The Search for Unity in Keeping Time

By

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PURPOSE--TO EXAMINE THE ASTRONOMICAL TOOLS FOR EXPLORING THE FOLLOWING PROPOSITIONS:

(1) That dissention in timekeeping arose soon after the Flood with Cush and Nimrod as the perpetrators. Separation from the authority of Noah and Shem demanded a separate timekeeping system.

(2) That they changed from the intended lunar-solar system to a simpler, purely solar calendar. Twelve thirty-day months in a year, then a short wait for the beginning of the new intercolation!

(3) That our Roman calendar originated in Egypt with Nimrod. The Egyptians oriented their temples toward the northeast for the June 21 sunrise, the solstice, which coincided closely with the overflow of the Nile. They also discovered that Sirius arose just before the sun (heliacally) on this day.

(4) That the Arabs today use the 354 day, 12 month lunar calendar that has degenerated from the early proper system. Egypt had gone the opposite direction preferring a solar calendar.

(5) That the Babylonians and others in the Tigris-Euphrates valley used a solar calendar tied to the spring overflow of their river. For them the observance of the spring equinox became important and temples were thus oriented toward the east.

(6) That Jacob (or Joseph) certainly brought the lunar-solar Sacred Calendar to Egypt. From that time forward the orientation of Egyptian temples was equinoctial, toward the east.

(7) That the first Passover was the offering of Isaac by Abraham. Isaac had been selected on the tenth day of the month; they went a three-day journey, they "saw" the place. To see a place it must have a peculiar appearance. The geological formation at Golgotha is recognizable today 1900 years after the CRUCIFIXION. It could also have been recognizable 1900 years earlier in the time of Abraham. The offering of Isaac and the crucifixion of Christ then, occurred at the same place and on the same day of the year of the same lunar-solar Sacred Calendar.

(8) The Exodus was 430 years to the day. Which day? Nisan 14,15. Certainly this proves that the Sacred Calendar was in existence at the time Abraham was 99 and given the promise.

(9) That there were thus two calendars in Egypt, one originating with Osiris, the other having been brought in by Joseph or certainly by his father Jacob. Israel in Egypt may have used the Egyptian calendar as we today use the Roman calendar. Weeks were known by Jacob in the years he worked for a wife.

(10) Joseph had married the daughter of the royal astronomer and himself held a higher position. Imhotep (Joseph) was called the High Priest of Heliopolis. The Pharaoh put Joseph over all Egypt so that "without thee shall no man lift up his hand or foot in all the land of Egypt." Genesis 41:44. He was thus very well acquainted with the Egyptian solar calendar.

(11) The calendar is a mathematical arrangement intended to keep the year in line with the seasons for religious and agricultural purposes and to provide for shorter periods, seasons, months, days. Equinoxes or solstices might serve equally well for this purpose.

(12) That the Egyptians used a different basis. They assumed they could use the heliacal rising of a star to keep the seasons and calendar year in line. They only later became aware of the precession of the equinoxes. Their Sirius year (like the Julian) was about 11 minutes longer than the tropical year. It would move forward in the seasons 23 days in 3000 years.

(13) That other stars besides Sirius were also used by the Egyptians. Each star would give a somewhat different reading (because precession affects each differently). Alignments would not remain the same due to precession. Some temples had to be rebuilt. Lockyer covers this problem thoroughly.

(14) The westward precession of the equinoxes causes the stars to be displaced eastward from the first point of Ares parallel to the ecliptic. (Proper motion of the stars and periodic change in the obliquity of the ecliptic had additional effects.) The celestial longitude thus varied while celestial latitude (ecliptic system) remain the same. However, on the equitorial system both the right ascension and declination would change.

(15) The daily change of the sun's amplitude (using terminology of the horizon system) near the equinox is much greater than at the time of the solstice, therefore the moment of the equinox can be determined with greater accuracy than the (Egyptian choice of the) moment of the solstice. (Amplitude would also vary with the observer's latitude.)

(16) The one degree per day eastward movement of the sun along the ecliptic is even more rapid than the change in the sun's amplitude at the equinox. The Egyptians made use of this fact in depending on the heliacal rising of Sirius to pinpoint the end of their astronomical year. While they used the 365-day calendar year, they held the correct length to be 365.25.

(17) That Egyptian astronomical records need not be observations, but could be calculations into the past. The Maya indians also have "records" which supposedly go back to 3113 B.C. Certainly Egyptian astronomers enjoyed calculating the movements of the heavens backwards as well as forwards, just as we do today.

(18) That in early Egypt the agricultural year had 360 days, divided into three seasons of 120 days each, each season again divided into four months of 30 days each, plus a five day waiting period to form the calendar year. Every fourth year an additional day should have been added to agree with the 365.25 day Sirius (astronomical) year. The 1460 year Sothic cycle resulted from the failure to intercolate this day.

(19) The moon's thirteen degree per day eastward movement allows an even more accurate measurement of time. Astronomers might have closely determined the relative positions of the sun, moon and "stellar sphere" at the central moment of a lunar eclipse.

(20) The building of Stonehenge must have followed the discovery of the 56-year eclipse cycle, which implied a knowledge of both the 235-month Metonic cycle and the 223-month Saros cycle plus a knowledge of the regression of moon's nodes in 18.61 years (roughly 1/3 of 56).

(21) That by closely watching eclipses astronomers in the time of Joshua were attempting to put the Sacred Calendar on a more sure mathematical basis.

The Search For Unity in Keeping Time

Today's emphasis is on extreme accuracy in minute units of time. A modern world depends upon split second coordination and precise definition of When? and How long?

An international conference in 1956 established a new length for one second of time. It had previously been defined as 1/86,400 of a mean solar day. Still earlier 1/86,400 of any solar day was precise enough.

Extremely exacting measurements determined that our day was lengthening 10 to 15 micro seconds per year. Thus the mean solar day was not a stable constant. The second has now been redefined as 1/31,556,925.9747 of a tropical year (the return of the seasons). Expressed as days and hours, our year now contains 365 days, 5 hours, 48 minutes, 45.9747 seconds. The older value was 46.08 second.

Small variations in the rotational speed of the earth made this redefinition of the second of time necessary. New, extremely accurate timing devices were allowing the measurement of time in micro seconds (a millionth of a second), nanoseconds (a thousand times smaller), and picoseconds (a millionth of a millionth of a second). It was urgent that an accurate standard for the second of time be developed.

Whole Days for a Calendar Year

The most uniform measure of time known to us is the tropical year, the revolution of the earth about the sun. Yet even here we must have a marker to tell us when we have completed the revolution. The return of the seasons is our standard year. We are accustomed to thinking of it as 365 days, or once every fourth year an extra day making it 366.

In terms of the Sacred Calendar, we think of the return of Festivals and Holy Days that were meant to be kept "in their season." Without a knowledge of the length of the year the Sacred Calendar would have drifted from its tie with the spring and fall harvest seasons.

Our purpose is to determine how earlier calendar designers measured the relative lengths of the day, the month, and the year. What were the builders of Stonehenge determined to understand? How does the Metonic cycle reveal time measurements? What vital information does the Saros cycle offer?

> "Eclipses of the moon give more accurately than any other kind of observation the actual time when sun and moon are in opposition. From an early date, the Babylonian astronomers must have deduced from them not only the mean interval between two conjunctions, but the principle inequality in the motion of the moon and . . . as on their geocentric theory they conceived it, of the sun, and they were able to define the periods of these inequalities, which astronomers call the anomalistic month and year. . . . By assuming, what is approximately true, that the Saros of 6,585 1/3 days contained an exact number (a) of synodic months . . . (b) of anomalistic months . . . (c) of draconic months . . . the early astronomers, perhaps in the 6th century B.C., computed the relative motions of the sun and moon, the lunar perigee and apogee, and the nodes. (Encyclopedia Britannica, article "Eclipse.")

How early were men aware of eclipses? They would have been an invaluable aid to any people using a lunar-solar calendar such as the Sacred Calendar preserved today by the Jewish people.

The work of Gerald S. Hawkins pointing out Stonehenge as an early astronomical observatory capable of predicting the year, month and even day of solar and lunar eclipses has awakened this generation to the level of intelligence of these early men. Why did men 1500 B.C. care to predict eclipses?

360-Day Calendars

Two methods of keeping time trace their origins back to a time shortly this side of the Flood. The one most familiar to us is the Egyptian system, an easy complete the solar year. "the year began when the sun crossed the zenith on July 16th, and consisted of 365 days, divided into 18 months of 20 days each and an extra week, the days being grouped into weeks of 5 days each." The Universal Standard Encyclopedia, article "Maya."

These three calendars (from Egypt, the Tigris-Euphrates valley and Central America) have a common origin. The same spirit of simplicity and uniformity pervades all three. A 360-day work year could be divided into either 3 or 4 seasons. Twelve months of 30 days each could be divided into thirds, fourths, fifths, sixths, tenths, and twelfths. But the 7-day week was not followed by these people. Nor did their months follow the moon in its phases.

A Calendar for Tomorrow?

The New World Calendar is based on this same desire for a uniform system to promote commerce and bring "order." Four seasons would contain 91 days each, with the first month of each season having 31 days; the following two months 30 days each producing a 364-day year. An additional day following December 30th would complete the normal 365-day year. Every fourth year a day would follow June 30th to take the place of our present February 29th that shows up each leap year.

The beauty of this system lies in its monotony. Each month would contain 26 working days. Each quarter would begin with a Sunday, and contain 3 months, 13 weeks, or 91 days.

The principle of this New World Calendar betrays its origin in ancient Egypt. It is a neat system, ideally suited to commerce. Its single tie with the heavens is the solar year. Its beginning would be near the winter solstice, December 22, rather than the June 21 summer solstice used in Egypt. The unbroken, 7-day week, the lunar month, and other "primitive" concepts would have been conveniently forgotten.

God Ordained A Different Way!

A markedly different system has remained practically unknown even among the educated elite of today. A few slighting comments refer to a "very complex . . . calendar (that) evolved through the ages for religious purposes" and "a grouping of days into weeks of seven days (that) has no single historical origin." A belittling description of this type disposes of this "other" system. Why?

Why is the 7-day week termed "a time measurement problem that has plagued the world"?

When the children of Israel left Egypt, God insisted, "this month (Nisan) shall be unto you the beginning of months: it shall be the first month of the year to you." (Exodus 12:2.) The beginning of a lunar month was determined by the appearance of the first faint crescent of the new moon in the west just after sundown. The children of Israel were commanded to follow a lunar-solar calendar replacing the solar calendar of Egypt.

If the moon and sun had been in conjunction at noon, and the sun was centered directly on the spring equinox, then by sunset (6 o'clock) the sun would have moved $\frac{1}{2}°$ eastward through the stars. Its western edge would just touch the equinox. The moon would move about 13/4° or $3\frac{1}{4}°$ eastward and be visible as a crescent in the western sky just after sunset.

Why Observe the New Moons?

"Thirty days hath September . . ." goes the rhyme that we learned as children to determine the correct number of days for each of the months of the Roman calendar; but why did we need to do that? The word month comes from moon. The length of the Roman month is about the same as the interval between full moons. We look east in the evening for that full moon to rise, just after sunset. We look east for sunrise. The Egyptians looked east to begin their year.

We take note of the full moon in the sky, even as Job did, but probably not with the same extreme self-righteous concern. "If I beheld the sun when it shined, or the moon walking in brightness; and my heart hath been secretly enticed, or my mouth hath kissed my hand." (Job 31:26, 27.)

Worship Toward the East

The most (self-) righteous man who ever lived was concerned lest he lift up his eyes to the sun or moon and behold them in an attitude of worship. Centuries later Ezekiel wrote of people with an opposite attitude, people "with their backs toward the temple of the Eternal and their faces toward the east; and they worshiped the sun toward the east." (Ezekiel 8:16.) The women had observed a period of "weeping for Tammuz" (identified by Hislop as Nimrod in his book The Two Babylons).

Ezekiel gives a further description of the events of that spring celebration. "The children gather wood, and the fathers kindle the fire, and the women knead their dough, to make cakes (the original Hebrew word used here is boun or buns) to the Queen of Heaven, and to pour out drink offerings unto other gods, that they may provoke me to anger." (Jeremiah 7:18.)

The time here referred to is not the summer solstice observed in Egypt but the equinox observance in the Tigris-Euphrates valley. The Queen of Heaven is none other than Astarte (or Easter, or Öster in the German language), the mother of Tammuz (Nimrod). These people faced the east and continued to follow a practice of keeping time originated by Nimrod and his father Cush just shortly after the Flood.

Why does it make any difference which way a man looks at the heavens? The year, the month, and the day could be determined from the east as easily as from the west, but would the end result be the same?

Rather than looking toward the east some people by nature and training look west. A common slogan today is "Go West, Young Man, Go West." What event in the western sky would be used to keep time? How would it differ from looking east toward the rising sun? What difference would it make?

