	8	7	8	8	7	7	6

Table 4: Observations and records of the following setting moon phases - crescent, gibbous, gibbous and then crescent - and count of the number of days between each phase. (Source: Author's derived data from astronomical program for 2650B.C.).

TYPE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
New-First quarter Number of new moon days + crescent (2-5) moon days	7	6	7	7	7	8	8	8	8	7	7	7
First quarter-Full Number of first quarter moon days + gibbous (9-12) moon days	6	7	7	6	7	6	6	6	5	6	5	6
Full-Last quarter Number of full moon days + gibbous (17-20) moon days	9	9	8	8	7	8	7	7	8	8	9	9
Last quarter-New Number of last quarter moon days + crescent (24-27) moon days	7	6	7	7	8	7	7	8	8	8	7	7

Table 5: Observations and records of the following setting moon phases - first quarter, full, last quarter and then new - and count of the number of days between each phase. (Source: Author's derived data from astronomical program for 2650 B.C.).

Date	Declination	Azimuth	Number of days between each alignment	%-Illumination-Phase
14.12.2651 BC	-09.45.53	258.01.27	0	41% – (First quarter)
01.01.2650 BC	-08.27.33	259.27.13	17	42% – (Last quarter)
10.01.2650 BC	-12.21.47	254.25.50	9	15 %– (Crescent)
29.01.2650 BC	-12.51.16	254.00.49	18	58% – (Last quarter)
09.02.2650 BC	-08.59.23	258.59.49	9	5% – (Crescent)
28.02.2650 BC	-11.14.20	256.01.59	17	82% - (Gibbous)
06.03.2650 BC	-11.56.13	254.58.14	9	0% – (New)
24.03.2650 BC	-09.04.32	258.45.09	17	97% – (Full)
03.04.2650 BC	-08.05.25	259.55.36	10	5 %– (Crescent)
21.04.2650 BC	-12.42.22	254.19.51	17	100% – (Full)
30.04.2650 BC	-10.11.15	257.24.46	9	25% – (Crescent)
19.05.2650 BC	-09.27.53	258.20.29	17	93% – (Full)
28.05.2650 BC	-12.02.20	254.42.48	9	46% – (Last quarter)
16.06.2650 BC	-12.47.32	254.09.30	17	82 %– (Gibbous)
24.06.2650 BC	-14.09.35	252.06.55	8	72 %– (Gibbous)
11.07.2650 BC	-10.19.54	257.11.51	17	56 %– (First quarter)
21.07.2650 BC	-10.28.00	256.58.36	9	86% – (Gibbous)
07.08.2650 BC	-08.33.06	259.17.28	17	29 %– (Crescent)
16.08.2650 BC	-13.48.51	252.51.51	9	99% – (Full)
03.09.2650 BC	-12.58.32	254.01.12	18	16% – (Crescent)
13.09.2650 BC	-10.28.35	256.56.10	8	99% – (Full)
01.10.2650 BC	-10.53.30	256.24.26	17	0% – (New)
11.10.2650 BC	-13.16.38	253.18.10	9	86% – (Gibbous)
28.10..2650 BC	-08.00.16	259.59.27	17	3% – (New)
09.11.2650 BC	-08.48.17	259.18.09	10	73% – (Gibbous)
26.11.2650 BC	-11.13.53	255.59.04	17	12% – (Crescent)
05.12.2650 BC	-10.40.18	256.47.15	9	46% – (First quarter)

Table 6: Alignments along the main passage of the temple with an azimuth of 256° (Source: Author's derived data for setting moon along the main passage of the Tal-Qadi temple.

During the investigations performed on the rising and setting of the moon along the main axis of the temple, it was noticed that the sun performs a pendulum motion during its rising and even in its setting. Hence there must also be sun alignments along the main axis of the temple. Once again through the astronomical program calculations were made considering the latitude and longitude of the temple, by first considering the declination of 11.3° and azimuth of 76° and subsequently with values of 256° and −11.3° respectively. It is interesting to note that on 20th April 2650 BC and 23rd August 2650 BC, the sun rose along the main axis of the temple, and that on 20th February 2650 BC and 18th October 2650 BC the sun set along the main axis of the temple.

Conclusion

Whether the Tal-Qadi stone was used to read the number of days for the rising or setting of the first quarter, full, last quarter and new moon phases, one may never know. However it is interesting to note that the interval of days between these moon phases fits in the Tal-Qadi stone sequence. The alignment of the temple's main passage with the different phases of the moon is indeed an intriguing fact and an achievement

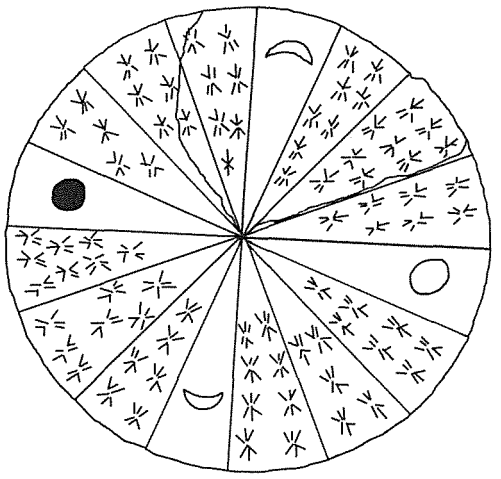

Figure 3: Possible reconstruction of the Tal-Qadi stone showing first quarter, full, last quarter and new moon interval. The symbols in the other sectors reveal the number of days between these phases. Shaded area is the still extant part (Author's interpretation)

for the Temple period culture. The alignment with the sun is also another interesting feature. If one considers alignment with the rising sun then the dates 20th April and 23rd August 2650 BC are the days when the rising sun was aligned along the main passage of the temple. If one considers alignment with the setting sun then the dates 20th February and 18th October 2650 BC are the days when the setting sun was aligned along the main passage of the temple. In the beginning of July 2650 BC, the main passage of the Tal-Qadi temple was aligned with the crescent moon. It is also possible that the Tal-Qadi stone is a representation of the constellations of Gemini and Auriga.

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