Historical Analysis of Calendars-Chinese Calendars and World Calendars

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The History of Calendars

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Abstract

Nations all over the world have sought different ways and methods to monitor, track and keep time in sequence with happenings around them. The Calendar serves as one of the greatest inventions of man to achieve this noble objective.

A calendar therefore serves as a tool for man to keep records of events around them, to monitor changes in the environment, to keep themselves abreast with the dynamic weather conditions.

As Nations have distinct characteristics, the evolution of Calendars all over the world was based on the movement of the astrological symbols such as the stars, moon and the sun in different regions of the world while having unique beliefs, cultures and traditional undertones of such nations at hand.

Key Words: Astrology, Time, days, nights and temporal hours.

Introduction

The creator said:

'Let us create lights in the sky which is conceived as a solid dome, this creation is to separate day from the night, they would act as symbols for seasons, for days, and for years.' After the flood, the Almighty said: 'With the remaining of the earth, these things shall never cease, planting time and harvest, heat and cold periods, summer and winter, day and night' these basic attributes mentioned above contains the sequential order in which we shall use to study past event or also connoted as the science we adopt in arranging time in periods.[1]

Calendars are tools made by man to trail time and they have become one of the most important tools of our evolution. Previously the usage of calendars and dates by our ancient ancestors was not always used to define an event in time; the calendars of the earlier periods were used for monetary, spiritual and political uses and habitually did not include a year calculation. The Greeks were the first known historians to use the calendar date systems for relating events, they referred to a particular Olympiad (4 year period) and year of the Olympiad to give an occurrence a year reference (2nd year of the 98th Olympiad is one illustration).

The concept of Calendars changed in Rome under the ruler ship of Augustus Caesar, Calendars were used to refer to particular year names or numbers and month and day dates. The first calendars are believed to have emanated from the ancient Babylonian or Mesopotamian tradition, it is also believed that calendars already existed in Ante-Diluvian times, noted by the months and days counted during the Flood of Noah[2]

What actually is a Calendar: The name given the Roman calendar was fasti, that is to say "list of court sittings", the Latin word calendarium, on the other hand, meant

[1] Friedrich Karl & Gutzlaff (1834) : A Sketch of Chinese History; Ancient and Modern comprising a retrospect of the foreign intercourse and trade with China.

[2] Lyle Anthony: Ancient History :A Revised Chronology : An updated revision of Ancient History based on New Archaeology Volume 1 (2012)

"register of debts"; it referred to the kalendae/calendae, the first day of the month, when loans were given and interests payments fell due. Already in the Early Middle Ages, however, Isidore of Seville used the word calendarium in its modern sense of "calendar". Thus neither of the Latin terms refers to the reckoning of time in the abstract. A 'Calendar" is a document, a graphic, a text, with a particular look and a particular function. The computation of time is one characteristic of such calendars, and calls for continuous updating. Most extant examples of chronological calendars contain amendments, additions, and deletions.[3]

Archaeology supports that all ancient cultures before 700 B.C used calendars that were comprised of 360 days per year. William Whitson, "New Theory of the Earth", showed that classic authors of the ancient world all supported the idea that the ancient calendars were made of 360 days per year calendars. The "Nidana Sutra" of India gives exact calculations for the calendars of ancient India totaling 360 days per year. The Arabbatiya, an old Indian work, also gives exact calculations for a 360 day calendar. The corrections were not made to the calendars of India until after 700 B.C. That the ancient Babylon calendar only had 360 days was known long before Babylon had cuneiform. Their mathematical system was based on the number 60 which was the way the earth and the calendar were broken down. The ancient Assyrians, local to the Babylonians, also had a calendar year of 360 days, according to Immanuel Velikovsky, "Worlds in Collision". In ancient Greece, Cleobulus defined a year of 360 days. This was later changed around 600 B.C to add the 5 days that were suddenly missing between calendars and actual location of the Equinox. One of the 7 sages of Greece (from Thrace), born around 700 B.C, corrected the calendar in Greece. In Rome, the first Roman calendar consisted of a year of 360 days and was corrected by Numa after 700 B.C.[4]

[3] Jorg Rupke: The Roman Calendar from Numa to Constantine,; Time, History and the Fasti, Wiley-Blackwell
[4] Lyle Anthony: Ancient History :A Revised Chronology : An updated revision of Ancient History based on New Archaeology Volume 1 (2012)

Egypt and Calendars Evolution

Ancient Egypt was run according to three different calendars. The first was a lunar calendar based on 12 lunar months, each of which began on the first day in which the old moon crescent was no longer visible in the East at dawn. A thirteenth month was intercalated to maintain a link to the helical rising of Serpet. This calendar was used for religious festivals.

The second calendar, used for administrative purposes, was based on the observation that there was usually 365 days between the helical risings of Serpet. This civil calendar was split into twelve months of 30 days with an additional five epagomenal days attached at the end of the year. These additional five days were considered to be unlucky. Although there is no firm archaeological evidence, a detailed back calculation suggests that the Egyptian civil calendar dates back to c. 2900 BCE.