While Egypt dropped the objectionable lunar month, the Muslim's retained it. Their calendar today is totally lunar, a calendar of 12 lunar months without an intercalary 13th month. They do not keep Festivals "in their season." The beginning of the year works its way backward through the seasons by about 11 days each year, making a complete cycle in about 34 years.

Out of Step With the Heavens

God's Way was not to be a yoke of bondage but an easy "yoke," not a temptation but a deliverance from temptation. We've grown up with the Roman days that begin at midnight as the sun reaches its lowest point in its circle around the earth. Then at sunrise we again see the day begins!

We look to the blinding sphere of light in the east. We follow it through the heavens, and the day continues once more to midnight, and we are left in perfect darkness.

The Roman year too is intended to start when the sun has reached it southernmost point of rising. Bonfires are lit even today to encourage the waning sungod so he will turn once more to warm the earth.

Winter has officially begun on this day, December 21, but the returning sun promises summertime again. The year begins in darkness (as the day did) and continues through twelve months to end once more in darkness.

Resolutions, tax time and perhaps an aching head from celebrating the New Year are the order of the day. What better example of a "yoke of bondage."

The months roll by 31, 28 or 29, 31, 30, 31, 30, with the old rhyme, "Thirty days hath September, April, June, and November, all the rest . . ." But there is no order. (The average must be held to 30.43685 days, a solar month, 1/12 of a tropical year.)

So the word month comes from moon and the length of the moon was originally set by the moon's $29\frac{1}{2}$-day path eastward through the stars, today there is no agreement between the moon's phases and the month. Hardly anyone is at all sure where the moon rises, whether it does every day, whether it ever rises in the west and sets in the east or what. Man is certainly out of step with this hand of his "celestial clock."

Why Look West?

An epitaph "Sundowners" is used by the less tactful in describing a system of keeping time by a people who have their "backs to the east" and are watching for some event in the western skies.

Just as the Egyptians watched the east for the appearance of Sirius just before the "first flash" of sunrise, so this "other people" looked west just after the "last flash" of sunset, to catch a glimpse of a crescent moon, a moon that minutes later would drop from view. What remained as a temptation to worship? Nothing. "My yoke is easy, my burden is light."

If this "new moon" belonged to the month that began a new year, this moment was the beginning of that year. Sunset! Not the Egyptian splendor of sunrise, nor the Maya moment of noon, nor the Roman choice of the blackness of midnight. But the quiet moments when the day of man's work is over, he returns to the campfire, to his evening meal. An hour or so later the sky fills with stars as darkness falls. "The heavens declare the glory of God."

A Seven-Day Week

A day of rest commenced with evening. Here is a gift to man, a Sabbath that "was made for man." But doesn't the Roman calendar include a week of seven days?

Do calendar makers like the division of time into sevens? Notice its insertion into the Roman system of timekeeping.

A 7-day week period was inserted into the calendar by the Counsel of Nicea, "a time-measurement problem that has plagued the world since that day." (Page 212 of Sun, Earth, and Time by

Fractional Parts of The Day

Could divisions of the day give us any clue as to the basic knowledge available to early astronomers? Daylight and darkness make obvious divisions into day and night. But is there any good reason for 12 hours in a day?

Consider a morning of 6 hours. It might be easily divided in half, in thirds, and even in quarters of an hour and a half apiece. The entire 12 hour daylight part might be divided in the same fashion. The "dozen" system has its merits.

The Roman calendar divides the hour into 60 minutes, and each minute into 60 seconds. The additional advantage of 60 over the dozen system is that 60 is divisible by five as well as the previously listed factors. The origin seems related to the 360-day agricultural year and the 360° into which a circle is divided. The sun moves eastward through the stars 1° per day, 360° per year.

Why 1080 Parts In An Hour?

The Jewish calendar divides the hour into 1080 parts. Is there also a logical basis? A moment's thought reveals that 1080 is 360 times 3. A few moments further reflection reveals that 1080 is divisible by every number from one through twelve, except seven and eleven.

These parts (or Halakim) or then further divided into 76 moments (or Regaim). A part would correspond to 3 1/3 seconds while a moment would equal 5/114 seconds. The choice of the number 76 seems unusual. It is divisible only by 19, 4, and 2. Of what significance is 19 to calendar makers?

Early Calendar Efforts

It seems certain that the 19-year Metonic cycle must have been known as far back as the division of 1080 parts of an hour into 76 moments. One might also assume that the 365¼ day Julian (or Sirius) year provided the factor of four.

Instead of dealing with a single Metonic cycle, suppose we put four cycles together giving a 76-year period of 27,759 days. These four Metonic cycles could be divided evenly by 19 to form four-year periods of exactly 1,461 days each.

We are assuming here an "even" 6,939.735 days in a 19-year cycle. Early calculations just after the Flood could not have been as exact as they are today.

The following table shows the length of the elements of the cycle as determined today and are listed in descending order.

Elements of the Metonic Cycle

19 Sidereal year (of 365.2563604 days) =	6939.8708476 days
19 Julian years (of 27.321661) =	6939.75
255 Sidereal months (of 27.321661) =	6939.70164
235 Synodic months (of 29.5300588) =	6939.688180
19 Tropical years (of 365.2421988) =	6939.601772
20 Eclipse years (of 346.620081) =	6939.40062
254 Nodical months (of 27.21222) =	6939.11610

Note that 19 Julian years (the approximate equal of 19 Sirius years in Egypt, the Sirius being a sidereal year modified by precessional factors) are .06 of a day longer than the 235 Synodic months of the cycle.

A nation wishing to keep its Holy Days "in their season" would want to compare the 235 Synodic months with 19 Tropical years which are .09 of a day shorter. This difference between the Julian and Tropical years initiated work on the

Gregorian calendar, where the year is considered 365.2425 days (still a trifle too long).

The 19-year cycle would have been recognized shortly or immediately after the Flood. I believe we can almost prove that it was recognized. Whether the day, month, and year were the same length before the Flood is unknown. Longevity of life would have enabled pre-Flood man to discover long, accurate eclipse cycles. Variations in the length of the day, month and year in the centuries after the Flood must also be watched for in historical accounts and observations made at that time

A Pharaoh's Oath

We are going to show evidence that a lunar-solar calendar was in use shortly after the Flood. History records that the new Egyptian Pharaoh was forced to take an oath not to intercolate days or months. Yet a lunar-solar calendar would require such intercolation. Nimrod and Cush rebelled against the authority of Shem in this matter of the calendar and set up their own system both at Babylon and in Egypt.

Solar-Lunar Simplicity

The 19-year cycle does not demand a complex system of keeping time as some authors of modern astronomy books insist. Consider the simplicity of its rules. The final month of the year always has 29 days, whether that month is an intercolary 13th month or a normal 12th month.

The next seven months, which contain Holy Days, are a standard series of 30, 29, 30, 29, 30, 29 and 30. Thus we have a stable 8-month section vital to national unity in the matter of Festival observance.

At the time of the Feast of Tabernacles in the 7th month, the priests could give instructions to the people whether to add a 30th day to the normal 29 days kingdom. He had fled to Egypt in the time of Solomon fearing for his life. Upon his return with an Egyptian wife, Jeroboam seized control of the rebellious northern tribes. (I Kings 12.)

It is Jeroboam who "ordained a feast in the eighth month, on the fifteenth day of the month, like unto the feast that is in Judah" (the proper Feast of Tabernacles). The reason for this change: "if the people go up to do sacrifice in the house of the LORD at Jerusalem, then shall the heart of this people turn again unto their lord, even unto Rehoboam king of Judah, and they shall kill me, and go again to Rehoboam king of Judah." His rule would have come to an end unless he could change their religious observances.

There is also evidence that it was Jeroboam who changed the weekly day of rest from the Sabbath to the first day of the week. The "statutes of Omri" and the "sins of Jeroboam the son of Nebat" are repeatedly mentioned in the following centuries until the destruction of the northern kingdom and captivity of its people in 721 B.C. by King Shalmaneser of Assyria. When we again find these people they are keeping a late fall festival (Halloween), Sunday and the religious concepts of Nimrod.

The urgency of national religious unity was recognized by early religious leaders. Nimrod recognized that by changing the calendar so he could keep his people separate from the leadership of Shem. Moses led Israel out of Egypt under a calendar different from that of the Egyptians. Jeroboam knew he had to change "times and seasons" to hold his control over the people. The effect of any new world calendar in our time would be to create a sharp distinction between the people of God and those following the priests of Baal.

Quatrodecimans Preserve Passover

Religious leaders (and politicians too) have changed the date for observance of festivals to insure that people would be cut off from their former habits.

Like the case of Passover, which occurs on the 14th day of Nisan and might properly fall on various days of the week.

> "Most Christian sects agree that Easter (Passover) should be celebrated on a Sunday. Others follow the example of the Jews, and adhered to the 14th day of the moon (of the month Nisan); but these, the minority, were accounted heretics, and received the appellation of Quartodecimans. The council of Niaea, in the year 325, ordained that the celebration of Easter (Passover) should thenceforth always take place on the Sunday which immediately follows the full moon that happens upon, or next after, the day of the vernal equinox. Should the 14th of the moon, which is regarded as the day of the full moon, happen on a Sunday, the celebration of Easter was deferred to the Sunday following, in order to avoid concurrence with the Jews and the above-mentioned heretics." (Encyclopedia Britannica, article "Calendar." Parenthetical material and underlining added.)

To insure that their converts would be following faithfully after them, these religious leaders simply changed the day of observance. The article continues:

> "The complicated, though highly ingenious method, invented by Lilius for the determination of Easter . . . is entirely independent of astronomical tables or indeed of any celestial phenomena whatsoever . . . the equinox is fixed on the 21st of March, though the sun enters Aries generally on the 20th of that month, sometimes even on the 19th. . . . the intention of the council of Nice (was not) rigidly followed . . . epacts are also placed to indicate the full moons generally one or two days after the true full moons; but this was done to avoid the chance of concurring with the Jewish Passover, which the framers of the calendar seem to have considered a greater evil than that of celebrating Easter a week too late."

A Goal Almost Achieved

The subtle, step-by-step approach goes by unrecognized; the final goal to destroy every time-keeping principle that God gave Adam is slowly achieved, yet a vestige of the original way remains. The day, week, month, season and year all are recognizable in even the New World Calendar, yet NOT ONE IS PROPERLY OBSERVED. "Your new moons, your sabbath days . . ."

Passover Before The Exodus

Was the Sacred Calendar in existence prior to the Exodus? Or did it only begin when God said to Moses, "This month shall be unto you the beginning of months: it shall be the first month of the year to you." How then could it be said, "Now the sojourning of the children of Israel, who dwelt in Egypt, was 430 years. And it came to pass at the end of the 430 years, even the selfsame day it came to pass, that all the hosts of the Eternal went out from the land of Egypt"? (Exodus 12:40, 41.)

How could the children of Israel leave Egypt 430 years, even to the selfsame day, unless a very careful count of days as well as years had been kept? Were they leaving Egypt's calendar as well as Egypt, and resuming a calendar that dated back to Joseph, Jacob, Abraham and even to Shem?

What kind of calendar did Adam follow? "Let there be lights in the firmament of heaven . . . let them be for signs, and for seasons, and for days, and years." (Genesis 1:14.) Does the seven-day week date from Eden? (Genesis 2.) Egypt's 360, 365 day calendar ignored all signs but the sun and its solstice.

Why is it supposed by some that the 360-day year of Egypt would be God's year, that there should be 30 days in a month and just 12 months in every year? True, a prophetic year where the day for a year principle applies, contains but 360 days. But that in itself is not proof that pre-Noachian years had just 360 days. Rather than being God's year, history will show Egypt the source and Nimrod the perpetrator of this timekeeping system.

Geology and Golgotha

Consider the time and place of the Crucifixion. What does Golgotha look like today? How did it appear nineteen hundred years ago? thirty-eight hundred years ago? Where was Isaac offered "in the land of Moriah . . . upon one of the mountains which I tell thee of." (Genesis 22:2.)

The Place of the Skull

The crucifixion of Christ took place at the "place of a skull" or Golgotha. (Matthew 27:33.) The location of Golgotha north of the temple area seems rather obvious today for it still has the appearance of a skull. Geology (and some quarrying) has had 1900 years to alter the appearance, yet it remains basically unchanged. Why?

The erosion and weathering of this geological formation depends on the structure and the hardness of the rocks that constitute it. If we were to look 1900 years into the future, would it still have the shape of a skull? Probably so. Unless some unknown geological event were to take place, we would expect the appearance to be basically the same.

"The Latin calvaria ("a bare skull") is a translation of the word kranion, which the Greek Evangelists used to interpret the Hebrew Golgotha." (The Universal Standard Encyclopedia, article "Golgotha.")

