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Fig. 1. Central section of the Tausert Temple site from the north. Although not large by temple standards, the site is still an extensive one encompassing many hectares.

The Tausert Temple Project

2007 Season

By Richard H. Wilkinson

The University of Arizona Egyptian Expedition (UAEE) began excavation of the unfinished temple of Queen Tausert in Western Thebes in 2004. Reports on the first three seasons' work at the site were published in previous issues of the *The Ostracon*.[1] This article summarizes the fourth field season, conducted throughout May 2007.[2]

Archaeology has not always been as systematic as it at least attempts to be today. Because only limited parts of the Tausert Temple site were briefly examined by W.M.F. Petrie[3] in 1896 and the site has since been ignored, specific goals have been set for the UAEE project:[4]

1) To properly clear the temple site and to publish the results.
2) To produce a detailed archaeological plan of the temple site and its surrounding area.
3) To conserve the scant remains of the temple as much as possible.

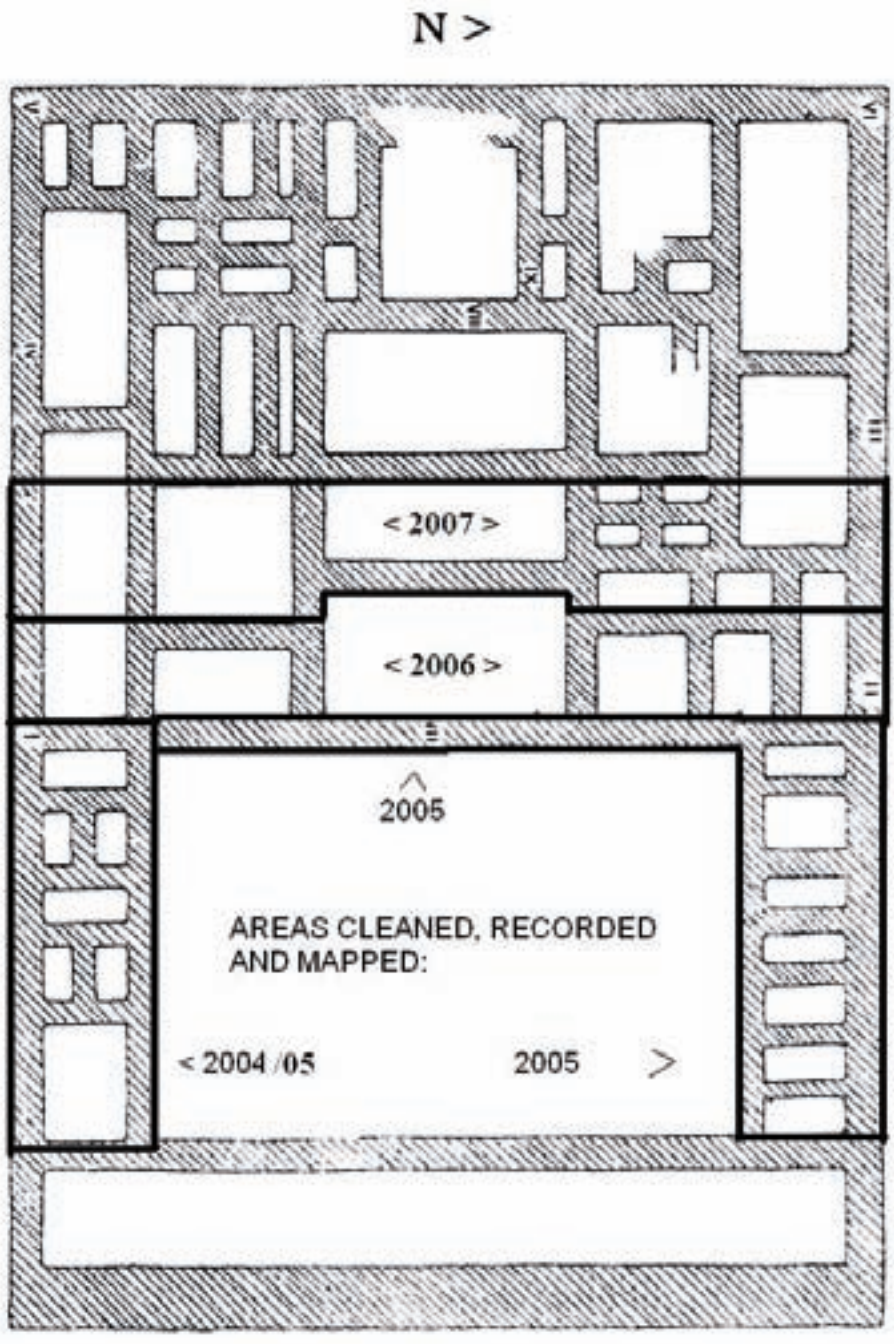


Fig. 2. Petrie's plan of the Temple of Tausert (1897) showing the areas cleaned, recorded, and mapped in the University of Arizona Expedition's 2004, 2005, 2006, and 2007 seasons.

EXCAVATION

Over time a large amount of debris has been deposited across the whole temple site by floods from the Theban massif. In addition, thousands of meters of the temple's exposed foundation trenches (all of which are c. 2 meters wide by c. 2 meters deep) are full of the sand originally placed in them as well as accumulated fill—all of which must be removed for full cleaning of the site. In our 2007 season we continued our work to the west of the temple's courtyard—moving farther into the inner part of the temple area—and were able to clear a number of trench and surface units across the entire width of the temple.

Some of the sections of the trenches we cleaned this season contained mixed sand and dirt but virtually no artifacts. These sections were clearly areas where Petrie's men had probed when they examined parts of the site. For example, several units along the trench[5] we designate as TB10 were disturbed and produced no finds—yet other units, farther to the north in the same trench, were undisturbed and contained a number of features and artifacts including a large number of mud bricks with cartouche stamp impressions. A number of these bricks bore the clear cartouche of Thutmose IV indicating that building materials from that king's monument—located just a little to the north of our site—were frequently used in the construction of Tausert's memorial temple.

Our latest season was marked, in fact, by the discovery of a number of inscriptions and features of the temple including a stela or statue niche in the *gebel* wall of trench TB10, an intriguing hieratic note painted on the *gebel* wall suggesting the location of a foundation deposit pit (doubtless removed by Petrie's men without his knowledge), an intact offering pit with the remains of a meat and plant offering, several superstructure walls, and a row of megalithic foundation blocks—two of which revealed hieratic inscriptions.

Of particular interest because of what it suggests was the small hieratic note painted onto a stone on the east side wall of unit 7 of trench TB10. This hieratic note simply records the name "User-ma'at-ra" but is of interest both because it points to the association that we find Tausert constantly made with her illustrious forebear, Ramesses II (this association will be fully documented in our final site report), and also because it probably indicates the location of a foundation deposit pit that was unknown to Petrie and likely

robbed by his men. The location of the graffito on the central axis of the temple at exactly the spot where foundation deposits were found in parallel south-north foundation trenches makes this extremely likely. This area of trench TB10 is one of the few on the site that we have found so far that was completely disturbed, yet this hieratic note and the rock-cut niche only a few meters away were both unnoted by Petrie and were clearly unknown to him.

The rock-cut niche appears to be an anomalous feature as we have found nothing else like it in our excavation to date. Measuring some 43 cm across its top and 41 cm across its base, the niche narrows to c. 33 cm across its back interior. Its depth in the *gebel* wall is about 48 cm. The purpose of the niche is unknown as it was found empty (doubtless robbed of any contents by Petrie's men), and its very existence was apparently unknown to Petrie,

Fig. 3. Rock from wall of foundation trench with hieratic note "User-ma'at- ra" likely marked the location of a foundation deposit pit unknown to Petrie and robbed by his men.