This 365 day calendar is also known as a wandering calendar, from the Latin name ‘annus vagus’ since it slowly gets out of synchronization with the solar year. (Other wandering calendars include the Islamic year.)

A third calendar, which dates back at least to the fourth century BCE was used to match the lunar cycle to the civil year. It was based on a period of 25 civil years which was approximately equal 309 lunar months.

The months of the Egyptian civil calendar were further divided into three sections called "decades", each of ten days. The Egyptians noted that the helical rising of certain stars, such as Sirius and Orion, matched the first day of the 36 successive decades and called these stars decans. During any one night, a sequence of twelve decans would be seen to rise and were used to count the hours. (This division of the night sky, later adjusted to account for the epagomenal days, had close parallels to the Babylonian zodiac. The signs of the zodiac each accounting for 3 of the decans. This astrological device was exported to India and then to Medieval Europe via Islam.)

Early man divided the day into temporal hours whose length depended upon the time of year. A summer hour, with the longer period of daylight, would be longer than that of a winter day. It was the Egyptians who first divided the day (and night) into 24 temporal hours.

The Egyptians measured time during the day using shadow clocks, precursors to the more recognizable sun dials seen today. Records suggest that early shadow clocks were based on the shadow from a bar crossing four marks, representing hourly periods starting two hours into the day. A midday, when the sun was at its highest the shadow clock would be reversed and hours counted down to dusk. An improved version using a rod (or gnomon) and which indicates the time according to the length and position of the shadow has survived from the second millennia BCE. Problems with observing the sun and stars may have been the reason the Egyptians invented the water clock, or "clepsydra" (meaning water thief in Greek). The earliest remaining example survives from the Temple of Karnak is dated to the fifteenth century BCE. Water drips through a small hole in one container to a lower one. Marks on either container can be used to give a record of hours passed. Some Egyptian clepsydras have several sets of marks to be used at different times of the year, to maintain consistency with the seasonal temporal hours. The design of the clepsydra was later adapted and improved by the Greeks. As a result of the campaigns of Alexander the Great, a great wealth of knowledge of astronomy was exported from Babylon into India, Persia, the Mediterranean and Egypt. The great city of Alexander with its impressive Library was both founded by the Greek-Macedonian family of Ptolemy, served as an academic centre. Temporal hours were of little use to astronomers, and around 127 CE Hipparchus of Niceae, working in the great city of Alexandria, proposed dividing the day into 24 equinoctial hours. These equinoctial hours, so called because they are based on the equal length of day and night at the equinox, split the day into equal periods. (Despite his conceptual advance, ordinary people continued to use temporal hours for well over a thousand years: the conversion to equinoctial hours in Europe was made when mechanical, weight driven clocks were developed in the fourteenth century.)

The division of time was further refined by another Alexandrian based philosopher, Claudius Ptolemeus, who divided the equinoctial hour into 60 minutes, inspired by the scale of measurement used in ancient Babylon.

Claudius Ptolemeus also compiled a great catalogue of over one thousand stars, in 48 constellations and recorded his concept that the universe revolved around the Earth. Following the collapse of the Roman Empire it was translated into Arabic (in 827 CE) and later into Latin (in the twelfth century CE). These star tables provided the astronomical data used by Gregory XIII for his reform of the Julian calendar in 1582.[5]

In conclusion from Egypt, the Canopus Decree states specifically that the calendar had 360 days per year in the ancient past. The Eber Papyrus from the eighteenth dynasty gives the same calculations for the year. The additional 5 days, epagomenal days, were added after 700 B.C, and due to the conditions surrounding these days, were considered bad luck with the decree that no work was allowed on these days.[6] The Mayans added 5 days to a 360 day per year calendar added 5 days to a 360 day per year calendar after 700 B.C, which were also considered bad luck days. The Peruvians also had a 360 day year calendar in ancient times; finally even China had a calendar of 360 days in ancient times. The indication is overwhelming in that ancient calendars consisted of a year of 360 days evenly. All of them had months of exactly 30 days which aligned with the moon at that time. It would appear that the difference between ancient calendars had nothing to do with the number of days in the month or year, but mainly with the names associated to the months and the years. All of the ancient societies started their year in spring with the new moon closest to the Spring Equinox. From Biblical sources Exodus 12 states that Nisan is the first month (Abib) which falls in the spring of the year. This was still true in the time of Esther (See book of Esther), who namely indicates that Adar was the 12th month or last month of the year.

