

Astronomy of Nabta Playa

J. McKim Malville, Romauld Schild, Fred Wendorf and Robert Brenmer

Introduction

The Southwestern desert of Egypt, now one of the driest areas on the Earth, was not always so inhospitable. Beginning about 9000 BC the summer monsoon rains moved northward from central Africa and created a landscape where nomadic pastoralists with their cattle could survive (Wendorf et al. 1992–1993; Wendorf et al. 2001; Wendorf and Schild 1998; Schild and Wendorf 2004). Even with rains it was still a dry environment with an annual rainfall no more than 100–150 mm. Rain was unpredictable and the climate was punctuated with numerous droughts, some of which caused the desert to be abandoned for long periods of time. Game was scarce, consisting of small gazelles and hares. Cattle were walking larders of milk, blood, and meat, used in a manner similar to those of modern Masai. Cattle allowed people to live in the desert, thereby controlling their lives and dominating much of their ceremonialism.

Located 100 km west of Abu Simbel, Nabta Playa is a large internally drained basin. During the early Holocene (ca 9000–6100 BC), the playa was seasonally flooded attracting nomads to bring settle intermittently on its shores (Figure 1) The first settlements at Nabta were small seasonal camps of cattle-herding and ceramic-using people. These people probably came into the desert after the summer rains from either farther south or the adjacent Nile, in search of pasture for their cattle. Each fall, when the water in the playas dried up, they had to return to the Nile or to better watered areas in the south.

The depression of Nabta Playa was covered with potential fodder grasses following the summer rains and would have been a very attractive area for grazing by wild and domesticated animals. In addition to grasses and seeds of other plants. *Boerhavia* has edible seeds and leaves which are grazed today by sheep and goats. Seeds of *Schouwia* were also found at Nabta. That plant has palatable leaves for human consumption and is good fodder for cattle. Eating its leaves reduces the need

J. McKim Malville
University of Colorado, (303) 492-8766
E-mail: kim.malville@colorado.edu

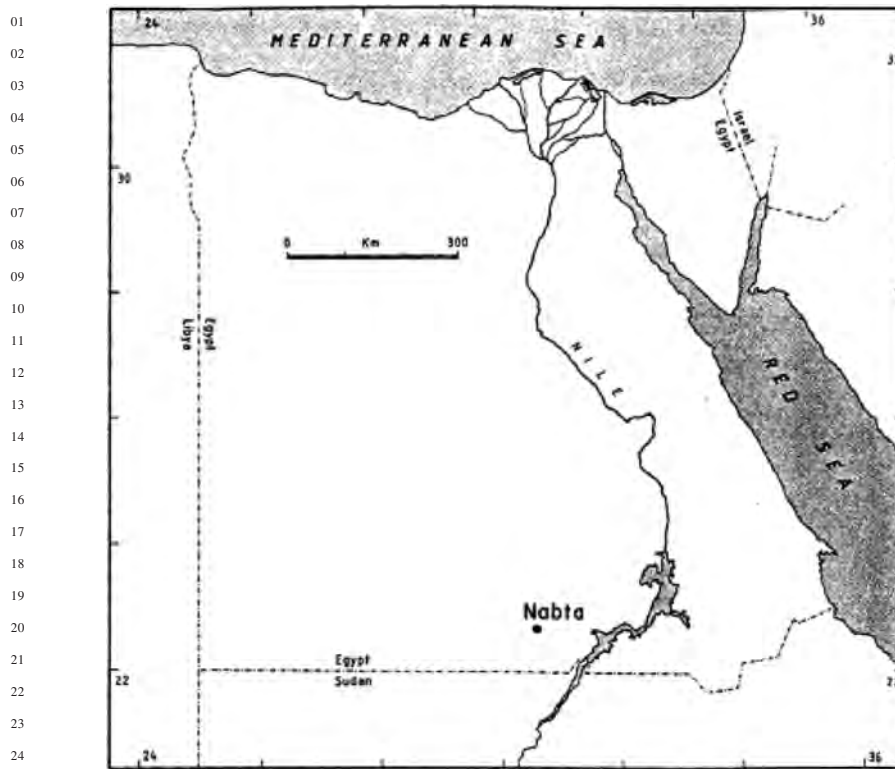


Fig. 1 Location of Nabta Playa

for water. Large stands of *Schouwia* often develop in depressions after monsoon rain, growing so high that camels can not be seen within them. Animals could also feed upon parts of shrubs and trees such as *Acacia* (Wasylikowa 2001).

