

Calendar Reform:

METRIC, SIDEREAL OR DECIMAL CALENDAR

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We have lived with an extra 'Leap Day' every fourth year, but centurion years like 1700,1800,1900 were no-leap day years since these were not divisible by 400. Thus the year 2000 will 'leap' like it or not! Is there any alternative to this?

The Earth was considered to be at the center. The Sun and all other planets revolved around it, formed the basis of Geocentric Astronomy which regained supreme till these ideas were 'shredded & torn' apart during late 15th century by Nicolas Copernicus (1473-1543), the famous Prussian astronomer. He argued to put 'SUN' rather than 'EARTH' at the center of the Solar System and the present day scientist knows that the duration, in time, taken by Earth in its annual path around the Sun, called Tropical Year (cycle) is 365 days 5 hours 48 minutes and 45.9747 seconds or 31556925.9747 SI-seconds using the solar day clock of 24h x 60m x 60s.

My interest in the calendar reform grew since 1970's when I realised that the 'metric system' had left out the duration of TIME standard – **Second**, out of its fold deliberately or otherwise from Systeme Internatinal d'United (SI in all languages). To me it meant that a 'gap' had been left **of not bridging the length standard – metre, and the time standard – second; thus** not defining the Nautical Kilometre. The 'second' in SI is defined as 'the 1/31556925.9747th fraction of the tropical year; and corresponding to the period occupied by 91926 31770 cycles of radiations of Cs-133 atom, at the defined hyperfine levels, when the atom is at rest'.

This defied fulfilling the dream of the French Academy of Sciences: '**of the task of establishing a measuring system which could be acceptable to the whole world**'. Improvements and corrections have continuously been made to update and make the Gregorian calendar for its acceptability; but United Nations & UNESCO are still looking for a uniform calendar that could be followed by all nations and efforts at national and international levels continue. Duration of Gregorian years is 365.24219878125 days and attempts have been made to plan a 'format', which could remove anomalies persisting in its irregular format. What permutations and combinations can be tried to benefit all human of the mother Earth?

Lunar, Solar and Luni-Solar Calendars

Since the dawn of civilizations, man's quest for recording the past events between time elapsed during TWO full moons; which according to modern value is 29.530558877 days wherefrom duration of 'Tithi or phase of the moon is determined. Nakshatra or asterism being 1/27th of the duration of sidereal period i.e. 27.321661 days, of the moon. The purely 'lunar' calendars still in use are among the Muslim populace/communities. The Hindu calendar and festivities, however, follow the lunar calendar but it needs to align itself with 'cardinal points in relation to the position of Sun in the sky had been felt long ago; along with the need to determine 'season' for civil purposes is known since **Surya Sidhantika**. Surprisingly the ancient civilizations had precise knowledge of astronomy and study of the sky. The official calendar used by the Government of India, although lacking its popularity is the SAKA Era 1915 (for March 1993 to 1994 mid-March). India is a country with diverse religious faiths; and most faiths have an Era linked to it. There are some EIGHT prominent eras in use with local variations, like Vikrami, Budha, Nirvana, Mahavir Nirvana, and some hybrid Eras – Fasli & Vilayati. The 'Sidhantic' period has all India favour with its start at 3102 BC February 17/18 linked to 'Kali or Kaliyug'. But, the Christian faith

of the British empire has come to stay being the only calendar commonly used throughout India; now also called the Gregorian calendar – current year being 1994 AD

Panchangs and 'jantri' makers have devised several schemes indicating datewise details of tithi-nakshatra or phase-asterism for observation of zonal festivals and festivities in relation to civil dates of the Gregorian Era/National SAKA Era are currently in use. Discrepancies exist in respect to several modes of expressing the date of origination of a document, such as:

22.3.1993	22.3.93	22-03-1993
22 March 1993	March 22, 1993	22nd Mar. 1993
22 Mar. 93	22Mar. 93	22nd March 1993

International Organisation for Standardisation vide ISO 2014:1976 desired uniformity be brought and recommended the All Numeric Descending Order form for writing 'calendar' dates. Several organisations in the country follow Bureau of India Standards recommendations IS: 7900-1976 for the purpose. To accommodate the need to 'count' number of elapsed days from start of the year(ISO 8610:1988) recommends to follow:

Era-Year-Week Number-Day Number followed by hour-minute-second (WeekDay) to realise instant retrieval and/or recording an event.