After the calamitous events around 750- 700 B.C, calendars around the world were adapted and not in the same manner. Egypt added 5 epogomenal days to a new Empirical type calendar, the Hebrews had to modify their calendar to represent a Metonic Lunar solar calendar that would track dates by both lunar and solar cycles. Their festival year required a precise accounting of lunar related months. The Romans abandoned the lunar cycle and went with the solar cycle due to the agricultural growing seasons. Some ancient societies began to observe not one, but multiple

[5] Alistair Boddy-Evans: Ancient Egypt: The Father of Time, Part II: Counting the Hours. (2001)
[6] Lyle Anthony: Ancient History :A Revised Chronology : An updated revision of Ancient History based on New Archaeology Volume 1 (2012)

calendars systems at once. China and India have several different calendar systems in operation side by side.[7]

Chinese Lunar Calendars

Chinese astronomy, like that of every other ancient civilization, had its roots in astrology. Starting from the Warring States period (480-222 BC), astrologers began to group the stars into constellations, each with a symbolic significance, in relation to which the motions of the sun, moon and planets were used as portents of earthly events. Eventually up to 283 constellations were identified, and the 28 most important were classified as lunar mansions (xiu). They were then further divided into 4 'palaces' of 7, corresponding with the 4 seasons and 4 compass directions. There was also a 'central palace' consisting of all circumpolar stars within 40 degrees from the north celestial pole. The 28 lunar mansions later formed the basis of the Chinese astronomical coordinate system, which sliced the celestial sphere into 28 sectors like an orange, with all the lines radiating from the 'orange stem' of the north celestial pole. Each sector contained one of the lunar mansions, and its width therefore depended on the size of the constellation. As the lunar mansions were spaced out along both sides of the celestial equator, this coordinate system was usually regarded as equatorial.

Unlike Greek astronomy, which was based on an ecliptic coordinate system, Chinese astronomy generally ignored the horizon and the ecliptic. It has, in fact, been argued that our modern equatorial coordinate system was inspired by the Chinese, as Tycho Brahe switched to using the equatorial coordinate in the 17th century when he found the Chinese system to be more convenient than the Greek one.[8]A Lunisolar calendar (yinyangli) has been used in China since at least the Shang dynasty, after this was abolished in 1911; it was referred to as the jiuli (the old calendar) or the moon calendar (yinli). After 1949, it was also called the farmer's calendar (nongli). Nowadays all these terms are in use, as well as Zhongli (Chinese calendar) or Xiali (the Xia Calendar). The old calendar is still used for certain purposes today. It is essentially the same as the last great revision, the Shixianli devised at the end of the Ming and introduced by the Qing in 1645. During the spring and autumn and Warring

[7] Lyle Anthony: Ancient History :A Revised Chronology : An updated revision of Ancient History based on New Archaeology Volume 1 (2012)
[8] Fong L et al :Zu Chongzi and the Chinese Calendar Reform of 462 AD

States periods, three main lunisolar calendars were in used at different times, the Xia, Yin (shang), and Zhou calendars. Each started the year in a different solar month, the Zhou calendar began in the first month (Ziyue, i.e in the month on or just before the winter solice). The Yin of Shang Calendar began in the second month (Chouyue, i.e beginning with the first new moon after the winter solstice); and the Xia began in the third month (yinyue, i.e beginning with the second new moon after the winter solstice). During the Warring States, each kingdom based its calendar with minor variations on one of these three calendars. In general, the states in the middle Yellow River used the Xia Calendar, and the remainder used that of the Zhou.

By the end of the Warring States, the calendar was remarkably accurate, at the Qin unification, the tenth month (Haiyue) was adopted as the beginning of the year (it had been in use in Qin since at least 265 BC). This was continued by the Han until 104 BC, when it was replaced with the Xia calendar. With few exceptions, this remained the basis for all subsequent calendars until 1912 when the Gregorian calendar was promulgated and the old New Years' Day was renamed the Spring Festival (the winter solstice remained in the eleventh month). The annual task of establishing and promulgating the calendar (Zhili, shouli) was the exclusive prerogative of the ruler. Each dynasty announced its own calendar, and some dynasties reformed the calendar several times.[9]

[9] Wilkinson Endymion : Chinese History : A Manual; Revised and Enlarged

Characteristics of the Chinese Traditional Calendar

Synodic Month (Suo Wany Yue)

The traditional Chinese calendar is based on the synodic month, which is the time taken by the moon to make a complete circle around the earth. The month begins with the new moon (first day), progresses to the full moon (the 15th day), then ends with the new moon. A month has 29 (minor month) or 30 days (major month) while a year is made up of 354 or 355 days. A leap month will have to be inserted every three years.

Twenty-Four Forth-nightly Periods (Jie Qi)

The waxing and waning of the moon does not reflect seasonal and climate changes. As the Lunar calendar was not useful to farmers, the ancient people divided a year into 24 fortnights according to the positions of the earth along its orbit around the sun. Hence, each month was divided into two periods. The farming community then worked out their farming schedules based on these periods.

Twenty-Four Forthnightly Periods

Spring:

First Month:

Li-Chun: The Spring begins and it turns warm

Yu-Shui: It starts to rain.

Second month:

Jing-Zhe: Thunderstorms come, hibernating animals become active again.

Chun-Fen: In the middle of spring, day and night are equal in length.

Third Month:

Qing-Ming: Warm, weather is clear and bright.

Gu-Yu: Rainfall increases, good for planting crops.

Summer:

Fourth Month:

Li-Xia: Summer begins; temperature rise.

Xiao-Man: Seeds of wheat and other crops maturing in summer become plump.