What then was the appearance of Golgotha 1900 years prior to the crucifixion? Assuming a measure of uniformity, it might have had the appearance of a skull then too. It could have been selected for that very reason. Quarrying has been done in this region. Had early inhabitants of Jerusalem obtained building stone here?

The Mosque of Omar

Muslems today claim that Abraham offered Isaac on the spot where the temple was later built. They have built the Mosque of Omar on this place. It had originally been a threshing floor on the outskirts of the original city of Jerusalem. Abraham saw this city as he passed by on the way to Egypt.

Was Isaac actually offered on the site of the Mosque of Omar? Was Isaac offered on this hill and Christ on a hill to the north? Would any threshing flood be used for a sacrifice? Did Abraham spill the blood of a ram on this area set aside to accomodate grain, human food?

Set Aside On the Tenth

Consider that Abraham went a 3-day journey and saw the place from afar. (Genesis 22:4.) To be seen from afar a place must have a distinctive appearance. Abraham made camp and left his servants (Verse 5), then took Isaac and went to this appointed place. Was it Golgotha? The alternatives are other nearby hilltops. The Mosque of Omar is visible from Golgotha today even with buildings between. Both are elevations above the surrounding area.

Was Isaac also selected as a "Passover Lamb" on the tenth day of the first month? If so, then we have direct evidence of the Sacred Calendar before the time of Moses. We can also understand how Israel left Egypt 430 years, "even to the selfsame day," from the time of the promise to Abraham. The promise referred to was not the one given at the time of Isaac's sacrifice, but rather at the time when God said to Abraham, "Walk before me and be perfect." (Genesis 17:1.)

Alternative Locations

We then question whether Isaac was selected on the 10th day of the month, spent three days traveling with Abraham to the vicinity of Jerusalem, then was offered on the 14th day of the month as a type of Christ. Nineteen centuries later the same scene is re-enacted. Christ is selected by the people as the Passover Lamb on so-called "Palm Sunday" (which was really a Sabbath). Christ's crucifixion took place on the 14th of Nisan.

The alternative is to believe without evidence that the offering of Isaac by Abraham was not on the same site as the crucifixion and that it was not on the 14th of Nisan. The evidence in favor is that God does not change.

A Feast of Tabernacles for Egypt

The children of Israel had been slaves under the Egyptian 360-day calendar, enjoying no Sabbath and no pattern of festival observance. A 5-day festive period was held prior to the June 21 appearance of Sirius. Consider the reasons for this Egyptian pattern. Weigh also the fact of prophecy that it is Egypt that will hesitate to "come up to Jerusalem . . . to keep the Feast of Tabernacles."

The flood time of the Nile makes a solar calendar ideal. Irrigation rather than rainfall waters the Nile valley. Egypt does not depend upon rainfall today! The rainfall predicted for many areas is zero!

But note Zechariah 14:17, 18. "And it shall be, that whoso will not come up of all the families of the earth under Jerusalem to worship the King, the Eternal of hosts, even upon them shall be no rain. And if the family of Egypt go not up, and come not, they shall have no rain; there shall be the plague wherewith the Eternal shall smite the heathen that come not up to keep the feast of tabernacles."

Egypt is singled out and threatened with "no rain." But Egypt doesn't depend on rain. Today it doesn't.

What is the Nile did not Flood annually in the Millennium? What is the mountains were pushed down and the heavy rains in Abysinnia which cause the Nile to flood fell elsewhere?

So long as the Nile floods on time, Egypt is not going to want to keep any Feast of Tabernacles tied to a lunar-solar calendar.

A Description of the Egypt's Nile
and the Heavens as Seen From the Land of Egypt

To really grasp the problems faced by calendar makers in Egypt and the situation that confronted Moses and Joshua as they led Israel from this land, it will be helpful to pick up some background material from two sources. One by Emil Ludwig entitled The Nile, describes the effect of the river on the people living along its banks.

The other by G. Norman Lockyer entitled The Dawn of Astronomy contains a wealth of detail on the astronomical aspects of Egypt's temples. The value of his research into an understanding of man's past is only beginning to be realized. Part of the prodding of this generation has come from writings by Gerald S. Hawkins, who forcibly presents ancient man (1500 B.C.) as very qualified to understand eclipses, mathematics, computers and what have you.

Quotes from The Nile

First a number of quotes from Emil Ludwig in his widely read boo, The Nile.

> "Suddenly, though the sky is clear blue, there is a rumble of distant thunder. All the thousands of men and women encamped in the river bed rush out, carrying their tents and their household goods with them to take flight. A confused clamor arises--El Bahr! The river! . . . A thousand miles downstream hourly telegrams warn the engineer how far the river has travelled, how high it is, and how muddy . . . A moving wall, the river approaches, fifteen hundred feet wide, pouring downward in brown waves, full of trees, bamboo, and mud, and so it hurries past. . . . Already rain is on its heels, and together they call forth buds . . . the leaves immediately afterwards--they seem to unfold before ones' very eyes." (Page 104.)

Thus the Blue Nile begins its rush to the sea as it did in the days of Osirus. At places the rise of the Nile is more gradual, at others a spectacular event.

What causes the Nile to flood in summer and when does it reach its peak?

The time and the height attained are not the same each year. The seven years of famine in Egypt were seven low years, not years with no water at all. Rainfall in Egypt was not involved in this famine for it does not normally rain in Egypt.

> "But the rain is the real mother of the Blue Nile, the mountains are its father . . . If Abyssinia bore no alps, if these alps were not volcanoes, and if the wind did not break against them, to send the rain streaming from the sky, there would be no stream on earth to 'hurry snakewise to the plain,' carrying with it metallic detritus from the mountains to fertilize the desert a thousand miles away." (Page 101.)

> "For a hundred and fifty days, the wave of the Nile has been travelling from the equator to Cairo; it has flowed through thousands of miles, more than thirty degrees of latitude. Is it going simply to pour into the sea like a wave of any of the thousand rivers which link the earth to the sea? Nature's last stroke pours fresh vitality, for the last time, into the Nile's creative power: just above its mouth, it divides." (Page 437.)

This richest of all lands is the area given by Pharaoh to Joseph and his brethren.

Prior to the arrival of the river, hot dry winds threaten Egypt. The harvest must be completed before this time. Priest astronomers who knew the "day" for the arrival of the flood could promise the people a proper planting and harvest time, plus some relief from the hot dry days. Ludwig describes the rainless climate of Egypt and the rise of the river:

> "The wholesome dryness (of Egypt) is troubled only in spring by the Chamsin, the hot south-east wind which suddenly darkens the earth . . . suddenly raises the temperature of the air to over 118^{o} F., the water to nearly 80, drying up the lungs of men and of plants . . . annual rainfall figures: at the source of the Blue Nile in the Abyssinian Alps, over 50 inches . . . in Upper Egypt, 0; in Cairo, 1.2; in Alexandria, 6 (inches)." (Page 318.)

> "For three to four months, from June to September, (the Nile) rises 13 to 14 ells in Upper Egypt, 7 to 8 in the Delta. In these hundred days, the virile river takes possession of the expectant land, then, every inch a god, withdraws into the

> unknown, leaving behind only the symbolic priest, who represents it and guards its temples. Thus, as a god, it has been worshipped by all men dwelling on its banks, by all who have conquered it, down to our own day." (Page 325.)

Yet the rise of the Nile is not the same year after year. "In close succession--in 1904 and 1908--one flood was twice as high as the other." (Page 103.) Who could predict the rise of the Nile? Pharaoh Zoser in the time of Joseph knew that "only God can know" and he entrusted the future of his kingdom and his own future to the man who interpreted a dream of seven years of plenty and seven years of famine. The height of the Nile rise was a matter of life and death to Pharaoh's nation.

> "Today that secret (of what makes the Nile rise) is the secret of the monsoons that break against the Alps of Abyssinia. No one knows their strength, nor can anyone reckon in advance the conditions of cloud-formation; hence neither the volume of the Ethiopian rain nor the force of the flood rolling down the Blue Nile at the Atbara can be known. . . . Once it is there, we can measure the flood exactly and distribute it . . . but so could the Pharaoh's . . . men knew the numbers and prayed for 16 ells: that is the high flood, and that is the meaning of sixteen 'children' on the statue of the bearded Nile in the Vatican. Pliny expressed this with Roman terseness: '12 ells mean hunger, 13 sufficiency, 14 joy, 15 security, 16 abundance.'" (Pages 326, 327.)

Why did the children of Israel worship "the golden calf" so readily while Moses was in the mount receiving the Ten Commandments? Does the following cast any light on the subject?

> "Sometimes, during the anxious period of drought just before the flood, Pharaoh came in person up the Nile to Silsileh, where the river seems to vanish in the narrows between the rocks. There he sought to propitiate the Nile god with gifts, particularly a white ox, and if he threw a roll of papyrus with magic formulas into the water, the river was certain to rise again from the earth." (Page 396.)

It is a commonly accepted belief that the Nile rose on a certain day and we are led to accept a simple picture of a river flooding one day and then slowly tapering off. A study of the problem shows a <u>river</u> that <u>rose at a different day</u>

for every point along its course, and that day was by no means the same one each year. Once the river began to rise it continued that rise for three months. Thus the high point of rise was in September not the 21st day of the solstice and rise of Sirius.

> "Of the three Egyptian seasons, Nili, Shitwi, and Sefi--flood, winter, and summer--summer and flood merge, for though the flood sets in from June on, it reaches its height only at the beginning of September." (Page 335.)

So firm is the belief of the historians in the validity of Egypt's history that the following long quote is urgent. Did Egypt's calendar begin a first cycle in the days of Zoser or 1460 years earlier? Or did Egyptian astronomers enjoy our modern pasttime of figuring backwards?

We must not forget the principle used in our own time of setting some remote arbitrary date in the past as a starting point. "The Renaisance scholar Joseph Justus Scaliger suggested in 1582 that all dates be referred to an arbitrary initial date, January 1, 4713 B.C., which he chose in connection with his work on early chronology. The date thus reckoned is known as the Julian day . . . in honor of his father . . . and not to be confused with the Julian calendar." (Page 47 of Introduction to Astronomy by Cecilia Payne-Gaposchkin. The choice of 3113 B.C. by the Mayas is of similar origin.)

Quoting again from The Nile by Ludwig:

> "For aeons these sons of the desert must have observed the stars, seeing that, a thousand years before the first Pharaoh, they had already invented the calendar. It has been proved that they possessed it in the year 4236 before our era. Since they divided the year into three parts, Flood, Seedtime, and Harvest, and into twelve months of thirty days each, a few days remained over every year, which had accumulated in five hundred years to such an extent that the Flood season actually fell in harvesttime. To eliminate this error, that is, to bring the whole year round to its starting-point again, it would take 1460 years; and in the epochs of Egyptian history, this 'wandering year' first arrived in 2776 under Pharaoh Zoser, who built the step-pyramid, then again in 1316 under a successor of

> Ikhnaton, and still in time to find the Pharaohs in the Nile valley, but the third time the wandering year came round, it encountered Ptolemy, the greatest mathematician of his time, in 144 A.D.; the fourth time it met Mamelukes, and there was still two centuries to wait for General Bonaparte." (Page 406.)

The above quote ignores the 5-day festival period at the end of the year. If the 1460 year Sothic cycle began in Pharaoh Zoser's time, the previous 1460 years were merely a chronologer's effort to run the calendar backwards before his time.

Will modern Egypt really solve its problems with the new Aswan High Dam and the older Aswan Dam? What of the problem of "no rain" and a "plague" in the millennium on an Egypt that does not want to follow the lunar-solar calendar and come up to "keep the Feast of Tabernacles"? How has the idea of damming the Nile actually worked so far?

> "And little devils actually co-operate . . . to frustrate a great idea . . . First, the storage-water has no silt . . . and yields smaller crops . . . for the first time since thousands of years, the fellah has to manure the soil of Egypt . . . The land that was kept healthy by its dryness breeds insects when it perpetually lies under water; new diseases such as bilharziasis, rise from the widened Nile like Egyptian plagues, and from a thousand mouths rises the cry: 'No more dams! No more water!'" (Pages 336, 7.)

The Dawn of Astronomy by Lockyer

The following quotations from The Dawn of Astronomy BY G. Normal Lockyer point out the relationships of the heavens, the Egyptian calendar and Egyptian agricultural.

> "In Egypt the year was always, as it is now, associated with the rise of the river." (Page 225.) "The great difficulty experienced in understanding the statements generally made concerning the Nile rise is due to the fact that the maximum flood, is, as a rule, registered in Cairo upwards of 40 days after the maximum at Aswan." (Page 240.)