Along with the Gregorian calendar most countries follow their own National calendars used among nations on Earth resort to Luni-Solar adjustments to predetermine astronomical events, such as lunar eclipses, solar eclipses and religious festivities.

Metre, Metric Second and the Metric Calendar

With the signing of the 'Convention du Metre' on 1875 May 20, the metric system of units and dimensions has encouragingly been used in coinage and weights & measures. Decimalisation of time of the day, however, did not take-off grounds except for a short span that the French Republican Calendar lasted in France. One possible reason could be the dominance of the powerful 'church'; and an alternative that the length standard-SECOND, which defied to arrive at a definition for Nautical Kilometre(as an alternative to Nautical Mile). An attempt to review this was attempted to define in The Metric SECOND (1SI Bulln. ; V25 N4; p. 152-57;1973 April) which, in time duration, is:

'One-seventy three millionth 'bit' of the duration of Tropical year (cycle); corresponding to 3973852058.7 periods of Cesium 133 atom, when the atom is at rest between defined hyperfine levels'.

In the format of the Metric Calendar Year: 100 metric seconds equal ONE metric minute; 100 metric minutes make ONE metric hour; 10 metric hours (each) equal the span of metric 'day or night' i.e. 20 metric hours to the metric day(date change) TEN metric days form a 'Decaday' or TWO Quintodays(5-day subweeks or a 'million'(10⁶) metric second periods): (a) Sunday, Monday, Tuesday, Wednesday, Thursday and (b) Sigmaday, Alfaday, Betaday, Friday & Saturday. 73 metric days to the 'season' and 73-decadays make the MetricCalendar Year, equal to TWO tropical years (cycles). In angle, the circle has 400° i.e. 100 degree to the quadrant (instead of 90°). Like the hour-minute-second, each degree metric has 100 minutes & each minute 100 seconds (10 x 100' x 100"). **ONE minute of angular arc at the center of Earth represents a 'nautical kilometre'- like the erstwhile nautical mile.** As the Earth spin in its axis, the time difference per degree longitudinal transit across the Sun is 5 metric minutes (instead of 4 minutes). A FOUR metric year 'saros or quantum time' accounts for 99 lunations (2920 lunar tithi or phases) and 107

sidereal revolutions (2889 nakshatra or asterisms) for luni-solar inter-calations. The 19-tropical years or Metonic cycle is a useful tool, which accounts 235 lunations & 254 sidereal revolutions of the moon. Although, the format of Metric Calendar is UNIQUE in itself but it lacked support and acceptance, since most 'religious heads as also the scientist community **'felt the need on to the 7-day 'sabbath cycle'** and disfavoured addition of THREE extra days viz Sigmaday, Alfaday & Betaday between Thursday and Friday, as projected to make the 'Decaday'. All other parameters among derived 'units and quantities' in Systeme Internationale d'United(SI) can be conveniently worked by manipulating the NEW MAGNITUDE for time interval – the metric second or its reciprocal; as demonstrated in the books (1) Towards a Unified Technology and (2) The SI Metric Units. The investigation for establishing a possible 'Length standard used in the Indus Civilisation resulted that their technological skill was far ahead of present day humans on Earth; and that their 'length unit' was TWICE THE METRE and possibly they knew of time division of the day into $10 \times 100 \times 100$ Indus seconds.

The Tropico – Sidereal Calendar

What then is the alternative, if not the Metric calendar? Three distinct functions are expected, of giving: (1) the time of the day; (2) a measure for time interval or duration; and (3) the season of the year. The time of the day is give by the position of the Sun in the day time, and by night locating the position of stars. It is known that the most 'precise' astronomical measurement is that of **the star transit** resulting from the rotation of the Earth, *i.e.* the duration of sidereal day (d_s). "Why this knows duration of **astronomical significance remained untapped**, for 'calendar' format", I argue? The duration of a 'sidereal day (d_s)' is 86164.0905 seconds or 23h 56m 4.0905s. This is the time duration between TWO sunrises.