Fifth Month:

Mang- Zhong: Wheat and other awny crops mature.

Xia-Zhi: Summer arrives, longest days and shortest nights of the year.

Sixth Month:

Xiao-Shu: It is becoming hot.

Da-Shu: The hottest period of the year.

Autumn:

Seventh Month:

Li Qiu: Autumn begins and temperatures fall.

Chu-Shu: The summer heat will pass soon.

Eighth Month:

Bai-Lu: The night is cools and dew drops appear.

Qiu-Fen: In the middle of autumn, day and night are equal in length.

Ninth Month:

Han-Lu: Temperatures drop significantly and dew drops are cooler at night.

Shuang-Jiang: Frost starts.

Winter:

Tenth Month:

Li-Dong: Winter begins and the weather turns cold.

Xiao- Xue: Snowfall starts.

Eleventh Month:

Da-Xue : Heavy snow appears.

Dong-Zhi: A period of severe cold starts, shortest days and longest nights of the year.

Twelfth Month:

Xiao-Han: The weather turns much colder.

Da-Han: The coldest period in the year.

Heavenly Stems and Earthly Branches

The Traditional Chinese calendar uses heavenly stems and earthly branches to count years:

The 10 Heavenly stems: Jia, Yi, Bing, Wu, Ji, Geng, Xin, Ren, Gui.

The 12 Earthly branches: Zi, Chou, Yin, Mou, Chen, Si, Wu, Wei, Shen, You, Xu, Hai.

These stems and branches combine to form 60 groups representing 60 years, a period called Jia-Zi. The cycles of Jia-Zi are used by the traditional Chinese calendar to count years, such as Jia-Zi, Yi-Chou, Bing-Yin,etc.[10]

As a lunisolar Chinese calendar in nature which uses the solar year (measured as the mean time between 2 winter solstices, rather than vernal equinoxes as in Western astronomy) and the lunar or synodic month (the mean time between 2 new moons). However, a solar year is about 11 days longer than 12 lunar months, and this necessitated the addition of a leap (intercalary) month slightly more than every 3 years. By the beginning of the Warring States period, the "¼ Calendar" (sifen li) had been invented, with 365 ¼ as the length of the year. It was found around the same time that 235 lunar months is nearly equal to 19 solar years, with a difference of only about 2 hours. But 19 years of 12 lunar months is still 7 months less than 235. Thus a system was formulated of inserting 7 leap months in every 19 years, bringing the mean length of the month to 29.53085 days. This system, called the zhang method in China, is better known as the Metonic cycle after the Greek astronomer Meton who first used it in the West. The Chinese method for finding the length of a year was to first find the number of days in a given number of months - for example, 81 months contain 2392 days - and then multiply that by the Metonic cycle (i.e. 19 years contain 235 months). The number of days in a year would in this case be 235/19 x 2392/81 = 365 + 385/1539. This accounts for the widely varying fractions (now more commonly represented as decimals) in different calendars which started their calculations with different day-month ratios. The length of a mean lunar month was then found by dividing the length of the year by 12.[11]

[10] Asiapac Culture (2004): Origins of Chinese Science and Technology

[11] Fong L et al :Zu Chongzi and the Chinese Calendar Reform of 462 AD

The main purpose of the pre modern Chinese astronomy, however was not to set the calendar or indeed to regulate the farming year, important though these tasks were, the main purpose was to predict and interpret heavily signs, both periodic and non periodic, especially to predict eclipses and the movement of the planets for astrological divination. If this responsibility was carried out accurately it demonstrated the emperor's right to rule. The imperial monopoly on astronomy and the setting of the calendar was enforced by laws forbidding people to possess astronomical instruments, maps of the heavens or esoteric books, to study astronomy privately, or to publish calendars. Infringement was punished by two years of penal servitude[12]

The key difference of the Chinese calendar from the Western system was that, rather than measuring right ascension from the vernal equinox, the Chinese used ruxiu du: degrees east of the determinative star (ju xing) in the relevant lunar mansion. The equivalent of declination was quji du: distance in degrees from the north celestial pole. As the ancient Chinese divided a circle into 365 ¼ degrees, instead of 360 as the Babylonians did, one Chinese degree was in fact equivalent to 360/365.25 of our degrees. While the Chinese astronomical system would seem to depend upon the concept of the celestial sphere, this idea was still highly contentious in Zu Chongzhi's era. From the Han Dynasty onwards, there had been a lively debate regarding the shape of the heavens, generally split into 3 schools of thought.

The oldest school was that of the Celestial Dome (gaitian shuo), which held that the sky was a slowly spinning dome covering a flat earth. At first it was said that the earth was a flat square, but when this proved mathematically unsound, it was modified to a flat circle and then a convex circle.

The school of the Celestial Sphere (huntian shuo) believed that the heavens were a rotating sphere enveloping the earth as an egg envelopes its yolk. However, most scholars did not extend this analogy to consider the idea that the earth, too, might be round like an egg yolk.

