The Time Keepers

Ancient time keeping to the present

Armenians

- Had a Sothis calendar from 5000 BC.
- Sothis meant from the appearing of Sirius.
- The calendar had no February 29.
- The calendar backed up one day every 4 years.
- New year’s day was July 11.
- The cycle started over again in 2010 AD.

Armenian Calendar ended in 2012 AD

- The **Armenian calendar** uses the calendar era of AD 552, reflecting the separation of the Armenian Apostolic Church from the Roman Church by the Monophysite schism.
- 552 AD + 1460 years
- = 2012 AD.
- 552 AD – 1460 years:
- = 2363 BC. 3830 BC. 5290 BC

By Rita Willaert from Belgium - Zorats Karer - Carahunge - Armenia, CC BY 2.0

Armenian Calendar

- 12 X 30 day months
- 360 days
- 5 superfluous days
- Nawasard = new years, first month.
- Areg = Sun, first day of the month.

Egyptian Sothis Calendar

- The Egyptians also had a Sothis calendar.
- It was based on the first visibility of Sirius, 4:14 AM July 16.
- This coincided with the flood waters rising on the Nile.
- Thus this date served as a warning to take to higher ground.
- They like the Armenians and Mayans had a 360 day calendar
- With five unlucky days left over.
- But no February 29.

Sothis Cycle

- The sothis cycle should be 1460 years.
- However, if Sirius appeared one day earlier,
- The cycle would be 1456 years.
- Thus from 2737 BC to the end of the cycle
- 1282 BC = 1456 years.
- The end of the cycle was the Exodus.

430th year

- Exodus 12:40 Now the sojourning of the children of Israel, who dwelt in Egypt, *was* four hundred and thirty years.
- 12:41 And it came to pass at the end of the four hundred and thirty years, even the selfsame day it came to pass, that all the hosts of the LORD went out from the land of Egypt.

The end of the Egyptian Sothis Calendar

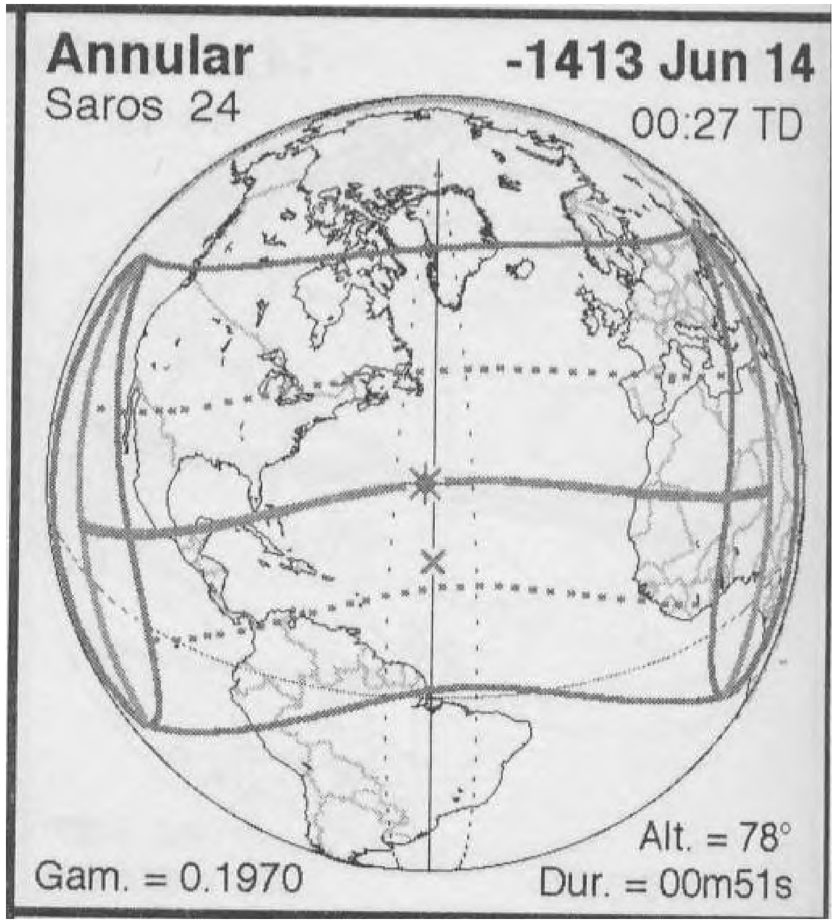
- The sojourning of Jacob and family into Egypt FROM the 430th sothis year.
- From 2737 BC 430th year is 2307 BC.
- New years had backed up 107 days from July 16 to April 1, 2307 BC.
- The Sothis calendar ends after about 1460 years.
- 1456 years from 2737 BC is 1281 BC.
- The end of the 430th new years April 1 is April 1, 1281 BC
- = the Exodus out of Egypt.