NO WORK HAD EVER BEEN UNDERTAKEN TO OBSERVE PLANETARY BODIES, AND DRAW A FORMAT OF THE WORLD CALENDAR ACCEPTABLE TO ALL NATIONS IN EARTH, USING THE TIME DURATION OF A SIDEREAL DAY.

It is interesting to observe that the duration of the Tropical Year(cycle), y_t , work to 366.242198943 sidereal days(as against 365.24219878125 solar days of 24h x 60m x 60s on clock time to the day). In deciding the format of the Tropico-Sidereal Calendar (Standards India; V6N4; p. 100-144; 1992 July) a publication of the Bureau of Indian Standards, New Delhi I have attempted to merge the TWO astronomical durations *i.e.* (a) the duration of the tropical year; and (b) the duration of the sidereal day, further divided into 240000 sidereal seconds(s_s) *i.e.* $24h_s$ *i.e.* $\times 100m_s \times 100s_s$. The Sidereal Second (s_s) is:

"the time interval between any TWO successive events that take place at intervals of the fraction $1/240000^{\text{th}}$ of the of the sidereal day; and corresponding to 35.901704375 percent of SI – secondor 3300311482 periods of radiations of cesium 133 atom, at defined hyperfine levels, when the atom is at rest".

The perpetual calendar is in TWO halves, each of 26 Weeks (and numbered from 'W 00 to W 25' and 'W 26 to W 51') or 182 days but **days are counted** from the start of the year as WEEKS ELAPSED & NUMBER OF DAY in a week(01 for Sunday to 07 for Saturday). All years are of 52-weeks (7-sidereal day week) with a 53rd week, to be called **LEAP WEEK occurring every 3rd year** (Refer the Leap Week Rule). Duration of SI-second is 2.78538308252 sidereal second; Lunation period of Moon is 29.6114408554 d_s ;

Sidereal period of the Moon is 27.3964652406 d_s ; and that of the Sidereal Year is 366.256398934 d_s (sidereal days), and it would be easy to see that the 19-Year Metonic cycle with 235 Lunations & 254 Sidereal revolutions of the Moon ideally fits for luni-solar inter-calations. Durations of other planetary bodies are likewise determined, without difficulty.

DECIMAL CALENDAR

Is the present 4-year & ‘centurian’ year rule used in the Gregorian calendar satisfactorily? Yes, and perhaps No! If the month of July is Reduced to 30 days (rather than 31); the Gregorian calendar in TWO halves shall each be of 26 week duration and the remaining period, in terms of ‘solar days’ shall be 1,24219878125 d. The **solar day can also be of 24h x 100m x 100s** (in place of 24h x 60m x 60s) on the clock time. The ‘decimal second’ for the use in SI shall be 36%(percent) of the present SI unit for the time standard – second. Refer to box for definition:

DEFINITION

“ONE DECIMAL SECOND (s_d) is the time interval between any TWO events that take place during the fraction 1/24000th of the solar day; and correspond to 3309347437.2 periods of radiations of cesium 133 atom, at defined hyperfine levels, when the atom is at rest.”
This is 36 % of the SI-Second; or 1/87658127.7074th of the tropical year.

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360° to a circle and 90° to the ‘quadrant’ are retained. However, like the ‘hours & minutes’ each degree (in angle) has 100 minutes (and each minute has 100 seconds) unlike the present 1° x 60' x 60". The Nautical Kilometre (decimal) works to: 1NKm_d=1.111948868884 Km. Using the known value for the ‘velocity of light’, the mean distance of Earth from Sun is 1.3445587453 x 10⁸ Km_d ; and the distance METRE, after correction, can be defined as: ‘**Metre(m)** is the distance traversed by light, in vacuum, during the time interval 1/97059575.22th of the decimal second’. In Systeme Internationale d’Unites(SI) all derived units, dimensions & quantities can be easily derived by using: (1) time conversion factor, $t_f=0.36$, and (2) distance conversion factor, $d_s=1.111948868884$ or their reciprocals $1/t_f$ and $1/d_s$ which become handy tools to derive various parameters. During the transition period, representation of Dual Time Scale on the same dial is easy, convenient & cost effective. As the Earth ‘spins’ its axis ‘local time’ at any point East or West of ‘Dateline or Zero longitude’ can be determined as six and two-third sidereal or decimal minute(against 4 solar minute) per degree longitudinal transit across the Sun. The face of clock shall, however, show 25 minutes where present clocks show 15 minute-marks i.e. a time span of 5 minutes (or at ONE o’clock position) equivalent time would be eight and one-third decimal minutes.