Fig. 4. Rock-cut niche found in the trench wall of section TB10:7, also unknown to Petrie.

Fig. 5. Possible doorway area of temple room S28 with cleared offering pit that was cut into the corner of the room. The pit contained the remains of an offering of meat and plants.

Fig. 6. Samples of the c. 3000-year-old leaves, *Persea* species, that had been placed as a symbolic covering for the meat offering discovered in the offering pit in room S28.

who does not note it in his publication. If the contents of the niche were indeed stolen and sold by Petrie's workers, then the existence of this feature would naturally not have been mentioned by them and the niche would simply have been hastily re-covered by backfilling. The churned and totally disturbed nature of the trench fill at this point leaves no doubt that the feature was indeed discovered even if it was not reported to Petrie. The examination of trench TB10 by Petrie's men seems to have stopped about this point, however, as the trench fill soon reverts to undisturbed strata. Although there were relatively few artifacts found in this area, the trench and its surrounding *gebel* surfaces revealed a number of undisturbed features unknown to either Petrie or his men.

For example, an intact offering pit that we found farther along this same trench clearly showed that Petrie's men had not continued their cursory examination of this area of the temple. The pit was cut into the *gebel* surface of unit S28—one of the temple's rooms. It measured some 30 cm wide and 35 cm deep and contained the remains of a haunch of beef (probably a young calf) set in very fine sand and covered with what may have been a plant wreath. Many of the leaves, stems and seed pods we found were in good enough condition that we have tentatively identified the plant as a species of *Persea*—a tree of particular religious and mythological significance to the ancient Egyptians.

Only a few centimeters from this offering pit we found a broken—though largely intact—jar embedded in what appears to be a shallow trough-like depression bisecting the surface of this unit. Although undecorated and of plain Nile silt, it is possible that the jar served some function in foundation ceremonies—as we believe the decorated Blue-Ware jar did that we discovered in 2006 a few meters away on another surface area adjacent to this trench.

The northern units of trench TB10 also revealed a row of

megalithic foundation blocks in this undisturbed area. The blocks are much larger than any we have previously found; they measure between 1.40 m and 1.80 m in length, about 1.20 m in width, and have an impressive thickness of between 60 and 70 cm. The blocks must each weigh a number of tons and most were carefully cut.

These massive blocks were positioned in an area of particular interest. The trench that we designate as TB10 seems to have been the interface between an inner, probably earlier, part of the temple and the outer area of expansion, which we believe was begun late in the queen's reign. The massive foundation could have been intended to receive a particularly large wall or pylon, and the liminal nature of this area is perhaps indicated by the numerous foundation-related features that we have discovered along its length and on its immediately adjacent surface areas: the *gebel* inscription, offering pit, extra-large foundation blocks, foundation block inscription, and apparently surface-smashed offering pots—all features that we have not discovered elsewhere on the site.

The foundation blocks themselves are regular in shape, but each has a semi-circular notch cut away on one top edge (usually on one end of the block) that must have been utilized in the building techniques employed in the temple's construction.

One of the foundation blocks that we discovered in our excavation last season, which bore an important hieratic inscription on its upper surface, revealed yet another text this season. Because the temple's foundation blocks overlay undisturbed sand, we recorded the exact position of the block, and then slid it to one side (a task that required a team of specially equipped workmen) to excavate the area beneath it. After this area was excavated, we returned the block to its exact previous location in order to preserve the original appearance of the temple remains. When we moved the inscribed block that we

Fig. 7. The first five foundation blocks (still half-buried) beginning to appear in the excavation of trench TB10. Several inscriptions were found on the blocks discovered so far.

Fig. 8. Example of the large foundation blocks discovered in the 2007 season—each with a distinctive semi-circular builder's notch cut into one end.

Fig. 9. Hieratic inscription with regnal date—"year seven of the king"—and number "129" (which may be an identifying number for the block), on edge of foundation block from unit TA13:5-6: Hesbet 7 Nesut-bity, 129 (?).

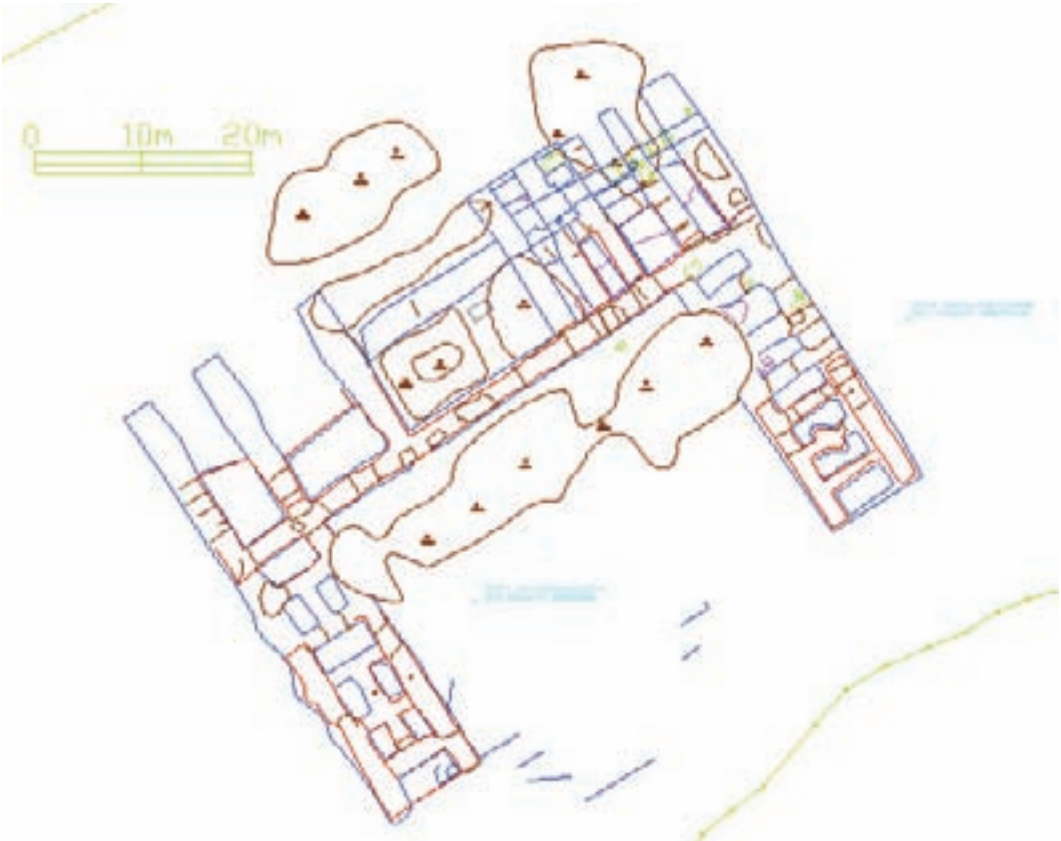


Fig. 10. Small-scale copy of AutoCAD drawing of areas investigated in seasons 1–4 of the Tausert Temple Project. Irregular areas outlined in brown are mud brick masses.

found last year, another text—this time on the western edge of the block—came into view.

While the first inscription discovered on the block designated FB:1 names the temple and gives a regnal date formula from Tausert's eighth year (including her regency with Siptah and likely marking the date of the temple's expansion), the newly found text seems to be a quarrying notation[6] listing year seven (doubtless when the block was cut) and the number of the block (129), showing that a great number of such stones had already been quarried for the temple.

Another foundation block (FB:7) revealed yet another inscription, though this text is poorly preserved and is still being studied. The inscription is written in very small characters on one of the block's long sides and is quite different in appearance from both the formal foundation inscription discovered on the top surface of FB:1 and the large quarrying text newly discovered on that block's end surface.