By 7000 BC settlements became larger, and their inhabitants survived in the desert throughout the year by digging large deep wells. They lived in organized villages consisting of small huts arranged in straight lines. By 6800 BC they began to make local pottery. A few hundred years later around 6100 BC sheep and goats appear for the first time, which were almost certainly introduced from southwest Asia.

Ceremonial Center

Nabta probably began to function as a regional ceremonial center during the Middle Neolithic (6100–5500 BC) during the summer wet season. By a regional ceremonial center we mean a place where related but geographically separated people gather periodically to conduct ceremonies and to reaffirm their social and political identity. The center at Nabta gives evidence of a complex ideology, centered on themes of

01 death, earth, water, skies, and cattle. These gatherings occurred along a dune on
 02 the northwestern shore of the basin where there are hundreds of hearths, extensive
 03 cultural debris, and many bones of cattle. While present at most other sites, bones
 04 of cattle are elsewhere never very numerous, which is good evidence that they were
 05 kept primarily for their milk and blood, rather than for meat. This pattern resem-
 06 bles the role of cattle among modern African pastoralists, such as the Masai, for
 07 whom cattle represent wealth and political power. They are rarely killed except on
 08 important ceremonial or social occasions such as death of a leader or marriage.

09 Following a major drought which drove earlier groups from the desert, the Late
 10 Neolithic began around 5500 BC with a new group that had a complex social system
 11 expressed in a degree of organization and control not previously seen. These new
 12 people, the Cattle Herders (also known as the Ru'at El Baqar people), appear to have
 13 been responsible for first establishing the ceremonial center at Nabta Playa. The
 14 newcomers had a complex social system that displayed a degree of organization and
 15 control not previously seen in Egypt. They sacrificed young cows and buried them
 16 in clay-lined and roofed chambers covered by rough stone tumuli and constructed
 17 many tumuli having both surface and subterranean features.

20 The Valley of Sacrifices and the Calender Circle

21
 22 Along the western rocky bank of a shallow valley entering Nabta Playa from the north,
 23 which we have called the Valley of Sacrifices, there are about ten identifiable mounds
 24 of broken sandstone blocks. These mounds contained offerings of large articulated
 25 pieces of butchered cattle, goats, and sheep. The largest and perhaps the oldest tumulus
 26 contained an entire young cow, the most precious offering that a herder can make, con-
 27 tained in an elaborat chamber covered by a tamarisk roof (Figure 2). A piece of wood
 28 from its roof yielded a radio carbon date of about 5500 years BC. Probably a female
 29 just entering adulthood, the animal, lying on its left side, was oriented approximately
 30 north-south, with its head in the west. This wadi brought water to the playa after the
 31 first rains at the beginning of summer, and thus would have been an appropriate spot
 32 to have performed cattle sacrifices, asking the gods for rain.

33 The wadi ends in a small a stone circle on top of a small sandy knoll (Malville
 34 et al. 1998; Applegate, 2001) (Figures 3, 4 & 5). The circle contains sets of upright,
 35 narrow slabs. Two pairs of slabs aim the eye approximately to the north and to the
 36 position of the rising sun at summer solstice, which would have been near the start
 37 of the rainy season. A radiocarbon date from a hearth adjacent to the circle yielded
 38 a date of around 4900 years BC. Its center contains six upright slabs arranged in
 39 two lines, for which the astronomical functions, if any, are not clear. One of our
 40 Bedouin workers reported that it was not uncommon in the desert to set similar
 41 stones the sand and watch their moving shadows as time keepers. Another well-
 42 known stone circle was discovered by Bagnold (1931) in the Libyan Desert. It is
 43 larger, 8.5 meters, but seems to be made up of the same kind of thin stone slabs as
 44 at Nabta. No evidence of astronomical orientations has been reported, and none is
 45 readily discernable in photographs of the circle.

