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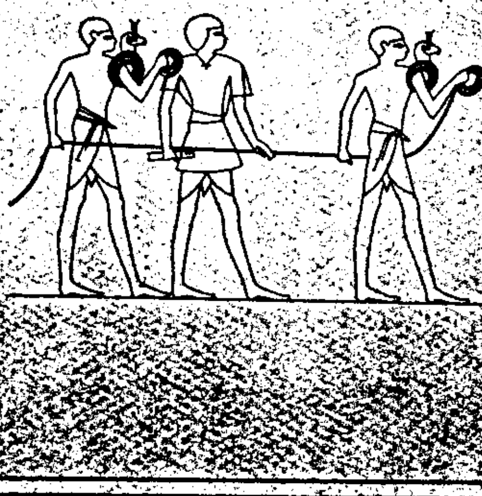

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THE SOTHIC DATING OF THE TWELFTH AND EIGHTEENTH DYNASTIES

Richard A. Parker

Recently Ronald D. Long has taken modern scholars to task for placing uncritical and undeserved reliance upon the earliest Sothic dates as firmly establishing the chronological setting of the Twelfth and Eighteenth Dynasties.[1] His point is that when these dates were first published—the Eighteenth-Dynasty date in 1873 and the Twelfth-Dynasty date in 1899—scholars debated them vigorously and reached no certain conclusions; but over the years the hypotheses proposed have come to be taken as facts now so firmly accepted that they are used as secure checks against other Near Eastern chronologies, as well as against carbon-14 dating.

Long examines all the known Sothic dates, seven in number, but his strictures are reserved essentially for the first and second in time. Thus in his conclusion he states:

> The two remaining Sothic dates are subject to serious doubt. Admittedly, they seem to fit the Sothic pattern and coordinate with the other dates. Have chronologists, however, juggled the reigns and figures in order to reconcile the evidence? To a certain degree this has definitely occurred. The Sothic date in Dynasty XII cannot be assigned to any one pharaoh until the papyri are made available for investigation. The identification of the Ebers papyrus hieratic cartouche, still the subject of speculation, will probably never be firmly and solidly resolved.[2]

Let it be admitted at once that it would be easy to document Long's thesis that over the years what first appeared as a qualified statement about a historical event may have undergone a gradual transition to an unqualified statement. But how well has Long made his present case? Have modern Egyptologists really gone so far astray as he claims? Since his charges have appeared in such a reputable journal as *Orientalia* these are important questions that require answers.

[1] A Re-examination of the Sothic Chronology of Egypt," *Or* n.s. 43 (1974) 261–74.

[2] *Ibid.*, p. 274.

THE ILLAHUN DATE

In 1899, on the basis of two papyrus fragments found in the precincts of a temple at Illahun, Borchardt proposed that together, one before and one after the event, they confirmed a heliacal rising of Sirius on the sixteenth day of the fourth month of the second season (the eighth month of the Egyptian civil year) of the seventh year of a pharaoh whose name appeared on neither fragment. They were nevertheless to be assigned to Sesostris III because their handwriting was the same as that found on other fragments of a temple register for years five to nine, securely dated to Sesostris III.[3] This conclusion by Borchardt, according to Long, has been uncritically accepted by his successors so that present-day studies take it as an unequivocal fact, instead of the mere supposition that it really is.

Long argues (1):

> The truth is that no name of a ruler, not even a partial cartouche, or any other evidence of a pharaoh is to be found in the Illahun papyrus. Thus, year seven could apply to almost any pharaoh of Dynasty XII—a dynasty which was 200 years long.

and (2):

> Thence, the assignment of both fragments to Sesostris III is based on an assumption. In fact, the fragments may belong to two different pharaohs. Any doubt as to the Sesostris III arrangement or desire to read the hieratic itself is hindered and frustrated by the fact the papyri have not as yet been published.[4]

Taken together these seem strong arguments, quite sufficient to invalidate the accepted chronology for the Twelfth Dynasty and leave that dynasty floating in a range of two hundred years, plus or minus. Unfortunately for Long, however, he committed the cardinal sin for a scholar of not having gone back to the original sources. Had he done so, he never would have made such a sweeping statement for his first point.