End of the 430 years

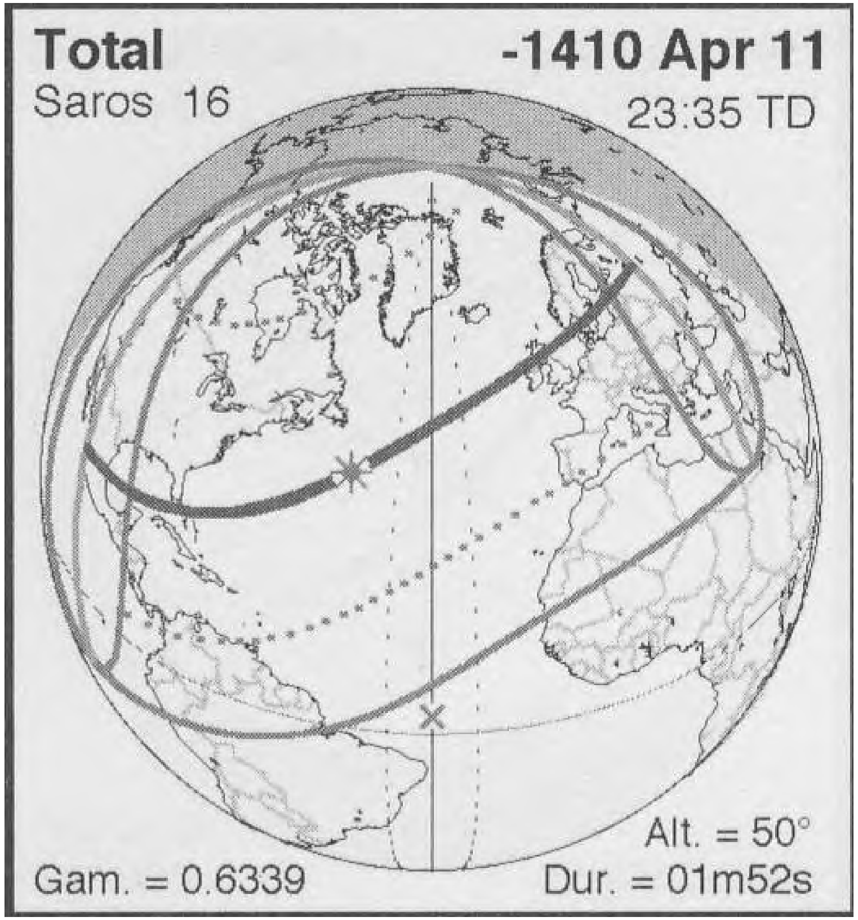
- 2737 BC – 430 years = 2307 BC.
- 2737 BC – 1456 years = 1281 BC.
- New Years July 11, 2737 BC.
- 430/4 = 107 days
- = New Years April 1, 2307 BC.
- Exodus, March 31, 1281 BC.
- The self same day April 1.

Total eclipse, Akhet-Aten	14 May 1338 BC 14 June 1414 BC	25 Shemu II Year 2	Inspired Akhenaten to celebrate heb-sed at Karnak
Annular eclipse, northern Egypt	13 Mar 1335 BC 11 April 1411 BC	24 Peret IV Year 5	Inspired Akhenaten to found city of Akhet-Aten
New moon	2 Mar 1334 BC 1 April 1410 BC	13 Peret IV Year 6	Boundary Stelae of Akhet-Aten First lunar aniversary of eclipse
Full moon	26 Nov 1333 BC 26 Dec 1409 BC	8 Peret I Year 8	Boundary Stelae of Akhet-Aten Repetition of Oath
Total eclipse, Nubia	30 Dec 1332 BC 29 Jan 1408 BC	12 Peret II Year 9	