Lastly, the smallest school, Light and Darkness (xuanye shuo), claimed that the universe had no tangible shape and was of infinite size, and that the heavenly bodies floated in the sky, moving in their own different patterns, like the waves and tides. The earth lay beneath the universe and was neither flat nor round but had infinite depth. This idea of the universe as an ocean was the closest yet to a non-geocentric

[12] Wilkinson Endymion : Chinese History : A Manual; Revised and Enlarged

model of the heavens, though it lacked any scientific basis. While the "shape of the heavens" debate never completely died down until the Tang Dynasty, the Celestial Sphere school gradually began to gain ascendancy, largely due to the practicality of the armillary sphere and celestial globe invented by its proponents. These two instruments, as well as the water clock and the gnomon (a long pole used to measure the shadow cast by the sun at noon), became the foundation for calendar calculations in ancient China.[13]

Indian Calendars

India was faced with not less than 30 calendars after its independence, differing in when the era and year began, and to some extent in the method of reckoning time, this diversity had its roots in the nation's history.

About 3,000 B.C, a calendar called the Kali Yuga came into use, but because India had no astronomical observatories and astronomers could not directly observe the heavenly bodies, data differed from region to region. Thus the Calendar became diversified throughout the subcontinent. With the advent of Muslim rule in 1200 A.D, the lunar Hejira calendar was adopted for administrative purposed and for Muslim religious purposes. It was employed until 1757 except for a brief period (1556-1605) when Emperor Akbar banned it and introduced his own calendar. In 1757, the British brought the Gregorian calendar, which was still utilized for official purposes at the time of India's independence. Regional calendars based on the kali and Yuga, however, survived the political changes and was also used. Each state of India had its own civil calendar of local origin which was used by the rural population and by a large segment of the urban dwellers for daily transaction, correspondence, etc. This system created chaos in a centralized state. The date which we know as March 21, 1957, would be called Chaittra in Bengal, Chaitra 8 in Orissa, and Panguni (Phalguna) 8 in the South. By the Indian Lunar calendar it would be called Chaitra Vadi 6 or Phalguna Vadi 6, depending upon the convention followed. All the calendars of India are from a standpoint of solar measurement, based on the kali Yuga and are, from kali Yuga on down based solidly on astronomical measurements made in accordance with and interpreted by a scatological methods. The India astrologers used the same symbols

[13] Fong L et al :Zu Chongzi and the Chinese Calendar Reform of 462 AD

and many of the same principals as do astrologers of the Western world today, the Indian Solar year, like the Western year, consists of 12months, each month having assigned to it one of the 12 signs of the zodiac. Each sign contains 30 degrees, the sign begins at 0 degrees and runs through to 29, 59, 59 degrees before entering the next sign. A major difference between the two systems is that the western zodiac is based on the tropical year, while the Hindu and Buddhist zodiacs are based on the sidereal year, which is about 24minutes longer. The Indian solar year begins with the month of Chaitra, or around April 13/14 by the Western calendar. This year is divided into 6 seasons of 2 months each, which are named as follows:

1. Vasanta
2. Grishma
3. Vars
4. Saruda
5. Hemanta
6. Sisira[14]

These periods can be translated loosely as Spring, summer, rains, autumn, winter and frosts (or mists)[15].The length of the solar month depends on the length of the apparent motion of the sun through each sign, this ranges from as few as 27 days during the shortest winter month to as many as 32 days during the longest summer month.[16]

Julian calendar

Julius Caesar introduced a new civic calendar that was very revolutionary because it ignored the moon because calendars of the early periods had been based on the lunar phase and had developed shortcomings with the seasonal year[17]

He therefore abolished the use of the Lunar year as well as the intercalary month and regulated the year using only the sun. He decreed that from 45 BC (709 YOR)there should be three years of 365 days each and then one year of 366 days in perpetual cycle. This became known as the Julian calendar. It is exactly 365.25 days per solar

[14] Parise Frank :The Book of Calendars, Gorgias Press, p171
[15] O'Neil: Time and the Calendars, Manchester University Press,(1975)p 98
[16] Parise Frank :The Book of Calendars, Gorgias Press, p171
[17] Ruggles, Clive: Ancient Astronomy: An Encyclopedia of Cosmologies and Myth, p.208

year (365 x 3 + 366 divided by 4). It began the custom we began today of adding one day to February every fourth year (i.e., years divisible by 4 = leap years). Whereas the year had begun March 1, it now became January 1. To realign the calendar with the seasons, 46 BC was made 445 days long (called "the year of confusion ' by the Romans). Even though the Julian calendar was an enormous improvement over all previous systems, it still was not completely accurate. Since there are approximately 365.25 days in a year, the mean solar year (often called "tropical year") consists of 365 days, 5 hours, 48 minutes, 45.975 seconds (365.24219879 days). The difference of eleven minutes fourteen seconds or a day in 128 years becomes appreciable over the course of centuries.[18]

The Julian calendar is a remarkable calendar of modern history because it has some distinct features which remain in our modern calendar today. The first is the division of the calendar into twelve months each with a fixed number of days; each when added up will be 365 days in a seasonal year. The second feature of the Julian calendar is the introduction of the Leap year, the introduction of the additional day every four years makes the average length of a year in the Julian calendar 365.25days.[19]