> "If the solstice had been taken alone, the date of it would have been the same for all parts of the valley . . . it was

chiefly a matter of the arrival of the Nile flood, and the date of the commencement of the Nile flood, was, by no means, common to all parts of Egypt." (Page 240.)

Thus we see that the year was associated with the rise of the river, but that the further down stream a city was the later the rise would be.

"In the 1878 flood . . . the river rose in the most abnormal fashion . . . the wheat was sown too late, and got badly scorched by the hot winds of March and April . . . the modern Egyptians still hold to the old months for irrigation . . . 30th Misra is the last safe date for sowing maize in the delta." (Page 242.)

A successful agricultural year would depend upon a calendar successfully tied to the tropical year. Various authorities give the length of the Egyptian year at 360, 365, and 365¼ days. If they had used the solstice alone, the length of the year would have been close to our Gregorian year, 365.2425. Instead, the Egyptians chose the heliacal rising of the star, Sirius, which, due to the precession of the equinoxes and its declination, gave a 365¼ day year. The exact length of the Sidereal year is 365.2563604, the precessional movement affected the declination as well as the right ascension of each star.

"The Sirius year, like the Julian, was about 11 minutes longer than the true year, so that in 3000 years we should have a difference of about 23 days." (Page 253.)

The Sidereal year, 365.2563604 days, is about 9 minutes and 13 seconds longer than the Sirius year.

"During 3000 years of Egyptian history the beginning of the year was marked by the rising of Sirius, which took place nearly coincidentally with the rise of the Nile and the summer solstice . . . the commencement of the inundation was later as the place of observation was nearer the mouth of the river . . . Of the three coincident, or nearly coincident, phenomena, the rise of the Nile, the summer solstice, and the rising of Sirius, they at first chose the last." (Page 249.)

An additional complicating factor was the taboo on adding intercalary days or months, as the Jewish calendar today does, or as we do with Roman calendar by by adding a February 29th every four years.

> "Each Egyptian king, on his acession to the throne, bound himself by an oath before the priest of Isis, in the temple of Ptah at Memphis, not to intercalate either days or months, but to retain the year of 365 as established by the Antiqui. The text of the Latin translation . . . cannot be accurately restored; only thus much can be seen with certainty." (Page 248.)

The Egyptian king was thus bound by oath not to observe a lunar-solar calendar, but to observe a purely solar calendar of whole days.

There was a 360-day work year plus "a 'little month' of 5 days . . . interpolated at the end of the year between Mesori of one year and Thoth of the next." But apparently there was no additional "February 29th" every four years.

> "They had a vague year (365 days) in the Sirius year (365.25 days), so related, as we have seen, that the successive coincidences of the first of Thoth in both years took place after an interval of 1460 years. Now, for calendar purposes . . . the easiest way would be to conceive of a great year or Annus Magnus, consisting of 1460 years, each day of which would represent four years in actual time . . . to consider everything . . . to take place on the first of Thoth in each year . . . as the cycle swept onward, the date would sweep backward among the months of the great Sacred Year until its end." (Page 257.)

Compare this with the system of the Mayas where a 365-day year was observed in conjunction with a 260-day year, making a great cycle of 52 (365-day) years or 73 (260-day) years. There should be further study of the Maya and Egyptian calendars, of their similar pyramids, and of their similar hieroglyphics.

It is obvious that the Egyptians recognized an astronomical year of $365\frac{1}{4}$ days, tied to the heliacal rising of Sirius.

> "Now it is clear, that if the Egyptians really worked in this fashion . . . this calendar system . . . is good only for groups of four years. Now, a system that went no further than this would be a very coarse one. We find, however, that special precautions were taken to define which year of the four was in question . . . Brugsch, indeed, shows that a special sign was employed to mark the first year of a series of four." (Page 259.)

Thus we have the Egyptians setting up a 360-day work year, followed by a five-day period of festivities, yet understanding that their year was one quarter day short of the astronomical Sirius year. The first day of Thoth was gradually moving backward in the seasons, one day in four years, 25 days in a century, a full revolution in the year to its original position in 1460 years, which is termed a Sothic cycle.

The astronomer in Egypt thus made his calculations on the basis of the Sirius year of 365.25 days while the king was bound to follow a 365-day year. The priest-astronomer was thus able to hold his position of authority over the king of Egypt. The beginning of the calendar year moved gradually backward through the seasons, yet everyone who cared to might observe the rising of Sirius in the east on June 21st (Gregorian date).

But there are two other complicating factors.

> "The heliacal rising of the star would not take place on the same day for the whole of Egypt, the difference between Thebes and Memphis (because of their latitudes), amounting to about 4 days; and, further still, the almost constant mists in the mornings in the Nile valley prevent accurate observations of the moment of rising." (Page 247.)

The Egyptians had aligned their calendar with the summer solstice, the rise of the Nile, and the heliacal rising of Sirius. Astronomers in the Tigris-Euphrates valley, however, were concerned with the equinox.

> "The Euphrates and Tigris rise at the Spring Equinox--the religion was equinoxial. The temples were directed to the east. The Nile rises at a solstice--the religion was solstitial and the solar temples were directed no longer to the east." (Page 229.)

Rather their direction was toward the northeast for the summer solstice. Our next step will be to determine the method Moses and Joshua used to side step the confusion of Egypt.

Problems Summarized

What were Stonehenge astronomers searching for? That would depend upon who they were. Personal discussions with Dr. Hoeh and others on campus point out the possibility that they were Israelites in the time of Joshua. If this is the case we should thoroughly search early British history for the accomplishments of "Hugh the Great."

If Israelites under Joshua built Stonehenge, the motives to be considered are limited to a fairly narrow range. Pagan motives (human sacrifice, fear of eclipses, sun worship, moon worship) are immediately cancelled.

We know Israel kept a seven-day week, the Sabbath, lunar months with the month beginning with the appearance of the crescent of a new moon, a lunar-solar calendar with holy days kept "in their season," and very probably a knowledge of the 19-year Metonic cycle.

Early Approximations

They would have known the approximate length of the year to be $365\frac{1}{4}$ days, thus giving a length of 6939 days and 18 hours to 19 tropical years. This was the length they had known in Egypt. Could we assume that they were attempting to relate it very carefully to the length of 235 synodic months, which we now set (about an hour and a half shorter) at 6939 days, 16 hours, 33 minutes and 3 1/3 seconds? (See reprint article "How to prove the Crucifixion was NOT on Friday!" by Dr. Herman L. Hoeh.) The difference amounts to 1 hour, 26 minutes, 56 2/3 seconds.

Still Earlier Evidence

It was God who revealed to Moses, "this month shall be the beginning of months, it shall be the first month of the year to you." Was this a change from the Egyptian way? Yes, the Egyptian year began at the summer solstice, near June 21, with the rise of the Nile, and the heliacal rise of Sirius. There are only three seasons in Egypt, the inundating, the planting season, and the harvest season. Any delay in planting would delay the harvest, which would then be endangered by both the rise of the Nile and the hot drying winds which preceded it. A successful agricultural economy in Egypt was closely tied to the proper beginning of a year.

Pharaohs began their year of reign from the heliacal rise of Sirius and the rise of the Nile. A five-day festival preceded this rise. The harvest was over and it was certainly a harvest festival. The 360-work days of the year were conveniently divided into 3 seasons of 120 days, then into 4 months of 30 days each. The thirty-day month could be divided evenly into sixths, fifths, thirds, and tenths.

The suggestion of Egyptiologist today that the 360-day year was allowed to progress through the seasons without the addition of five days at the end is an insult to the intelligence of the men who built Egypt.

A Lunar-Solar Calendar before the Exodus

The Exodus of the children of Israel from Egypt took place 430 years after the covenant with Abraham. Personal discussions with Dr. Hoeh point out that this covenant was prior to the birth of Isaac. It is further pointed out that Isaac was about 25 years old at the time his father placed him upon the altar as a sacrifice. Jewish trandition states that this sacrifice took place on the Passover!

Now note the amazing statement from Scripture. The children of Israel left Egypt 430 years "<u>even to the selfsame day</u>"! Now we have the covenant with Abraham, the offering of Isaac, the Passover in Egypt and Exodus, and the crucifixion of Jesus Christ all on the same two days.

Geology fills in more of the details of these events. Golgotha today has the appearance of a skull. It was called the place of the skull 1900 years ago at the time of the crucifixion. The rocks have slowly eroded away but the appearance is due to the geologic structure in the limestone beneath that crucifixion site.

Sacrificed on a Threshing Floor?

Arab tradition is that Isaac was offered on the site of the Mosque of Omar, on the rock, the threshing floor that was in use prior to the use of the site for the temple of Solomon. But is Arab tradition correct? Would Isaac have been offered here and Jesus Christ half mile to the north?

But the Scriptures supposedly say he was offered on Mount Moriah. But do they? A closer examination shows Abraham was to take his son to the Mountains of Moriah, to the place "where I shall show you."

Consider that they went a three-day journey, then camped, where they "saw the place" and leaving the servants behind went further to that place. How many days does three plus an additional journey make?

If Isaac were offered on the 14th day of Nisan, then on what day was he selected as a "lamb" to be sacrificed? Obviously on the tenth. They traveled three days, camped possibly near the site of the present Mosque of Omar, then after sunset in the early evening on the fourteenth day of the month, Abraham and Isaac were on Golgotha. The time and place were the same as those 1900 years later.

Why not on the site of the temple? Would a human sacrifice be asked on a threshing floor where human blood would mix with human food? Or would even a lamb be offered and its blood allowed to run on a rock surface that grain would later cover?

The answer is obvious. Any sacrifice would be made outside the camp. But the significance with regard to the calendar is also startling.

Even to the Selfsame Day

How could a 430-year period pass and time be counted to the selfsame day unless the timekeeping system Abraham used was identical to that revealed to Moses at the time of the Exodus?

Now the mystery of Stonehenge will solve itself. Leaving the stone temples of Egypt where the heavens could be watched closely and compared with earlier alignments, the children of Israel were going out into the desert into a new land.

The agricultural seasons were going to be different. There would be four seasons. The year would begin in spring as Abraham had observed it. A week with a seventh day of rest would be observed. The 360-day year of the Egyptians would be discarded. A lunar-solar calendar was to replace the solar calendar of Egypt.

The praise given the New World Calendar with its near four seasons, each 91 days in length, with its 13 months each with the same number of working days, its disregard for the continuity of the seven-day week with the Sabbath, turns our nation back once more to the calendar of Osiris.

The New World Calendar is merely a modification of the original 360-day work year with a five-day period of festivities. Yet the Spirit behind it is the same. A week with a rest period on its first day has been added. That day in honor of the sun was observed in Babylonia. Was it also observed in Egypt?

Thus we complete the picture, one calendar dating at least back to Abraham. The other with its origin in Egypt and going back to Cush and Nimrod.

How did early man keep time? First, what do we mean by early man? Historians take us back to Egypt and to the valley of the Tigris-Euphrates. The time before this supposedly belong to the cavemen. These early men were gradually becoming aware of the world about them; first superstitiously, later in a more civilized way.

A legion of errors has crept into modern studies. Egyptian chronology was altered by Manetho to give the appearance of great antiquity; the chronologies of other nations were warped to suit the Egyptian model.

The evolution of man is assumed, and artifacts are arranged from the simple to the complex in the approved pattern. "Stone Age" cultures of the past are assumed to be more ancient than their contemporary but more advanced neighbors. Whole civilizations are placed in backward order.

Recent declarations by astronomer Gerald S. Hawkins startled the world by insisting that these "Stone Age" men designed Stonehenge as an astronomical observatory in Britain about 1800 B.C., and that with that design were able to predict both solar and lunar eclipses.

What is even more disturbing to the modern scholar is that these men supposedly knew of a 56-year eclipse cycle that modern astronomers do not acknowledge. By calling their device a computer, Dr. Hawkins has captured the imagination of the public, so fascinated by the electronic marvels of our age.

Here then is the starting point for our search into just what these early men knew and what they were attempting to learn, not only at Stonehenge but at other early "observatories." Egyptian temples and pyramids were supposed to have both solar and stellar allignments. Early "Indians" in North America set up "henges," huge circles of posts to learn something from the heavens.

Sundance, Wyoming is located at an ideal spot for watching the location of the sunrise. At this site an almost perfectly level, barren horizon stretches from the southeast to the northeast. A mountain near the city of Sundance was used as an observation point. What could man have learned in this way?

A Fifty-Six Year Eclipse Cycle

The research of Gerald S. Hawkins purported to find a 56 year eclipse cycle. Other astronomers deny that such a cycle exists. The available evidence is simply 56 "Aubrey Holes" dug in a circular pattern on the Salisbury plain for some unknown reason and then quickly filled in again. They seem to have served as markers.