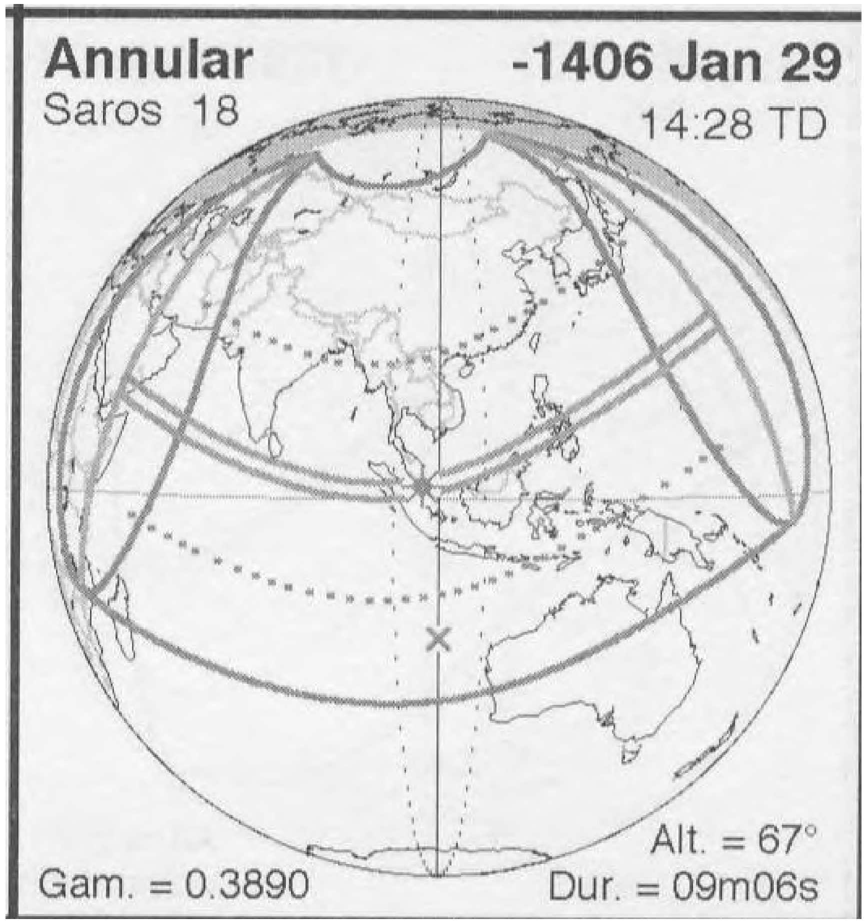
1414 BC


Annular
Saros 24
-1413 Jun 14
00:27 TD
Alt. = 78°
Gam. = 0.1970
Dur. = 00m51s

1411 BC



1408 BC


Annular
-1406 Jan 29
Saros 18
14:28 TD
Alt. = 67°
Gam. = 0.3890
Dur. = 09m06s

The Egyptian Sothis corrected

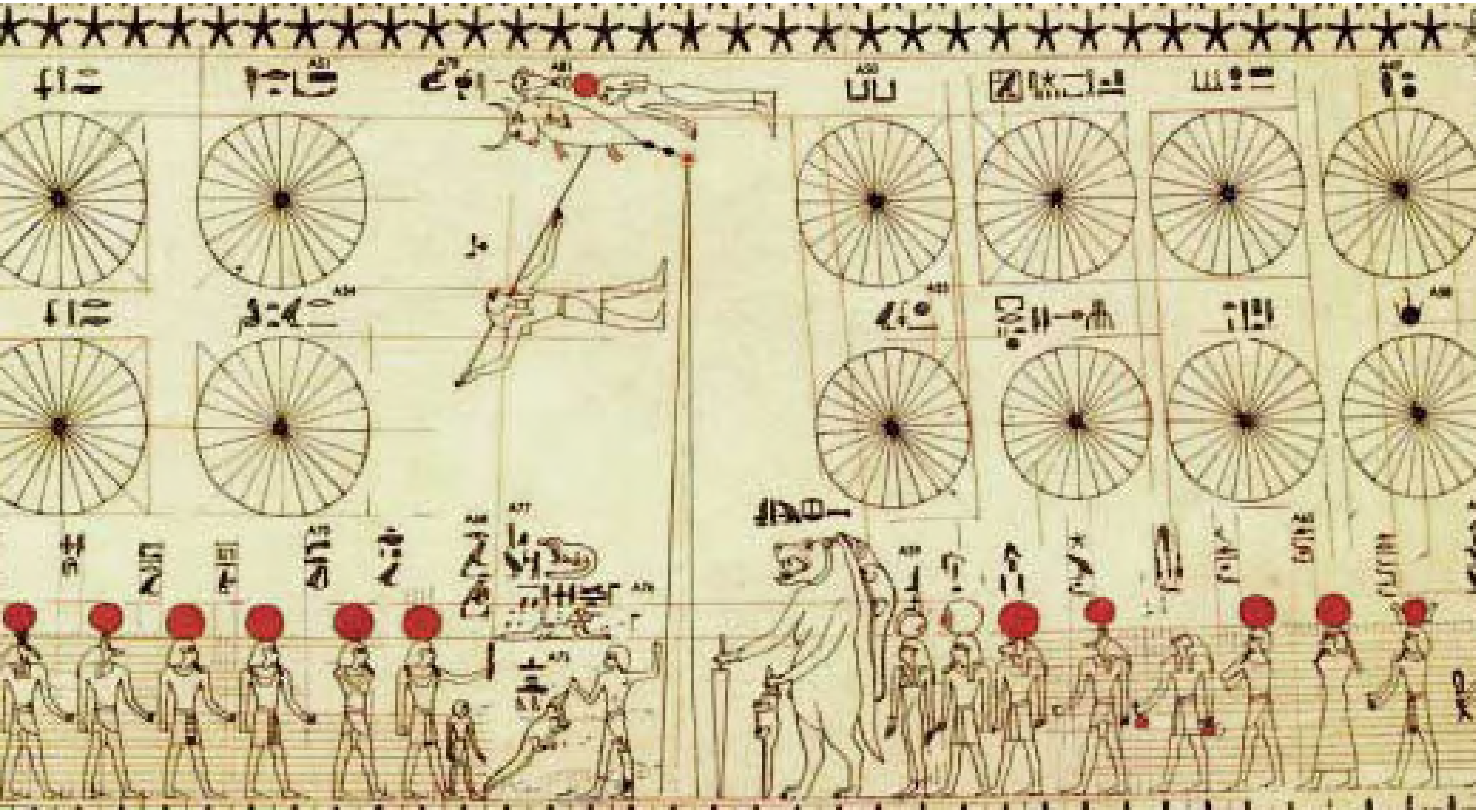
- End of Egyptian Sothis incorrectly 1320 BC.
- Should be 1281 BC = 40 years difference.
- End of Pharaoh Merneptah incorrectly 1205 BC.
- Should be 1281 BC = 76 years difference.
- Difference 1320 BC – 1205 BC = 115 years.
- Dates the same every 19 years.
- 4 X 19 = 76 years less 1 day
- 6 X 19 = 115. 115 / 4 = 30. A whole month difference exactly.

