THE USE AND ABUSE OF ASTRONOMY IN DATING

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The science of astronomy is of double interest to Bible-believing Creationists; for it has applications both to cosmology and cosmogony, and also to chronology. In both of these fields, however, not only uses, but also abuses, are possible, and, indeed, common.

Abuses in cosmology and cosmogony usually involve unwarranted extrapolation of data from the present to the remote past, or maybe to remote distances.

Abuses having to do with chronology usually involve mixing unwarranted assumptions in with the astronomical data, or in accepting one out of several possible interpretations of a record, and ignoring others.

In this article the author has examined several dates supposedly established by astronomical data. The dates are mostly from Eqypt, and obtained by the Sothic method. In fact, these alleged results are very questionable; and alternate interpretations do not lead to conflicts with Scripture, when Scripture deals with Egyptian matters.

From the article title one could infer that there is a *proper* use of astronomy in establishing historical dates of antiquity. Less well recognized by the casual reader is the misuse and abuse of astronomical data to bolster a chronological structure that is sagging precariously from the increasing weight of controverting evidence.[1]

1. Use of Eclipse Data in Dating

As for the proper use of astronomical data in dating, one thinks first of the use of eclipse data. The motions of the moon relative to the earth and of the earth relative to the sun have been accurately defined. This knowledge makes it possible to predict the exact time of first appearance, the duration, the degree of eclipse for a given area, and the area of best observance.

On the same basis, it is possible also to calculate back in time to date eclipse phenomena of antiquity in terms of the same details, Or conversely, if an ancient inscription refers to an observed eclipse in a stated area, it is then theoretically possible to determine the date of that eclipse on the B. C. time scale.

It might seem that with such a method at the disposal of chronologists, it would be readily possible to arrive at a chronology of antiquity, such that remaining problems were limited to refining a few dates between established eclipse dates. Actually, this is not at all the case.

The principal reason is the paucity of examples of eclipse records which provide adequate data for unequivocal identification of the eclipse record with a calculated eclipse. There is thus always the possibility that the eclipse record has been correlated with the wrong eclipse, thus leading to obscuring the truth rather than establishing it.

A second factor limiting the value of this method for dating purposes is the fact that only *major* eclipses have any genuine potential for dating. Partial eclipses are of such frequency that the chances for proper correlation are remote, thus leading to erroneous conclusions. Even a total or near total eclipse of the sun can be expected to have occurred within any period of a century or less in a given area.

Major eclipses of the moon are even more frequent There is thus a potential for miscorrelation, even with major eclipses, unless the associated incident is already known with close approximation on the basis of independent data. This problem is well illustrated by the inability to unequivocally decide between two eclipses of the moon, separated by only four years, as a basis for deciding between two dates for the birth of Christ.[2]

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The often indecisive nature of such data in dating is also strikingly illustrated by the series of eclipses provided by Ptolemy for the era 791 to 491 B. C. This series of data was long regarded as above question since the data seemed to match without flaw the series of calculated eclipses between these dates. More recently, the series has been questioned on the basis that Ptolemy did some "fudging" in the provision of other data,[3] and if some things are fudged others may be suspected.

There seemed to be no question as to the correctness of the identification of the eclipse record dated to the 10th year of Assur Dan III, king of Assyria, with a calculated eclipse in 763 B. C. Yet even this date has been queried[4] in favor of identification with a lesser eclipse in 791 B. C. Whether or not the bases for these queries are valid, they illustrate the uncertainty that is possible, even in cases that seemed to be altogether above question.

Unfortunately, there is no extant reference to any eclipse prior to the early 8th century B. C. which may be unequivocally correlated with a calculated eclipse. In a number of cases, used to assign or confirm dates, it is virtually certain that the phenomenon referred to was not an eclipse at all. In this category belongs the attempt to date Abraham in terms of an assumed eclipse of the sun on the basis that he would have had to see the stars in the day time to be rationally asked to number them.[5]

The same holds true for the attempt to date the Exodus in terms of an assumed eclipse as the cause of the plague of darkness and for the early attempt to date the crucifixion of Christ on the basis that the darkness of Matthew 27:45 was of such origin.[6] In the latter two cases, moreover, the darkness is stated to have lasted too long to have had such an origin.

To these examples may be added the attempt to date Takelot II of dynasty XXII on the basis of an obscure inscription which has been variously translated. One such translation reads:

> When now had arrived the 13th year, the month Mesorii, the 25th day . . . the heaven could not be distinguished; the moon was eclipsed (literally "was horrible") for a sign of the events in this land.[7]

A similar case is the attempt[8] to date Necherophes of dynasty III from the note following that name in a transcription of Manetho's king list which reads: "In his reign the Libyans revolted against Egypt, and when the moon waxed beyond reckoning, they surrendered in terror".

There are other inscriptions in which an eclipse seems to be more clearly indicated, but the dates assigned to the accompanying incidents are not established to the point of permitting unequivocal correlation with a specific calculated eclipse. Examples of such misuse of data may be recognized in the attempt[9] to date the destruction of Ur at the time

of an eclipse of the moon, and to date Mursillis II of the Hittites by reference to an eclipse of the sun.[10] These attempts depend on the traditional dates rather than provide any support for or confirmation of the dates.

A guiding principle in the use of such references for dating purposes could be stated thus: eclipse data *do not* confirm proposed dates except as adequate data are at hand to preclude any alternate interpretation. Disregard of this principle is clearly a misuse of astronomy.

To be sure, scholars have convinced themselves that the current views on ancient chronology have been settled within narrow limits, at least as far back as the XIIth Egyptian dynasty. The fallacy in such a belief follows from the fact that the ultimate support for this view of chronology is this same sort of abuse of astronomy that characterizes the misuse of eclipse data.[11]

The validity of this chronological structure has been repeatedly challenged of late. One cannot arrive at *valid* conclusions by using that which remains to be proved as the basis of proof.

2. Use of Sothic Method as Abuse of Astronomy

When the archaeologist or historian speaks about "astronomically fixed dates", he is usually not referring to dates fixed by eclipse data. He is referring rather to dates assumed to have been fixed by the method known as the *sothic dating method*.

To refer to dates derived by this method as astronomically fixed is deceptive since the term infers that the dates are as unalterable as are the movements of the earth and the moon in their orbits. Evidently, the term has been sufficiently pretentious to have intimidated or discouraged scholars generally from even admitting a casual interest in a chronological view which lies outside the limits imposed by these "fixed dates."

Astronomical data *are* used by the method, but the interpretations of the data are based on premises that have never been established.[12] Consequently, from a scientific standpoint, these dates are no more certain than are the unestablished premises on which the interpretations rest.

The fact that the resulting chronological structure is characterized by a multiplicity of anachronisms and incongruities should be recognized as adequate basis for questioning the validity of these premises and of the dates derived by this method.[13] To assume that the dates thus derived eliminate all defensible basis for further consideration of opposition evidence is an abuse of astronomy.

The alternate possibility remains that an assumed, but unwarranted, "fixation of dates" has provided the pressure for disregarding the increasing amount of opposition evidence and for the use of highly improbable, or even incredible, explanations to camouflage the difficulties. The acceptance of this method for providing dates in antiquity has never been universal among scholars.