The effect of the Julian calendar was that it was longer than the average Jewish year, the Jewish calendar drifted backwards with the Julian calendar dates for the Jewish holidays and the Jewish calendar. Ironically, even though the Julian calendar was the official length of the solar year at the time, we now know that the average length of the Jewish year was more accurate in defining a solar calendar itself. This called for reforms of the calendar system and in 1582 we converted from the Julian calendar to the Gregorian calendar causing the average length of the Gregorian calendar to be shorter than the average length of the Jewish calendar.[20]

[18] Jones, Nolen: The Chronology of the Old Testament, Solving the bible's most intriguing mysteries, 1993, p287
[19] Ruggles, Clive: Ancient Astronomy: An Encyclopedia of Cosmologies and Myth, p.208

[20] Cohn Marc : The Mathematics of the Calendar, 2007, p.32

Gregorian calendar

In 1582, Pope Gregory XIII made another calendar correction. The Gregorian calendar is the one we use today. The mean Gregorian year has 365.2425 days. To make up for all the days that had accumulated since the beginning of the Julian calendar, Gregory XIII decreed the elimination of 10 days from the year 1582. The result was that in many countries the day after October 4, 1582 became October 15, 1582.[21]The time required for the Sun to travel from one tropic, all the way around the ecliptic, and return to the same tropic is about 365.2422days, this is called Tropical Year. Obviously, the tropical year can only be measured with such precision over an interval of many years. The Julian year exceeds the tropical tear by 0.0078 day;

I Julian Year = I Tropical Year + 0.0078 day.

In any one year, or even over a period of several years, this discrepancy would not be noticed, but over the centuries, it mounts up. In A.D 300 to take a definite example, the vernal equinox fell on March 20. For the next several decades the equinox continued to fall on March 20 or 21. (The date of the equinox oscillated between the 20th and the 21st, because of the leap system). But gradually, over a longer period of time, a systematic shift in the date of the equinox occurred. Consider an interval of 400 years, if we multiply the relation above by 400 we obtain:

400 Julian years= 400 tropical years + 400 X 0.0078 day
= 400 tropical years + 3.22 days.

Therefore, the spring equinox of the year 700 did not take place on March 20 but on March 17.[Because of the difference in length between the Julian and the tropical year, the date of the equinox retrogresses through the Julian calendar by about 3 days every 400 years]. By the sixteenth century, the equinox had worked its way back to the 11th of March.

[21] Jones, Nolen: The Chronology of the Old Testament, Solving the bible's most intriguing mysteries, 1993, p287

The Easter Problem and Reform

The Principal motive for the reform was the desire to correct the ecclesiastical calendar of the Catholic Church, particularly the placement of Easter. As Easter is the festival of the resurrection, its celebration depended on the proper dating of the crucifixion and the events around it. According to the Gospels, the last supper occurred on a Thursday evening, the trial, crucifixion, and burial of Christ on Friday. On the evening of the same Friday, the Passover was celebrated by the Jews. Finally, the resurrection occurred on the following Sunday. The Passover, around which all these events centered is celebrated on the week beginning in the evening of the 14th day of Nisan of the Jewish calendar. Now, the Jewish calendar is of the luni-solar type, and the beginning of each month corresponds closely to a new Moon. It follows then, that the 14th day of Nisan was the date of a full Moon. Moreover, the month of Nisan was traditionally connected with the Spring Equinox; a month was intercalated before Nisan whenever necessary to ensure that Passover week did not begin before the Jewish Calendar Equinox.[22] The Spring Equinox is the time in the spring when the Sun crosses the equator, and the length of the day and the night are equal. For thousand of years of human history, in temperate climates, surviving the early spring meant survival for the year. Early Spring Rituals were timed with big hunts, and later with important plantings and other farming events. Ancient people could not jump into their minivans and drive to the grocery store. Their survival depended on growing food, they held rites and rituals to welcome the warmer weather and keep the corn, yam and wheat spirits pleased. People feared that if these deities were not happy, the Sun would not shine, or there would be too much rain or worse, there would be no rain and then the plants would not grow. The ancient celebrations of spring, while often merry, were also a matter of life and death to a community. The modern springtime celebrations draw some of this ancient energy. Spring festivals sometimes overlap with the New Year's celebrations as many as ancient civilizations began their new year in spring, when they planted crops for the forthcoming year. While today thousands of spring celebrations are enjoyed around the globe in the form of neo-pagan rites and environmental occasions such as Earth Day and Arbor Day, four festivals were widely observed by many cultures in many places, from Liechtenstein

[22] Evans James:The History and Practise of Ancient Astronomy, Oxford University Press,1998, pp 166- 167.

to India, Argentina to Zanzibar, and everywhere between. These four are the Hindu celebration of Holi that originated in Southern Asia, the Persian new year festival Navruz, the Jewish observance of Passover (or "Pesach" in Hebrew), and the Christian Easter Celebrations.