Fig. 2 Skeleton of a Young Cow



The Complex Structures

To the south of the Valley of Sacrifices are a series of knolls carved in the ancient lake clays by the desert winds. The area contains several dozen complex megalithic structures built during the Final Neolithic by the Megalith Builders (Bunat El Asnam



Fig. 3 Calendar Circle

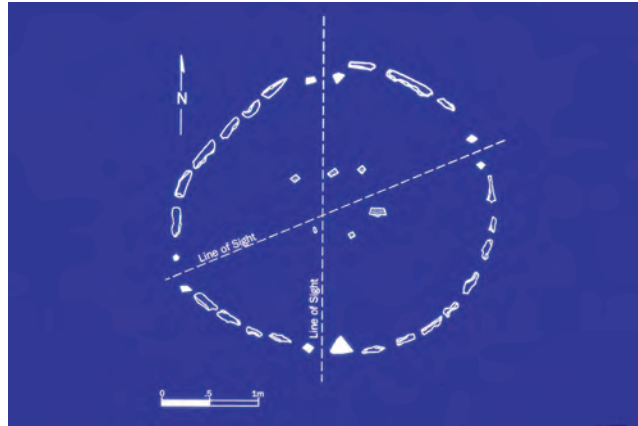


Fig. 4 Reconstruction of Calendar Circle

people). The Final Neolithic at Nabta Playa extended from 4600 BC to abandonment of the area in approximately 3400 BC. The complex structures are identifiable on the surface by groups of sandstone blocks, which were originally set in silt deposited during the final part of the Early Neolithic.

The groups of shaped sandstone blocks consist of megalithic ranging in weight from several tons to less than 50 kg (Schild and Wendorf 2004). A few upright, and other broken bases were found still embedded in the clays, suggest that originally they had been set up vertically, facing north. The dynamics of collapse involved the prevailing northerly winds that carved holes in front of the megaliths and caused their collapse. These depressions can be found underneath the collapsed large blocks, indicating that the individual stones generally faced north. Many are sculptured in a manner similar to the blocks of the alignments, with anthropomorphic shoulders

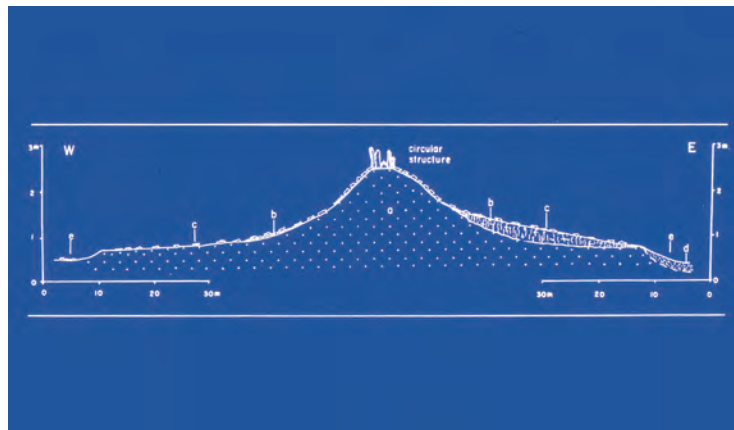


Fig. 5 Profile of Calendar Circle

01 suggesting that they represented the dead. Groups of these shaped stones may rep-
 02 resent souls of departed members of clans or extended families.

03 The largest of the complex structures, A, appears to play a major role in the
 04 symbolism that overlies the ceremonial center in the Final Neolithic (Wendorf and
 05 Krolik 2001). We originally thought the structure might contain elite graves, but
 06 excavation has failed to disclose any human remains. It is the focus of the five ra-
 07 diating megalithic alignments. The builders of the structure had dug a pit through
 08 playa sediments to expose a table rock at a depth of 2.6 m. The rock is quartzitic
 09 sandstone that remained after the surrounding softer sediments had been removed by
 10 erosion. A similar rock was found under the second and the third complex structure
 11 that were excavated a fourth rock was located under a cluster of slabs by a probe.
 12 The table rocks were probably formed during the initial deflation of the Nabta basin
 13 by wind, long before the deposition of the playa sediments. In the case of Complex
 14 Structure A, the northern and western sides of the table rock were shaped and its top
 15 was probably worked and smoothed. After shaping the oval rock measured 3.3 m by
 16 2.3 m with its long axis aligned north-south.

17 The pit was partially refilled and a large secondary stone, weighing 2–3 tons, was
 18 placed above the center of the table rock. This secondary stone was also slightly
 19 shaped with a large head-like projection facing slightly west of north. It was held
 20 upright by two large slabs set against the structure at its north end. One side had
 21 clearly been smoothed by pecking. The stone has a vague resemblance to a cow and
 22 may have represented a surrogate sacrifice. What is clear is that considerable effort
 23 was expended in quarrying the stone, shaping, transporting, and placing it on top of
 24 the table rock.