Jacob J1 enters Egypt 2307 BC, 4300 ybp

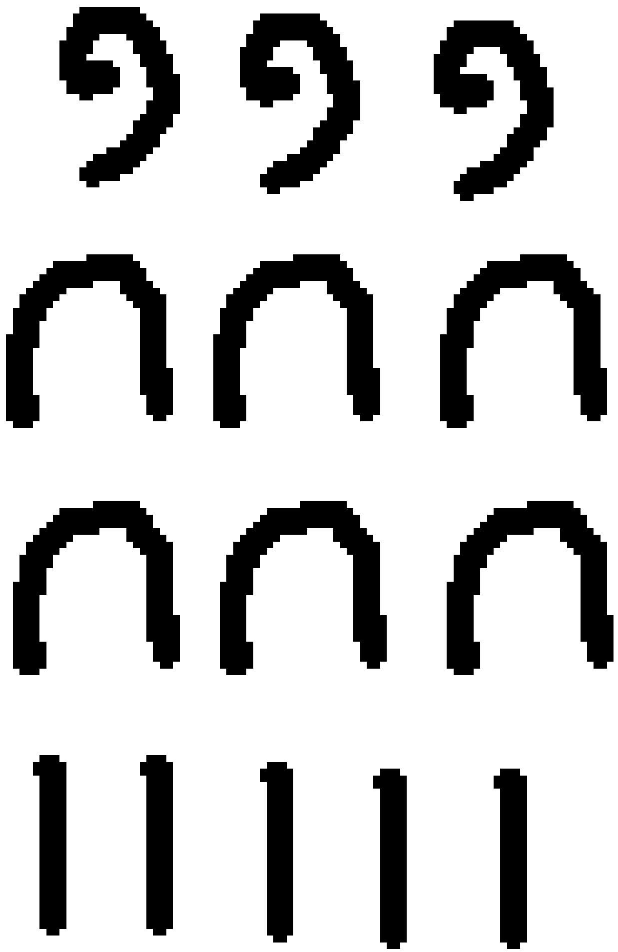
- A pattern of Y-chromosomal mutations in 37 and 67 marker haplotypes of the Jews and the Arabs indicates that their most recent common ancestor in haplogroup J1 (subclade J1e*) and that (a different one) in haplogroup J2 (subclade J2a*) lived 4300+/-500 years before present (ybp) and 4175+/-510 ybp, respectively, that is practically at the same time. Then a split between the Jewish and the Arabic lineages in both J1 and J2 haplogroups occurred, which is clearly visible on the respective haplotype trees."

Marking Time with the Stars

- The Egyptians determined 36 stars to mark out the 24 hour day.
- Later this was simplified to 24 stars and 24 hours.
- The Egyptians used a duodecimal system because:
- 12 lunar months a year
- 12 zodiac constellation
- Senenmut’s ceiling shows the circle of the day divided into 24 hours:



Decimal Year = 10 base



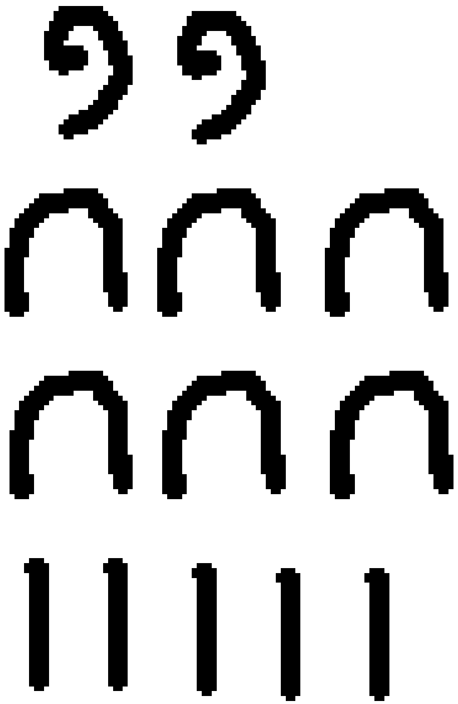
300

60

5

Egyptian inscription depicts the 365 days of the year.
Thesaurus Inscriptionum Aegyptiacarum (1883)

Duodecimal Year = 12 base



Ancient civilization may have used the duodecimal system. Then 365 days would be written 265: 2 X 144 + 6 X 12 + 5

The Clepsydra water clock

- It used a slanting interior surface that was inscribed with scales that allowed for a decrease in water pressure as the water flowed out of a hole at the bottom of the vessel.
- There were few other ways to accurately measure time.
- Until 1500 AD and mechanical clocks the length of each of the 12 hours of the day varied according to the season.