The Leap Week Rule

It is easy to account or convert completed number of ‘solar to sidereal’ days or vice versa, using the multiplication factor: ONE solar day equals 1.0027379097 sidereal day; or ONE sidereal day equals 0.99726956598 solar day.

Now considering a time ‘span’ of 896 Tropical (solar) years, y_t , the period remaining **to be leaped** is 1113.010107776 days i.e. 159 ‘full weeks’ and 0.0101078 d. These 159 weeks can be LEAPED in 18, 18, 17; 18, 17, 18; 18, 18, and 17 weeks per 100-years. Thus, each ‘century’ can have EVERY SIXTH YEAR of 53-weeks i.e. with a LEAP WEEK OF 7-days, along with its 50th & 100th year also to have the ‘leap week’; but the years 300th, 600th & 900th will be NORMAL YEARS having 52 weeks; so that only 159 weeks are ‘leaped’ during 896-years. The remaining discrepancy shall be only ONE DAY over a long span of 88644.6237035 years.

Calendar Reform

NEED THEREFORE EXISTS for an open discussion to decide a ‘calendar format’ which can be acceptable to the whole world, for5 international trade and a common dating system and to replace the

anomalistic Gregorian calendar. Astronomically, the solar day has already lost its 'significance' in favor of the SI-second, and therefore exists a need to review this, which being linked to Nautical Mile. The Sidereal Day (d_s) and the Tropical Year (y_t) have known duration, in time, I favor consideration of the 'Sidereal or Decimal Day' which can further have $24h \times 100m \times 100s$ (or 240000 sidereal or decimal seconds to the day) from one sunrise to the next sunrise.

My discussions with several scientists, however, point to consideration of 'SOLAR DAY', which can be suitably subdivided into decimal/metric units, for convenience. APPENDIX-I exhibits a comparative tabulation picture of Decaday/Sidereal day/Decimal Solar Day calendars attempting Decimalization of Time of the Day.

It may, however, be pointed that ANY SUB-DIVISIONS of time of the day are possible (be it solar, metric or on the sidereal basis) decimal or otherwise. The important factor is where from we start and what 'basic reference' is chosen, depending upon which all other parameters shall need reworking, as exhibited at Appendix-I.

The '**New Calendar Plan**' can be introduced as the dawn welcomes the First rays of SUN on the day following 1998 December 19(Saturday); and be dated (Kali) DS.5100-W00-01(Sunday) corresponding to Gregorian date (to be called) 1998 December 22(Sunday) after omitting Two CALENDAR DATES i.e. December 20 & 21, allowing for the correction left out by pope Gregory XIII on 1582 October 5 (Friday). This shall be closest to the winter solstice, which according to one thought coincides with the birth of Lord Jesus.

References

1. Metric Norms for Time Standard; the Standard Engineer; V25N4;p. 58-62; (1971)
2. The Metric Second; ISI Bulln.; V25N4; p.152-7;1973 April.
3. The Metric Calendar Year; published 'views &news' during 1971-93.
4. Linear Standard in the Indus Civilization; Frontiers of Indus Civilization (Sir Mortimer Wheeler Commemoration Volume (1984); Doc. No. 16; pp. 153-56; Indian Archeology Society and Indian History & Culture Society, New Delhi.
5. The Tropico-Sidereal Calendar; Standards India; V6N4; p.110-114 (1992).
6. ISO 8601 : 1988 and International Organisation for Standardization Bulletin 1989 January.

Note: The author would be pleased to have discussions on the topic of Calendar Reform – especially the concepts of Leap Weeks since NO WORK HAS BEEN UNDERTAKEN except as at Ref. No. 5 based on the latest available figures of Planetary bodies.