We could assume as Dr. Hawkins does, that these early men spaced six stones (8 and 9 holes apart) on these 56 spots, rotating them (clockwise or counterclockwise, take your choice) one position a year, and thus were "warned" of impending eclipses. Dr. Hawkins assumes as do many scholars that early men "worshipped" the moon, the sun, the stars; that they were terrified by the commencement of any eclipse, and willingly rewarded any savant well who could ward off evil the eclipse was certain to bring. Eclipse prediction would have been a blessing to these superstitious folk.

But is that what these men were doing? Does the 56 year eclipse cycle even exist? It is also know that the 19 year Metonic cycle, which forms the basis for the Sacred Calendar perpetuated by the Jewish people, is an eclipse cycle. Yet astronomy books mention neither of these cycles.

We do find a 3.8 year cycle, the shortest practical one; another cycle 18 years, 11 1/3 days long called a Saros (a very accurate predictor of eclipses). Others are generally mentioned in terms of the number of eclipse years (346.62 days each) they contain, and are called the 23, 42, 61, 342 and 385 year cycles. The latter contains 365 tropical years (our year of the seasons) plus four months and 13 days.

The obvious fact is that astronomy books do not mention any 56 year cycle; nor is there any allusion to the 19 year cycle. The reason for this will become apparent as we continue our research for the reason for Stonghenge.

Eclipse Tables Give the Answer

The scientific approach to any problem is 1) determine that a problem exists, 2) formulate a possible means of arriving at a solution, 3) carry out an experiment to discover new facts. Eclipse tables are available in various books. One entitled Eclipses in the Second Millennium B.C. gave calculations for the years 1600 B.C. to 1200 B.C. These are not actual historical observations of eclipses but rather the backward extrapolation of our modern observations.

A solar eclipse took place March 19, 1558 B.C. (Julian Calendar) and 56 years later the table failed to show any March eclipse of the sun. Several tries with other dates led to the same expected failure. Dr. Hawkins' method was not working. Perhaps our approach to the problem was wrong. A table of lunar eclipses was available in the same book. Stonehenge was supposedly able to predict both. I wonder if . . .

Curiosity rightly directed was sure to bear fruit. Could a solar eclipse be followed by a lunar one 56 years later? The following table was obtained by turning from the solar eclipse of 1558 to the lunar eclipse of 1502, to the solar eclipse of 1446, to the lunar of 1390 to the solar of 1334, to the lunar of 1278, all dates B.C. An unrecognized cycle was "in the book" all the while! The FIFTY-SIX YEAR CYCLE of alternating solar-lunar eclipses was a reality, but it was about 4 days shorter of 56 full years.

Stonehenge Sequence of Eclipses

The following series shows that there is a FIFTY-SIX year cycle, that "stone age" man was successful in relating the tropical year, the synodic month and the recession of the moon's nodes.

Eclipse of	Date B.C.	Julian Month	& Day	Julian Day
Sun	1558 B.C.	III	19	1,152,441
	- 56		-5	+ 20,451
Moon	1502	III	14	1,172,890
	- 56		-4	+ 20,450
Sun	1446	III	10	1,193,340
	- 56		-4	+ 20,450
Moon	1390	III	6	1,213,790
	- 56		-4	+ 20,450
Sun	1334	III	2	1,234,240
	- 56		-4	20,450
Moon	1278 B.C.	II	26	1,254,690

Julian Days are reckoned consecutively from Jan. 1, 4713 B.C., an arbitrarilly chosen date; parts of days are expressed as decimals; Jan. 1, 1950 is Julian day 2,432,282.

An Eclipse Cycle of Whole Years

The main alignment of Stonehenge is with the sunrise of June 21, the day of the summer solstice. These early astronomers were certainly watching for the "turn of the year." Historians tell us that bonfires were lighted on this day and the news of the "new year" spread across Europe. Calendar years could be kept in step for all the early nations of Europe. The summer solstice on June 21 would mark the end of spring and the beginning of summer.

The fifty-six year cycle still presents a problem. An eclipse near the solstice would be followed about 56 years later by another, but of what value is that to a primitive people?

The NINETEEN-YEAR Eclipse Cycle

Another puzzle needs to be solved. Why do astronomy books omit any reference to the 19 year Metonic cycle as an eclipse cycle, which it is purported to be? Has a certain portion of astronomy been deliberately ignored by scholars? Or is this but another oversight?

The short cycle of 3.8 years can be easily multiplied by five to produce the Metonic cycle! Yet only the short cycle is mentioned.

Nineteen Year Metonic Cycle	
235 Synodic Months	6939.688180 days
20 Eclipse Years	6932.40
19 Tropical Years	6939.601772

Short Cycle	
47 Snyodic Months	1387.93764 days
4 Eclipse Years	1386.48012
3.8 Tropical Years	1387.9203547

The increased value of the 19 year cycle is that now it comes out almost exactly as a whole number of tropical years, whereas before it was 3.8 years. Its use as a calendar standard would have been immediately apparent even to the average astronomy student. Yet neither his professor nor the author of his astronomy text considered the item worthy of mention. More of this later.

The question at the moment is what relationship the ignored 19 year cycle might have on the forgotten 56 year cycle. Three Metonic cycles would total 57 years. If there were only an 18 year cycle.

The Saros Completes the Picture

There is an 18 year (plus an 11 1/3 day) cycle called the Saros. Could it be related in any way? Perhaps it would only be fair to mention that according to some historians, neither the 19 year Metonic cycle nor the 18 year Saros cycle was known in those early days. If we pretend ignorance of the historians "knowledge" and proceed a bit farther, we may yet be amazed at the understanding of these early men. Why assume the cave man hypothesis?

The Saros cycle is always given a good write-up in astronomy texts. It contains 12 more Synodic months than does the Metonic cycle. The value of the Saros is that a very similar solar eclipse can be predicted for and, usually seen from, the same geographic location. The one-third day excess (over 18 years, 11 days) shifts the eclipse one-third the way around the earth to the west. An observer seeing a total eclipse of the sun early in the morning would see another almost identical total eclipse in the afternoon one cycle later. The third eclipse of this sequence would be on the other side of the earth. The fourth one (three cycles later than the first) would still be total and its track shifted northward (if the eclipse is at the ascending node) or southward (at the descending node). It could be seen once more by our observer. The following table gives a comparison of measurements.

It would have been a simple step to note another eclipse 346.62 days later, completing a Metonic cycle. The unusual fact that 19 tropical years were then complete, would make this latter eclipse stand out as being of great importance to calendar makers.

From this time forward both Saros and Metonic cycles could have been used to predict eclipses. Several cycles might have been added together. Suppose they added three Metonic cycles. The total would be 57 years. Subtracting a single eclipse year, would bring us close to the 56-year (less four days) Stonehenge cycle. It would require half a synodic month more.

Conditions for an Eclipse

Let's consider lunar eclipses first because they are of greatest value in timekeeping. A lunar eclipse will occur only at the time of full moon, but not at every full moon. It must be a full moon during an "eclipse season."

For lunar eclipses this eclipse season is a 25-day period of time, centered on the crossing place of the moon's orbit and the ecliptic, called a node.

These 25-day eclipse seasons (there are two of them, 173.31 days apart, one at the ascending and one at the descending node) for lunar eclipses drift slowly backwards through the calendar year. They come about 18.6 days earlier each year because the "eclipse year" (346.62) is that much shorter than the tropical year.

Will there be a lunar eclipse during each of these "eclipse seasons" each year? No, because the 29.53-day synodic month is longer than the 25-day season.

We might have a full moon three days before the season began; then the following new moon would arrive one day after the season ended. Thus, no lunar eclipse. In most cases, however, the 25-day season would contain one lunar (and one solar) eclipse, and that lunar eclipse could be seen by more than half the people on earth.

Years without Lunar Eclipses

There is a possibility that the full moons might "straddle" the season at both seasons (173.31 days apart) and thus we might go an entire calendar year without a lunar eclipse. Examples are 1929, '40, '51, '62, '66, '69 and '80.

The synodic month is only 2.32 days longer than the 27.21-day nodical month and thus at the second season, the new moon would arrive just before the season and the following new moon about three days after. In both cases the intervening new moon would produce a central solar eclipse with its track near the equator.

Solar Eclipse Frequency

Solar eclipses are more frequent than lunar eclipses because the seasons at which they might occur at 37 days long, again centered on the ascending and descending nodes. These eclipses of the sun will occur at the very moment of the molad, or conjunction of the moon and the sun in the sky. This is the astronomer's new moon and will also precede the "new moon" day of the Sacred Calendar by six hours to several days.

Five solar eclipses might occur in a single calendar year. How is this possible? Each 37-day eclipse season must contain at least one solar eclipse, and may contain two. The synodic month is only 29.53 days long; thus two new moons could occur during the season and both would produce solar eclipses. Both however would be partial eclipses, the shadow cone crossing above the north pole in one, and below the south pole in the other.

How many seasons might occur in a single calendar year? Three; if one began early in January, the next would begin 173.31 days later in July, and a third season late in December. With conditions just right we can have 3 eclipses in the first season, 3 in the second and 2 in the third, all in a single calendar year.

Eclipses in Sequence

Are eclipses so infrequent that 18, 19 and 56-year cycles are needed to keep track of them? Not at all. Eight have been known to occur in just over a year. We might have three eclipses in less than a month's time! Consider the sequence that started with an eclipse of the sun on January 5, 1935:

Season	Roman Date / Jewish Date	Ascending or Descending Node	Phase of the Moon	Solar - Lunar and Type	Days - after 1st Eclipse	Synodic Months
First Season	January 5 / Shebat 1	Ascending Node	New Moon	(1) Solar (partial)	0	0
First Season	January 19 / Shebat 15	Descending Node	Full Moon	(2) Lunar (total)	14.765	½
First Season	February 3 / Shebat 30	Ascending Node	New Moon	(3) Solar (partial)	29.53	1
Second Season	June 30 / Sivan 29	Descending Node	New Moon	(4) Solar (partial)	177.18	6
Second Season	July 16 / Tammuz 15	Ascending Node	Full Moon	(5) Lunar (total)	191.945	6½
Second Season	July 30 / Tammuz 29	Descending Node	New Moon	(6) Solar (partial)	206.71	7
Third Season	December 25 / Keslev 29	Ascending Node	New Moon	(7) Solar (regular)	354.36	12
Third Season	Jan. 8, 1936 / Tebeth 13	Descending Node	Full Moon	(8) Lunar (total)	369.125	12½
	Jan. 22, 1936		New Moon too late for an eclipse		383.89	13

This series of eight eclipses in a 369-day period shows a startling frequency in a phenomenon that we are apt to think of as occurring only at widely spaced intervals. Five are eclipses of the moon, most valuable to Stonehenge astronomers in noting the exact relative positions of moon and stars at the central moment of the eclipse with the sun exactly 180° away at that moment. The hour of the day would give the fraction of the earth's revolution.

Eclipses in the Sacred Calendar

No attempt has been made in this listing of eclipses to determine their date on the Jewish calendar on a sunset-to-sunset basis, nor has the factor of a round earth been taken into consideration which would allow the eclipse to occur on two different calendar dates for observers with different longitudes.

The purpose is merely to show the frequency with which eclipses may occur, and that they occur at the end of a lunar month, usually on the 29th day, with lunar eclipses scheduled for midmonth.

People using a lunar-solar calendar would expect eclipses to occur as a natural phenomena preceding the beginning of a new month or just preceding the middle of the month. The word month means moon. The moon causes eclipses. It is the heathen using a solar calendar that Jeremiah warns Israel of in Chapter 10:2: "Learn not the way of the heathen, and be not dismayed at the signs of the heaven; for the heathen are dismayed at them." Neither The 30-day Egyptian "month" nor the 20-day Maya "month" follow the phases of the moon.

Thumb Rule for Prediction

As a "rule of thumb" astronomers (and common people alike) had only to watch for an eclipse on the days of the astronomical new and full moons (these preceded the calendar new moon day and middle day of the month) during an "eclipse season." This season is a 37-day period for solar eclipses (and a shorter 25-day period for lunar eclipses) centered on both the ascending and descending nodes (points where the moon's path crosses the ecliptic, the sun's eastward yearly path through the stars).

Lunar nodes "precess" westward along the ecliptic, the same (westward moving) node meeting the (eastward moving) sun every 346.62 days, an eclipse year. Thus these "eclipse seasons" arrive 8 or 9 days earlier each year in our Gregorian calendar, which is tied to the seasons and equinoxes.

In 18.61 years the node has moved completely around to its starting place. It is the fact that three complete revolutions of the moon's nodes closely equals 56 years, that allows the 56-year Stonehenge eclipse cycle to function for centuries without resetting.