Sun Dial

- The Egyptians used a moveable sun dial.
- To adjust the time to the seasons they used a rope to heighten or lower the shadow.
- This gave the correct hour as marked on the board.
- The dial faced east at sunrise,
- Then at noon the dial was moved to face west to sunset.

Mayan Begin Date

- 4 Ahau 8 Cumhu precedes the Leyden Plate
- 3433 years from 320 AD.
- = 3114 BC.
- 4 Ahau 8 Cumhu precedes the Stela 9 Plate
- 3440 years from 328 BC.
- = 3114 BC.
- 751 AD – 3863 years
- = 3114 BC.
- 9 X 144,000 days = 3548 years.

New Years Beginning of Mayan Calendar

- The beginning of the calendar was
- 3 POP
- September 6, 3115 BC Julian.
- New Years February and August.
- Like the East Indians, their calendar extends
- 374,440 years into the future.

Mayan Calendar

Year was 260 days

Numbers 1 to 13 to one of twenty Maya day names.

14th Men number 1

260 days to elapse till 1 Ik recurred and a new tzolkin began.

18 months of 20 days

18 X 20 = 360

19th month was 5 days

Mayan Calendar Long

- 20 kins = 1 uinal of 20 days
- 18 uinals = 1 tun of 360 days
- 20 tuns = 1 katun of 7200 days
- 20 katuns = 1 baktun of 144,000 days
- 20 baktuns = 1 pictun of 2,880,000 days
- 7,885 years far into the future like the East Indians.
- Thus a duodecimal, base 12, like others was used.

Mayan calendar accuracy by trial and error

- 365.2422 modern astronomy
- 365.2500 Julian
- 365.2425 Gregorian = present calendar
- 365.2420 Mayan = closer to modern astronomy.

Mayan Accuracies

- 29.53059 days = Lunar period in modern astronomy
- Our system of leap year every 4 years, except centuries not divisible by 400.
- Codex Dresdensis: 405 lunar cycles:
- 69 groups:
- Six or five lunations each.
- 60 six lunation group -
- each six totals 177 or 178 days

Codex Dresdensis

- 30 + 29 + 30 + 29 + 30 + 30 = 178 days
- 30 + 29 + 30 + 29 + 30 + 29 = 177 days.
- Each of the five lunation groups total 148 days:
- 30 + 29 + 30 + 29 + 30 = 148 days.
- A solar eclipse table
- The closing days of each group predicts a solar eclipse.
- The 30 day lunar months placed so that no where in the 405 lunations does the discrepancy exceed one day.

Mayan Calendar Corrections

- Date 9.16.0.0.0 = 2 Ahau Tzec = AD 751, May 9
- From July 26 Gregorian October 27, 751 AD
- = 171 days later than the Mayan calendar indicated.
- The Correction – 8 uinals and 11 kins = 171 days
- Day counted forward from 9.16.0.0.0 2 Ahau 13 Tzec
- New date 9.16.0.8.11 4 Chuen 4 Kankin 751 AD October 27
- 13 Tzec now fell on May 9
- Without this correction the Mayan calendar would be useless for Ag.

Mayan Venus Cycle

- 4 periods:
- Morning star for 240 days
- Disappears for 90 days
- Reappears as the evening star for 240 days
- Disappears for 14 days
- = 584 days.

Mayan Venus Correction

- 5 X 584 days = 2,920 days
- 8 X 365 days = 2,920 days
- 8 solar years with 5 revolutions of Venus.
- Venus calendar was falling behind 2/5 of a day every 8 calendar years
- 57th period error = 8 days. They dropped 8 days.
- 61st period error = 4 days. They dropped 4 days.
- Accurate for 384 years.

East Indian Calendar

- The East Indian calendar had many epochs.
- 5 planet conjunction in 500 AD.
- 3600 years earlier to epoch
- = 3100 BC.
- K Yaud = 3101 BC February 18
- 3179 years before
- 78 AD March 16

East Indian Calendar

- Began 3102 BC.
- Sun 4320000 t =
- T'/1577917500
- T = days from Kaliyuga Dawn
- Tky = 3102 BC New Moon February 18 Dawn =
- JD 588465.75
- 3600 years before 500 AD.