3. Theoretical Basis for Sothic Dating Method

The basis on which the sothic dating method rests is not difficult to understand. It is based on references from ancient Egypt, indicating the use of a calendar composed of 12 months of 30 days each. Five additional days were added at the end of the year to bring the number to 365. However, the solar year is close to 365.25 days in length. In modern time, the calendar is kept in line with the seasons by adding an extra day as February 29 every fourth year.

A calendar uncorrected for this discrepancy i.e., without leap years would result in a wandering of New Years day backward through the seasons at the rate of one day every four years. New Years day would then return to an original position in the seasons only after the lapse of 365 X 4 or 1460 years. This is the *sothic* period, or *sothic cycle*, sometimes referred to as the *sothic year*.

If one grants the use of such a "vague" calendar, at least throughout one sothic period,[14] it would be theoretically possible to date on the B. C. time scale an incident defined in terms of a specific position in the 1460 year cycle. If from such data the extent to which New Years day has wandered is determinable, it would only be necessary to multiply the number of days by four to obtain the number of years elapsed from the beginning of the cycle.

4. Some Demands on Such a Dating Method

As with the use of eclipse data, before such calculations could provide *dependable* dates, certain minimal requirements must be met. Among such, the following are of critical importance:

(1) The date on the B. C. time scale for the beginning or ending of such a cycle must be known with certainty.[15]

(2) It must be known with certainty that such a "vague" calendar was in use, as demanded by the theory, without interruption or alteration, during the entire period for which the method is used for dating purposes.[16]

(3) Since there is no *necessary* relation between a 365 day calendar and a coincident use of the calendar as demanded by the sothic method (reasons noted later).[17] references used as a basis for applying the method *must* provide clear evidence that such a relation existed. This is probably the most serious mistake that was made by earlier scholars in the interpretation of data in an unwarranted manner (more later).[18]

(4) Since it is known that at least one other calendar was in coincident use with this vague calendar,[19] each application of the method should provide satisfactory evidence that the data given are in terms of such a vague calendar and not some other existing calendar.[20]

(5) The dates presumed to be fixed by the scheme should lead to a chronological structure which is relatively free of major anachronisms and internal inconsistencies.[21]

If any one of these critical prerequisites for a dependable dating method is not met, the dates derived from its application *cannot* be rationally labelled as fixed, or even dependable as approximations. Short of meeting these demands, reference to dates derived by the method as "fixed" is an inexcusable deviation from the accepted rules of scientific procedure and of recognized principles of logic.

It is proposed to show that these supposedly fixed dates are the result of the same sort of faulty handling of data that supports the concept of evolution. The creationist who rejects the concept of evolution should not be misled into supposing that the first criterion to be met by his chronological views is that they shall not lie outside the limits imposed by this mehtod of dating.

There is nothing more disastrous to arrival at truth than to regard concepts as fixed that do not merit any such evaluation. In the face of the multiplicity of anachronisms and incongruities that characterize the traditional chronological structure, there is no demad that these views be regarded as above the need of *gross* modification.

Thus far, the term calendar has not been defined. The term as here used does not refer to a published arrangement containing a sequence of the days of the month and months of the year which is the meaning of the modern term. The term refers only to the *method* by which the ancients referred to specific dates within the month or year.

As far as is known, the Egyptians had no word for expressing the modern concept of the word calendar. I will now discuss some of the problems that rise from the use of this scheme, and which invalidate the method as providing dates that can be properly labelled as "astronomically fixed."

5. What Phenomenon Marked the Beginning of the Cycle?

The label "fixed" as applied to dates derived by a sothic dating method, would seem to demand a clearly defined and defensible astronomical phenomenon for making the beginning of the cycle. This phenomenon is referred to in the Egyptian sources as a "Rising of Sothis," a phenomenon which wandered through the seasons along with the New Year of the vague calendar. To make the term definitive, it is taken to mean the *coincident* rising of Sothis (Sirius) with the sun (heliacal) on the wandering New Years day of the vague calendar.

One difficulty with this definition is that it is not possible to *observe* a coincident rising of Sirius with the sun, due to the excessive brilliance of the sun. It has been determined that Sirius must be above the horizon by at least 9° ahead of the sun for such visibility.[22] This 9° is known as the *arcus visionis* and is equivalent to about 36 minutes of time.

However, many years ago, Poole calculated[23] the *actual time* between the position of Sirius relative to the rising sun on New Years day of the wandering calendar in 1320 B. C., the date *supposed* to represent the beginning of a cycle. His calculations were confirmed by the Astronomer Royal of England. The results indicated that Sirius was *not* 36 minutes ahead of the sun but rather one hour and 16 minutes high as would be observable at Thebes and little more than one hour high as observable at Memphis, farther to the north.

The astronomer MacNaughton concluded that the identification of Sothis with Sirius was incompatible with the ancient data, and devised an alternate chronology of Egypt based on the premise that Sothis was Spica.[14] As far as is apparent, his reconstruction attained *no* significant acceptance. However, as an astronomer, he has provided much *factual* data in his work from which I have drawn freely.[25]

The problem of this discrepancy has been a matter of consideration by a number of scholars and a number of different explanations have been offered. The most recent, and probably the most defensible, is that which proposes to account for the discrepancy on the basis of the movement of the sun among the stars during a period of 1460 years, together with perturbations in the earth's rotation.[26] This problem can be ignored, settled or unsettled, since there are other bases of far greater significance for recognizing the invalid nature of the sothic method for dating purposes.

6. When Did a Sothic Period Begin?

As noted above, no calculations are possible using this dating scheme, *except* as an established date for the beginning of a cycle is obtained. Currently, a period is regarded as having ended in the era 139-143 A. D. An era of four years is used to express the date since four years are required for the New Year to migrate by a single day. On this basis the cycle began c. 1320 B. C.

Differences of opinion have been entertained by various scholars on this point, yielding significant differences in the dates to be derived by the method. Budge commented at the beginning of the century on the insecurity of any specific date for such an ending of a sothic period:

> . . . It must be remembered, as said above, very little confidence is to be placed on any calculation of this kind in attempting to formulate an exact chronology, especially as authorities, both ancient and modern, are not agreed as to the exact date in the second century of our era when the Sothic period ended on which they based their calculations.[27]

These differences of opinion have been much wider than suggested by Budge. The astronomer Lockyer recognized evidence pointing to a beginning date some four centuries earlier than the now accepted date.[28] The ancient astronomer, Theon, seems to have recognized[29] an end to a cycle in B. C. 26.

Ingham proposed[30] retaining the date 141 A. D. for the *end* of the cycle but considered the beginning to have been in 1312 B. C. rather than 1320. Brugsch and Petrie,[31] at least at one time, repudiated the scheme on the basis of the uncertainties involved, though Petrie seems to have acquiesced later.

A further factor entering into the problem of establishing such a beginning date is the fact that the ancients used an inexact figure for the length of the solar year in their computations. The year is not exactly 365.25 days in length. It is rather 365.2422 days. If this figure is used in the same calculation by which the period was assigned a length of 1460 years, the length becomes 1507 years.

Should this extra 46 years be added to the date recognized for the end of the period or should the period be given a beginning 47 years earlier? Or, as seems to have been done, should the figures of the ancients be accepted, and the best effort be made to explain how the scheme could be used for dating in spite of these insecurities?