The Amplitude of Moonrise

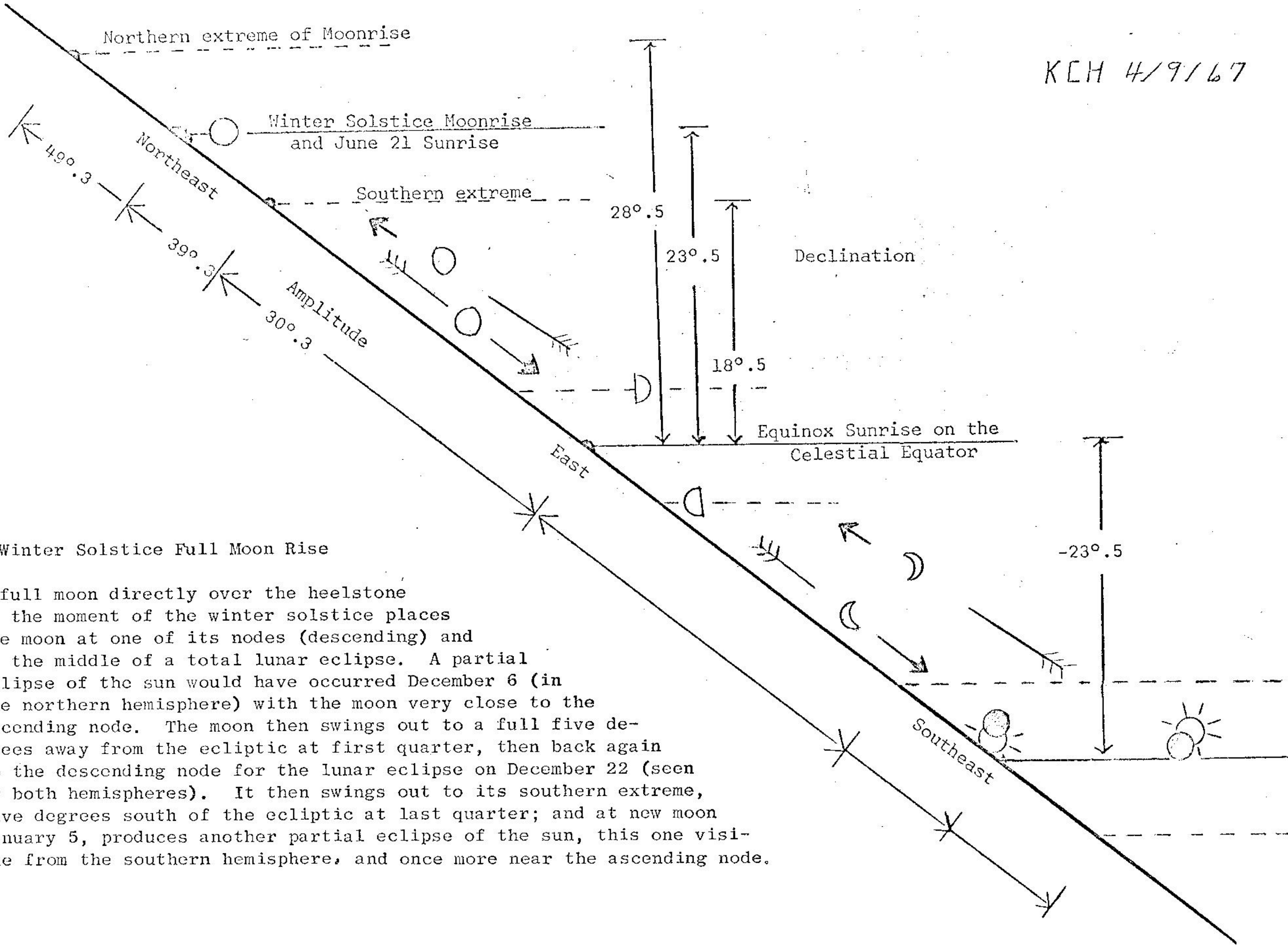
Suppose we were to select that July 16th total eclipse of the moon. At what point on the eastern horizon would that eclipsed full moon rise for an observer with the latitude of Stonehenge? Amplitude is measured in degrees north or south of the east and west points.

On July 16th we are 25 days past the solstice. The sun's declination will have dropped back to 21.5 degrees (from 23.5 degrees). The sunrise will be 36 degrees north of the east point, sunset 36 degrees north of the west point.

Where will the eclipsed full moon rise for an observer with the latitude of Stonehenge? Exactly 180 degrees away from the point of sunset, or at a point on the eastern horizon 36 degrees south of the east point.

On the day of the summer solstice, June 21, the sun had set about 40 degrees north of the west point. An eclipsed full moon on that date would have arisen on the eastern horizon 40° south of the east point. However, the moon was north of the ecliptic several degrees on that date in 1935 and approaching the descending node which it met on June 30. The amplitude of full moon rise on June 21, 1935, was thus several degrees south of the calculated 40° position.

KCH 4/9/67



Winter Solstice Full Moon Rise

A full moon directly over the heelstone at the moment of the winter solstice places the moon at one of its nodes (descending) and in the middle of a total lunar eclipse. A partial eclipse of the sun would have occurred December 6 (in the northern hemisphere) with the moon very close to the ascending node. The moon then swings out to a full five degrees away from the ecliptic at first quarter, then back again to the descending node for the lunar eclipse on December 22 (seen by both hemispheres). It then swings out to its southern extreme, five degrees south of the ecliptic at last quarter; and at new moon January 5, produces another partial eclipse of the sun, this one visible from the southern hemisphere, and once more near the ascending node.

A Five O'clock Eclipse

The central moment of this July 16th lunar eclipse is given as 5 hours, 0 minutes W.E.T. Would an observer at Stonehenge have seen this eclipse? And at what time of day? Where would he have looked for the moon? The middle of the eclipse would have been at five o'clock in the morning. Sunrise on this date at the latitude of Stonehenge is approximately 4 a.m. Moonset is obviously at the same time.

Would the observer at Stonehenge have seen any of this eclipse? ~~Is~~ longitude slightly west of Grenwich would allow him several minutes additional time. Yet he would have missed the entire time the moon was in total eclipse, beginning approximately 4:30 and ending approximately 5:30. The partial phase would have begun approximately 3:30 and the observer at Stonehenge might have been able to detect this entry of the moon into the earth's penumbra.

The Value of a Lunar Eclipse

What could be learned from such an event? A lunar eclipse is exactly one-half month from the conjunction or <u>molad</u>. The moon is exactly 180° away from the sun. Observing where the moon was among the stars would show the position of both sun and moon in the heavens. Because the date was 25 days past the summer solstice, the sun's position in the heavens would be about 25° eastward from the summer solstice point in the heavens. The moon would be 25° eastward of the winter solstice in the heavens. A careful check would be possible on the location of these points (especially with eclipses nearer the beginning points of the four seasons).

Because this lunar eclipse was central (being flanked by two partial eclipses of the sun June 30 and July 30), the position of the fully eclipsed moon in the heavens marked quite closely the position of the node or crossing point of the moon's path over the ecliptic (sun's path). In this case it was the ascending node.

We thus have an exact location of the sun (25/365.25 of a tropical year past the solstice point), an exact location of the moon (near the node and at the very midpoint of a synodic month) and the exact position of a revolution of the earth (5/24ths of a day past the midnight hour, or 17/24ths of a day past the normal six o'clock mean sunset time used for the Jewish calendar. Thus the day, month and year are brought into alignment where they can be compared with the sequence of days, months and seasons of the calendar.

Questions Answered

Problems that needed to be solved were these: What pattern should be adopted for adding a 13th month to keep the calendar in line with the tropical year? In the second century a scheduled 135h month had to be dropped and a new cycle of 12- and 13-month years begun. What pattern of 30- and 29-day months should be used to keep the calendar months following the new moons of the heavens?

Even in our own time there is concern because the Sacred Calendar is based on a synodic month and tropical year that are both somewhat too long. Quoting from <u>The Comprehensive Hebrew Calendar</u> by Arthur Speer, "the traditional figures . . . in our present time units are:

M - 29d 12h 44 min. 3 1/3 sec. (lunation period)
(29d 12h 793 parts)

S -365d 5h 55 min. 25.438 sec. (tropical year)
(365d 5h 997 parts 48 moments)

The more exact astronomical magnitudes are:

M*- 29d 12h 44 min. 2.841 sec.

S*-365d 5h 48 min. 46.069 sec.

"The deviation . . . is very slight . . . (for) the lunar month . . . The difference . . . (for) the sun year . . . is, however, not negligible and causes the Hebrew months to advance against the sun 4½ days in a thousand years . . . The rebirth of Israel rekindles in us the hope that a new Sanhedrin . . . will be established . . . (and) make a decision as to when and how the sanctified calendar of Hillel II is to be modified in accordance with the requirements of astronomy and the Torah" (pp. 226, 227).

Thus the most critical reason for the observation of the position of the eclipsed full moon in the background of stars, and also the hour of the day at which it occurs, is to note whether the calendar (an artificial sequence of months and days) is gaining or losing on the heavens.

Information from the Saros

Suppose we assumed the Saros to be exactly 18 years 11 1/3 days (6585 1/3) and that it contained exactly 223 synodic months, 239 anomalistic months, 242 nodical months or 19 eclipse years. How close to the currently accepted figures could we come?

		Calculation	Modern Value
6585 1/3 ÷	242 draconitic m.	27.2121212	27.21222
	239 anomalistic m.	27.5536959	27.554550
	223 synodic m.	29.5306427	29.5305879
	19 eclipse yrs.	346.5964912	346.620031
	365 days = 18 years 15 days		

Quoting again from the Britannica, "By assuming what is approximately true, that the saros of 6,585 1/3 days contained an exact number of . . . synodic months . . . anomalistic months . . . and draconitic months (also eclipse years) . . . early astronomers . . . computed the relative motions of the sun and moon, the lunar perige and apogee, and the nodes."

Information from the Metonic Cycle

The 6939 3/4 day Metonic cycle yields the same type of information. This time rather than the anomalistic month, the siderial month is included.

		Calculated Value	Modern Value
6939.75 ÷	255 draconitic m. =	27.2147058	27.21222
	254 siderial m.	27.3218503	27.32166
	235 synodic m.	29.5308510	29.5305879
	20 eclipse yrs.	346.9875	346.620031
	19 tropical yrs.	365.25	365.2421988

In both cycles we have used "round numbers" 6939 3/4 and 6585 1/3 in addition to assuming whole months and whole years. Good results have been obtained even in this "crude" fashion.

To put a fine polish on these figures would require the observation of repeated Saros and Metonic cycles.

Division of Time Units

The second and most exacting reason for searching out lunar eclipses is to determine the length of the month and year in terms of days, hours, parts and moments. (In the above tables we used a modern calculator and thus the decimal system.) Note that we can describe the rotation of the earth on its axis as a day divisible into 24 hours, or in terms of degrees, 15 per hour.

The hour, for the Sacred Calendar, is divisible into 1080 parts (360x3). Parts are then divisible into 76 moments (19x4).

It was necessary for lunar-solar calendar makers to relate the 19-year Metonic cycle, the 4-year "February 29th cycle," the 360^{o} division of the heavens, the sequence of 12 and 13-month years, and the sequence of 29 and 30-day months.

Measurement of the Saros

A table (from Oppolzer's Canon) given on page 11 of Dr. Van Den Bergh's Eclipses in the Second Millennium B.C. gives the length of 25 Saros measurements 1207-1192 B.C.

through 1189-1174 B.C. The mean value of the Saros is 6585 days, 7 hours, and 46 minutes.

But the mean value is not the value of every Saros. The shortest listed is 6 hours, 33 minutes; while the longest is 8 hours, 51 minutes over 6585 days. These variations would have been of great significance to any calendar supervisor.

What Changes the Saros?

Why the deviations? "If the solar system consisted of only two perfectly spherical homogeneous gravitating bodies, the motions would be simple and repeat themselves exactly . . . The interplay of sun, moon and earth produce a motion so complex that the relative positions of the three are never exactly repeated. The motion of the moon can be broken down into about 150 principal periodic motions along the ecliptic, and about the same number perpendicular to it: there are also about five hundred smaller terms." (Pages 129-131, Introduction to Astronomy by Cecilia Payne-Gaposchkin.)

A Changing Calendar

The conclusion for calendar makers is obvious. NO LUNAR-SOLAR CALENDAR CAN CONTINUE UNCHANGED! Even a strictly solar calendar such as the Sirius (or Julian), or its improved form, the Gregorian, cannot be used perpetually.

This argument for uniform, perpetually reoccurring time-units is basic in the desire of man to discard any remnant of God's system and adopt instead the New World Calendar.

The sun and moon were intended to give us days, months, seasons, and years. They provide a variable pattern of life, morning and evening, sunrise, increasing length of daylight, planting and harvest. A glance at the moon's phase gives the time of month; a glance at the sun, the time of day. A moment's consideration of the amplitude of sunset tells the progress of the season. What improvement could man make?

Man was intended to arrange the number of days in each month, and number of months in each year. That is what the builders of Stonehenge were attempting to do.