In addition to these megalithic blocks, we also continued to find a number of what we have called "Type A" walls (built from the bottom of the foundation trenches to the top of the sand level) and "Type B" walls (built from the sand level to the top of the trenches.[7] The latter seem to be associated with foundation deposit pits as they are usually found near them or their probable locations. These walls appear to be unique to our site and the purpose of both types remains unclear. It is also clear that we now also have at least two "Type C" walls next to trench TB10 which, unlike the other types, reach above the level of the trenches or surface areas and represent superstructures of some type. Whether these "Type C" walls represent the walls of rooms or other features of the original, inner area of the temple is presently unknown. Certainly their location indicates that this might well be likely.

In total, this season's work enabled us to clear an area of many hundred square meters using

a somewhat smaller team of thirty-five workmen. Considering the many thousands of cubic meters of debris still remaining to be excavated, it is expected that the site will require at least two more seasons of clearing.

MAPPING

In our first four seasons we have made good progress toward creating a modern, archaeologically and scientifically accurate map of the temple. In our second season we began production of an AutoCAD model of the site and the areas worked, and this model was updated and further developed in our 2006 and 2007 seasons.

Eventually we plan to incorporate all our data for the site into a three-dimensional GIS model based on the completed AutoCAD file. One of our new team members this season is an experienced computer specialist, and he has begun the initial work for this total matrix GIS model. The completed model will give full and immediate access to all excavation and survey data from our project. In the finished program, clicking on any area of the map of the temple site will show excavation, artifact, feature, unit, and conservation details for that locus. The GIS model will incorporate textual and photographic evidence as well as statistical analysis of the site's data.

This interactive, computer-based plan will be much more valuable than the existing limited and inaccurate plans of the Tausert Temple site, especially as we have already discovered that the plan of the temple made by Petrie (on which all others have been based) is not accurate in many—if not most—areas. Petrie's plan misinterpreted many features and missed or inaccurately recorded others. Examples of this inaccuracy have already been given in our previous reports, and other examples became apparent in our current season. Our final site report is expected to change the presumed plan of the temple considerably.

PRESERVATION

In clearing the temple's foundation trench areas we have continued to carefully assess each 2-meter unit in terms of the condition of the walls and floor of each trench. Every unit was assessed as being intact, good, fair, poor, or destroyed (using a percentage range breakdown). We have also used this method to assess all the mud brick walls and other features uncovered in the trenches so far in this manner. This season we also began to assess the condition of the surface units that represent the courtyards and rooms of the temple site. We utilized the same range of assessment criteria to keep all our data consistent and fully searchable. The data is being entered into a digital database in which we record the level of preservation needed for each section of the temple and group units of similar level of preservation needs together for parallel assessment and treatment.

Two areas need special consideration. The first is that of the foundation trenches and surface areas of the site. Although they are intact in many areas, the trenches and surface areas are broken down and weathered in other areas—especially in the outer area of the temple. It would seem preferable to preserve the original configuration of the temple wherever possible, and toward this goal we began this season to move beyond the simple recording of the condition of trench and surface units and have now drawn up a prioritized list of areas needing specific consolidation and preservation—which we hope to begin next season.

Also needing special consideration are the mud brick walls in the temple's foundation trenches as well as those that we are beginning to find above ground level. These walls are important remaining features of the temple's design and architecture, but many are partly broken down. Accordingly, we began to preserve these walls in this year's season and were able to stabilize and reconstruct a number of them.

RETROSPECT

Overall, our fourth season of work on the Tausert Temple Project was extremely successful. Not only did we clear another large area of the temple site, but we also recovered a number of artifacts and features of the monument not previously found or recorded. Most notable was our discovery of a further hieratic text on an important foundation block dating the temple foundation or expansion to Tausert's eighth regnal year—and now showing that (contrary to Petrie's assessment) a great many blocks had been prepared and placed in the temple's trenches. We were thus able to continue to gain a greater understanding of the temple's design and structure and the history of its development. Our further recording of the condition of the features of the monument will aid in its preservation, and our mapping of the newly cleared area has advanced our goal of producing the first accurate plan of this long-neglected temple.

It is sometimes said that archaeology is the clearest example of a profession where one never knows what will come up at work. Our fourth season at the Tausert Temple site recovered fewer artifacts than our preceding seasons—due to the disturbed nature of some of the areas on which we concentrated—yet the features and inscriptions discovered this season have amply rewarded us for our work.

NOTES

1. See: Richard H. Wilkinson, "The Tausert Temple Project: 2004 and 2005 Seasons," *The Ostracon: The Journal of the Egyptian Study Society 16.2* (Summer 2005): 7–12; "The Tausert Temple Project: An Additional Feature Discovered in the 2005 Season," *The Ostracon* 17.1 (Spring 2006): 9; "The Tausert Temple Project: 2006 Season," *The Ostracon* 17:2 (Fall 2006): 9–12.
2. We thank the Director General and the members of the Permanent Committee of the Supreme Council of Antiquities for granting us permission to continue this project. We would also like to thank Mr. Magdy El-Ghandour, Director of Foreign Missions, for his continued help in arranging our work in Egypt. In Luxor, the Director of Upper Egypt, Mr. Mansour Boraik, was of great help and we thank him particularly. We also thank Mr. Ali El-Asfar, Director of West Bank Antiquities, as well as our assigned inspectors, Mme. Zaneb Ali Mohammad and Mme. Asma Kamel El-Adin Ahmed, for their help, along with Reis Ali Farouk Sayed El-Quftawi, Assistant Reis Omar Farouk Sayed El-Quftawi and our workmen. As before, our thanks are also due to Dr. Gerry Scott and the staff of the American Research Center in Egypt, which facilitated our expedition—and most especially to Shari Saunders and Mme. Amira Khattab. Finally, and certainly not least, we gratefully acknowledge the generous support of Stephanie Denkowicz, Donald Kunz, Kathryn Michel, Dr. Bonnie Sampsell, Ted Snook, and The Amarna Research Foundation, whose kind help made our season possible.
3. Petrie's work at the site of the Tausert temple is recorded in his book: W. M. Flinders Petrie, *Six Temples at Thebes* (London: 1897), pp. 13–16. Other publications deal with the site only

briefly but include: U. Hölscher, *The Mortuary Temple of Ramesses III*, part I, vol. III of *The Excavation of Medinet Habu*, The University of Chicago Oriental Institute Publication LIV (Chicago: 1941), pp. 22–32.

4. Our project staff for the 2007 season consisted of Dr. Richard Wilkinson (director), Ashleigh Goodwin (assistant director for mapping), Damian Greenwell (assistant director for excavation), Danielle Phelps (object registrar), Stephanie Ratcliffe (field assistant), Linda Regan-Gosner (field assistant), and Christopher Schafer (photographer and data matrix specialist). We employed thirty-five Egyptian workmen as well as a reis, an assistant reis, a driver and boatmen for the season. Several team members were not able to participate this season, but they were available for consultation and communication throughout our work.
5. The numeration employed in our designation of trench and surface units in the Tausert site is documented in our reports and publications but may be briefly explained here as follows: The temple's foundation trenches were assigned designations TA1–14 for east-west trenches and TB1–9 for south-north trenches (with 2 meter sub-units) in the areas cleared so far. This system makes possible a better analysis of artifact distribution than a regular grid system would allow. Surface units defined, studied or cleaned so far have been designated S1–S34.
6. We are grateful to Professor Eugene Cruz-Uribe for his kind help in translating the hieratic texts that we found, and to Dr. Teresa Moore, who also provided input on one of the texts.
7. See "The Tausert Temple Project: 2006 Season," *The Ostracon* 17.2 (Fall 2006): 12.