The Reality of Indian Astronomy

- Y = 432000
- G = 4y = 1728000
- M = 71y = 306720000
- Elapsed: 6M+7g+27Y+4y+3y+2y
- = 1,972,944,000 years
- Solar year = 365.2584375

The Chinese

- The Chinese had a 60 day and 60 year cycle.
- Beginning from the new moon, January 27, 2636 BC.
- Eclipse dates are accurate to the day of 60.
- A 120 year period of no history lead to a shortened chronology.
- Assumptions the Zhou dynasty started in 1049 BC.
- Matches are mistaken.
- Wu became emperor in 1174 BC not 1045 BC.

Dating The Zhou Dynasty

- "35th year of king Wen of Zhou, 1st month, day bingzi 13, during worship of the full moon the king announced, 'The many...eclipses are untimely, you should begin planning for the succession.‘
- September 23, 1205 BC was a lunar eclipse day 15 of the lunar month, but day 13 of the cycle of 60. Unlucky 13!
- First year = 1240 BC.
- 54 years to Wen’s death = 1186 BC.
- 12 years to Wu becoming emperor = 1174 BC.

Chinese Missing Reigns

- The Short Chronology has Wu becoming emperor in 1045 BC.
- Jupiter is in the Fire constellation in Wu’s ninth year:
- Jupiter was recorded to be in the Quail Fire constellation Leo just before Wu became emperor.
- Thus Jupiter is in Virgo/Leo in 1045 BC/1046 BC.
- Wu became emperor of China in 1173 BC not 1045 BC.
- Jupiter was in the Quail Fire constellation between Hydrae and Crateris in 1177 BC in Wu's ninth year.

Emperor Wu

- "In the first month, the day jin-shin immediately followed the end of the moon's waning."
  - the year Woo/Wu became emperor.
- March 1, 1174 BC is day 29 and is the last waning of the moon. Importantly this day 29 of cycle 60 March 1, 1174 is when the moon was just becoming invisible a few days before it passed the sun.
- In Wu's 28th year of cycle 60 in the Bamboo Annals = 1170 BC when the vassals resubmitted was the new moon fourth month cyclical date was day 37 of cycle 60, April 17, 1170 BC.

The Time Jar

- King E 894 BC to 869 BC:
- The movements of king E were without proper regulation; the orders of his government were ill-timed; the holder of the TIME-JAR did not attend to his duty; - and the consequence was that the princes began to lose their virtue.
- The time jar may mean a sand clock.

360 day calendar around the world

- Owing to the 365 day year,
- Counting in 12ths was obvious.
- 12 lunar months, 12 years of Jupiter.
- 3 X 12 X 10
- The 5 left over years were counted unlucky by the Egyptians and the Mayans.
- The duodecimal system, base 12, better suits the 365 day year.
- The Babylonians invented the 360 degree circle.

Yao China year = 366 days 2300 BC

毻毛。○帝曰、咨汝羲暨和、朞三百有六旬有六日、以

八[illegible]

6 3 6

A round year consists of 366 days.

365.25 Day Calendar

- The Egyptians also had a fixed 365.25 day calendar.
- 12 months of 30, with five left over days
- Then a leap year correction every 4 years to keep the static calendar.
- The spring equinox would occur one day earlier every 128 years.