There were two finds of papyri at Illahun (Kahun). The earlier, in 1889, was published in 1898 by F. Ll. Griffith under the title *Hieratic Papyri from Kahun and Gurob*.[5] The second find, still unpublished, was made in 1899. In quantity of papyri the second was some seven to eight times larger than the first. Both finds were made in the precincts of the pyramid temple of Sesostris II, who evidently founded the town of Illahun when he built his pyramid. From neither

[3] Ludwig Borchardt, "Der zweite Papyrusfund von Kahun und die zeitliche Festlegung des mittleren Reiches der ägyptischen Geschichte," *ZÄS* 37 (1899) 99–101.

[4] *Or* n.s. 43 (1974) 265.

[5] "The Petrie Papyri" (London, 1898).

find has there come to light any papyrus dated to a pharaoh earlier than Sesostris III. Besides him there are papyri dated to Amenemhet III and Amenemhet IV (though none to Queen Sobek-nefru, the last of the dynasty), and to two of the earliest pharaohs of the Thirteenth Dynasty, Sekhem-Reʿ Khu-tawy (the third ruler)[6] and Sekhem-ka-Reʿ (the fourth).[7] Moreover, had Long checked Borchardt's 1899 article, he would have found that the first papyrus fragment, announcing the forthcoming heliacal rising of Sothis, was a letter addressed to "the staff of the temple of Sekhem-Sesostris, justified, of Anubis . . . , of Sobek . . . ." The staff in question was that of the mortuary temple of Sesostris II, deceased, and no amount of wishful thinking can ascribe the fragment to a pharaoh prior to Sesostris III, the immediate successor of Sesostris II. The only other possible candidates to whom the fragment might be assigned, then, would be Amenemhet III and Amenemhet IV, since neither Queen Sobek-nefru nor the early rulers of the Thirteenth Dynasty reigned for as long as seven years. In view of these considerations the possible range for the Sothic date is immediately reduced from Long's two hundred years to less than ninety.

Is the argument based on paleography substantial enough to assign the fragment to one of the three above-named pharaohs? Edgerton, in an article from which Long quotes in an effort to make his first point, had this to say about Borchardt's assignment of the date to Sesostris III:

> This statement was printed after Borchardt had devoted a considerable amount of study to the originals of these and the related papyri in Berlin and, presumably, to the photographic facsimiles of those in London. The claim that he could recognize an individual handwriting is inherently plausible and has never, as far as I know, been challenged by anyone who has seen the originals. It has been endorsed by Möller and by Scharff. In any such case the personal equation must weigh heavily. Until Borchardt's, Möller's, and Scharff's identification is questioned, after examination of the originals or sharp photographs, by some equally high authority on Middle Kingdom hieratic, I am compelled to accept the identification as a fact.[8]

Although Long neither quotes nor counters this decision by Edgerton, by his silence and his call for the publication of the papyri as the only real possibility of judging the validity of Borchardt's conclusion he appears to suggest that the

[6] Following Griffith, I had, in "The Beginning of the Lunar Month in Ancient Egypt" (*JNES* 29 [1970] 220), erroneously taken Sekhem-Reʿ Khu-tawy to be the first ruler of the Thirteenth Dynasty. Jürgen von Beckerath (*Untersuchungen zur politischen Geschichte der Zweiten Zwischenzeit in Ägypten* ["Ägyptologische Forschungen," Vol. 23 (Glückstadt, 1964)] pp. 30–36) has shown that he is actually the third. This does not invalidate my argument, since according to von Beckerath the first three rulers of the dynasty ruled only about eight years in all.

[7] Georg Möller, *Hieratische Paläographie* I (2d ed.; Leipzig, 1927) 13.

[8] William F. Edgerton, "Chronology of the Twelfth Dynasty," *JNES* 1 (1942) 307–8.

paleographic evidence is too dubious to serve as the decisive factor in the acceptance of such an important date, and his own conclusion, as we have seen, is that it is "subject to serious doubt."

I do not, of course, agree with Long, since some years ago, in a study of the various Egyptian calendars, I attempted to fix the date of the Twelfth Dynasty by combining Edgerton's calculated date for the seventh year of Sesostris III as 1870 B.C. ± *ca.* 6 years with the dates of certain lunar events as given in the civil calendar for the reigns of both Sesostris III and Amenemhet III.[9] All the data I could assemble fitted together nicely to establish 1872 B.C. as the correct seventh year, and from this fixed point the other reigns of the Twelfth Dynasty could be worked out. In the years since 1950 I have not seen any evidence to challenge the validity of this date for Sesostris III.