25 26 27 *Alignments*

28
29 After reanalysis of our previous measurements and a new campaign of mapping the
 30 sandstone blocks of the area, we identify five alignments of megaliths that radiate
 31 outward from Complex Structure A (Figure 6, 7 & 8). We also have likely dates for
 32 the placement of these stones in the sediments of the playa based on carbon dates
 33 from the nearby quarry. Approximately 100 m east of the quarry is a storage area
 34 where dozens of additional sandstone blocks are resting for use. Five radio carbon
 35 dates from the quarry are 4500 BC to 4200 BC. Since we also have a carbon date
 36 for complex structure E at 3600 BC, we estimate that the megalith period lasted for
 37 approximately 800–900 years from 4500 BC to 3600 BC. A closer inspection of the
 38 stones reveals most were worked, shaped into apparently anthropomorphic shapes,
 39 and many were set in the sand approximately facing north.

40 Our original measurements of the megaliths (Wendorf and Malville 2001) have
 41 been complemented by satellite imagery by the Quickbird satellite in 2002 and addi-
 42 tional GPS measurements by Brophy and Rosen (2005). We are gratified that there
 43 is good agreement with regard to the locations of the megaliths by these independent
 44 measurements. In our analysis we combine the two sets of GPS data and the satellite
 45 results.



Fig. 6 Tilted megalith in northern alignment; tents of field camp in background

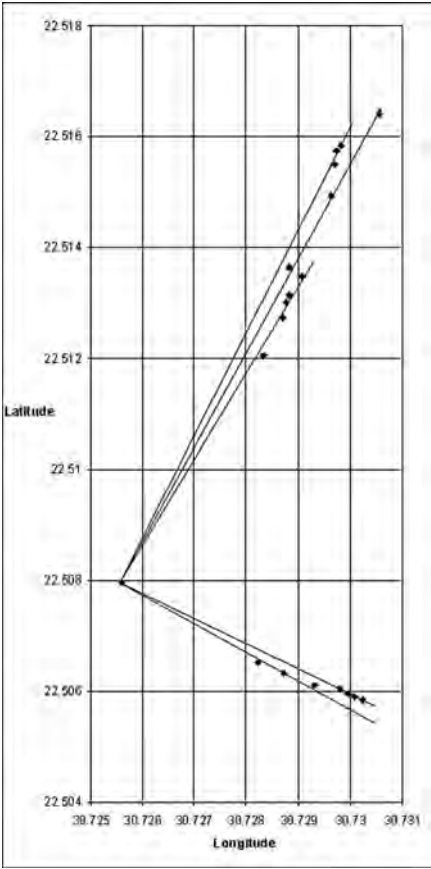
Alignments at Nabta Playa

For our calculations of precession we have used the formulae of Bretagon et al. (1997). Because of the movement of the dunes over 6–7 millennia, it is difficult to estimate the actual horizon, and we assume a level horizon. Many of the slabs are scattered and fragmented, and in estimating the dates when these alignments may have been oriented to certain stars, we include an uncertainty of $\pm 0.6^\circ$. While we had originally considered Dubhe, the brightest star in Ursa Major, to be a possible candidate for the three northernmost alignments, Arcturus now appears to be a much more likely choice during the period of megaliths (4500–3600 BC). It is the



Fig. 7 Top of buried megalith

Fig. 8 Alignments at Nabta Playa



brightest star in northern celestial hemisphere, and there were three occasions when alignments A1, A2, and A3 were oriented to the rising positions that star in that span of time. Each of these three alignments may have been to account to the changing location of the star due to precession.

A fourth alignment, B1, would have lined up with Sirius, which is the brightest star in the night sky and α Centauri, which is the third brightest, in the period 4600–4300 BC. The final alignment, B2, may have been lined up with Alnilam in the belt of Orion between approximately 4400–4200 BC and/or with winter solstice sunrise. A close inspection of the southernmost alignment, which we had initially designated as C, indicates that it consists of stones resting on the slopes and tops of erosional silt hillocks and may not represent an original set of aligned slabs.

