

Reinventing the Indian (Hindu) Calendar

by Rajen Barua - Monday, June 10, 2013

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Summary: Following the Indian (Hindu) calendar, we Indians are celebrating the seasonal festivals on wrong dates. It is because in the Indian calendars, the seasons are out of phase with the real tropical phenomenon of the earth. This article analyses how and why we are doing that and what to do about it.

In the Indian calendars, the *Makar Sankranti* which marks the transition of the Sun into *Makar Rasi* (Capricorn), generally falls around 14th or 15th January of the Gregorian calendar. *Makar Sankranti* also marks many of the Indian harvest festivals such as the *Pongal* of the Tamils, the *Bhogali Bihu* of the Assamese, the *Maghi (Lohri)* of the Punabis, *Bhogi* in Andhra Pradesh etc. Many communities start their new years on this date. Astronomically, *Makar Sankranti* is the winter solstice. It is the shortest day marking the beginning of the *Uttarayan* (the northern journey) of the Sun with gradual increase of the duration of the day. The *Bhagavad Gita* mentions great importance of the *Uttarayan*. This was the reason why *Bhishma*, when wounded in *Mahabharata* war, chose to await for the *Makar Sankranti*, before choosing to die. In the Jagannath temple at Puri the *Uttarayana Yatra* is celebrated on this *Makar Sankranti* day.

Like the *Makar Sankranti*, three other *sankrantis* mark the cardinal poles of equinoxes and solstices of the Indian calendar. The *Mesha Sankranti* marks the spring equinox, the *Karkat sankranti* marks the summer solstice and the *Tula sankranti* marks the autumnal equinox. Like the solstice, an equinox (equi=equal, nox=night) occurs twice a year. According to the Indian calendar, the spring equinox (*Mesha Sankranti*) falls around April 14th-15th when the Assamese celebrates the *Rongali Bihu*, their springtime festival, when they also usher in their New Year. Like the Assamese, the Bengalis celebrate *Baishagi* and the people of Kerala also celebrate *Vishu* on this *Mesha Sankranti* day as their new year.

However, there is a fallacy in all these celebrations because if we follow the Indian calendar, you will notice that the dates of these festivals do not fall either on correct dates of the seasons nor these fall on correct dates of the equinoxes and solstices. To make the point clear, let us take the case of *Makar Sankranti* which is celebrated around January 14th at present time. However, as we all know, the winter solstice falls not on January 14th but it actually falls on Dec 21st which is the shortest day of the year and also denotes the end of winter and marks the official start of the harvest season. Thus to be correct with the seasons and with the solstices, the *Makar Sankranti* should fall on 21st Dec and not on 14th Jan. It is apparent that something is wrong with the Indian (Hindu) calendar. As a matter of fact, in the Indian calendar system, the tropical seasons (and the solstices and the equinoxes along with it) are out of phase by 24 days with the correct seasonal phenomenon as marked by the Gregorian calendar. To make matters worse, it is not only out of phase, but that this out of phase is also increasing every year.

We will try to analyse how and why the Indian calendar is out of phase with the seasons and what to do about it. First, the reason why it is out of phase is very simple. We Indians are measuring the solar year by a different method than being measured by the Gregorian calendar. Basically, we Indians are measuring

what is called a 'sidereal' (Sans. *sayana*) solar year while the scientific community is measuring a 'tropical' (Sans. *nirayana*) solar year. This brings us to the question how differently we measure a solar year.

The solar year is measured by counting the time period of the successive return of the earth to the same reference point on the ecliptic. However, we can measure it two ways. We may take one reference point by taking a fixed background star on the ecliptic. In this system, the solar year measured, is the actual time taken for the earth to revolve once around the Sun with respect to a fixed star. This is known as the *sidereal* year. However, another reference point may be taken as the 'equinox point'. That is, you measure the time from (say) one spring equinox to the next spring equinox. The year you measure thus is known as the *tropical* year.

In order to understand the situation with the Indian perspective, we must start with the birth of the calendar itself. The basic purpose of a calendar is to measure the length of the year along with its seasons. It is the tropical year that accurately measures the seasons while the sidereal year does not.