Easter is considered the most important Christian Festival, Easter celebrates the central Christian belief that Jesus rose from the dead three days after his Crucifixion. Christians believe Jesus was the Son of God, and died on the cross to redeem humanity from sin. In addition to its religious meaning, the Resurrection symbolizes the revival of hope and a fresh lease on life for all human beings. Christ's victory over death signifies to Christians the possible salvation of their eternal souls.[23]

The proper time to celebrate Easter was therefore shortly after the first full Moon of spring. In practice then Easter was celebrated on a Sunday in March or April following March 21. But by the sixteenth century the date of the Equinox had retrogressed to March II, so that Easter was steadily moving towards summer. The need for reform had long been felt, but the state of Astronomy in Europe had been inadequate for the task. In 1545, the Council of Trent authorized Pope Paul III to act, but neither Paul nor his successors were able to arrive at a solution. Work by the astronomers continued, however, and when Gregory XIII was elected to the papacy in 1572 he found several proposals awaiting him and agreed to act on them. The plan finally adopted had been proposed by Aloysius Lilius (the Latinized name of Luigi Giglio, an Italian physician and astronomer, d. 1576). The final arrangement was worked out by Christopher Clavius, Jesuit astronomer and tireless explainer and defender of the new system. The reformed calendar was promulgated by Gregory in a papal bull issued in February, 1582.[24]

Pope Gregory XIII kept the Leap year rule whereby, normally, every year evenly divisible by four with no remainder would be a Leap year. However, the Gregorian Leap Year rule adds the exception that every year ending in "00" whose number cannot be divided by 400 will not be a Leap year. Thus, the years 1700, 1800, and 1900 were not Leap years and had only 28 days in February. Being divisible by 400, February 2000 had 29 days. This system will serve us for more than a thousand years hence. The Gregorian year is 26 seconds longer than the solar-tropical year; this is

[23] Morill Ann: Holidays and Celebrations, Easter, Passover and other Spring Festivals, 2009, p 2-3
[24] Evans James:The History and Practise of Ancient Astronomy, Oxford University Press,1998, pp 166- 167.

less then one day every 3000 years. Thus, although the Gregorian calendar is a great improvement over the Julian calendar, it still is not 100% accurate.[25]

The Mayan Calendar

The Mayans had an elaborate calendrical system, no longer in use, which obviously evolved in complete isolation from those of the old world. This system ended with the fall of the Mayan civilization. Most of the remaining knowledge of it was destroyed by the Spanish during the conquest. It was not until very recently, during the 1990s, that arachnologists have finally been able to fill in many of the gaps in our knowledge of Mayan civilization, including the calendrical system.[26]

During the 1930s, after enough dates had been deciphered and correlated, scholars could see that the Classic Maya who lived from around AD 200 through 900 were obsessed with computing time and determining its meaning. Working to decode the meaning of time, the Maya invented what is possibly the most sophisticated mathematical computational system in the history of human culture. Actually, the origins of this dating system considerably predated the Maya Classic period, and obviously in history there are many inscribed dates at Maya Classic sites that go back thousands, millions, and even billions of years. These great dates are computed by means of a simple but brilliant system of bars, dots and a symbol for zero: a totally accurate place-value notation system.

The Olmec are the mother culture of Maya civilization, and elements of the Tzolkin- the 260 day count, which is still in use today- have been found at Olmec sites dating back around three thousand years, a further indication of the antiquity of the Maya dating system. In Maya mythology, the domestication of maize is associated with the origins of the people, and maize was discovered in the region seven thousand years ago, the calendar is called the Mayan Calendar not Olmec because the Classic Maya perfected all the aspects of it. They calculated how time influences history, and they

[25] Jones, Nolen: The Chronology of the Old Testament, Solving the bible's most intriguing mysteries, 1993, p287
[26] Current Mayan Date:baktun 13 katun 0 tun 0 uinal 17 kin 6,Haab: 4 Mac,Tzolkin: 12 Cimi， Mayan epoch: 11 Aug, 3114

left a clear and complex record of their discoveries. When they were developed enough to mythologize their origins, they linked the development of maize with their own origins in time in their creation account, the Popol Vuh. Today, corn remains a central focus of Maya culture and ceremony. The Long Count begins around 3133 BC, which happens to be the moment when complex temple-city civilizations suddenly arose in ancient Egypt, Sumer and China[27]

The features of the Mayan astrology is a significant approach to understanding the Mayan Calendar, it's as follows:

The Day-Sign: The Mayan Calendar divides its year into periods of twenty days, each of these days have its own sign. It holds a similar concept with the Western Zodiac Sign with reveals important components of personality and destiny.

The Trecena: The 260- day astrological calendar is divided into twenty blocks of thirteen days that also functions like signs. Trecenas are a kind of subset of the day-signs, and they seem to describe qualities of the personality that are similar to those described by the moon in Western Astrology.

The Lord of the Night: A repeating sequence of nine days is named for important deities of the underworld, the lords of the nights represents one's deep unconscious, hidden motivations, and even one's dark side.