Ptolemy

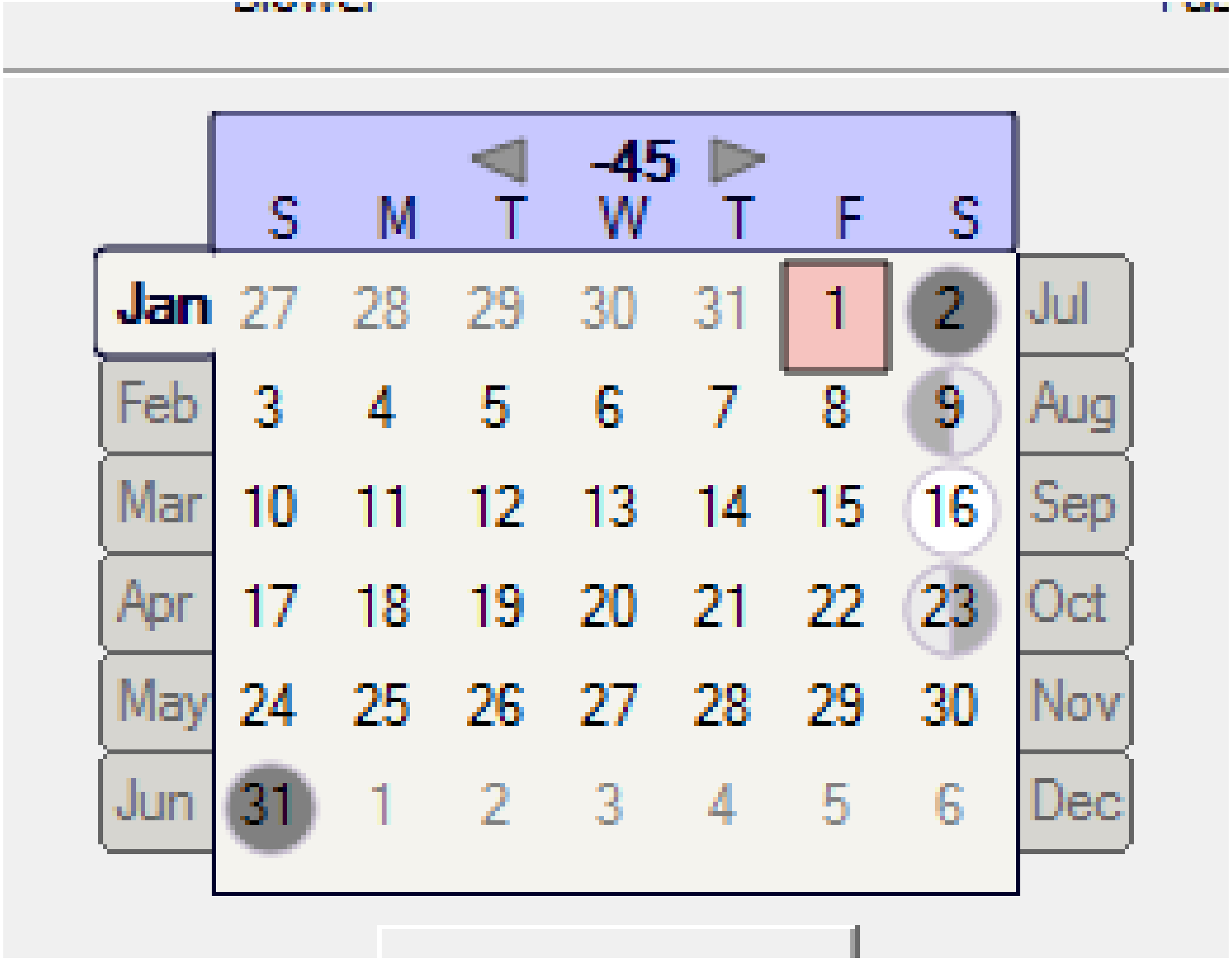
- Ptolemy Equinox at Alexandria, 463rd year after Alexander from 177th.
- The Equinox:
- 9th day of Athyr, third month of the Egyptians one hour after the rising sun.
- 285 Egyptian years 70 days 7:10 hours.
- Deficient one day in 300 years

Julian Calendar

- Julius Caesar established an Egyptian style leap year calendar.
- A leap year was added every three years.
- Until 10 BC when the mistake was realized.
- The leap year post phoned till 4 AD.
- And then resumed a leap year every four years.
- Thus dates before 4 AD may be unreliable.

80 day correction by Julius Caesar

- The first was the customary intercalation of 23 days following February 23, the second, "to bring the calendar in step with the equinoxes, was achieved by inserting two additional months between the end of November and the beginning of December. This insertion amounted to an addition of 67 days, making a year of no less than 445 days and causing the beginning of March, 45 B.C. in the Roman republican calendar, to fall on what is still called January 1 of the Julian Calendar.“
- Thus March 21 would become January 1.
- = 80 day correction. The Kalends, new moon, January 1, 45 BC:


-45
S M T W T F S
Jan
27 28 29 30 31 1 2
Feb
3 4 5 6 7 8 9
Mar
10 11 12 13 14 15 16
Apr
17 18 19 20 21 22 23
May
24 25 26 27 28 29 30
Jun
31 1 2 3 4 5 6
Jul
Aug
Sep
Oct
Nov
Dec

Julian to Gregorian Calendars

- The Julian calendar gains against the mean tropical year at the rate of one day in 128 years.
- Thus astronomy programs must be adjusted one day every 128 years.
- For the Gregorian the figure is one day in 3,226 years.
- The Gregorian Calendar we use today was introduced in 1582 by Pope Gregory XIII

24 hours

- Since the day and night could now be divided up into 12 equal parts, the concept of a 24 hour day was born.
- 150 BC the Greek astronomer Hipparchus suggested the idea of a fixed set of time for each hour was needed.
- He proposed dividing the up the day into 24 equinoctial hours observed on equinox days.
- It wasn't until about the 14th century, when mechanical clocks were commonplace, that a fixed length for an hour became widely accepted.

Egyptian 24 hour day

- The ceiling of Senmut from about 1400 BC shows the day broken down into 12 daylight hours, and 12 night time hours.
- The Egyptian calendar stayed steady through the centuries.
- The time of equinox did not need a lot of recalculations like all the other Roman calendars did.
- The time of the equinox was of grave concern.
- Dates from the first Olympiad, the death of Alexander the Great, etc combined to determine the equinox were very complex.

The Actual Year

- 365 days, 5 hours, 48 minutes and 46 seconds.
- Not 365 days 6 hours.
- A day is lost every 128 years in the Julian Calendar.

Gregorian acceptance

- A correction of 10 days was made in 1582 AD by Pope Greggory.
- Italy, France, Portugal and Spain immediately accepted the calendar.
- Britain did not accept it till 1771 AD when a correction of 11 days had to be made, amid much protest.