The problem is dropped here for the simple reason that there are much larger reasons for repudiating the validity of the sothic dating scheme. The conflicting data *do* contribute to the insecurity of the method as now used. As will be shown, when satisfactory solutions are provided for the larger problems, settlement of the beginning date is of no consequence. Based on the acceptance of an ending date c. 140 A. D., cycles began in 1320, 2780 and 4240 B. C. Eduard Meyer, an avid proponent of the sothic dating method, proposed the date 4241 B. C. as the earliest fixed date in egyptian history, supposedly representing the date for the introduction of the sothic calendar.

This date was not at odds with the then accepted date for the beginning of the dynastic period in Egypt back in the 6th and 7th millennium B. C. However, with the introduction of the Carbon-14 dating method, data from the early dynastic period demanded a reduction of the dates to the era 3300-3000 B. C. These dates were shortly thereafter reduced by Scharff to c. 2850 B. C. Such developments gave rise to a further question.

7. Did the Sothic Scheme Begin at the Beginning of a Cycle?

Problems rising from attempts to establish a date for introduction of the wandering calendar and, by inference introduction of the scheme as demanded by the sothic method, have led to a reconsideration of the question as title of this section. It *had* been deduced that the sothic rising referred to in an inscription from the XIIth dynasty[32] could not refer to a rising at the *beginning* of a cycle.

The reason was that the inscription provides a date for the "rising" on the 16th day of the 8th month and not on day one of month one. Meyer reasoned that since the XIIth dynasty had been assigned approximate dates between 2000 and 1800 B. C., with the sothic rising necessarily falling between these dates, the scheme could not have

been initiated in 2780 B. C. Hence at least one additional period was theorized as having preceded this date to enable the Egyptians to determine its length by observation.

However, the date 4241 B. C. proposed by Meyer rests on the presumption that the Egyptians were accumulating data during this period with no knowledge of writing. For this and other reasons, Neugebauer repudiated Meyer's date. In this, he was joined by many, perhaps most scholars. Hayes *et al*[33] begin their discussion of early Egyptian chronology with the following statements:

> The most significant advance made in the study of ancient Egyptian chronology in recent years is the repudiation by Neugebauer and others of an astronomical origin for the Egyptian civil calendar and, as a corollary, the elimination of the so-called Sothic Cycle as a factor in dating the earliest periods of Egyptian history. It is thus unnecessary to associate the inauguration of the calendar and all that is implied therein, with the beginning of such a cycle in 4241 B. C.

According to the above statements, it was the *astronomical origin* of the calendar, *along with* its application to this early historical period, that was repudiated. This statement reflects the growing recognition that the system need not, or perhaps could not, have been initiated at a date representing the beginning of such a cycle. This shift in thinking gives rise to a still further question.

8. During Which Cycle Was the Scheme Introduced?

Was the scheme introduced within the cycle beginning in 2780 B. C., or could it have been within the cycle beginning in 1320 B. C.? If the latter was the case, this would mean that the scheme did not exist for even one complete sothic period. This view has been entertained, particularly among early scholars who had difficulty in recognizing any satisfactory method for avoiding the difficulties in the scheme, and even more so from the incongruities in the chronological scheme that results from its acceptance.

With a deep insight into the problems involved, Bickerman concluded with excellent reasons that all proposed dates for the introduction of the vague calendar, and by inference the sothic scheme of dating based on this calendar, are *premature*. He wrote:

> . . . All conjectures about the date of the introduction of the *annus vagus* are premature. We can only state that there is evidence of the use of a variable year from the V dynasty on, that the rising of Sirius was observed as early as 1900, and that the celebration of this event was, from the Middle Kingdom, a changeable date in the civil year.[34]

Bikerman recognized the *crux* of the entire problem though this may not be readily apparent. His statements provide a definition of the most serious mistake that has been made in the use of this scheme for dating purposes. *This is the obvious fact that there is no necessary connection between the use of a 365 day calendar and the introduction of the scheme as it appears in use down in the very late period of Egyptian history.*

When this truth is recognized, it leaves open the very large probability that the *scheme*, as distinguished from the calendar on which the scheme was based, was never in use until significantly later than the date 1320 B. C. Even the probability for such a deduction, standing alone, is sufficient basis for repudiating these dates in dynasty XII as having been "fixed," either astronomically or by any other method. Once this is recognized, the entire problem of ancient chronology may be relieved of the strictures that resulted from acceptance of the sothic dating method as being valid.

The reasoning leading to such conclusions is quite direct. There is no necessity for presuming that the *scheme* was in use in dynasty V on the basis of the use of a 365 day calendar at that time. Neither is there any necessity for presuming that the sothic rising in dynasty XII, dated to the 16th day of the 8th month, has any relation to this scheme of dating, and by inference no relation to the calendar on which the scheme is based.

A 365 day calendar is still in use today. Yet New Years day does not migrate backward through the seasons. It does not because the calendar is corrected to prevent such changes.

Whether it was this 365 day calendar that was corrected by the ancients, or whether there was an alternate calendar in coincident use which *was* thus corrected, *and by which the sothic risings were celebrated*, is beside the point. In either case, the dynasty XII inscription provides *no* basis for deducing even an approximate date for the incident. The remaining question is then whether it was the 365 day calendar that was corrected, or whether there was an alternate calendar in coincident use that was corrected, or whether perhaps both were corrected.

9. The Tropical Year of the Egyptians

The concept of the existence of a seasonal or tropical calendar by the Egyptians from earliest times is universally recognized among scholars in this area of investigation.[35] Some difference of opinion remains as to when the New Year of such a calendar fell with reference to the seasons. Most certainly it began with the beginning of one of the three seasons of Egypt. These were the Summer or hot season, the Season of Waters or inundation, and the Winter Season or season of growing.

Parker has defended the view that the seasonal year began with the first evidence of a beginning rise of the Nile from the lowest level.[36] This occurs with surprising regularity during the second week of August according to the modern calendar. This is the recognized beginning of the Season of Waters.

Parker assumed that it was originally marked by the rising of Sothis as a symbol of the rising Nile. Poole, on the other hand, regarded it as *certain* that the tropical year began with the Winter Season and with the winter solstice. He wrote:

> "The Season of Waters" in the ancient nomenclature, plainly shows that the Tropical Year to which that nomenclature was originally applied commenced at the winter solstice, and not at, nor near, either of the equinoxes, or the summer solstice.[37]

He continued,

> . . . Thus we find that the true period of the commencement of the Season of the Inundation was one month before the autumnal equinox; and consequently, that the Tropical Year anciently in use among the Egyptians commenced at the winter solstice, when all things in Egypt begin anew.[38]

It is not feasible to define exactly the ancient limits of the Egyptian seasons in terms of present conditions. One reason is that artifical dams have altered the times of rise and fall of the Nile by several days.[39] However Poole' s approximate correlation of the winter season with the four months following the winter solstice is reasonable. This date could have been readily determined by observation of the day on which the shadows from some tall structure

were longest. There were many such tall structures in Egypt.