Dr. Richard H. Wilkinson is professor of Egyptian archaeology at the University of Arizona and director of the University's Egyptian Expedition, which has conducted research and excavation in Egypt since 1989. He is the author of many articles and books on ancient Egypt and editor of a forthcoming book, Egyptology Today, *to be published by Cambridge University Press early next year.*

Erratum

Figure 8, page 12, of *The Ostracon*, volume 17, no. 2 (Fall 2006) was incorrectly published in the printed copies but corrected in the on-line edition. We apologize to Dr. Wilkinson for the error. The correct figure is:

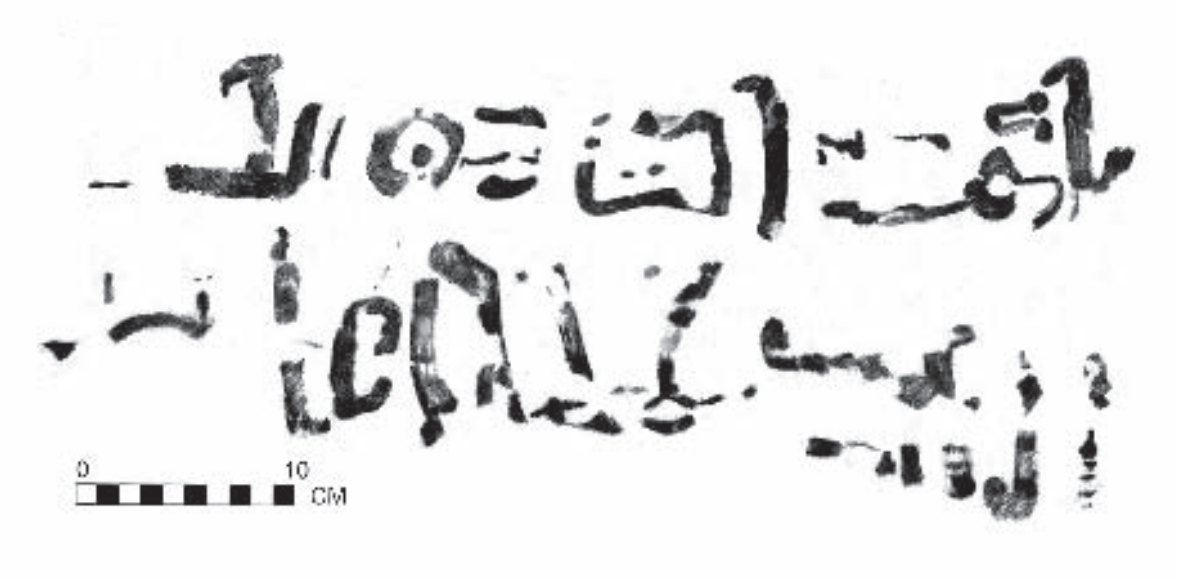
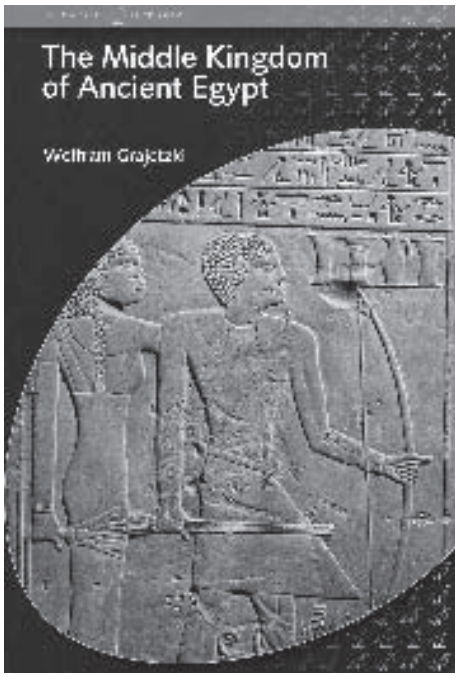


Fig. 8. Drawing of the hieratic inscription with regnal date formula.



Wolfram Grajetzki, *The Middle Kingdom of Ancient Egypt: History, Archeology, and Society.*

London: Gerald Duckworth & Co., Ltd., 2006. ISBN 0-7156-3435-6. Paperback, 208 pages, $31.

By Jane Bigelow

Read this book if you're curious about ancient Egypt's Middle Kingdom. Wolfram Grajetzki quotes extensively from original sources, especially in the history section of the book; he also provides a bibliography, a list of recommended titles for further reading, and appendices which give both king lists and information on what evidence we have for each king's name and reign.

Also read this book if you're interested in seeing how archaeologists can work from fragmentary finds to build up a coherent picture of an era and a place. Where speculation is needed to fill in the many gaps in the record, Grajetzki is careful to label it as such. He shows us exactly why he proposes each scenario.

Like the subtitle, the book is divided into three main sections. The first, about history, is a chronological record of events and rulers. A shorter archaeology section then describes the main archaeological sites, working from south to north. Another short section on society in general completes the main text. Several useful appendices follow, giving lists of rulers, viziers and treasurers as well as tables of names and dates.

Grajetzki's aim is to provide an introduction to the history of the Middle Kingdom. He lays out the weaknesses and strengths of his sources with great care. He explains the difficulty of establishing a chronology from sources such as the king-lists of Manetho, which are known only from later sources, sometimes at third or fourth hand. Since most of the monumental architecture of the period was quarried for its fine limestone, there are many times when we are uncertain even of the names of the rulers.

We do have many individual objects from this time. The lovely model of a garden that appears in so many books on ancient Egypt was from this era. Middle Kingdom block statues of squatting people, carved so that the legs, torsos and arms almost disappear into a cube, have a curiously modern, semi-abstract character. Unfortunately, this book has no color illustrations; it would have been pleasant and useful to see the colors of the coffin fragments, for example. I suspect that this was done to keep the book affordable. However, there are numerous line drawings, maps, and a short section of black and white photographs. These are clear and usable, though some of the fine detail in the photographs suffers from the lack of color.

Although many details of the Middle Kingdom remain uncertain, it produced what is now considered the great classical period of ancient Egyptian art—and especially literature. According to Grajetzki, "The language of the period remained the classical language for royal and religious writing [until] the end of the use of the hieroglyphic script." After reading the quotations that Grajetski supplies, the reader can understand why this is so. Even in translation (which is the only way that most of us can hope to read these works) the beauty of the language is clear.

This book is an excellent place to start exploring Egypt's Middle Kingdom.

ESS member Jane Bigelow is a librarian, a writer and an occasional contributor to The Ostracon. *She has published several short stories and her fantasy novel,* Talisman. *She lives in Denver with her husband and a small, noisy cat named Miss Motley.*

The Phoenix and the Benben

The Start of the Egyptian Calendar as the First Time

By James R. Lowdermilk

On the morning of July 20, 4243 BCE, a conjunction of Mercury and Venus appeared, creating a giant triangle in the sky with the rising bright star Sirius (figure 1). The conjunction resembles the *benben* triangle of the Egyptian creation myths in many ways. It also appeared when the first calendar-day of the 365-day calendar year, day 1 of the month of Thoth, coincided with an event the ancient Egyptians called *prt spdt,* the Sothic rise. The coincidence of these two dates, 1 Thoth and *prt spdt*, defines the beginning of a new Sothic period. If the assumption is correct that the calendar was inaugurated by the Egyptian peoples at the beginning of a Sothic period, as suggested by Eduard Meyer in 1904, then this rare conjunction points to this date as the best choice for the beginning of the calendar. A study of the standing stones at Nabta Playa and planetary conjunctions visible throughout Egyptian history will illustrate why this author believes that the 4243 Sothic rising was the commencement of the Egyptian 365-day calendar.

NABTA PLAYA

Nabta Playa was the location of seasonal lakes filled by rain that fell over the Sahara between 12,000 and 5,000 years ago. Tribes of cattle herders who utilized the Saharan grasslands congregated at this site every year to socialize and trade while their cattle fed and drank from the lakes. The many tribes would move their herds to better pastures before the lakes completely dried in the summer sun.