Stellar Associations of the Megalithic Alignments

With the exception of Canopus, these alignments might have been associated with the brightest stars in the night sky of Nabta. (Figure 9; Table 1) In 4500 BC Canopus

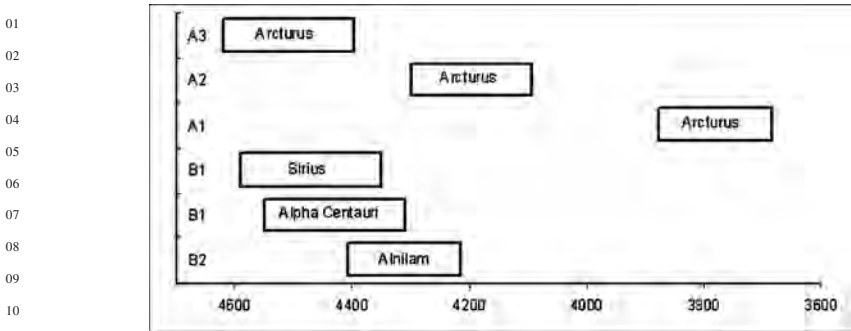


Fig. 9 Orientations of Alignments

would have risen with an azimuth of 159° and would have reached a maximum altitude of approximately 8° above the southern horizon. It is conceivable that the slight rotation of some of the megalithic slabs away from north-south was due to an attempted alignment with the rising position of that star. Another possible geometry of the site involves the approximate right angles between A3/B2 and A1/B1, which possibility has a certain credibility because of the interest the nomads in the cardinal directions.

In their analysis of the positions of the alignments Brophy and Rosen (2005) propose that the southernmost alignment, C, (which we consider to be problematic because of migration of the stones) was associated with Sirius in 6088 BC and that the other alignments are associated with Vega and stars of Orion in 6270 BC. Their suggested dates are about 1500 years earlier than our best estimates for the establishment of a ceremonial center. Brophy (2002) has also suggested that the table rock of Complex Structure A is a map of the Milky Way galaxy dating from 17,500 BC, showing spiral arms and a neighboring dwarf galaxy. He also proposed that the stones of the stone circle represent a map of the stars of Orion as early as 16,500 BC. These extremely early dates are not consistent with the archaeological record. Before about 9000 BC, the Saharan desert had no settlements beyond the Nile valley. With the arrival of monsoon rains, the hyper-arid desert was replaced by savannahs and occupied by nomadic pastoralists (Kuper and Kropelin 2006; Wendorf and Schild 2001). After about 5000 BC human settlements became well established, including the ceremonial center at Nabta Playa. There is no archaeological evidence whatsoever supporting the idea that a high culture was present in the Eastern Sahara as early as 17,000 BC. The likelihood of a culture interested in establishing the alignments in the playa in 6000 BC is also very slight. Inference in

Table 1 Orientations and Identification of the Alignments

Alignment	Azimuth(degrees)	
A3	26.3	Arcturus
A2	28.3	Arcturus
A1	30.6	Arcturus
B2	116.6	Alnilam Winter solstice
B1	120.1	Sirius α Centauri

archaeoastronomy must always be guided and informed by archaeology, especially when substantial field work has been performed in the region.

Prehistoric Herdsmen

Judging from the elaborate burials at the nearby cemeteries at Gebel Ramlah, the nomads associated with the ceremonial center were prosperous, healthy, possessing a strong aesthetic sense, and interested in preserving and honoring their dead (Kobusiewicz and Schild 2005). These cemeteries are some 20 km from Nabta Playa and are most likely part of the extended community that established the ceremonial center and alignments. Since it is a rare opportunity to learn about people associated with such an early ceremonial center, it seems worthwhile to describe these prehistoric herdsman in some detail. The most reliable carbon dates are from bone collagen giving almost 4400 years BC. The cemeteries contained 67 individuals in both primary and secondary inhumations. Inspection of dental features indicates that there were two different populations of Mediterranean and sub-Saharan peoples represented in the cemeteries.

The exceptional wealth of grave goods is notable. Many were buried with ceramic pots, some of which were elaborately decorated. Vessels known as tulip beakers were apparently produced exclusively as grave goods and usually placed on the chest or near the head. They were accompanied by sets of cosmetic artifacts consisting of stone pallets, stones for grinding color-bearing minerals, and containers made of ivory, bovine horn, stone, or ceramic. Many of the graves contained large sheets of mica, more than 10 cm across and 1 cm thick. They must have been highly prized since they were frequently buried in the vicinity of the head. One sheet was shaped in the form a tilapia, a fish frequently encountered in the Nile. This is the oldest known sculpture to be discovered in Egypt.