Of course, it is not improbable that, for different purposes, a year may have begun at more than one point in the seasons just as is true today. The existence of a tropical calendar with the beginning fixed at the winter solstice does not preclude the use of a second fixed calendar beginning at the beginning of the Season of Waters as proposed by Parker.

10. On the Probable Method of Calendar Correction

The very existence of a tropical calendar in Egypt back into the era of earliest Egyptian history indicates that some method was in use for maintaining the calendar in close approximation with the seasons. The extant inscriptions from the early period provide no information as to *how* this was done. This is not surprising in view of the relative paucity of inscriptive evidence. Absence of such evidence does not controvert existence of such a method of correction. On the other hand, it may point to a simple and relatively automatic method that required no reference to it.

Scripture, likewise, makes no mention of *how* such a correction was made. Yet it is certain that it *was* done since the Hebrew festivals were related both to the month and to the seasons. In later Hebrew history, this was done by addition of an extra lunar month as needed. A similar method was evidently in use in Mesopotamia[40] and possibly in Greece.[41]

Existence of some method of correction in Egypt is indicated by the simple fact that the lives of the Egyptian populace, from earliest times, were linked inseparably with the rise and fall of the Nile level. These phenomena recurred with a surprising degree of regularity and provided the basis for defining the seasonal changes.

It is preposterous to presume that the Egyptians permitted their *practical* calendar to wander in such a manner that the Season of Waters fell in the hot dry season. It is equally preposterous to presume that even down in the late era when references appear indicating a use of such a wandering calendar, that this was the calendar in general use by the populace, even though such had become the civil and official calendar. Bickerman remarked,

> In effect, alongside the official year, there was the popular lunar calendar of alternating months of 29 and 30 days which is attested from c. 1900 on. It was *basic in everyday life* and used for cult purposes. At some time (before 235 B. C.) the Egyptians devised a 25 year cycle of 309 months which indicated the dates of the civil calendar on which the lunar months were to begin.[42] (Emphases added)

That a correlation of the civil calendar with the lunar months was thus used in *late* Egyptian history is very probable since 309 lunar months is a very close equivalent to 25 years of 365 days. If it is recognized that the usage of the *names* of the lunar months continued in a sequence of twelve, this would result in a wandering of a given month *name* backward through the seasons during this interval.

However, if the correlation was in terms of the tropical calendar, an interval of 33 years would be required for the month names to return to a former position.[43] This would account for the apparent anomalies that occur between month names and the beginning of the year and of sothic risings.[44] The possibility, however has not been eliminated that more frequent corrections were made.

11. The Sothic Rising Reference in Dynasty XII

It is the sothic interpretation of this reference that stands as the ultimate basis for the current views on the chronology of Egypt. Without this reference, it is extremely doubtful that such a viewpoint would ever have been devised, and certainly without this reference, there is little reason to suppose that the general outline of ancient chronology as now accepted would have survived the opposing evidence to the present.

The pertinent statements in question are part of a fragment of papyrus inscription found at Kahun Egypt. The particular statements are part of a letter addressed to the priest Papihotep and read as follows:

> You ought to know that the Rising of Sothis takes place on the 16th of the 8th month. Announce it to the priests of the town of Sekhem-Usertasen and of Anubis on the mountain and of Suchos . . . and have this letter filed in the temple record.[45]

12. An Attempt to Date the Inscription

Prior to about 1945, scholars conceded that it was not possible to assign a date to this inscription,[46] since the king, in whose 7th year the inscription is dated, is not named. An attempt was made by Lynn Wood[47] to surmount this problem by correlating data based on the sothic dating method with a series of lunar data found in another papyrus fragment which seems to be part of the same group of inscriptions. Wood had noted that a later reference to a change of priestly function was dated to the 26th of the month Payni.

Assuming that this dating was in terms of the wandering calendar, and assuming that this practice of priestly change on Payni 26 had been in use from back in the XIIth dynasty, and assuming that the change of priestly function was at the time of a new moon, this date was traced back in time in terms of the vague calendar to determine the dates when the 26th of Payni fell at the time of a new moon.

Since a single lunar datum of this type repeats in periods of 19 solar years and of 25 years of 365 days, fourteen such dates were located between the years 2000 and 1810 B. C., which was the period assigned to dynasty XII.

The problem was to determine which of these dates agreed best with one of the data in the lunar series. A decision was made in favor of the date 1849-1848 B. C. This date was assigned to the 31st year of the unnamed king, who was identified as Sesostris III, and also to the year to which the lunar data belonged.

From this date, the date of the Sothic Rising in the 7th year of the king, could be calculated as 1873-1872 B. C. The corresponding dates for the beginning and end of the dynasty were thus computed as 1991 and 1778 B. C. respectively. These are the so-called "astronomically fixed" dates of dynasty XII.

13. Parker Proposes a Different Date

Five years after the report by Wood, R. A. Parker proposed a *different* date for the series of lunar data.[48] Since the nature of the series of lunar data was such as to preclude the data belonging to more than *one* date over a period of a millennium or more, Parker recognized that the date proposed by Wood was insecure, in spite of labelling as astronomically fixed. Earlier scholars had expressed a suspicion that one of the data of the lunar series was being misread. Parker began his study with a critical examination of a photostatic copy of the inscription and concluded that the earlier suspicion was correct. One datum *had been* misread.

Since the lunar series could not belong to more than one specific year, and since Wood had not recognized the misreading, a further attempt was made to define this specific year without recourse to the sothic dating scheme. *No acceptable date* was found between the limits assigned to dynasty XII which now met the lunar series as corrected.

Strangely, Parker then reverted to the use of the misread datum and varied the definition for the beginning of a lunar month. Earlier scholars had defined this beginning as the day of the *first* appearance of the *new* crescent moon. This was in agreement with the Egyptian expression for a new month as "new light." This definition had been adopted by Wood. Parker, however, elected to define the beginning of a new month as the day of the *last* appearance of the *old* crescent moon. It is thus left to the individual to provide a basis for equating the old crescent with "new light." On the basis of this study, a date of 1813-1812 B. C. was proposed as an alternate date for the year to which the lunar data belonged. The unnamed king is now identified as Amenemhet III rather than Sesostris III.

14. Proposals of Wood and Parker Challenged

In 1972, John Read recognized that neither of the previously proposed dates was soundly based and thus reopened the problem.[49] Read blistered Parker for presuming to propose a solution to this problem based on the assumption that the misread datum was actually an error on the part of the ancient compiler. He boldly asserted that neither Wood nor Parker had found a correct solution to the lunar data series, and that it was impossible that they could have done so, since neither study was based on this corrected datum.

Read challenged Parker's proposal also from the standpoint that he used an unwarranted definition for the beginning of a lunar month, and on the basis that his solution did not actually meet the demands of this lunar series otherwise. It was pointed out that Parker had used one month of 31 days in arriving at his solution which was not only unwarranted but was impossible astronomically.

15. Subsequent Period Searched by Read

Most certainly there must be a specific year into which *all* 12 of these lunar data could be fitted. Since neither Wood nor Parker had found a year within the limits ascribed to dynasty XII, Read elected to extend the search into the subsequent period. Not until be reached a date of 1549-1548 B. C. was a year found that met all data in the series. In Read's study, the corrected datum was used and the earlier definition for the beginning of a lunar month recognized.