The people at Nabta Playa erected standing stones aligned with the rising points of various stars before 4700 BCE (Malville 1998, 488). One of these alignments is directed toward the rising point of Sirius (Malville 1998, 488), suggesting that these people could have identified and observed the "Sothic rise." This is the morning when the star Sirius, which the Greeks called Sothis, rises above the eastern horizon just before sunrise, allowing it to be seen for the first time each year after being absent from the night sky for some 70 nights. The dynastic Egyptians called this event *wpt rnpt*, the "opener of the year," or *prt spdt*, the "coming forth of Sothis" (Parker 1950, 33–34).

The site of Nabta Playa contains large walk-in wells (Wendorf 2002, 15), so some of the tribesmen may have resided at the playa year round. The tribesmen were probably acquainted with mathematics through the management and accounting of the herds. They could have observed that most Sothic rises occur 365 sunrises or days apart with additional leap years of 366 days interspersed usually every fourth sighting. These early astronomers could have used this data to create the tools necessary to devise and maintain the Egyptian calendar of 365 days (Lowdermilk 2000, 2–5), here referred to as an "e-year." The stones were erected about 500 years prior to the 4243 BCE start date, leaving ample time to collect and interpret the data about the risings of the stars.

START OF THE EGYPTIAN CALENDAR

The ancient Egyptians used a calendar year broken into three seasons of four months each. These twelve months of 30 days each with five additional days that belonged to no month add up to 365 days. The five "epagomenal" days, as they are called, are mentioned in the Pyramid Texts from Pepi II's pyramid (Clagett 1995, 29). The calendar was in use before the fourth dynasty pharaoh Shepseskaf (Clagett 1995, 28), but the references in the Pyramid Texts suggest an earlier origin.

The 365-day calendar did not take into account leap years, but the Sothic rise, *prt spdt*, exhibited leap years every fourth year with few exceptions. This caused the calendar to move ahead of the Sothic rise one day every fourth calendar year. After 1,460 Sothic rises the calendar would show 1,461 e-years counted and the Sothic rise would return to the same day of the calendar. The Sothic rise occurred on 1 Thoth at the beginning of these Sothic periods. This happened on July 20, 139 CE (Clagett 1995, 333–5). This also occurred on prior multiples of 1,460 Julian years: 1322 BCE, 2782 BCE, and 4242 BCE. The events happen together on four-year intervals ending in the given years; therefore the two phenomena occurred together on July 20, 4243 BCE, as well.

A running count of e-years kept by the Egyptian priests from the start of the calendar may have been referenced in the Book of Sothis by Manetho, transmitted only through Georges de Syncellus. Manetho states, "Now, among the Egyptians there is current an old chronography" (227–9). Syncellus claims, as he does many times, that this led Manetho into error. Manetho continues, "Hephaestus has no period assigned, because he shines night and day. Helios, son of Hephaestus, ruled for 30,000 years. Then Chronos (it says) and the remaining gods, 12 in number, reigned altogether for 3,984 years." *Chronos* in Greek means "time." The "reign of Chronos" could mean the length of measured time, as in the 12-month Egyptian calendar.

Manetho writes in a letter included in the Book of Sothis, "To the great King Ptolemy Philadelphus. Greeting to my lord Ptolemy from Manetho, high-priest and scribe of the sacred shrines of Egypt…. I shall place before you the Sacred Books which I have studied" (Manetho 209–211). A count of 3,984 e-years from the 4243 BCE starting date of the calendar falls in 262 BCE during the reign of Ptolemy Philadelphus, 281–246 BCE. It must be noted that some modern authors date this "old chronography" anywhere from 400 BCE to the late 2nd century BCE, contrary to the account of Syncellus (Manetho 226). However, the count from the given starting

date of the calendar is striking in that it is said to be "current" and accurate to Manetho's time. The Egyptian god Thoth is the god of record keeping, suggesting that this record of counted years could have been kept religiously, without adjustment, from 4243 BCE to at least the Late Period.[1]

OBSERVING THE BENBEN

If the tribesmen identified the Sothic rise using the Nabta stones then these people must have been making long-term observations of the stars. A pattern in the conjunctions of Venus and Mercury could have been recognized before 4243 BCE while collecting the data on the yearly star risings. If these people were experimenting with a 365-day year before the actual implementation of the calendar, they presumably could have recognized that Venus, after reappearing many times, resided at its highest point in the sky every 8th e-year or every 8 x 365 = 2,920th day.[2]

The appearance of Venus in the same location after eight e-years is a model for the apparent motion of any planet. Every planet will appear in the same visible location in multiples of 365 days with little error.[3]

- Mercury 20 e-years
- Venus 8 e-years
- Mars 47 e-years (or 17 e-years with greater error)
- Jupiter 12 e-years
- Saturn 29 e-years

The observations for Venus and Mercury are the easiest to attain because these planets rise up and drop down in the morning or evening sky. These planets' "high" points are easily observed because the planets move slowly at these apexes or elongations. If Venus and Mercury appear together at their morning maximum elongations they will appear together again in 40 e-years, this being the second e-year return of Mercury, 2 x 20 e-years, and the fifth e-year return of Venus, 5 x 8 e-years.

The conjunctions of Mercury and Venus would be visible to someone observing the rising of the stars in the morning hours before sunrise. The 40 e-year cycle could have been recognized within one lifetime and then checked for generations. Eventually, after about 400 years, the error accumulates so that Mercury visibly moves past its apex at the expected 40 e-year intervals. Any time both planets align they will realign every 40th e-year with the larger error of the faster-moving Mercury eventually breaking the pattern. This cycle only works with 365-day years; the error accumulates too quickly when using a solar or sidereal year of approximately 365.25 days.

Each 40 e-year interval is about ten days short of 40 solar or sidereal years. Therefore, the stars progress about ten degrees toward the eastern horizon as each Mercury-Venus conjunction recurs.

- 120 e-years before the 4243 BCE conjunction, Sirius resided about 40 degrees above the horizon.
- 80 e-years prior Sirius appears about 30 degrees above the horizon.
- 40 e-years prior Sirius appears about 20 degrees above the horizon.

Sirius appeared to be marching into place each of these 40 e-year periods to make a triangle with Venus and Mercury (figure 2).

MYTHOLOGY OF THE BENBEN

Utterance 600 of the Pyramid Texts states, "To say: O Atum-Khepri, when thou didst mount as a hill, and didst shine as *bnw* of the *ben* (or, *benben*) in the temple of the 'phoenix' in Heliopolis" (Mercer 1952, 253). Atum is the creator god "in the beginning" and Khepri

Figure 1. Triangular conjunction of Mercury, Venus, and Sirius as seen from the site of the Nabta Playa stones (Lat: 22° 30′ 29″ N, Long: 30° 43′ 31″ W) before sunrise on July 20, 4243 BCE.

Figure 2. Conjunctions of Mercury and Venus over 40 e-year intervals. Top to bottom: August 9, 4323 BCE; July 30, 4283 BCE; July 20, 4243 BCE.