The credit for the invention of the first intelligent and accurate tropical calendar goes to the Egyptians who invented the calendar some 6000 years ago. Today the scientific calendar that we use, the Gregorian calendar, is basically a modification of this ancient Egyptian calendar. The Egyptians could invent the tropical calendar for a very simple reason. As we all know, and as rightly called by Herodotus, Egypt is the gift of the Nile. Every year, there occurs, the annual flood in the river Nile that starts around the month of June and lasts till around October. What the Egyptians did not know was when is the month of 'June' and what exact date the flood would start. This was very important for the Egyptians economy, for the farmers as well as for the Egyptian Pharaoh. The Egyptian astronomers thought that they could probably make some link of the occurrence of the annual flood with some stars as a reference point. So they started to observe night sky. And Eureka. Very soon they found out that the flood actually occurs every year as soon as the bright star 'Sirius' (which they call the Dog Star) appears on the morning sky on the horizon. By counting the days from one Sirius rising to the next, they found out the exact length of the year to be 365 days. Not only that, they also observed that the length of the year must be more than 365 days because every four years, the flood comes one whole day later. So the correct length of the year (tropical) must be 365-1/4 days. "*By timing the Sirius's appearance exactly from year to year, Egyptians astronomers eventually realised that the solar year was one fourth day longer than 365 days. Egyptians also used pyramids to measure shadows to determine the coming of the equinoxes.*" (*Calendar – D.E. Duncan pp 21*). We would like to note here that this Egyptian calendar of 365 days and 6 hours is accurate upto 11 minutes to the present most scientific Gregorian calendar that we use today. We should say that it was a great feat for the Neolithic civilization of Egypt 6000 years ago. (According to the modern scientific measurement, the Solar year is 365.2424 days (based on Vernal equinox as reference) i.e. about 365 days, 5 hours and 49 minutes. It also may be noted that the modern calendar, as we have it today, was only modified in 1574 AD by Pope Gregory. It may also be noted that this modification was suggested by Roger Bacon of England as back in 1267 AD. The reason for this required modification was the tropical year is also affected by another factor called the precession of the equinoxes.

The basic point to be made here is not how accurate was the tropical calendar that was originally invented by the Egyptians but the fact that it was this tropical calendar of the Egyptians that was adopted and developed further by the scientific communities of the Western world starting with the Greeks (Ptolemy), Romans (Julius Ceaser) and by the Christian world (Pope Gregory), and that it is this tropical calendar that

the scientific communities of the world is using today. This tropical calendar is synchronizes with the seasons of the year along with the equinoxes and the solstices.

It is this '*precision of the equinoxes*' (Sans: *sanrantis*) which is not accounted for in the Indian calendar and which makes the Indian calendar out of phase with the seasons. The Indian calendar is a sidereal (*sayana*) year calendar that was originally developed by the Vedic Indians thousands of years ago. We will not speculate here as to why the Vedic Indians could not (or did not) develop a more practical tropical (*nirayana*) year calendar by measuring (say) from one *Uttarayana* to the next or by taking help of important Indian local annual phenomenon like the '*monsoons*' (say). It may be because of their religious world view which made them to believe that what was more important was to maintain the world order (*Rita*) by making proper sacrifices to the gods. As we know, in the *Brahman* theory, the world had come into existence through a primeval sacrifice, and must be maintained in existence by further performance of sacrifices by the Brahmans. According to the Upanishad idealism, the world is also considered not to real but simply '*maya*' or illusion any way. Or it may be because developing a tropical calendar needed practical scientific planning and execution of earth bound experiments of measuring shadows to determine solstices and equinoxes or the observing the monsoons for that matter, and these were considered rather mundane and not important by the Vedic Brahmans.

What is important for us to know is that normally, one would expect that both the measurements, tropical and sidereal, would give the same length of the year. However that is not the case. It was observed that there is a slight difference, of about twenty minutes, between these two measures of the year; and that makes all the difference. It was observed that, one full orbit later, when the Sun has returned to the same apparent position relative to the background stars, the solstice is already about twenty minutes "beyond" this. In other words, every year, the solstice (and the seasons for that matter) occurs twenty minutes earlier in the orbit than the sidereal year. Today we know that this difference in time measurements, is due to a phenomenon called the '*precession of the equinox*' which is not accounted for in The Indian calendar.

The discovery of the '*precession of the equinox*' is usually attributed to Hipparchus (190–120 BC) a Greek astronomer. According to Ptolemy, another Greek astronomer of the 2nd century, Hipparchus measured the longitude of Spica (*Sitra*) and other bright stars on the equinox day, and compared his measurements with data from his predecessors and concluded that Spica (*Sitra*) had moved about 2° relative to the equinox. He also compared the lengths of the tropical year (the time it takes the Sun to return to an equinox) and the sidereal year (the time it takes the Sun to return to a fixed star), and found a slight discrepancy. Hipparchus concluded that the equinoxes were moving ("precessing") through the zodiac, and that the rate of precession was less than 1° in a century. Ptolemy continued Hipparchus's study and found that between Hipparchus' time and his own (about 265 years), the stars had moved at about the same rate determined by Hipparchus.