Since Read saw no possibility of moving dynasty XII forward on the time scale by this 300 years, he proposed that the Kahun *papyri inscriptions* be redated to the era of the early XVIIIth dynasty. Thus he identified the unnamed king as Ahmose I, first king of the dynasty. This raised a new problem. The lunar series was dated to the *31st* year of the ruling king. But Manetho had credited Ahmose with only 25 years of reign, and no evidence had been noted for questioning this figure.

16. An Impasse is Reached

Parker was quick to respond[50] to Read's challenge, pointing out that it was out of the question to redate these inscriptions to the era of dynasty XVIII since there was clear evidence in other fragments of the group indicating a background in dynasty XII. In this rebuttal, Parker defended his use of the misread datum on the basis that the error was that of the ancient compiler. Parker defended his use of the altered definition for the beginning of the lunar month on the basis that he had previously confirmed other dates by the use of this definition. But had he? Or were his confirmations on the same level of unacceptability as his proposed date for the lunar series?

So what is the situation as far as *any one* having provided a defensible "fixed date" on which a chronology can be solidly constructed? Read claimed a date 300 years too late to meet the demands of the current setting of dynasty XII. But Parker provides excellent reasons why the inscriptions cannot be so dated.

17. Is This Situation a True Impasse?

Is it true that there is no obvious road around this "blind alley" reached by application of the sothic dating method? Have all the possibilities been considered? Or, does the *apparent* impasse point clearly to a third alternative–one that would recognize that the dates for dynasty XII should be moved forward by 300 years *along with* the date representing the year of this series of lunar data?

If this is the case, then the chronology of antiquity should be adjusted to this revision. If such a shift is actually impossible, then the impasse holds. If the adjustment can be done in such a manner as to provide solutions to numerous problems of archaeology, without upsetting any of the established interrelations between ancient peoples, such a reconstruction, alone, is the best possible evidence that this third alternative is the correct solution to the apparent impasse.

There is no difficulty in understanding *why* such a suggestion could not be given serious consideration by any one who accepts as fixed the dates derived by the "approved" sothic dating method. One does not move "fixed dates" any more than one moves fixed mountains. *These dates must be retained*, even if it is necessary to use incredible explanations for the difficulties that result. Once this fixity is accepted, the remaining task of scholars is not to question the *method* but only to try to make the data "fit" regardless of the pathetic nature of the misfit.

Interestingly enough, this third possibility of adjusting Egyptian chronology by 300 years is quite the same as that proposed in the volumes entitled *The Exodus Problem and Its Ramifications*.[51] Such a reconstruction was worked out long before Read made his discovery of a date for the series of lunar data 300 years later than that previously recognized; indeed, this reconstruction was based on totally independent data. The dates assigned[52] to the beginning and ending of dynasty XII are within a year, that is, 300 years later than those deduced by Wood–namely, 1692-1479 B. C. rather than 1991-1778 B. C.

This is the same chronology that provides the backgrounds for the various incidents of Scripture, which elimicates the very bases for these claims of a multiplicity of historical errors in Scripture. This is the same reconstruction that provides solutions to well over 100 problems of archaeology, many not related to Scripture at all.[53] Yet the reconstruction retains the *established* synchronisms of antiquity, as distinguished from the proposals which actually depend on the accepted chronology rather than provide any support for it. Instead of the expected appearance of new problems and anachronisms, there is an elimination of anachronisms and incongruities that characterize the traditional chronological structure.

The *apparent* impasse only emphasizes the general correctness of this third alternative. If one can extend his

thinking beyond the objection that this solution lies *outside* the limits imposed by application of the sothic dating method, then remaining objections are reduced to the level of trivia for which alternate and rational explanations are available. It has been assumed that the combined wisdom of scholars over a century or more could not make a mistake of the magnitude of 300 years. But could they?

If such scholarship could make a mistake of a few hundred million years in assigning the period of man's existence on the earth, what is at all strange about a mistake of 300 years in dating the XIIth dynasty in Egypt? If a mistake of a *multiplicity* of millenniums could be made in dating the evidence that clearly belongs to the immediate postdiluvian era of Scripture,[54] then what is so surprising about an error of a millennium in dating the beginning of the dynastic period? Could it be posssible that when scholars accepted the premise that Scripture has *no necessary* dependability in its historical details that they deprived themselves of the one source that could have prevented such errors?

18. Another Look at XIIth Dynasty Inscription

The current interpretation of this sothic rising inscription, on the basis that the data given are in terms of a wandering calendar, cannot be rationally regarded as leading to "fixed dates." This holds true so long as there is at hand an alternate interpretation that leads to elimination of difficulties.

In the face of a necessary recognition of the existence of a tropical calendar in Egypt from earliest times,[55] an interpretation of this inscription in terms of such a calendar is altogether in order. This follows from the fact that there is *no necessary* relation between the existence of a 365 day calendar and the sothic scheme, as it appears in late Egyptian history.[56] Recognizing such a starting premise, the months there referred to are *lunar* months, not 30-day months of a vague calendar. This is a reasonable deduction since other data from the same group of inscriptions are clearly lunar months.[57]

Since the sothic rising was on the 16th day of the 8th month, the beginning of the tropical year was 7 months, 16 days (or 222 days) prior to the sothic rising. If then it is possible to date the sothic rising in terms of the modern calendar, it will also be possible to date the beginning of the tropical year at that time in the same manner. If this date agrees with a recognized date for the beginning of the ancient tropical calendar, the starting premise is confirmed. The reasoning is as follows:

The sothic period ending in 140 A. D. falls on July 19 when correlated with the modern calendar. It is then inherent in the definition of a sothic period that the *beginning* of that period also coincided with July 19. This is true irrespective of what length may eventually be assigned to the period. Hence the problem of the exact length of the period can be disregarded. This is also true, whether or not the sothic scheme was in use at the time in question. Hence this question also is not involved in the reasoning. This specific day will also fall on July 19 in terms of any other calendar that was in use at this time, no matter how the day is defined by that calendar. Thus it was July 19 also by the tropical calendar of that day.

Since this tropical calendar had been in continuous use from earliest historical Egypt, it then follows that the sothic rising of the XIIth dynasty inscription was also on July 19. The tropical year then began 222 days earlier, or on December 9. But this is within a few days of the recognized beginning of the tropical year in mid-December and only two weeks away from the winter solstice, a point which may well have been the original basis for beginning the tropical year. The minor discrepancy can be accounted for on the basis that the year of the sothic rising fell between corrections of the lunar calendar.

By this interpretation, the priest Pepihotep should know about the upcoming sothic rising because it had been occurring on approximately this same date for as far back as sothic risings had been observed. The discrepancy from a fixed date could have been readily calculable mentally. This makes a lot more sense than to assume that his knowledge was based on accumulated data on sothic risings by a wandering calendar over a period of a millennium, or to assume the existence of a series of chronological charts from which such a deduction could be calculated.

19. The Enigma in the Inscription of Una

The inscription of Una of dynasty VI provides potent evidence *against* the accepted interpretation of the sothic rising inscription of dynasty XII.[58] Una tells how he had gone to a quarry to the south to secure large stones to be used in a ceremonial structure. During the last 17 days of his quarrying, he *hastily* constructed a barge to transport the stone down the Nile. But on reaching Memphis, he found that the Nile level was so low that he had extreme difficulty in unloading the stone. The time was thus obviously at the end of the Season of Waters.