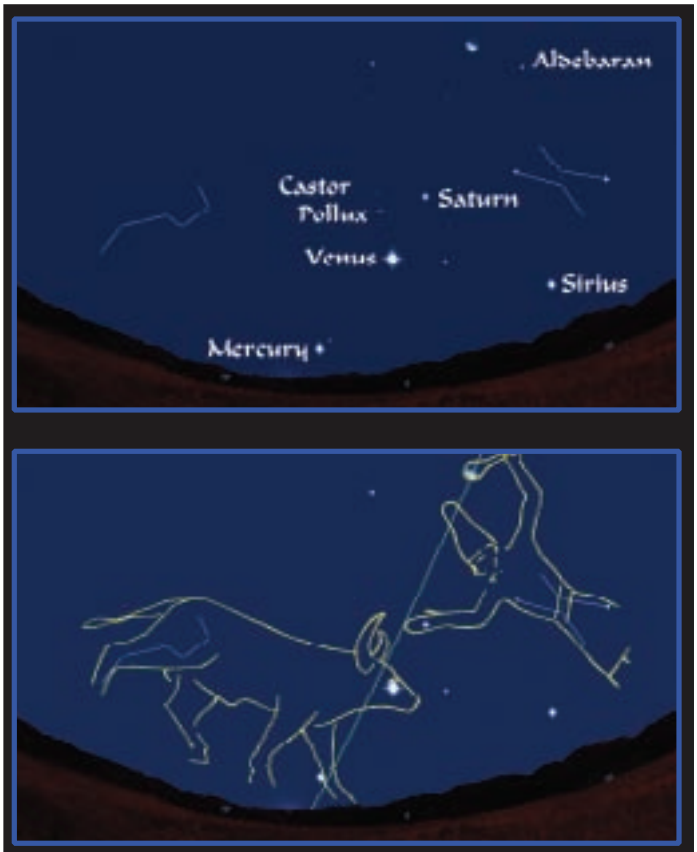


Figure 3. On the morning of July 20, 4243 BCE, a half-moon resided high over Orion/Atum as a mace with Aldebaran as a cocked-elbow (top). To the north the Big Dipper sat as an upright "Leg of the Bull" with Castor and Pollux as the horns, Venus as the eye, and Mercury as the hoof of the Bull (bottom). Saturn sat as an outstretched arm of Orion/Atum holding the horns of the bull (top). The path of the moon over the following two weeks is shown as a green line (bottom).

is the manifestation of the sun god as the sunrise. Therefore Atum-Khepri is the "first sunrise." The *benben* is represented as a triangle throughout Egyptian history. It is the primordial mound of earth that rose out of the eternal waters before the first sunrise.

If July 20, 4243 BCE, is the first day of the Egyptian calendar, then the Mercury-Venus-Sirius conjunction could represent the *benben* that rose before the "first sunrise" of the calendar. Above this triangular conjunction and to the south sits the constellation Orion (figure 1). This anthropomorphic constellation appears as Atum mounting the hill of the *benben*. The pyramid text could be describing this scene as it was viewed on that morning before the calendar was inaugurated.

SMITING SCENE

On this morning a half moon sat above Orion/Atum with the star Aldeberan in position as a cocked elbow (figure 3). This view closely resembles one of the many smiting scenes often depicted in pre-dynastic iconography, such as on the Narmer palette. Orion/Atum appears to be striking to the north. North of the *benben* conjunction sits the constellation we call Ursa Major or the Big Dipper. The Egyptians called this the "Leg of the Bull." On this morning the constellation sat upright as if the "Leg of the Bull" were standing, not spun around as it would be at any other time of the year. The stars Pollux and Castor make the horns of a bull with Venus and Mercury as the eye and hoof of the bull respectively.

Saturn resides between Orion/Atum and the horns of the bull as if Atum were holding the bull by the horns with an outstretched arm. The moon moves toward the bull on each successive morning and strikes the bull right in the forehead four mornings later as a crescent moon. It continues on each morning and chases Mercury below the horizon as the planet sets and the moon wanes. Orion/Atum smites the bull and knocks its hoof out from under him.

In Greek mythology the constellation of Orion is also smiting a bull, Taurus, except to the south (figure 4). This symbolism may have its roots all the way back at the beginning of the Egyptian calendar. The smiting scene of Orion/Atum striking the bull sends its hind leg spinning around yearly just as the Big Dipper still spins today.

Forty e-years later the Mercury-Venus conjunction returns to view with Sirius just above the horizon and Orion/Atum clearly mounted on the "hill" (figure 5). Sitting on top of the hill, next to Venus, is Jupiter, the brightest of the planets that traverse the whole of the heavens. This marks Atum as triumphant with the two brightest planets in conjunction atop the *benben*.

The *benben* is presented here as a planetary conjunction whose appearance worked its way into the mythology of the people who inhabited ancient Egypt. This theory would be supported if other planetary conjunctions can be shown to appear in the imagery of the Egyptian religion. Such is the case of the phoenix.

PHOENIX

The phoenix is the Greek name for the mythical bird known in Egypt as the *bennu*. The first century Roman historian Tacitus, writing about the discussions of phoenix among the "most learned men of [Egypt] and of Greece," said, "It is my wish to make known all on which they agree" (Tacitus, Annals 6.28), making this the best source about these "marvelous phenomena." Tacitus claims that a phoenix appeared in Egypt during the consulship of Paulus Fabius and Lucius Vitellius, in 34 CE. Duncan Macnaughton, writing in 1932, put forth the idea that the phoenix was a conjunction of Jupiter and Saturn occurring close to the star Spica because this occurred in 34 CE (Macnaughton 1932, 72–73). However, the conjunction in 34 CE was a rare double conjunction of these two planets.

The planets that reside outside the Earth's orbit around the sun sometimes appear to move backwards, or east, when the faster-moving Earth passes between them and the sun. This is called retrograde motion (figure 6). If both Jupiter and Saturn go into retrograde motion at about the same time, the planets can appear to pass each other, forward and back, up to three times in seven months. The planets were in conjunction on October 5, 34 CE, and then again on March 13, 35 CE. Double conjunctions can occur between 20 and 600 years apart; the average is about 250 years.

Pliny the Elder claims a phoenix came to Egypt during the consulship of Quintus Plautius and Sextus Papinus in 36 CE, but he calls the phoenix "counterfeit" and "fabulous" (Pliny 10.2). Tacitus calls this phoenix "spurious." This could be because a proper phoenix must show Jupiter and Saturn in conjunction three times. Triple conjunctions of Jupiter and Saturn can occur between 40 and 300 years apart; the average is about 185 years apart.

Tacitus writes that "the former birds flew into the city called Heliopolis." When referring to the phoenix, commonly known as a bird, he uses the plural, "birds." Herodotus also speaks of a father and son pair of birds (Herodotus 2.73). The Egyptians called Jupiter "Horus, who bounds the two lands" (Clagett 1995, 226) and Saturn

"Horus: bull of the sky." Horus is depicted as a falcon. The phoenix could be the spectacular dance of these two planetary "birds" as they go through retrograde motion together at the same time. An inscription on an obelisk erected by Hatshepsut at Karnak mentions the "time of the double hen" (Budge 1968, 17). A triple Jupiter-Saturn conjunction occurred in 1495 BCE during her reign.

Tacitus also claims the birds flew into Heliopolis during the reigns of "Sesostris, Amasis, and Ptolemy, the third king of the Macedonian dynasty." A double "phoenix" conjunction occurred in 265/4 BCE during the reign of Ptolemy Philadelphus, the third king of the dynasty, counting Alexander. Triple conjunctions appeared in 562 BCE during the reign of Amasis II and in 1834 BCE during the reign of Senuseret III, called Sesostris by the Greeks. The two conjunctions associated with foreign rulers are the only double alignments of the planets mentioned by Tacitus.

OBSERVING THE PHOENIX

Herodotus writes of the phoenix, "He comes at the time his father dies…. He sets out from Arabia and conveys his father to the shrine of the Sun, and he carries his father emplastered in myrrh and buries him in the Sun's shrine. The manner of his conveyance is this: first he forms an egg of myrrh, of a weight that he is able to carry, and after that he tries carrying it; and when the trial of it is over, he hollows out the egg and stows his father into it…. When his father lies within it, the weight is then the same as at first; and so, having plastered it over, he carries his father to the shrine of the Sun in Egypt" (Herodotus 2.73).