The seven-day week and proper place for its beginning had been predetermined for man. Yet it is this week of seven days that makes those who could have designed the heavens better fret and chafe.

Perhaps a year might be evenly divided into 100 days, each with 100 hours, each hour having 100 minutes. Electric lighting could do away with day and night.

The length of the minute in this new system would be cut approximately in half. There are presently 31,556,925.9747 seconds in a tropical year; the new system would change that (with 100 seconds to the minute) to 100,000,000. And the week could have an even ten days. IBM stock would climb rapidly.

Whole and Fractional Units

We have become so accustomed to a decimal system (tenths, hundreths, thousandths), especially since the advent of IBM, that it seems strange to think only in whole units. Even our monetary system in the United States is partial to 10's and 100's, dimes and cents. Yet it retains a measure of "halves" and "quarters." The two-cent piece and the two-dollar bill are now officially relics of the past; the half dollar is disappearing. Yet the five-cent piece (a half dime) and quarter are still with us.

Why is the quarter called two bits? The original silver dollars used in this country were chisseled into eight equal pieces termed "bits." A quarter of a dollar is thus two bits.

Consider the British monetary system for a moment. Count out, not ten, but twelve pence to make a shilling, then discover coins valued at 1/4, 1/2, 3 and 6 pence. The shilling could be divided into 24 farthings, so the latter unit is no longer used. Decimal thinking has become rather ingrained in our own thought patterns. The convenience of being able to divide a dozen pence into thirds, quarters, halves and sixths more than compensates for the difficulty of the newcomer experiences.

The British pound of 20 shillings divides neatly in half, in fourth, eighth, and tenth. Another coin, the gueina (now obsolete though the monetary term is used), was worth 21 shillings, and thus divisible into thirds and even sevenths.

Dividing into Basic Units

This ability to divide into many fractional quantities (yet each quantity a whole in itself) would be of utmost importance in any calendar calculations. Consider once more the quantities of 76 moments to the part, and 1080 parts to the hour.

A $365\frac{1}{4}$ day tropical year multiplied by four would give us a whole number of days, 1461 days. But the problem of the month had to be solved also for any people using a lunar-solar calendar.

Nineteen years (6939 3/4 days) would equal 235 months very closely, but the number of days is a fraction. The only way to make this come out as a whole number is to multiply by four also. Four times 19 is 76! That is the number of moments in a part.

Seventh-six Moments

Why does the Sacred Calendar divide days into 24 hours, hours into 1080 parts, and parts into 76 moments. Each part is equal to 3 1/3 seconds in our system; a moment equals 5/114 seconds.

Why such a strange choice for fractional units? Do these go back into antiquity? A search should be made. If men shortly after the Flood were aware of both the 19-year Metonic cycle and the $365\frac{1}{4}$ day tropical year, these unusual divisions of time almost explain themselves.

The solar calendar used by the Sumerians divided its hours into 30 <u>ges</u>. But a lunar-solar calendar presented a different problem.

A Seventy-six Year Cycle

Could all the divisions of a 76-year cycle be measured accurately in whole parts? Would it divide out evenly into whole units per day, per month, per year and per Metonic cycle? This would have formed the basis for an early calendar. (The seven-day week would remain independent of the month and year.)

Note how 1080 parts can be divided. By 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 20, 30, 40, 60, 90, and 108. But neither 7 nor 11 will divide evenly. Nor is there need.

No provision was made to allow the day to be divided into sevenths. Neither the 24 hours, the 1080 parts nor the 76 moments took the week into consideration. The intent was to deal in whole units and to distribute the units in the year and month.

Post-Flood Calculations

The first step in finding order in the heavens would have been the discovery of the 19-year Metonic cycle (5 of the 3.8-year "short cycles"), and the $365\frac{1}{4}$-day tropical year. Multiplying this 19-year cycle by four would give us a 76-year cycle with a whole number of days, 27,759 days.

The next step would be dividing this quantity of time into months of 29 and 30 days, and years of 12 and 13 months.

Allowance would have to be made to refine the length of the 76-year cycle. If this refinement were always expressed as a whole part, then the 76 moments could be evenly distributed by year and by 19-year cycle.

The total length of the 76-year cycle is 27,759 days ($365\frac{1}{4}$x4x19). Or it could be expressed as 940 months (235x4). Any refinement in the length of the 76-year cycle by a single part could be divided one moment to a year, 19 moments to a 19-year cycle.

Length of the Month

The Pharaoh's of Egypt swore by an oath not to intercalate days or months. Their practice stemmed from the first Pharaoh Menes (Mizriam or Cush) and his són Osiris (Nimrod).

Shem faced a problem of intercalating both months and days. The calculations were not too difficult. There were 940 months (235x4) in a 76-year cycle. If each had 30 days, the total would be 28,200 or 441 days too many. Obviously 441 of these months had to be shortened to 29 days, while the other 499 would have 30.

The length of the average month was thus 27,759 ÷ 940 or 29.530851 6/94, whereas our modern measurements give 29.530588. If they did their calculations in hours, parts and moments the answer would be 29 days, 12 hours, 799 parts 50 120/940 moments. The Sacred Calendar today is based on 27 days, 12 hours, 793 parts, almost 7 parts shorter (or about 23 seconds shorter). Note that the Sacred Calendar is based on a whole number of parts.

Why Avoid Eclipses?

The immediate conclusion jumped to by some investigators is that any close solar or lunar alignments at Stonehenge would have constituted sun worship or moon worship.

The fact of the matter is that few people even see a lunar eclipse, and that it occasions no fright in any normal person. Possibly two per year might be seen at the locality of Stonehenge. All would be between sundown and sunrise; people awake and watching only in the early evening with continual good weather might see as few as 1/10 of those that do occur.

Yet these very reasons point out the use of the "Stonehenge machine" as an eclipse predicter for an entirely different purpose. The very fact that bad weather, infrequent lunar eclipses, and that the entire night would have to be watched proves that the builders were determined to WATCH ECLIPSES, not AVOID THEM.

Search Out Eclipses

Solar eclipses occur with greater frequency than lunar, yet their value in calendar keeping is of lesser importance. The path of totality is narrow, even the path of partial coverage is limited, while a lunar eclipse might be seen from any place on the side of the earth facing the moon. A lunar eclipse is merely the earth's shadow on the moon, visible to all who can see our satelite. The middle of the lunar eclipse seen toward the west at sunrise (as in our July 16 eclipse) from the longitude of Stonehenge, would be seen overhead (and at midnight) by a viewer in the central United States. At the same moment, and just after sunset by those halfway across the Pacific, who would be looking east. The lunar eclipse occurs at the same moment for all who can see it, though their local time varies from sunset to sunrise as one goes further west.

The solar eclipse, on the other hand, is a narrow cone of the moon's shadow sweeping eastward across the earth. Like lunar eclipses it is seen by relatively few. Unless publicized ahead of time, few people in a modern world would take note.

The obvious conclusion is that eclipses have to be searched out, that unless people were taught otherwise, eclipses would scare almost no one, and that any structure involving the labor of thousands of men over years of time is not intended to alleviate the fears of a few. Stonehenge's purpose was to enable calendar makers to avoid missing eclipses that were vital in keeping an ideal calendar.

Primitive Knowledge

We know Stonehenge astronomers were observing the summer solstice. If we assume their 56 Aubrey positions were used as Dr. Hawkins suggests, we might almost conclude that they were aware of BOTH the Metonic and Saros cycles centuries earlier than any historian has even allowed for "civilized nations." Is this conclusion justified? Or are we seeing"56 spots" arranged in a circle that might have had an altogether different purpose?

Suppose we assumed that they had a knowledge of both cycles? Would that have been unusual for a "primitive" people with a lunar-solar calendar? The typical college student today is not even sure the moon always rises to the east as some point along the eastern horizon, let alone possess a working knowledge of eclipse prediction.

Even today's astronomy students in college are unconcerned about the basic trunk of the tree of astronomy but are searching far out on the twigs. However, an agricultural people concerned with crops were surely acquainted with the sky. Their leaders, concerned with Holy Days and national unity, might have treated both Metonic and Saros cycles as everyday knowledge, not even worth writing down.

A Saros Plus TWO Metonics?

Suppose they had added three Metonic cycles together then took away an eclipse year (346.62 days) to give a cycle of just over 20,450 days. (The Saros is just one eclipse year shorter than the Metonic cycle.)

The fact that this cycle would be just a few days short of 56 tropical years would have tied in closely with their agricultural year. Or they might have approached the problem by adding two Metonic cycles and a Saros cycle.

56 year	470	Synodic Months	13,879.37636 days	Two 19 year + 1 Saros cycle
(-4 days)	+223	Synodic Months	+ 6,585.32112	
Stone-	693		20,464.697484	
henge				
cycle	-1/2	Synodic Month	- 14.765294	- 1/2 Synodic Month
	692.5	Synodic Months	20,449.93219 days	

59 Eclipse Years (20,20 + 19)	20,450.5812	(.69964 longer)
56 Tropical Years (19, 19 + 18)	20,453.5531328	(3.6209428 longer)
56 Julian Calendar Years	20,454.0000000	(4.06781 longer)
55.83 Tropical Years equals	20,391.462 days	(18.61 times 3)
	equals 3 revolutions of the Moon's Nodes	

Comparing the 692.5 Synodic Months with the 59 Eclipse Years, a difference of about .65 of a day occurs over the period insuring a long sequence of eclipses. Comparing with the 56 Tropical Years the difference will cause the eclipses to be

3.6 days early in the year and 3 days early in the 37 day eclipse season over the period. The .5 of a Synodic Month means solar and lunar eclipses will alternate. Comparing with the Julian Calendar the 692.5 Synodic Months show a difference of over 4 days causing the eclipses to retreat 4 and sometimes 5 days in the Julian Calendar, (which itself being too long progresses forward 3/4 of a day per century in the seasons) the equinox in 1500 B.C. would thus be April 4.

Early Accuracy

It is obvious that early post-Flood astronomers did not have the accurate measurements we have today. Yet regarding Saros we have an unusual statement, "Each cycle of the moon's eclipses is completed in a period of 223 months . . . they (the Chaldeans) computed the length of the Synodic and periodic months so accurately that modern astronomers have found the calculation to fall short of less than 5 seconds of our time . . . From Babylon a series of . . . astronomical observations dating as far back as 1903 years before the year 331 B.C., the year Alexander entered that city." (Page 140, Sixty Centuries of Progress.)

The knowledge available to those early observers is going to have a bearing on why Stonehenge was built. History tells us of a 360-day year in Egypt. It states that the Egyptians also had a festival period of five days at the end of their year, that they knew the length of the year should have been 365 $\frac{1}{4}$ days because of the heliacal rising of Sirius. Records show they had discovered the precession of the equinoxes, though they were not aware of the cause. Early astronomers might also have had misgivings as to the length of the Synodic month, as it is not a constant measure. "The length of the Synodic month may vary by as much as 13 hours, chiefly because of the excentricity of the orbit and the consequent on uniformity of motion . . . Because the moon's motion undergoes many disturbances (perturbations), the

Sidereal month may vary by as much as seven hours." (Page 120, Introduction to Astronomy by Payne-Gaposchkin.)

These variations even out to a staple length for the month over a longer period of time. If we can prove that eclipse cycles were common knowledge to early man, then they might also have known the main length of the month was great accuracy.

At the same time we have the reasons for building Stonehenge (as well as "henges" throughout the world and the "star temples" in Egypt). Knowing when to watch for an eclipse, they could very carefully note the time of the beginning, the place in the heavens, and carefully bring a calendar into accurate measure.

Post-Flood Years

What factors control the number of hours in a day, the number of days in a tropical year, siderial year or synodic month? A calendar in use prior to the Flood might have required repeated adjustments to suit a changing post-Flood heavens.

The rotation of the earth seems like a stable item. Yet even today there are minor variations. For a series of years the earth will run slow (or fast) until a number of seconds accumulate:

> "The earth is not a perfect clock. . . The day is steadily lengthening about a thousandth of a second a century as a result of the action of tides . . . There are also very small erratic changes in the rate of rotation . . . The earth may 'run fast' by twenty seconds or so for a couple of decades, then become 'slow.' These small irregularities are incompletely understood." (Pages 39, 40, Introduction to Astronomy by Cecilia Payne-Gaposchkin.)

If the earth were to have picked up its Flood waters from outer space, its rotational speed would obviously be slowed down. The source of the Flood waters might have been ice crystals found in comet and meteor trains today. There is speculation that a great meteor, which fell in Siberia in 1908 causing widespread damage but leaving only small craters and no meteorite fragments, might have been frozen gases or ice crystals.