Applying the principle of the vague calendar, a date was assigned to this episode c. 3350 B. C. But with the necessary abbreviation of the dynastic period on the basis of data from the introduction of the Carbon-14 dating method, this date was as early, or even prior to, the date assigned to dynasty I. It was not possible to move the date forward by an entire sothic period to maintain the interpretation since dynasty XII had already been assigned to this later period. To meet the difficulty, it was assumed that Una had made the trip down the Nile *before* the Nile level had raised to a suitable level, namely, in the late summer season.

But this does not make sense. Una tells of his *haste* in building the barge. This leaves us with the question of why Una was in such a hurry to build his barge. Why did he not take his time in building the barge, making the trip down stream a few weeks later when the water was higher? By the altered interpretation, the stated date (month x, day 28) is 30 days before the end of the year and 30 days before the end of the Season of Waters when the Nile level would be subsiding. The problem disappears.

20. "Fixing" the Dates for Dynasty XVIII

A sothic rising is mentioned in a inscription known as Ebers Papyrus.[59] The inscription is in the form of a series of items, the first three of which read as follows:

New Years Day	month 11, day 9	Sothic Rising
Tekhi Thoth	month 12, day 9	
Menkhet	month 1, day 9	

Then follows the names of the other nine months, each with the number of the month and "day 9" added. The inscription is dated on the back to the 9th year of a king whose name has been obscured. After various suggested readings, the "best that could be done" was to read it Zeserkare, the throne name of Amenhotep I, second king of dynasty XVIII.

Other than the uncertainty in the reading of the name, the inscription is enigmatic in that it gives Menkhet as month 1, when by the sothic dating method, it should be Thoth. Assuming that the compiler meant Thoth when he

wrote Menkhet, and inserting the five intercallary days between month 12 and month 1 as demanded by the method, but which the compiler forgot to include, a date for the 9th year of Amenhotep I was calculated on the basis of the vague calendar. From this, a date for the beginning of the dynasty was "astronomically fixed" to 1580 B. C. MacNaughton quotes Weill on the ambiguity of this inscription.

> The explanation without doubt difficult enough, as we are going to see, has not been satisfactorily attained up to 1920. During the 50 years which preceded, the innumerable interpreters of the document see themselves as at the foot of an insurmountable wall.[59]

If anything meriting consideration has appeared since 1920, it has escaped my attention. Can dates be truly "fixed" from such source materials?

As an alternate hypothesis, it is suggested that the months are not lunar but 30 day months since they are all the same length. Since there are no intercallary days, the inscription belongs to the early Hyksos period when a 360-day year was in use and prior to the correction to 365 days credited to the Hyksos king Aseth.[60]

Brugsch-Bey recognized[61] that the Hyksos invasion occurred at a point in the Turin list of XIIIth dynasty rulers represented by name No. 26. To this same era belong the names Kah-seshesh-re (No. 22) and Kha-hotep-re (No. 27), one of which may be that of the obscured name on the inscription, now read Zeser-ka-re.[62] The order of syllables in Egyptian names has no necessary significance.[63]

The sothic rising then may be also dated to July 19 by the modern calendar. The apparent dislocation of the months is explained on the assumption that the Hyksos had failed to correct their calendar to meet the Egyptian schedule for such correction.

21. Sothic Rising Reference from Tomb of Senmut

A further reference to a sothis rising was found[64] in the tomb of Senmut who served under Hatshepsut of dynasty XVIII. The sothic rising had been dated by Borchardt[65] to the era 1465-1462 B. C. to correspond with the date month xi, day 28 of the inscription. Borchardt defended a date 1490 B. C. for the coronation of Thutmose III, which date was accepted by Read.[66] Read did not explain what was to be done with the date May 3, 1501 B. C. supposedly astronomically fixed[67] for the accession of Thutmose III. Can two dates for the same occasion both be astronomically fixed?

I propose that this sothic rising should also be interpreted in terms of a lunar calendar corrected, as noted above, to the seasons. Hence this rising occurred also on July 19 of the modern calendar. The beginning of that tropical year was then 30 days later, or on August 18. But this is the approximate date recognized for the *beginning* of the Season of Waters, and not at its *end* as was found to hold for the era of dynasty XII.

Parker, then, seems to be quite correct in deducing that the seasonal year of dynasty XVIII began with the *beginning* of the Season of Waters. However, it was not marked by a sothic rising as he proposed. This had occurred a month earlier. The explanation for this difference in the beginning of the tropical year may be accomplished by one of two suppositions. Either there were two calendars in use, corrected to the seasons but differing in their beginnings by a full season, or there had been a shift of one full season during the interval between dynasties XII and XVIII. The former explanation would be analogous to the modern use of one fiscal year beginning on January 1, and another on July 1. For the present discussion, it is of no consequence which of these is eventually substantiated.

22. Lunar Data in the Reign of Thutmose III

There are two lunar data[68] from this reign which must be considered in any proposed establishment of a date for the beginning of the reign of Thutmose III. However, lunar data repeat at intervals of 25 years of 365 days, or at intervals of 19 solar years. Hence such data have no genuine value in corroborating such a shaky date as that provided by the Ebers Papyrus. As to be expected, Read[69] had no difficulty in finding alternate lunar dates in this reign to fit a date 1490 B. C. differing by 11 years from the earlier supposedly astronomically fixed date 1501 B. C.

This earlier study must also have considered these lunar data since the year of the king's reign is not given in the inscription. This date is 550 years earlier (plus or minus a year or two) from that proposed in my reconstruction.[70] Again, my date is based on totally different and independent data. The figure 550 is divisible by 25 and the figure 551 is divisible by 19. Hence there should be no difficulty in also finding dates within one of these years which meet the demands of the lunar data.

23. Sothic Rising in Reign of Rameses III

A sothic rising reference occurs[71] as the first item in a calendar of events found in the temple of Rameses III. This king is currently dated to c. 1200 B. C. By the reconstruction, the date is c. 725 B. C. The *name* of the month is not given. It is only stated that the sothic rising occurred on the first day of the first month. The *name* to be assigned to the month has been a matter of difference of opinion with no satisfactory answer. Brugsch-Bey[72] thought the month should be Thoth, but by the sothic dating method, a sothic rising occurs on Thoth 1 *only* at the beginning or end of a sothic period. Certainly Rameses III cannot be so dated by any chronology. Could it be that Thoth 1, in those days, was recognized by some as the first day of every year?

The inscription gives the feast of Hathor as celebrated on day one of month iv. But Hathor was the *third* month at a later time. The calendar does not seem to be interpretable in terms of a tropical calendar beginning with either the beginning or end of the Season of Waters.

I have a strong suspicion that prior to a very late date in Egyptian history, the names of the months, as distinguished from their numerical positions in the year, migrated not alone with the vague calendar, but also with a lunar calendar corrected to the season. The names would then wander backward through the seasons in a cycle of 33 years.[73]

The use of such a system might explain the apparent anomalies in the Egyptian sources which indicate a variation of name for the first month, yet not in agreement with the sothic dating method. Examples[74] of such might be the inscription of Unas and the flood inscription of Tibi 12 in the reign of Osorkon II. Even dating of the Ebers Papyrus may ultimately be solved satisfactorily in terms of such an arrangement.