This was a healthy and prosperous community. The lack of dental enamel hyperplasia, an indicator of growth disruption during early childhood, also indicates that children must have been healthy and well-fed. The tall stature of the burials suggests good health and nutrition. Secondary inhumations may have been of individuals who died while traveling. All 7 primary inhumations were in flexed position, oriented to west, facing south (Figure 10).

The cemeteries indicate that there was a keen interest in preserving the remains of the dead. There were two skulls in which some of the upper teeth were replanted in the lower jaw and vice versa. The forearm of one woman was found with four bracelets, which had been fastened to the skeleton. Other skulls were found with 18 teeth placed an eye socket and three placed in the nasal aperture. Many of the burials were sprinkled with large amounts of red hematite dust, which in many cultures is associated with blood, the life force, and high status.

An important conclusion we can draw from these burials, is that the people living near or visiting the playas of Gebel Ramlah and Nabta participated in a wide trading network, which could bring them into contact with ideas as well as trade goods. Their contacts stretched far as evidenced by a turquoise nose plug, of which the closest known source is 1000 km to the north on the Sinai Peninsula. Shells were

Fig. 10 Adult burial facing south



brought in from the Nile; mica came from the distant mountains along the seacoast; ivory came from elephants further south.

Each of the three cemeteries contains the graves of individuals who seem to have belonged to single clans. The individual graves that preserved anatomical order were of people who died at the settlement and were interred there. The secondary graves, in which the skeletons are co-mingled and incomplete, can be interpreted as burials of higher status individuals who died during the distant migrations of the herders. The bodies may have been transported throughout the grazing season until the nomads returned to the vicinity of the ceremonial center. Alternately, they may have been exposed to animals such as Catal Huyuk (Malville N.J. 2005) or buried and subsequently disinterred. The disarticulated remains were placed in the graves at Gebel Ramlah without preserving anatomical order (Kobusiewicz and Schild 2005). It was important to bury them in the clan cemetery at a site that was believed to be the center place for the culture.

Summary and Conclusions

The evidence for astronomical observations by these ancient herdsmen comes in three forms. The repetitive orientation of megaliths, human burials, and cattle burials toward the northern regions of the sky reveals a very early symbolic connection to the northern regions of the sky, and it is the most substantial evidence of astronomy. The groups of shaped stones facing north may have represented spirits of

01 individuals who died either on the trail or locally. The second bit of evidence for
 02 astronomy is found in the stone circle with its two well-identified sightlines toward
 03 the north the positions of the rising sun at June solstice. Finally, the alignments of
 04 sandstone slabs, which are oriented to bright stars in the fifth and fourth millennium,
 05 suggest an even more careful attention to the heavens. The dates for possible asso-
 06 ciations with the brightest stars largely agree with the dates at the quarry and the
 07 cemetery.

08 Interest in the northern part of the heavens does indeed seem pervasive during the
 09 Final Neolithic at Nabta Playa and Gebel Ramlah, where we have found orientations
 10 to the north. The northern circumpolar region of the sky is that realm where stars
 11 never set and later in dynastic Egypt was identified as the realm of eternal life.
 12 Survival in the desert may have required an ability to navigate by the stars, as the
 13 nomads moved across the sea of sand without trails or major landmarks. There was
 14 no bright star at the north celestial pole at that time, but north could easily have been
 15 inferred from the circulation of stars around that region in the sky. On a flat northern
 16 horizon, the positions of the rising and setting of bright stars could have been marked
 17 by cairns and the midway position would have been north. North could have been
 18 established during the day by shadow casting of a vertical stick or gnomon.

19 The complex groups of slabs provide the greatest enigmas of Nabta Playa. Why the
 20 buried table rocks were chosen as the buried center piece and how they were located
 21 beneath the sands remain a puzzle. It seems unlikely that that the rocks had been
 22 found accidentally during excavation for wells, as these were in dunes at the edge of
 23 the playa and not in the playa sediments. Perhaps these large table rocks were revered,
 24 as in animistic traditions, for possessing supernatural forces or souls (Eliade, 1974).
 25 Unusual rocks have been viewed as sources of power and spirit throughout history,
 26 and these may have attracted attention earlier than the late Neolithic before they were
 27 submerged in the blowing sands. Their presence may have been part of the cultural
 28 memory of the community, and their location may have been revealed by slight mounds
 29 in the sand. In any case, this grouping of buried stones, water of the playa, human and
 30 cattle burials, the solstice sun, and stellar alignments appears to identify powerful and
 31 evocative symbols of these ancient herdsman.