Any shift of mass from the polar regions to the equitorial regions would also slow rotation and without having to add any mass from outer space. The "Ice Ages" began with the beginning of Noah's Flood. In the following centuries additional ice continued to pile up and gave rise to the Wisconsin advance. During these years when mass was transferred to the northern regions, the rotational speed would have increased. Then continents would sag under the load of ice and in so doing tend to cancel out that increase in rotational speed.

Changing the Year's Length

There has been considerable speculation that at some time in the past our earth turned on its axis an even 360 rotations in the time it took to revolve about the sun, thus producing a year with an exact 360 days. Some ancient records actually claim such a 360-day year and a 30-day month. How could this be accomplished?

One way would be to slow the rotation of the earth; the number of days in a synodic month would also drop from the present 29.53 to 29.11. Obviously we are not going to get the neat 30 days in a month needed to make an exact 12 months in a year.

Another way would be to increase the mass of the sun. The result is that all the planets (but not their moons) would increase their orbital velocity. Earth's rotation would remain the same. The number of days required to make a revolution about the sun could be cut from 365¼ down to 360 rather easily.

Side effects? Yes, while the siderial day (24 hours less 4 minutes for a star to return to our meridian) would remain the same because our rotation was unchanged, there would be a slight lengthening of the solar day (24 hours) by a few minutes because of our increased orbital velocity. Our meridian would require a bit more time to catch up with the faster, eastward-moving sun on its yearly course through the stars. The synodic month would also be slightly lengthened by this same factor.

A third way would be to move the earth into a smaller orbit thus requiring it to complete its revolution about the sun in less time. Our distance would be .919 Astronomical Unit rather than the present 1 Unit. To make the moon go around in 30 days would mean a larger orbit, 1.2% greater than its present 238,857 mile distance from the earth.

A Correct Goal?

Or the end of obtaining a "fixed" calendar might be accomplished by all three of the above methods each applied in part. Yet is the goal of a "fixed" calendar one that can actually be achieved? The answer is, No! Perturbations from the other planets, the effect of the moon's (and sun's) gravitational pull on the earth's equatorial bulge, tides, wind, weather, a host of minor influences slowly and gradually would cause it to drift from this "perfect" system.

Our wish for a fixed calendar is the same as the Egyptian and Maya desire that has been proven to be of pagan origin. The correct calendar is one that requires intercalation of both days and months.

Historical Record of a 360-Day Year?

A number of quotations from Immanuel Velikovsky's Worlds in Collision, containing quotes from many ancient sources, should be considered:

> "The texts of the Veda period know a year of only 360 days. 'All Veda texts speak uniformly and exclusively of a year of 360 days. Passages in which this length of year is directly stated are found in all the Brahmanas.' 'It is striking that the Vedas nowhere mention an intercalary period, and while repeatedly stating that the year consists of 360 days, nowhere refer to the five or six days that actually are a part of the solar year.' This Hindu year of 360 days is divided into twelve months of thirty days each." (Pages 330, 331.)

How can we reconcile a historical record of twelve thirty-day months with what we see in today's heavens?

> "Here is a passage from the Aryabhatiyz, an old Indian work on mathematics and astronomy: 'A year consists of twelve months. A month consists of 30 days. A day consists of 60 nadis. A nadi consists of 60 vinadikas.'" (Page 331.)

> "The Persian year was composed of 360 days or twelve months of thirty days each." (Page 332.)

> "That the ancient Babylonian year had only 360 days was known before the cuneiform script was deciphered: Ctesias wrote

> that the walls of Babylon were 360 furlongs in compass, 'as many as there had been days in the year.'" (Page 333.)

But notice the next quote. It will play a vital part in the deciphering of these unusual "day" counts. What is a decade, a year, a decan, a day?

> "The zodiac of the Babylonians was divided into thirty-six decans, a decan being the space the sun covered in relation to fixed stars during a ten day period. 'However, the 36 decans with their decades require a year of only 360 days.'" (Page 333.)

The decan was a space the sun covered, not 10 or 11 revolutions of the earth on its axis. Here is the solution to the problem. But continue:

> "The Assyrian year consisted of 360 days; a decade was called a sarus; a sarus consisted of 3,600 days."

Surely convincing evidence has been presented that our earth was turning at a different speed and/or in a different orbit. Or was it? Or was the text corrupted in all these cases?

Remember the quotation from the Mayas that their calendar was tied to the synodic periods of Venus and Mars, and that it went back to the date 3113 B.C.? The Mayas were depending upon synodic periods as well as rotation of the earth.

Consider one more quote from Velikovsky; this one with regard to synodic periods, for if the earth's rotation on its axis or its velocity in orbit were to change, the synodic periods of all the planets would be affected!

> "The old Hindu astronimical observations offer a set of calculations different from those of the present day. 'What is extraordinary are the durations assigned to the synodic revolutions. . . . To meet in Hindu astronomy with a set of numerical quantities widely differing from those generally accepted is indeed so startling that one at first feels strongly inclined to doubt the soundness of the text. . . . Moreover, each figure is given twice over.'
>
> "In the astronomical work of Varaha Mihira, the recorded synodical revolutions of the planets, which are easy to calculate against the background of the fixed stars, are about five days too short for Saturn, over five days too short for Jupiter, eleven days too short for Mars, eight or nine days too short for Venus, less than two days too short for

> Mercury. In a solar system in which the earth revolves about the sun in 360 days, the synodical periods of Jupiter and Saturn would be about five days shorter than they are at present, and that of Mercury less than two days shorter. But Mars and Venus of the synodical table of Varaha Mihira must have had orbits different from their present ones, even if the terrestrial year was only 360 days."

The problem is whether to adjust the orbits of the earth, moon and several planets to fit this unusual set of figures, or whether to admit that man's knowledge of astronomy has suffered greatly through the Dark Ages.

Could a day be anything but an exact 24 hours? Why of course, we answer. Our modern world has siderial, solar, mean solar, lunar, 12-hour, 24-hour, sunrise-to-sunset, school, office, 8-hour and obviously other "days."

We are faced with an Assyrian, Babylonian, Egyptian, and Persian count of days and other fractional portions of the year that disagrees with the way we count.

What is a decade, a year, a <u>decan</u>, a day, a <u>nadis</u>, a <u>vinadikas</u>? <u>Ten</u> years, <u>one</u> year, <u>ten</u> days, <u>one</u> day, a <u>sixtieth</u> of a day; but what kind of "days"? Do we have a corruption of the texts from all these sources? Or a corruption of a once "perfect" solar system? Or a corruption in the comprehension of astronomy through the Middle Ages?

360 "Day-grees" in a Tropical Year?

Suppose we were to set down Velikovsky's figures in a table and watch what happens when we understand what the Hindus were counting. Synodic periods of the planets, Yes; but days, No!

Let's ask the question of how many degrees the sun moves eastward through the stars in a year. A perfect 360; it was set that way by the men who invented the degree. And the men who invented the <u>decan</u> said it was "the <u>space</u> the sun covered" in 1/36 of a year.

Now question <u>how many degrees the sun moves</u> through the stars during the <u>synodic period of each of the "naked eye" planets</u>. Include the sun as a "planet" for it was considered such until the Copernican system.

The calculation is simple (synodic period in days divided by 365.2422 and multiplied by 360). The observation was as simple as the heliacal rising of Sirius. They simply observed the heliacal rising (or setting) of these planets or return to the same background of stars. Then they measured out the number of degrees not days that the sun had covered. ("Planets" are listed in order of their "radial velocity.")

	Modern Synodic Period in days	Hindu Synodic Period supposedly in days	Modern Synodic Period expressed in degrees
Moon	29.53	30	---
Mercury	115.88	- less than 2 = 114	114.21
Venus	583.92	- 8 or 9 = 575,576	575.54
Sun	(365.2422)	(360)	(360.00)
Mars	779.94	- 11 = 769	768.744
Jupiter	398.88	- over 5 = 393	393.15
Saturn	378.09	- 5 = 373	372.66
Solar Month (1/12 year)	(30.43683)	(30)	(30.00)

The problem is solved! The Hindus were measuring time in degrees, 1/360 of a tropical year. (Or possibly a siderial year until they became aware of the precession of the equinoxes.) There is no need whatsoever to change the orbits of the planets or our rotational speed.

But how could primitive man . . . ? Here is part of the problem; "primitive man" wasn't primitive! Early astronomers were highly skilled, careful observers. They were using the sun as a "year hand" on the "clock of the heavens." A fictitious moon (or month) served to divide the heavens into twelfths, a decan was a 36th, and a "day" or degree a 360th of a year. "The solar month is the 12th part of one solar (or tropical) year, or, 30.4368 days." (Encyclopedia Americana, article "Month.")

The next part of the problem is one solved only in the last few years by our modern measurers of time in using the tropical year as the basis for uniform time. The rotation of the earth is not the best timekeeper. True, it has been reasonably uniform these past centuries (and only gets off an accumulated twenty seconds one way or the other now). But what of Joshua's long day? And the return of the shadow on the sundial in Hezekiah's day? Had there also been earlier evidences of the power of God over the rotation of the earth and His ability to set "the dayspring" where He wanted it?

Early man counted days (sunset to sunset) and seven-day periods correctly. But he depended upon the return of the seasons, "the place of dayspring," the heliacal rising of the stars and planets for longer periods. He divided his year by 360 degrees but found it to contain 365+ days.

Let Them be for Signs!

The final problem is the one of a desire for a fixed calendar, a desire that began with Osirus shortly after the Flood and has persisted for more than four millennia. Surely no human mind is backing this venture.

Consider what Elizabeth Achelis experienced when she accepted the opportunity to work for the New World Calendar, which discards the continuity of the seven-day week, accepts for "eternity" the 30, 30-day calendar month rather than a month tied to the moon's phases, and except for the one point of intercalating a day every four years, accepts the oath taken by the Pharaoh's of Egypt:

> "I was reading in my room . . . and found there a letter describing . . . the 'twelve-month equal-quarter plan,' and I was immediately attracted by its simplicity, order and symmetry. As I was contemplating it, I heard a clear voice You must work for this plan.
>
> "Although the call was distinct and convincing, my first reaction was 'How can I? I have no experience.' Then I remembered the doubting Zachariah and the believing Mary,

The following is from Calendar Change--A Challenge, a pamphlet by the World Calendar Association:

> and I knew I had to accede. With no more hesitation my decision was made by answering aloud, 'If You wish me to do this Lord, I will do my best.'"

A fascinating account, similar in the ways to the experience of Joseph Smith. Yet in neither case were the "spirits tried" to "see if they were of God." A tragic error (with only a moment of hesitation) on the part of the now President of The World Calendar Association, her answer, "Yes, Lord" to an unknown, unidentified and untested voice.

She "recalled . . . Moses (but no trace of, Who art Thou?) . . . Samuel (but no trace of a careful tutoring by an Eli) . . . St. Paul (but no trace of "if they speak not according to this Word," the Bible) . . . knew that clergymen, teachers, doctors and reformers had been called to their professions and now . . . had experienced a 'calling.'" But from whom had she received this call?

Who is this that demands the end of the seven-day week as it has been observed by the servants of God from Creation? Who "shall think to change times and seasons? And change from what God-given standard?

Is there any doubt that a lunar-solar calendar with its unrelated seven-day week was that standard from the time of Moses? from the time of Abraham? from the time of Noah? from the time of Adam?

Does any doubt remain as to the Author of that Sacred Calendar that requires a priesthood of astronomers to "intercalate days and months" and that uses the "signs in the heavens" for days, for months, for seasons and for years?

pattern of 30 days in a month and 12 months in a year. This 360-day "agricultural year" was followed by a waiting period of 5 days for the heliacal rising of a star. The calendar year was thus 365 days in length. No provision was made for "leap year."

Only a single observation of the heavens had to be made during the entire year to keep the calendar in order, a single sighting toward the east. First the beauty of dawn, then the sudden appearance of the brilliant star, Sirius, in the southeast, following by the "first flash" of the rising sun at the solstice pointed in the northwest.

A new year had begun. Each succeeding morning Sirius would rise four minutes earlier, easily observed before the rising of the sun. It was an event that every schoolboy might witness and testify to.

Four-month Seasons

In Egypt the four-month harvest season had officially terminated 5 days earlier. Now the flood of the Nile would inundate the lowlands for a four-month flood season beginning the agricultural year. Planting season followed immediately to insure harvest time prior to the next flood of the Nile. Egypt had a year of three seasons, each 120 days in length. This same 12-month, 30-days-in-a-month principle was employed in the Tigris-Euphrates valley but with a different twist. Six years of 360 days were followed by an intercalary month of 30 days, giving a 365 day average. A four-season (rather than three) year suited the agricultural economy, and the flood time of their river was at the spring equinox rather than the solstice.

The Egyptian Model in Central America

The Mayas of Central America also had their basic 360-day calendar, but with 18 months each containing 20 days; then an additional 5-day period at the end to