It is not until the late 3rd century B. C., that a reference appears which indicated clearly the use of a vague calendar as related to sothic risings. Such a reference[75] occurs in the *Decree of Canopus* by Ptolemy III, Euergetes I (235 B. C.). The document contains a statement to the effect that this scheme had been in use long enough for festivals originally designed to fall in the summer months to have migrated back into the winter season. A period of some 400 years is adequate time for this to have occurred, making

unnecessary an interpretation of the inscription of Rameses III in terms of the sothic dating method.

24. Conclusion

It should be noted carefully that no claim is made for having *proved* that the proposed reconstruction of the chronology of antiquity is beyond the need of modification. It *is believed*, on the basis of overwhelming evidence, that dynasty XII belongs to an era 300 years later than that now recognized. Once this evidence was recognized, the problem was one of adjusting the chronologies of Egypt and of other contemporary peoples of antiquity to meet these later dates.

In spite of the apparent impossibility of making such a gross alteration, short of reducing to a shambles the interrelations between ancient peoples, such a reconstruction has been proposed. Evidence for the general correctness of this *reconstruction* is found in the solutions to numerous problems, both related and unrelated to Scripture, yet without disturbing any established synchronism. Those that are repudiated are shown actually to be anachronisms.[76]

All of this is a specific application of the unifying principle known as Ockham's razor. That principle, sometimes called the principle of parsimony, is recognized, at least tacitly, as an established tool of evaluation by every investigator in the field of archaeology, or of any other science, who is worthy of the designation of a scholar.

According to this principle, as it is commonly stated, entities, and in particular explanations, are not multiplied needlessly. It follows, then that when a choice has to be made among several proposed explanations, the one which deals with the most data should be chosen. The explanation proposed here, that the conventional Egyptian chronology needs correction, deals with a multitude of data, from both Scripture and archaeology.

Thus it is possible to have a proper background for the unique incidents of Scripture without having to compromise any significant details of its historical statements. Then claims of error in Scripture can be met head-on; and it is found that the error is not in Scripture, but rather in the conventional interpretations of archaeology and chronology.

Reference

[1]Courville, Donovan A. 1971. The exodus problem and its ramifications. Crest Challenge Books, Box 993, Loma Linda, California 92354. This work provides a rehearsal of a mass of controverting evidence. Some of the material has been summarized in the C. R. S. *Quarterly*, in the issues of June, 1974 and March, 1975.

[2]Filmer, W. E. 1966. The chronology of the reign of Herod the Great, *Journal of Theological Studies*, New Series, XVII (2): 283-298. Cited by Maier, Paul L., 1968. Sejanus, Pilate, and the date of the Crucifixion, *Church History*, xxxvii (1): 3-13. Actually, there could even be three possibilities. See Filmer' s remarks about the eclipse on 29 December, 1 B. C., on page 284 of his article.

[3]Newton, R. R. 1973-1974. The authenticity of Ptolemy' s parallax data, parts I and II; and The authenticity of Ptolemy' s eclipse and star data, *Quarterly Journal of the Royal Astronomical Society*, 14 (4): 367-388; 15 (1): 7-27; and 15 (2): 107-121.

[4]Personal communication with Lynn Wood (Reference 22) to confirm notes on his lecture at Loma Linda University in which he proposed correlation of this eclipse record with a partial eclipse in 791 B. C. in defense in part of his dating of the Exodus in 1612 B. C.

[5]Rowley, H. H. 1950. From Joseph to Joshua. Oxford University Press, p. 10, note 2. This cited Mahler, 1916, Handbuch der judischen chronologie.

[6]*Ibid.* Indeed, Luke says, in the Greek, that the sun was eclipsed; and the New English Bible has translated that literally. But there cannot have been an eclipse of the Sun in the astronomical sense. For the time was the Passover; the Moon was full, and on the wrong side of the Earth to cause an eclipse of the Sun. Luke must have understood "eclipsed" as meaning simply "hidden" or "obscured".

[7]Brugsch-Bey, Henry 1881. Egypt under the Pharaohs. London. II, p. 227. Another translation reads: ". . . before heaven devoured the moon". The differences in translation emphasize the obscurity of the meaning. For difficulties in the interpretation of this inscription, see Albright, New light from Egypt on the chronology and history of Israel and Judah, *Bulletin of the American Schools of Oriental Research*, No. 130, p. 4f.

Note that there could not be any eclipse on the 25th of a lunar month. Indeed, the description does not seem to be that of an eclipse. For if the heaven was obscured, by dust or clouds for instance, it would not have been known that there was an eclipse. On the other hand, an eclipse does not, in itself, obscure the heaven; the stars are still seen.

[8]Budge, E. Wallace 1904. Books on Egypt and Chaldea. London. IX, p. 217.

[9]MacNaughton, Duncan 1932. A scheme of Egyptian chronology. London, p. 354.

[10]*Ibid.*, p. 352.

[11]See subsequent sections.

[12]See sections 12f.

[13]See note 1.

[14]This point is not granted by the writer. The notion has also been questioned by others. See Budge, *Op. cit.*, ix, p. 148, for example.

[15]See Sections 5 and 6.

[16]See Sections 12 ff for examples of failures in applications of the sothic method.

[17]See Section 8 for the basis for this statement.

[18]See Sections 18 and 21.

[19]See Section 9 on the existence of such an alternate calendar.

[20]See note 18.

[21]See note 1.

[22]Wood, Lynn 1945. The Kahun papyrus and the date of the twelfth dynasty (with chart), *Bulletin of the American Schools of Oriental Research*, No. 99, p. 7.

[23]Poole, R. S. 1851. The chronology of ancient Egypt. London, pp. 30 and 31.

[24]MacNaughton, *Op. cit.*, pp. 28 and 31.

[25]MacNaughton's theoretical views are not acceptable since his starting premise was clearly in error.

[26]Newton, R. R. 1974. Two uses of astronomy, *Philosophical Transactions of the Royal Society of London*, Series A, 276 (1257): 99-116. See also Newton, R. R. 1974. The application of ancient astronomy to the study of time, *Endeavour*, XXXIII (118): 34-39.

[27]Budge, *Op. cit.*, IX, p. 151. (Reference 8)

[28]*Ibid.*, p. 149, citing Lockyer, Norman 1894. Dawn of astronomy, p. 202.

[29]Odom, Leo. 1965. Vittius Valens and the planetary week, *Andrews University Seminary Studies* III, p. 110.

[30]Ingham, M. F. 1969. Length of the sothic cycle, *Journal of Egyptian Archaeology*, 55, pp. 36ff.

[31]Cited by MacNaughton, *Op. cit.*, p. 10.

[32]See Section 10 for wording of the pertinent statements.

[33]Hayes, W. B., M. B. Rowton, and F. H. Stubbings 1962. Chronology: Egypt; Western Asia; Agean Bronze Age. Cambridge University Press, p. 3.

[34]Bickerman, E. J. 1968. Chronology of the ancient world. Great Britain, Thames and Hudson, p. 42.