32 33 34 35 36 37 38 39 40 41 42 43 44 45 References

- Applegate, Alex. 2001. "Site E-92-9: A Possible Late Neolithic Solar Calendar." In *Holocene Settlement of the Egyptian Sahara: The Archaeology of Nabta Playa*. Kluwer Academic, New York, pp. 463–467.
- Bagnold, R. A. 1931. "Journeys in the Libyan Desert 1921 and 1920." *The Geographic Journal*, Vol LXXVIII No. 1.
- Bretagon P., Rocher P., and Simon J. L. 1997. "Theory of the Rotation of the Earth." *Astronomy and Astrophysics* 319: 305–317.
- Brophy, Thomas G. 2002. *The Origin Map: Discovery of a Prehistoric, Megalithic, Astrophysical Map and Sculpture of the Universe*. Writers Club Press, New York.
- Brophy, Thomas G. and Paul A. Rosen. 2005. "Satellite Imagery Measure of the Astronomically Aligned Megaliths at Nabta Playa." *Mediterranean Archaeology and Archaeometry* 5: 15–24.

- 01 Eliade, Mircea. 1974. *Patterns in Comparative Religion*. New American Library, New York,
02 pp. 216–238.
- 03 Kuper, Rudolph and Stefan Kropelin. 2006. “Climate-Controlled Holocene Occupation in the Sa-
04 hara: Motor of Africa’s Evolution.” *Science* 313:803–807.
- 05 Malville, J. M., Fred Wendorf, Ali A. Mazar, and Romuald Schild. 1998. “Megaliths and Neolithic
06 Astronomy in Southern Egypt. *Nature* 392 (488–490)
- 07 Malville, N. J. 2005. “Mortuary Practices and Ritual Use of Human Bone in Tibet.” In *Interacting*
08 *with the Dead: Perspectives on Mortuary Archaeology for the New Millennium*, ed. G. Rakita,
09 J. Buikstra, L. Beck, and S. Williams. University Press of Florida, Gainesville. pp. 190–206.
- 10 Kobusiewicz, Michal and Romuald Schild. 2005. “Prehistoric Herdsmen.” *Academia- The Maga-*
11 *zine of the Polish Academy of Sciences*. No.3 (7) 20–23.
- 12 Schild, Romuald and Fred Wendorf. 2004. “The Megaliths of Nabta Playa.” *Academia- The Mag-*
13 *azine of the Polish Academy of Sciences*. No. 1 (1) 10–15.
- 14 Wasylikowa, Krystyna. 2001. “Site-75-6: Vegetation and subsistence of the Early Neolithic at
15 Nabta Playa, Egypt, Reconstructed from Charred Plant Remains.” In *Holocene Settlement of*
16 *the Egyptian Sahara, Volume 1. The Archaeology of Nabta Playa*. Kluwer Academic, New
17 York, pp. 544–591.
- 18 Wendorf, F. A. and H. Krolik. 2001. “Site E-96-1: The Complete Structures or Shires.” In
19 *Holocene Settlement of the Egyptian Sahara, Volume 1 The Archaeology of Nabta Playa*.
20 Kluwer Academic, New York, pp. 503–520.
- 21 Wendorf, F. A. E. Close, and R. Schild. 1992–1993. “Megaliths in the Egyptian Sahara.” *Sahara*
22 5:7–16.
- 23 Wendorf, F. A. and J. McKim Malville. 2001. “The Megalithic Alignments.” In *Holocene Settle-*
24 *ment of the Egyptian Sahara, Volume 1 The Archaeology of Nabta Playa*. New York Kluwer
25 Academic Plenum Publishers, New York, pp. 489–502.
- 26 Wendorf, Fred and Romuald Schild. 1998 “Nabta Playa and Its Role in Northeastern African
27 Prehistory. *Journal of Anthropological Archaeology* 17: 97–123.
- 28 Wendorf, Fred, Romuald Schild, and Associates. 2001. *Holocene Settlement of the Egyptian*
29 *Sahara, Volume 1 The Archaeology of Nabta Playa*. Kluwer Academic.
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45

01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45