Let us assume with Long, however, that paleography by itself is too weak a reed to support such an important conclusion. The problem then sets itself in this fashion: There are three pharaohs to one of whom the Sothic date for Year 7 must be assigned—Sesostris III, Amenemhet III, or Amenemhet IV. As we have just seen, a completely acceptable solution can be proposed for Sesostris III. Can the other two candidates be ruled out by any other means than the argument from paleography? I believe that to be possible in both cases, again by the combination of the Sothic date and the various lunar data available.

The most important of the lunar data comes from the reign of Amenemhet III. It is the Illahun temple account (Berlin Museum, Pap. 10056, verso) that lists alternate months of phyle-priests according to the lunar year and thereby provides a sequence of twelve dates (one emended) for the beginnings of lunar months over the civil/regnal years 30 and 31. There is no question of ascribing these dates to any pharaoh other than Amenemhet III since the phyle-leader, Meket's son Nekhtisonb, is mentioned both in the Berlin papyrus and in Pap. Kahun IV 1, in the latter in association with a Year 40 which must be ascribed to Amenemhet III.[10] On the assumption that the Sothic date belonged to Sesostris III, the twelve lunar dates for years 30/31 of Amenemhet III were calculated as having occurred during 1813–1812 B.C.; ten of the twelve papyrus dates are the same as those calculated on the basis of this assumption.

Here it is necessary to interject a few words about the repetitive character of Egyptian lunar dates.[11] In short, since 25 Egyptian years have almost exactly the same number of days as 25 lunar years (309 lunar months), any lunar date would have to repeat itself after 25 years. A single date might conceivably be

[9] *The Calendars of Ancient Egypt* ("SAOC," No. 26 [1950]) Excursus C.

[10] *Ibid.*, § 330 and see also Parker, *JNES* 29 (1970) 217–20.

[11] A full discussion appears in Richard A. Parker, "The Lunar Dates of Thutmose III and Ramesses II," *JNES* 16 (1957) 39–40.

repeated after 11 years (one day late) or after 14 years (one day early), depending on the accuracy of the observations. This hazard can be ruled out when a sequence of several dates is involved, and that is the peculiar importance of Pap. 10056. We can state with great certainty that years 30/31 of Amenemhet III fell either during 1813–1812 B.C., or else 25 or 50 years earlier.

At this point a digression becomes necessary. We have noted above that Edgerton gave a possible range for the Sothic date of IIII *prt* 16 as 1870 B.C. ± *ca.* 6 years—that is, from 1876 to 1864 B.C. The earlier date assumed the point of observation to be Heliopolis (latitude 30.1°) and the *arcus visionis* B (the necessary height for visibility of the star above the sun, calculated with the sun in the horizon) to be 9.5°. The later date had Illahun (lat. 29.2°) as the point of observation and B as 8.6°.[12] Edgerton added that even these limits might be too narrow and were subject to future verification. One comment can be offered immediately. Edgerton attacked the Sothic date as though it were a solitary example, without taking into account any of the later discussion by Greek writers of the phenomenon known to them as the Sothic cycle, and as though the heliacal rising of Sirius itself had to be actually observed every year for the proper celebration of the festival. And yet the Egyptians of the Twelfth Dynasty must have been just as aware as those who lived at the time of the Decree of Canopus under Ptolemy III Euergetes that the festival of *prt Spdt* normally fell for four years on the same day of the civil year and then moved to the following day. Nor must we forget that the date with which we are concerned was announced in a letter to the temple staff, some days before the festival. Now such a letter would hardly have been written in Illahun, where the official could have addressed the staff directly. It is much more likely that he was in either Memphis or Heliopolis and writing the forecast from there.[13]

Before going further with this point we must review the various years—tropical, sidereal, Julian, Gregorian, and Egyptian—that play a role in our problem. The *tropical* or *solar* or *natural* or *astronomical* or *equinoctial* year is the period that it takes the sun's center to pass from one equinox to the same equinox again; it has a mean length of 365.24220 days (365 days, 5 hours, 48 minutes, 45.5 seconds). This is the year that all calendar years try to match. The *sidereal* year is the time in which the sun's center passes from the ecliptic meridian of a given fixed star to the same meridian again; its length is 365.25636 days (365 days, 6 hours, 9 minutes, 9.54 seconds). The difference between the

[12] Edgerton, *JNES* 1 (1942) 309.