Today we know that the *precession* of the equinox occurs due to the wobbling motion, like that of a top, of the earth. This precession is about 50.3 seconds of arc per year or 1 degree every 71.6 years. Thus a complete precession cycle covers a period of approximately 25,765 years, the so called Platonic year, during which time the equinoxes, and the seasons along with it, will regress a full 360° through all twelve constellations of the zodiac. Note that 20 minutes per year is approximately equivalent to 365 days in 25,765 years. Thus the equinoxes, and the seasons, will always be out of phase in a sidereal calendar; and the Hindu calendar is a sidereal calendar. The European Gregorian calendar which measures the tropical

year takes into account the affect of the 'precession of the equinoxes'. It therefore is synchronized with the seasons.

The Vedic Indians definitely did not know about this '*pecission of the equinoxes*' since it was invented only in about 190 BC or after. However, this knowledge was definitely known to the later Indians since this invention was after the Alexander the great (326 BC) who opened the communication between India and the Greece. We find that the Indians used the word *sanrantis for the 'precision of the equinoxws'* which indicates that they knew about it. However, we don't find any records that the later Indians ever tried to 4 utilise this knowledge to correct the calendar to synchronise with the seasons. The Indian (Hindu) calendar was later reformed several times in the Christian era by several Hindu astronomers such as *Aryabhatta, Barahmihira, Bhaskara* and others. However, in none of these revisions, the affect of the *precession of the equinox*' was addressed or was taken into account to modify the calendar.

Let us now see how the discrepancy of 24 days has crept into the present Indian calendars. According to Surya Siddhanta, an ancient astronomical treaties, the Indian sidereal (*sayana*) year apparently coincided with the tropical (*nirayana*) year in KY (Kali Yugo) 3600, which has now been standardized as the as 285 AD. It means that in 285 AD, the solstices and the equinoxes were per the present Gregorian calendar; *Makar Sankranti* fell on 21st Dec and the *Mesha Sankranti* on 21st March etc. Since then however the equinoxes are precessing in the Hindu calendar at the rate of 20 minutes a year for total (2013-285)=1728 years, and this accounts for the $(1728*20)/60/24 = 24$ days discrepancy that we have today. To bring the matter home, we may note that at the present rate, we find that 500 years ago, the Hindua were celebrating the Makar sankranti around 7th January and that in another 500 years from now, we will be celebrating it on 21st January instead of the 14th January as we do today.

It is not that we Indians did not try to reform the calendar in modern times. The Indian Calendar Reform Committee tried to reform the Hindu calendar, and a unified calendar was introduced in 1957 creating a National tropical calendar which also tried to incorporate the Hindu religious calendars. This effort however failed mainly due to the orthodox schools of Vedic astrology which simply rejected modern astronomy. As a result, today, we have about four major regional Hindu calendars: Tamil, Orissa, Bengali and the North Indian, all following the traditional old Vedic treaties. And hence the discrepancy of the '*precision of the equinoxes*' with the seasons remain.

Till the issue is scientifically analyzed and resolved, it is suggested that Indian public need to be aware of the situation. In the meantime, it is suggested that we may use the Gregorian calendar to celebrate these seasonal festivals which falls on correct astronomical dates. Thus, all Indian festivals connected with Makar sankranti (i.e. the Assamese *Bhogali Bihu*, the Tamil *Pongal*, the Punjabi *Lohri*, the Andhara *Bhogi* etc) may be celebrated not on a flexible January 14th as being done now, but these should be celebrated on fixed day of December 21st per the Gregorian calendar which is the correct winter solstice day astronomically. The same thing may be done for the other festivals too; festivals connected with the Mesha Sakranti (Assamese *Rongali Bihu*, Bengali *Baishagi*, Kerala *Vishu* etc) be celebrated on the fixed date of Mach 21st which is the correct vernal equinox day and not on flexible date of April 14th etc. That would at least restore the dates of the seasons back to the original dates of KY (Kali Yugo) 3600 which has now been standardized as the as 285 A.D.

About the Author:

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