The Year: In the Mayan Calendar, Solar years are grouped in fifty- two year cycles. The Maya gave each year in the cycle a specific name and thus regarded each on these cycle its own special quality. This methodology is similar in some ways to the Chinese twelve cycles of animals, in which people who are born in a given year supposedly share similar qualities that are reflected in their personality and character.

The Phase of Venus: The cycle of the planet Venus is divided into four main periods which is used as calendar markers. The phase in which a person is born can offer insights into social values and his or her role in society.

The system works in the following manner:

Firstly, the twenty named days repeat endlessly, as does our seven-day planetary week [inherited from the civilizations of the Ancient Near East]. Each named day functions much like a zodiac sign, in that is symbolizes an archetypal concept that appears to be deeply imprinted in the psyche of any person born on that day. This interpretation is much like the Western Zodiac approach except that the sign changes

[27] Clow B. H: The Mayan Code : Time acceleration and awakening the world mind, 2007,pp8-10

daily. The unit of twenty days appears to function much like a biorhythm, a cycle of twenty days, in which one of the days is personal.

Days are grouped into units of thirteen days. These units take on the name of the day-sign [one of the twenty named days] that begins the period. After thirteen cycles of the twenty named days, and twenty cycles of the thirteen-day periods, exactly 260 days have elapsed, and the interplay of thirteen and twenty begins again. As a result, 260 basic personality types are possible in this system because any birth is located in one of the twenty named days, and also within one of the thirteen-day periods.

As a Calendar serves many purposes, including divination and the timing of rituals and events, the Mayan calendar offers a matrix system of personality types.[28]

CONCLUSION

The Egyptians had three Calendars to meet the demand of their society, one was a lunar calendar which was used for religious festivals, and another was used for administrative purposes with the last calendar was used to combine the lunar cycle into a civil year. Their calendars basically depended on constellations and Zodiac Signs. The Egyptians used shadow clocks, precursors and invented the water clock to measure time in the ancient Babylon.

The Chinese calendar was also deeply rooted in astrology and constellations. In ancient China they adopted three types of luni-solar calendars based on the seasons. The first calendar was adopted before the winter solace, the second starts with the first new moon after the winter solstice and the last calendar beings with the second coming of the new moon after the winter solstice. However, each dynastic ruler had the power of creating his own calendar. The purposes of the Chinese calendar were therefore an instrument they used heavily to forecast for agricultural purposes and for astrological divinations.

[28] Scofield Bruce & Orr Barry: How to practice Mayan Astrology; The Tzolkin Calendar and your life path. [2007 p:2]

India has had a variety of calendars that has its origin from the history of the nation and just like the Egyptian and Chinese Calendars they had different calendars to serve different purpose. In its history it had adopted the Muslim calendar, the British introduced Gregorian calendar and several regional calendars based on scatological methods interpretation of astronomical measurements. The Indian calendar stands distinct from the West because it's based on the Sidereal year of the Hindu and Buddhist zodiac which is longer by 24 minutes.

The Julian calendar was a remarkable calendar introduced by Julius Caesar because of some of its distinct features; first it eliminated the importance of the moon in regulating the calendar. Secondly it divided the calendar into 12 months of 365 days which is a modern feature of the calendar used in recent years. Thirdly, the Leap year introduction into the additional four days of the year's makes it further a different calendar that has served many generations.

The Gregorian calendar was propounded by Pope Gregory XIII as a problem of the actual dates of celebration of Easter in different countries. This stemmed out of the difference in length between the Tropical year and the Julian Year, great time differences occurred between these two years and the effect on the celebration of Easter was disastrous in many parts of the world. Thus revisions were made to adjust the calculation of the leap year to include dates that cannot be divided by 400 not to be included as a Leap Year. The Gregorian calendar was centrally concerned about astronomical events of the suns movement from one tropic through the ecliptic and return back to its normal position.

The Mayan had a different and very complicated calendar system; they were preoccupied with the notion of time and thereby invented the most difficult mathematical system to determine the time for their calendars computation. Their calendars also had cultural undertones of the agrarian nature of the Mayans, they connected Maize and important crop of the Mayan civilization to the origin of time. Other distinct yet similar features of the Mayans are the Zodiac signs, astrological features and gave each year in the cycle names and their own personalities as well.

In Conclusion the Calendars that we use now can be grouped into three broad main types:

1. Lunar calendars which basically are interrelated with the phases of the Moon, they ignore the Sun and adding occasional intercalary days as corrections.
2. Luni-Solar Calendars which basically is derived from months based on the movement of the moon, (alternating between 29 and 30 days to approximately the 29.5 day lunar cycle) with intercalary months inserted to keep the lunar and solar years from drifting too far from each other.
3. Solar Calendars which was derived to track and monitor the seasons, intercalating days to keep the calendar in line with the solar year.

These are the three basic types of Calendars that we have however one can add the Stellar Calendars of Antiquity which is derived and triggered by the heliacal rising of a star.[29]

[29] Stray Geoff : The Mayan and other Ancient Calendars, 2007, p.1