Leap N calendar ▼



by [VictorEngel](#) 2006-04-17 15:50 :: [Reply](#) | [Show Only this Message](#) :: Rate this Message: ★★★★★

Dear Calendar People:

> Karl's work on the uniformly 30-day leap month calendar is also an
> intriguing idea!

> Regular year = 360 days, Leap year = 390 days. How elegant!

On the list we discuss leap day and leap week calendars frequently, and also leap month calendars. Why not a leap year calendar? Every year has 365 days except a leap year, which has 366 days. After 1505 normal years, insert a leap year. What could be simpler? Mean year length is 365.24236 days.

If you prefer year lengths other than 365 days, you could choose from any of the following:

364 days (leap year after 293 years) 365.24232 days

363 days (leap year after 162 years) 365.24074 days

362 days (leap year after 112 years) 365.23214 days

361 days (leap year after 85 years) 365.24706 days

360 days (leap year after 69 years) 365.21739 days

Clearly, such a scheme is most accurate with a 365 or 364 day year.

Victor

➤ What could be simpler? Mean year length is 365.24236 days.

There is a slight inaccuracy in Victor's calculations.

$1505 \times 365.242189669781 = 549689.495453020405$ days ($1505 \times 365 = 549325$ d). The difference being 364.495453020405 d. This give, Mean Year = $549690/1505 = 365.242524917$ days.

BRAHASPATI YEARS/Brahaspati Leap Weeks:

Sidereal Year = $(365.242189669781 \times 86400)$ i.e. $31556925s.1874690784 \div 86164s.0905 = 366ds.242189807238532$ or $(366ds\ 5hs\ 48ms\ 45ss.19934541)$

Ratio: Solar day: Sidereal Day = $86400/86164.0905 = 1.00273790970961389072$

$128\text{-years} \times 366.242189807238532 = 46879.000295326532096$ d_s ($128 \times 52 + 41 = 6697$)

$896 \times 366.242189807238532 = 328153.002067285724672$ ds (46879 weeks i.e. $52 \times 896 + 287$ BLWks.

TWO Brahaspati LWK once every 7th years, can be introduced: ONE at the beginning and ONE at the end, leaving 31 BLWks to be accommodated ONCE every 28-years. This shall be a discrepancy of: ONE day (d_s) in 433418.5591years.

Mean Year = $328153/896 = 366.2421875$ d_s; Also, $7 \times (52 + 41/128) = 366.2421875$ d_s

DIVIDE by 3 Plan: There can be 298 BLWks in 896-years. We ONLY need to account 287 BLWks i.e. skip 11 or 12 weeks over 896-years. This can easily be arranged by **SKIPPING one Brahaspati LWK ONCE every 75 years**, to account 287 weeks. Desired Mean Year = $7 \times (52 + 287/896) = 366.2421875$ d_s.

An ALTERNATE way, is to insert ONE Brahaspati Year of 52-weeks ONCE every 128-years i.e. during 129th, 257th, 385th, 513th, 641st leaving 27 Brahaspati Leap Weeks to be accounted ONE every 9-years [$5 \times 52 + 27 = 287$ BLWks]. ALL Brahaspati Years, however are counted as EXTRA Years i.e. other than 896-year cycle. Mean Year = $7 \times \{52 + [(5 \times 52 + 27)/896]\} = 366.2421875$ d_s

NEW LENGTH UNIT (m'): I do NOT see any problem in considering the format of ANY scheme, using 364 or 365 days (sidereal); along with day divided in 24-h_s x 100m_s x 100s_s i.e. 240000 sidereal seconds to the day – or for that matter divisions of day into 10/20-metric hours or 12/24-hours solar or sidereal time. This can easily be linked with the QUADRANT of 90-degree or 100-degree. Considering Earth to be a hypothetical sphere, the New Length Unit – METRE New (m') could still be: **1/100th of arcAngle Pi/180 i.e. ONE degree.** NOTE: $366.2421875 \div 1.00273790971 = 365.242187368842231$ solar atomic days.

BRIJ BHUSHAN VIJ : 20060419H20:79