[13] One control of the forecast could very well have been the star clocks still in use in the Twelfth Dynasty. Sirius, as a decanal star, was preceded in the clock by other decans whose heliacal risings would mark the end of the twelfth hour of the night 10 days or 20 days before that of Sirius. See O. Neugebauer and Richard A. Parker, *Egyptian Astronomical Texts* I: *The Early Decans* (London, 1960) chap. 3.

two is .01416 of a day, or 20 minutes, 24.04 seconds per year. The *Julian* year is a calendar year of 365.25 days and represents an attempt to keep in synchronism with the tropical year. That it does not quite do so resulted, as we know, in the *Gregorian* reform and a mean year very close indeed to the length of the tropical year. Nevertheless it is the Julian year, projected backward, that has remained the one in use for dates in ancient history and for astronomical calculations. Another calendar year is the *Egyptian* civil year, consisting of only 365 days. Being 1/4 day shorter than the Julian, it moved forward against the latter so that any given coincidence of dates would have been repeated for four years but then again only after 1460 Julian years (= 1461 Egyptian years).

Now from Censorinus[14] and coins of Antoninus Pius[15] it is safe to conclude that in the years A.D. 139 to 142 Sirius rose heliacally on I *ꜣḫt* 1 Egyptian, corresponding to July 20 for A.D. 139 and July 19 for A.D. 140 to 142. From this anchor in time it would be quite simple to calculate the place of the yearly heliacal rising of Sirius in the Julian calendar if only that star were a fixed one whose position did not vary for long periods of time and so could be measured by the sidereal year. Unfortunately for simplicity, Sirius is not a fixed star but one with a motion of its own. Its year, measured from one heliacal rising to the next, is itself not constant in length, though throughout the millennia of Egypt's history it has always been very close to that of the Julian year. It was Theodor Oppolzer who, in 1884, first calculated the length of the Sirius year, and it was Eduard Meyer in 1904 who applied it. According to Meyer's figures, in 4231 B.C. the Sirius year was 365.2498352 days long, in 3231 B.C. 365.25 (exactly the length of the Julian year), in 2231 B.C. 365.2502291, and by 231 B.C. 365.2508804.[16]

Over the years these values have been slightly refined. The most recent study of the Sothic cycle was made by Ingham in 1969.[17] With Memphis as the point of observation and a constant *arcus visionis* of 9° he calculated four cycles, between −4226 (4227 B.C.) and +1591. The intermediate cycles began after 1458 years, in −2768; after 1456 years, in −1312; and after 1453 years, in +141. The final cycle was 1450 years long. His first mean cycle year was thus 365.25025 days long and the last one 365.25164 days long, to be compared with those of Eduard Meyer. Ingham, on the plausible assumption that the *arcus visionis* might have been smaller in the past than it is today because the sun and

[14] *De die natali*, chap. 21.

[15] Ludwig Borchardt, *Die Annalen und die zeitliche Festlegung des Alten Reiches der ägyptischen Geschichte* ("Quellen und Forschungen zur Zeitbestimmung der ägyptischen Geschichte," Vol. 1 [Berlin, 1917]) pp. 55–56.

[16] Eduard Meyer, *Aegyptische Chronologie* (Berlin, 1904) p. 14.

[17] M. F. Ingham, "The Length of the Sothic Cycle," *JEA* 55 (1969) 36–40.

Sirius were then farther apart in azimuth, also calculated the cycles for an *arcus visionis* beginning at 8° and increasing linearly to 9°. On this basis the first cycle became 1456 years in length, ending in −2770; the second ended in −1316, after 1454 years; the third in +136, after 1452 years; and the last in +1585, after 1449 years. The corresponding increase in the mean Sothic year for the first cycle was to 365.25051 days and for the last cycle to 365.25181 days.