[35]Parker, R. A. 1974. Ancient Egyptian astronomy, *Philosophical Transactions of the Royal Society of London*, Series A, 276 (1257): 51-65.

[36]Parker may well be correct here for the situation in Dynasty XVIII. See Section 21.

[37]Poole, *Op. cit.*, p. 4. (Reference 23)

[38]*Ibid.*, p. 5.

[39]See reference 37.

[40]Bickerman, *Op. cit.*, p. 22. (Reference 34)

[41]*Ibid.*, p. 29.

[42]*Ibid.*, p. 41.

[43]Actually 408 lunar months are equivalent to 32.988 years. During this time, 12 extra months would have been inserted, so that the names would return to the position in the seasons which they had 33 years earlier.

[44]See Section 23, paragraph 3.

[45]MacNaughton, *Op. cit.*, p. 146. (Reference 9)

[46]Wood, *Op. cit.*, p. 5.

[47]*Ibid.*

[48]Read, John 1972. Early eighteenth dynasty chronology, *Journal of Near Eastern Studies*, 29, p. 2. Read cites Parker, R. A. Studies

in ancient oriental civilizations 26, *Journal of Near Eastern Studies*, p. 64.

[49]Read, *Op. cit.*, p. 4.

[50]Parker, R. A. 1970. The beginning of the lunar month in ancient Egypt, *Journal of Near Eastern Studies*, 29, pp. 217ff.

[51]See Note 1.

[52]Courville, *Op. cit.*, I, chart p. 223. (Reference 1)

[53]Prominent in this latter category are: (1) elimination of the incredible time squeeze for the period between dynasties XII and XVIII, (2) restoration of the proper time order of the same events in Egyptian and Greek histories, (3) identification of the incident of which the 400th anniversary was noted by Rameses II. See Courville, *Op. cit.*, I, p. 123; II, p. 274, and I, p. 293 respectively. For numerous other solutions, consult the index at the end of II under Anachronisms.

[54]Courville, *Op. cit.*, chapters VII and VIII.

[55]See reference 35.

[56]See Section 8.

[57]For example, the lunar series used as the basis for attempts to provide a fixed date.

[58]Petrie, F. 1925. A history of Egypt. London. I, p. 95; and by Budge, *Op. cit.*, IX, p. 152.

[59]This inscription is reproduced and discussed by MacNaughton, *Op. cit.*, pp. 194f. (Reference 9)

[60]Waddell, W. G. 1956. Manetho. (translation) Cambridge, Massachusetts, Harvard University Press and London, William Heinemann, Ltd, p. 241.

[61]Brugsch-Bey, *Op. cit.*, II, p. 211. (Reference 7)

[62]Courville, *Op. cit.*, I, p. 126 (Table VI). (Reference 1)

[63]*Ibid.*, p. 155.

[64]MacNaughton, *Op. cit.*, p. 211.

[65]Cited by Read, *Op. cit.*, p. 6. (Reference 48)

[66]*Ibid.*

[67]Breasted, James Henry 1954. (Reprint) A history of Egypt. Charles Scribner's Sons, New York. Table, p. 599. Starred dates are "astronomically fixed".

[68]Read, *Op. cit.*, p. 6.

[69]*Ibid.*, p. 7.

[70]Courville, *Op. cit.*, I, chart, p. 268.

[71]MacNaughton, *Op. cit.*, pp. 242ff, gives a reproduction of this calendar of events and a discussion of its problems. (Reference 9)

[72]Cited by MacNaughton, *Op. cit.*, p. 242.

[73]See note 43.

[74]Petrie, *Op. cit.*, III, p. 251. (Reference 58)

[75]This inscription is reproduced in part by MacNaughton, *Op. cit.*, pp. 297f; and in total by Budge, *Op. cit.*, III, chapter VI. (Reference 8)

[76]The more notable of these are the popular identification of Shishak of Scripture with Sheshonk of dynasty XXII and the backgrounds popularly assigned to the unique incidents of Scripture.

Comments by Editor Armstrong

May I propose a few questions, the answers to which, if they can be found, might throw additional light onto the matter of Egyptian chronology?

Is it possible that originally the "rising of Sothis" referred primarily to the rising of the Nile in flood, and only incidentally to the appearance of Sirius about the same time? The rising of the Nile was a vital matter to the Egyptians; and Heliodorus and other writers have mentioned a festival to celebrate it.

Would the letter to Papihotep not make better sense in this way, if it referred to a festival; for what sense would there be in telling someone to observe an astronomical event when it was already known when it would happen? Is it possible even that the star was named after the flooding, not vice versa?

It is reported that Bruce found that, in parts of Abyssinia, the Nile was called by a name related to "dog" or "dog star"; and Pliny wrote that at one place the Nile was called "Siris", a name which sounds rather like "Sirius".

Is it possible that the word "Sothis", which, I believe, is found only in the Greek, or in Latin taken from Greek, has to do with the Greek word for "save"? Such would not be too strong language, in view of the terms used in the hymn to the Nile by Ennana, which still exists on papyrus.

Further, Diodorus Siculus mentioned, ". . . the time of the rising of Sirius, which is the season when the river is usually at flood . . ." It could have been, then, that later writers, who were interested in astronomy, not agriculture, shifted their interest from the river to the star.

If the answer to the above quesions is "yes", that means that while the "rising" is still known to have occurred about midsummer, it could hardly be called astronomically fixed. Moreover, there seems to be some evidence that there were three or so festivals connected with the flooding: one in anticipation and one in retrospect, besides one at flood time. (See Hardwicke, D. Rawnsley 1892. Notes for the Nile. Heinemann and Balestier, London, pp. 223-238.)

Also, is it possible that the "Egyptian year" of 365 days was just an astronomers' year, and was never used much for any other purposes, just as the Julian arrangement is still used for some astronomical purposes?

It appears that the Egyptian year was so used by astronomers for centuries after the times which are of concern to Dr. Courville, and when it is certain that the ordinary way of reckoning time was something else. If so, one would not expect to find it used much in inscriptions or records.

The Canopus decree, which was prepared for astronomical purposes presumably with the advice of astronomers, would be an exception. Josephus' writings, in one place, seem to say that the Hebrew lunar calendar corresponds to that used in Egypt, although the passage may be a little ambiguous.

Distinct references to a year of 365 days seem to be late, and by Greek writers. (Censorinus and such writers were Greek in outlook.) Geminus seemed to take the lunar one as a natural definition of "month", although he noted other systems.

Again, it is known that the Hebrews seem to have counted two different beginnings of the year. Moreover, Censorinus stated that at one time the Egyptians used seasons as if they were years. So maybe someone should consider whether, in some cases, the third month, say, might mean "of the season".

Could it be that, in the Egyptian lunar calendar, there was an appearance of months of 30 days because sometimes one day would be counted twice: as the 30th day of a certain month and the first day of the next month? That might have seemed as natural as calling a year the last year of a certain king and the first year of his successor. The effect would be to introduce five and a fraction "dummy" days. If writings and inscriptions which give dates are in terms of a lunar calendar, it is not likely that they will be very useful with regard to chronology.

Incidentally, for some interesting general discussion of this matter, see Velikovsky, I. 1973. Astronomy and chronology, Pensée, 3 (2): 38-49.