Gregorian Calendar

- Corrections continued to the middle ages.
- A February 29 every four years was not accurate enough.
- To keep with the seasons, every 400 years there would be no February 29 and year 2000 no leap year.
- The year 2000 scare because there was only room for two digits in Microsoft Windows.
- Hardly anything happened to computer systems January 1, 2000 AD.

How We Have Seconds

- Claudius Ptolemy expanded on Hipparchus' work and divided each of the 360 degrees of latitude and longitude into 60 equal parts. These parts were further subdivided into 60 smaller parts. He called the first division "partes minutae primae", or first minute. The subdivided smaller parts he called "partes minutae secundae", or second minute, which became known as the second.

The Exact Second

- In 1956, the second was defined in terms of the period of revolution of the Earth around the Sun for a particular epoch. Since it was already known that the Earth's rotation on its axis was not a sufficiently uniform standard of measurement, the second became defined as; "The fraction 1/31,556,925.9747 of the tropical year for 1900 January 0 at 12 hours ephemeris time."

To the Present

- Unfortunately for laypeople, scientist with their constant need to be correct and absolutely accurate, found the effects of gravitational forces cause the second to differ depending on the altitude at which it was measured. A uniform second was produced in 1977 by correcting the output of each atomic clock to mean sea level. This, however, lengthened the second by about 1×10^{-10}. This correction was then applied at the beginning of 1977.
- Today, there are atomic clocks that operate in several different frequency and optical regions. While state-of-the-art cesium fountain atomic clocks seem to be the most widely accurate, optical clocks have become increasingly competitive in their performance against their microwave counterparts.

Satellites and Relativity

- Because of relativity, time on satellites is slower.
- The time to get to the satellite and back to earth is a delay.
- GPS etc. had to be correct.
- A built in clock on the satellite had to accommodate the difference.
- There would be an error of one kilometer a year.

Relativity

- Special and general relativity predict that the clocks on the GPS satellites would be seen by the Earth's observers to run 38 microseconds faster per day than the clocks on the Earth. The GPS calculated positions would quickly drift into error, accumulating to 10 kilometers per day. The relativistic time effect of the GPS clocks running faster than the clocks on earth was corrected for in the design of GPS

Seconds Count

- In an irregular way seconds are added to our calendar every few years to keep time with earth's rotation.
- To project orbits into the future, future orbits take many gravity affects into consideration.
- Some astronomy programs likewise use the Julian Calendar for years before Christ.
- Some astronomy programs using the Gregorian Calendar project 10,000 years into the future = the end of the Gregorian Calendar.

Atomic Clock

- There are 9,196,631,770 cycles of the radiation of caesium atoms in one second.
- =the transition between two electron spin energy levels of the ground state of the 133 Cs atom.
- As of 2006 the accuracy is to within one second in 30 million years.

GPS Satellite Clock

- Unless the GPS was adjusted the error would amount to one kilometer a day.
- Relativity means the speed of the satellite they would fall behind 7 microseconds a day.
- Relativity by closeness to mass mean the satellites would run faster further from earth to 45 microseconds a day.
- Combined, the satellites run 38 microseconds faster than time on earth.

GPS - Wikipedia

- The Global Positioning System (GPS) provides very accurate timing and frequency signals. A GPS receiver works by measuring the relative time delay of signals from a minimum of four, but usually more, GPS satellites, each of which has at least two onboard caesium and as many as two rubidium atomic clocks. The relative times are mathematically transformed into three absolute spatial coordinates and one absolute time coordinate.[63] GPS Time (GPST) is a continuous time scale and theoretically accurate to about 14 ns.[64] However, most receivers lose accuracy in the interpretation of the signals and are only accurate to 100 ns.[65][66] The GPST is related to but differs from TAI (International Atomic Time) and UTC (Coordinated Universal Time). GPST remains at a constant offset with TAI (TAI – GPST = 19 seconds) and like TAI does not implement leap seconds. Periodic corrections are performed to the on-board clocks in the satellites to keep them synchronized with ground clocks.[67][68] The GPS navigation message includes the difference between GPST and UTC. As of July 2015, GPST is 17 seconds ahead of UTC because of the leap second added to UTC on 30 June 2015.[

Planck Time

- However, the pioneering work of Max Planck (1858–1947) in the field of quantum physics suggests that there is, in fact, a minimum distance (now called the Planck length, 1.616199(97)$\times 10^{-35}$ metres) and therefore a minimum time interval (the amount of time which light takes to traverse that distance in a vacuum, 5.39116(13) $\times$ 10^{-44} seconds, known as the Planck time) smaller than which meaningful *measurement* is impossible

Metric Time in our future?

- The unit of the second is hard to change.
- Thus 10 hours, 10 minutes, 864 seconds = 24 hours.
- In the 19th century, Joseph Charles François de Rey-Pailhade proposed using the centiday, abbreviated *cé*, divided into 10 *decicés*, 100 *centicés*, 1000 *millicés*.[3] and 10000 *dimicé*
- Any redefinition of the second, however, creates conflicts with anything based on its precise current definition.