After this somewhat lengthy and arid discussion we are now in a position to check Edgerton's range of years for the Sothic date of the Twelfth Dynasty. Taking Censorinus' +139 as the starting point, we reach the beginning of the preceding cycle by adding to it 1453 years (B of 9°) and 1452 years (B variable), with results of −1314 and −1313, respectively. For the next earlier cycle we add 1456 years to −1314 and 1454 years to −1313, with results of −2770 and −2767. Now from I *ꜣḫt* 1 to IIII *prt* 16 there are 225 days and from IIII *prt* 16 to the following I *ꜣḫt* 1 140 days. To allow for possible errors in observation we use the rounded figure of four years to one day (a cycle of 1460 years) and arrive at 900 years for the first interval and 560 for the second. From −2770 we take 900 for a lower limit of −1870; to −1314 we add 560 for an upper limit of −1874. Between these limits must have fallen the first year of the four in which our Sothic date must occur if the *arcus visionis* was constant at 9°. For a variable B we take 900 from −2767 for a lower limit of −1867, and add 560 to −1313 for an upper limit of −1873. To allow for both eventualities we combine these limits and arrive at −1874 as the upper and −1867 as the lower limits, with both extremes highly unlikely because the Sothic cycle, whether B was fixed or variable, was in fact shorter than 1460 years. The first year of four in which our date must have fallen then has to come between 1875 B.C. and 1868 B.C., with 1865 B.C. as the latest year possible.

Now Amenemhet's thirtieth year has to be either 1813 B.C., 1838 B.C., or 1863 B.C. His seventh year would then necessarily be either 1836 B.C. or 1861 B.C. Only the last comes at all close to the calculated range, and it is four years later than the latest possible extreme. The conclusion is secure. The Sothic date cannot belong to Amenemhet III. The date of 1872 B.C. already arrived at for Sesostris III, however, fits comfortably within the limits and involves neither of the extreme figures.

There remains to be considered the assumption that the Sothic date belongs to Amenemhet IV. Can he be excluded on astronomical grounds? This cannot be done simply by setting Year 30 of Amenemhet III back one more lunar cycle, to 1888 B.C. This would make his Year 40 1878 B.C. and it would be easy to work out a Year 7 for his successor within the range of 1875–1865 B.C., with allowance as well for the known coregency between the two.

There is, however, another possible line of attack. In the ninth year of one of our three pharaohs there was celebrated a *wꜣg*-feast on II *šmw* 29. If this feast belonged to Amenemhet IV, it is easily fitted into a chronology that assigns the Sothic date to Sesostris III.[18] The chronology breaks down, however, if the Sothic date be assigned to Amenemhet IV. The *wꜣg*-feast with which we are here concerned is a movable one, determined by the original lunar calendar. In this calendar it always falls in the first month of the year, *tḫy*, and most usually on the thirteenth day of the month, two days before the *tḫy*-feast on the day of full moon.[19] Now from IIII *prt* 17 (on the assumption that by Year 9 the rising of Sothis had dropped back one day) to II *šmw* 29 there are 72 days. In the original lunar calendar the feast of the rising of Sothis, also called *wp rnpt* (Opener of the Year) had to fall in the twelfth month of the year (named *wp rnpt*), and only if the feast fell in the last 11 days of the month was the following month intercalary. Therefore the maximum number of days that could go by between *prt Spdt* and the *wꜣg*-feast and still have the feast occur in the first month of the next year, *tḫy*, would be the 11 days of *wp rnpt* (if that month had 30 days), plus the 30 days of the intercalary month of *Ḏḥwtyt*, plus the number of days in *tḫy* that would have gone by up to the day on which the feast fell. At the very latest this day in *tḫy* could be only day 27, since the feast of *tḫy* followed that of *wꜣg* by two days and had to fall within the month it named. But these total at most only 68, and not 72 days.

By the same calculations as outlined above, both Sesostris III and Amenemhet III can be eliminated as pharaohs to whom the *wꜣg*-feast on II *šmw* 29 might be assigned. For these two pharaohs the results of the calculation could prove even worse. Since both preceded Amenemhet IV, the date of *prt Spdt* would have had to be even earlier for them than IIII *prt* 16, if that date be ascribed to Amenemhet IV.

We are left with only one possible solution to the problem of fitting Sothic date, lunar dates, and *wꜣg*-feast date with one another in an astronomically sound arrangement.

The Sothic date of Year 7 must belong to Sesostris III and fall in 1872 B.C., Year 30 of Amenemhet III must fall in 1813 B.C., and Year 9 of Amenemhet IV must fall in 1790 B.C.

When I first proposed this solution in 1950 I wrote: "In the chronology of the second millennium B.C. there is no such thing as absolute certainty, but I submit that there is strong probability that it is correct." Although we may still not have absolute certainty, the probability is now much, much stronger.

[18] Parker, *Calendars*, §§ 336–37.

[19] *Ibid.*, §§ 182–85.