The Egyptian name for the phoenix, *bennu*, is derived from the word *weben,* meaning "to shine" (Quirke 1992, 27), evoking images of the planets or stars. A triple conjunction of Jupiter and Saturn begins with Jupiter rising about 10 days before Saturn in the east, the direction of Arabia. Two months later they are in conjunction. Saturn takes from weeks to a few months to slow to a stop against the background stars, and then Jupiter passes Saturn for a second alignment. It appears that the dimmer Saturn, as the father, has died and is being tended to by the bright, young son, Jupiter.

This second conjunction of Jupiter and Saturn occurs when the two planets are directly opposite the sun. This places the planets in the path of a full moon. This full moon could represent the "egg of myrrh" mentioned by Herodotus, above. Some triple conjunctions are symmetric, with Saturn stopping twice evenly about 1.5° on either side of Jupiter during the three conjunctions (figure 7, top). The moon will be 100% full as it passes this conjunction (figure 8d). A non-symmetric triple conjunction has Saturn stopping too close on one side of Jupiter and passing about 3° on the other side before stopping (figure 7, middle). The moon will be about 95% full when it passes an asymmetric conjunction. Saturn and Jupiter can also just touch as Saturn stops, causing a double conjunction with no full moon close to either alignment.

When Saturn passes behind Jupiter it will slow, stop, and move back toward Jupiter to make a third conjunction within 7 months of the first. This could be construed as Jupiter pulling on Saturn to stop the backward motion, as if Saturn were being carried. This endeavor would be a "trial" lasting anywhere from a few nights to more than two months depending on symmetry.

The third conjunction will be closely passed by a waning quarter moon. At this point Jupiter places the father bird, Saturn, into the hollowed-out egg. After Saturn passes Jupiter for the last time it will surge ahead at the same pace as before the first conjunction, as if it were the same "weight" as before. The two planets will keep moving

Figure 4. Orion strikes the bull of Taurus in Greek mythology.

Figure 5. Conjunction of Mercury, Venus, and Jupiter on July 10, 4203 BCE, 40 e-years after the proposed start of the Egyptian calendar.

Figure 6. Retrograde motions of both Jupiter and Saturn together.

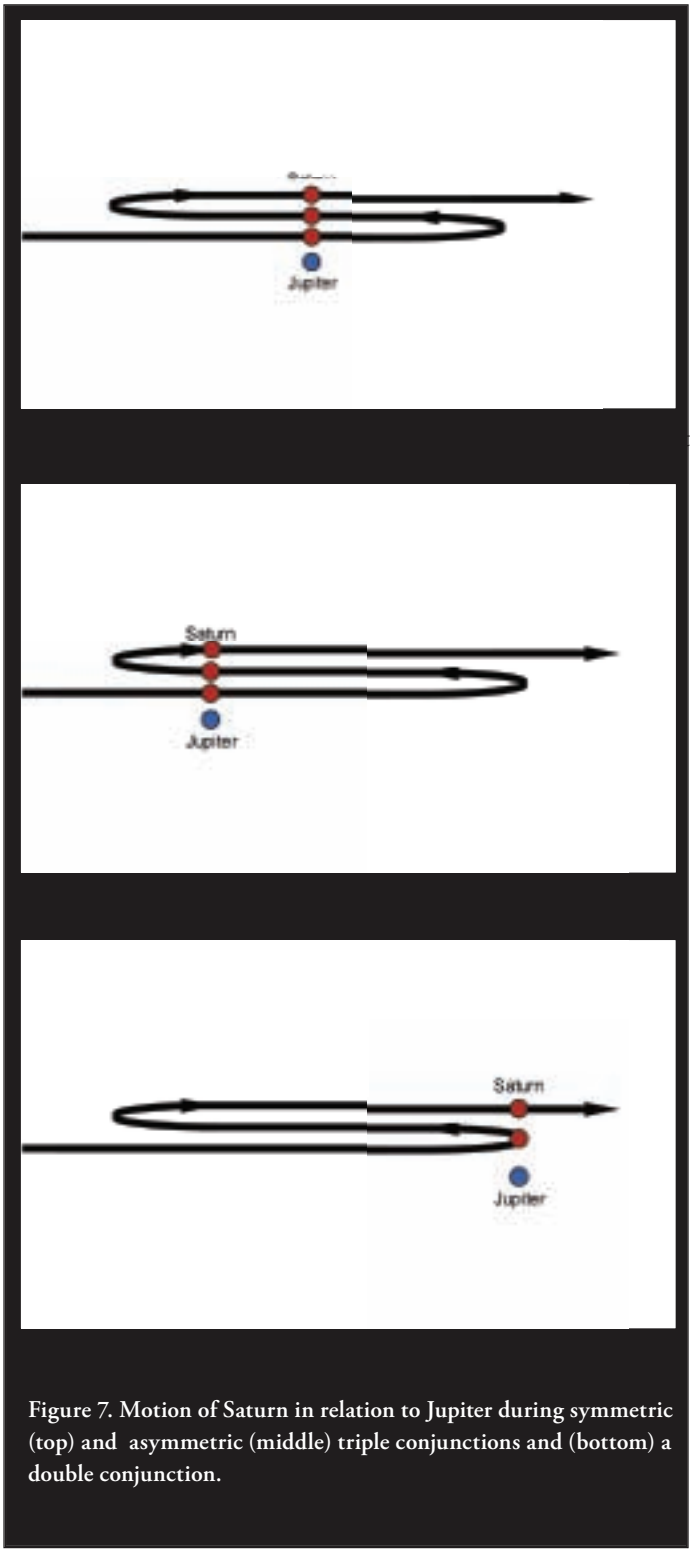


Figure 7. Motion of Saturn in relation to Jupiter during symmetric (top) and asymmetric (middle) triple conjunctions and (bottom) a double conjunction.

ten days before Jupiter. The son, Jupiter, has escorted the father, Saturn, to the "altar of the sun," meaning the sunset.

The dates mentioned by Tacitus match dates of the appearance of these double and triple conjunctions of Jupiter and Saturn. The only double conjunctions referenced by Tacitus are those associated with foreign rulers. The Egyptian pharaohs mentioned all reigned during times with proper triple conjunctions. The description given by Herodotus matches the conveyance of these two planets across the nighttime skies during a triple conjunction. Therefore, the phenomenon known as the phoenix could be triple or double conjunctions of Jupiter and Saturn.

THE PHOENIX AND THE "FIRST TIME"

The phoenix and the *benben* are closely related in Egyptian creation myths, and both were said to have appeared at what the myths call the "first time." Just as the *benben* may have been the Mercury-Venus-Sirius conjunction seen before the "first sunrise" of the calendar, the first time may refer to the times just preceding the start of the calendar. The first time would then include the time when the stars were being studied and planetary patterns were being realized.

Fifty years before the proposed starting date of the 365-day calendar there appeared a multitude of planetary conjunctions including a triple conjunction of Jupiter and Saturn. These conjunctions appeared over the course of just one year beginning with Mars and Mercury in conjunction in the east just before sunrise on July 22, 4296 BCE. This would have been noticed by someone observing the Sothic rise, because it appeared days after the Sothic rise and soon after all five visible planets had risen in the east (figure 8a). Within two months there appeared seven planetary conjunctions involving all five visible planets.

On the morning of October 13, 4296 BCE, Jupiter and Saturn were in the first of a triple conjunction with Mars aligned to Venus on the same day (figure 8b). On January 22, 4295 BCE, the second of the three conjunctions rose next to a completely full moon at sunset and set less than 8 degrees away from the moon at sunrise (figure 8d). The third conjunction appeared on the 12th of May with a waxing crescent moon near at the time of closest lunar approach. As the two planets continued on to the "altar of the sun" or sunset (figure 8g), Venus rose in the west to meet Saturn on July 16 and Jupiter on July 21.

Over the course of one year, 4296/5 BCE, there were twelve planetary conjunctions. The first conjunction appeared days after a Sothic rise and the last conjunction appeared one day after the next Sothic rise. This could have been inspirational to anyone who studied the heavens, specifically someone observing the Sothic rise. The story of the phoenix could have been created as Jupiter and Saturn crossed paths forward and back three times while nine other planetary conjunctions occurred in the same year. This spectacular event may have spurred these astronomers on over the next 50 years approaching 4243 BCE to collate the data they had acquired using the standing stones and compile it into the 365-day calendar. In 4177/6 BCE another triple Jupiter-Saturn conjunction occurred, which could have reinforced the mythical story of the phoenix.

CONCLUSION

The assertion that the calendar was instituted at the beginning of a Sothic period limits the choices for the starting date of the calendar. Sirius rose on the first calendar-day, Thoth 1, in the years from 1325 through 1322 BCE, from 2785 through 2782 BCE, and from 4245 through 4242 BCE. Any of these years properly begins a Sothic period that keeps documented Egyptian dates in line. Sirius rose on different calendar days in other years because the rising shifts away from the calendar one day about every fourth calendar year. If the "3,984 years" referenced by Manetho as the reign of "Chronos" is a "current" running count of Egyptian years then the oldest four years are valid. The fact that stellar studies were apparently being conducted using the standing stones at Nabta Playa at the same time upholds the early Sothic period dates. The triangular planetary conjunction of Mercury and Venus with the brightest star Sirius during one of the four choices narrows the start date down to July 20, 4243 BCE, because the triangle resembles the creation myths associated with the

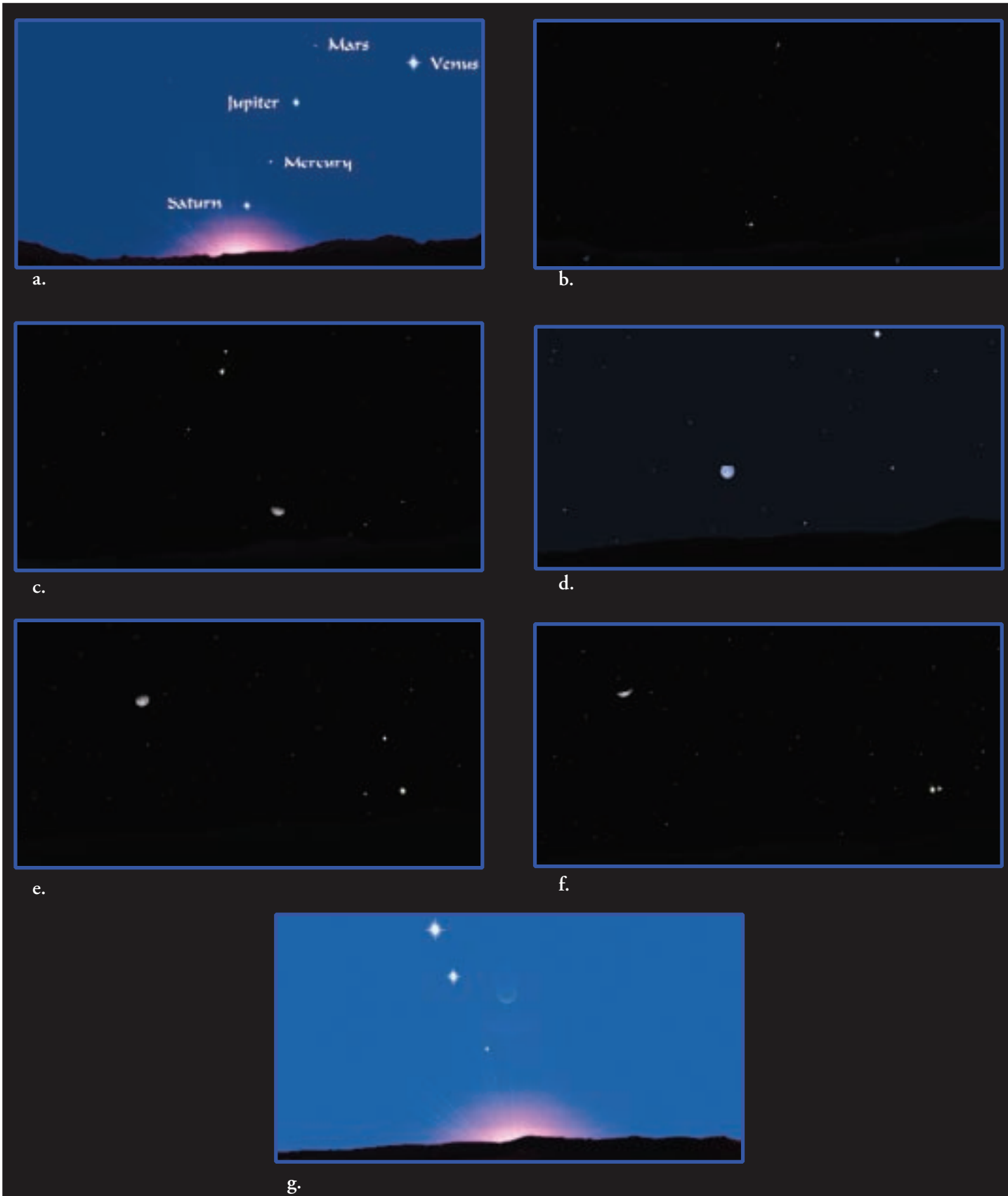


Figure 8. a) Jupiter and Saturn rise about 10 days apart near the other three visible planets on August 7, 4296 BCE. b) Venus and Mars in conjunction near a conjunction of Jupiter and Saturn on October 13, 4296 BCE. c) Saturn stops in relation to Jupiter and begins to move backwards on December 1, 4296 BCE. d) Jupiter and Saturn in conjunction set at sunrise next to a full moon, possibly representing the "egg of myrrh" on January 23, 4295 BCE. e) Saturn stops and moves forward on March 18, 4295 BCE. f) The third conjunction appears near a waning quarter moon on May 12, 4295 BCE. g) Jupiter escorts Saturn to the "Altar of the Sun" or sunset on July 25, 4295 BCE, after passing Venus (seen above Jupiter).

benben. Therefore these myths discuss the creation of the calendar in reality as well as the creation of the "world" in allegory.

Another planetary conjunction, a "triple" conjunction of Jupiter and Saturn, closely resembles descriptions of the phoenix. These conjunctions can be shown to have transpired during the reigns of pharaohs when phoenixes were said to have appeared. These triple conjunctions appeared close to the suggested starting date of the calendar as well. The phoenix is also closely related to the *benben* creation myths in which both were said to appear during the "first time." The inhabitants at Nabta Playa who were studying the stars therefore were also studying the planets. They worked these planetary conjunctions into their mythology surrounding the start date of their calendar, July 20, 4243 BCE.

NOTES

1. The possibility exists that this count was a retro-calculation done before or during Manetho's time. This calculation would be identical to the means used today to calculate Sothic dates on the 365-day calendar. Performing the calculation would require the knowledge to calculate back more than 2½ Sothic periods before Manetho's time. This would suggest that the Egyptian priests were aware of astronomical activities at the same time the Nabta Playa stones were in use, at very least in legend.
2. Five synodic periods of Venus are 5 x 583.92 = 2,919.60 days. The eight e-years also harmonize with every other leap-year, making this cycle most recognizable to someone who has studied leap-years.
3. These cycles are mathematically analogous to the 25 e-year lunar cycle preserved in the papyrus Carlsberg-9. For further discussion on the cause of these various "returns" see Swerdlow (1998, 57). These relations were in essence known to the ancient Babylonians, but are much easier to recognize using the Egyptian 365-day year than using the sidereal year (rotation of the zodiac) used by the Babylonians.

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