Possible errors in historical dates:

Error in correction from Julian to Gregorian Calendars[1]

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Introduction We have studied five major historical events reported between 1630 AD and 1680 AD where detailed references to the stars in the night sky are available. We show that the descriptions of the star patterns at that time are off by exactly 10 days. For example, the solar eclipse reported in one example to occur on March 20, 1680 in fact occurred on March 30, 1680 according to the current (Gragorian) calendar. This is checked using a computer simulation package (SkyMap Pro 8)and Oppelzer's Canon of Eclipses(1). We attribute this error in dating historical event(s) due to the switchover from Julian to Gregorian calendars in later half of 18th Century.

Important events in Indian History are dated to an accuracy of a specific date that is calculated based on the documentation of a specific period(s) and historical references. However, it is often difficult to verify these dates by independent means since the historical references do not often carry independent markers. However, documents on comparatively recent Indian history often give detailed description of astronomical events, which can be independently verified using modern software programs designed using data from high-precision astrometry satellites like Hipparcos and Tycho.

It is observed that while writing the history of Shivaji Maharaj, nearly all the evidences are written as per the Julian calendar. Due to many defects, this calendar was reformed by Pope Gregory in 1582 AD and announced that after 4 October the next date will not be 5 October but 15th October. Hence 10 days were deleted from the Julian calendar, which is now named as the Gregorian calendar.

The Catholic community immediately accepted this change but the Protestants including the British accepted it only after 170 years that is on 2 September 1752 AD. They took the next day as 14 September 1752 AD. This has a difference of 11 days because in the 170 years the difference between the two calendars increased from 10 days to 11 days. As the Protestants were ruling on many countries across the world, those countries continued to use

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Julian calendar till this time. In India also all the history written by British historians is as per the Julian calendar up to 1752 AD

Julian calendar shortcomings and corrections:

Julius Caesar introduced this calendar and put it in practice in 45 BC. The duration of a year in his calendar was 365.25 days as found by the Egyptians. It differs from both the sidereal period *Nakshatra varsha* of 365.2564 days used in India and the tropical year of seasons equal to 365.2422 days. The two differ because Vernal Equinox (ascending node of earth's orbit) moves backwards, that is toward the west due to the precession of the earth's axis of rotation around ecliptic poles at the rate of about 1 degree in 72 years. This produces a difference of 1 day in about 71 years in the Indian calendar and of 1 day in 128 years in the Julian calendar.

In 325 AD Sun used to enter Vernal Equinox on 21st March. In the Julian calendar therefore, it was declared that 21st March will be the Vernal Equinox day and it was related to the resurrection of Christ. However, the error due to precession was not taken into account while fixing this date. By the late 1500s the discrepancy became marked. On 1582AD, i.e.in 1258 years, the Sun started entering the Vernal Equinox 10 days earlier (1258 by 0.0078 = 9.8 days). So on 11 March Sun entered the Vernal Equinox point. To correct this problem Pope Gregory canceled 10 days of that year and after 4 October 1582 the next day was declared as 15 October 1582. The period of Gregorian calendar is of 365.2425 days. So there is still a difference of 0.0003 days. In spite of this, for the next 3000 years Sun will enter Vernal Equinox near 21st March[(2)].

In the history of Shivaji Maharaj the historians have converted the moon's position (*Tithi*) into Julian dates. However, after the British left, India has continued to use the Gregorian calendar introduced by the British in 1752. So, from 1582 AD to 1752 AD the difference of 10 or 11 days is also reflected in the calculation of *Tithi*. As a result, by Julian calendar 20 March 1680 was new moon, but by Gregorian calendar it was on 30 March 1680. This is highlighted in the records of events associated with the life and times of Shivaji Maharaj. A difference of 10 days is also noted in the eclipse of January 1665 and August 1673 in the dates of stone inscriptions of Karnataka [(3)].

Some examples in the history of Shivaji Maharaj:

According to the historians[(4)], the date of birth of Shivaji Maharaj was in the month of *Falgun* and the *Tithi* was *Vadya Tritiya*. Bhavar, Baneda and Bikaner horoscopes of Shivaji Maharaj indicate that he was born on *Sinha Lagna*[(5)]. Time of birth mentioned in *Jedhe Shakavali* and *Shivabharata* volumes yield *Simha lagna* only. This is 3 days after the full moon day of the month *Falgun*. This also means that the moon was near the *asterism Purva* or *Uttara Falguni* (in Leo) when it was full and after 3 days it was in *Hasta* (Corvus) or *Chitra* (Spica) in Virgo

asterism. **Also, three days after the full moon day the moon must have risen 156 minutes (52 by 3) later than on full moon night. So the moon-rise must be approximately at 9:00 PM. At that time the rising zodiacal constellation was Virgo. But the birth time of Shivaji Maharaj was in the evening after sunset. So at that time the earlier constellation Leo must be rising on the eastern horizon. In the history of Shivaji Maharaj, his birthday is mentioned as 19 February 1630. However, the above references do not match with the star patterns on this date as extrapolated back in Gregorian Calnder. They match very precisely on 1 March 1630 (10 days later).**

Another and probably more accurate example is the partial solar eclipse visible from fort Raigad in the year 1680. In the various biographies of Shivaji Maharaj, it is mentioned that partial solar eclipse was visible on 20 March 1680. From Gregorian calendar there were no chances of eclipse on that day because Sun was in Pisces and Moon was in Libra. But on 30 March 1680 the eclipse did occur. It was in the constellation of Pisces. From Raigad the eclipse started at 4 hours 37 minutes in the evening. The Sun was 30 degrees above the horizon. The mid-eclipse time was 5 hours 41 minutes in the evening. Sun was only 15 degrees above the horizon. The eclipse ended at time 6 hours 38 minutes in the evening when the Sun was only 1.5 degrees above horizon[(1)]. This observation exactly matches with the documented history.

Following is the table, which gives many other events in the life of Shivaji Maharaj, which confirms our observations. All the *tithis* are taken from reference (4).

Table 1: Historical Dates with astronomical details and comparison between stated and accurate dates

	Event	Julian Date	Gregorian Date	*Tithi* (Moon's phase)	*Nakshatra* (position)*
1	Birth	19 February 1630	1 March 1630	Falgun Vadya 3	*Hastha*
2	Pratapgad war	10 November 1659	20 November 1659	Kartik Shuddha 7	*Shravan*
3	Rescue from Agra	17 August 1666	27 August 1666	Shravan Vadya 12	*Pushya*
4	Coronation	6 June 1674	16 June 1674	Jyeshtha Shuddha 13	*Anuradha*
5	Death	3 April 1680	13 April 1680	Chaitra Poornima(Full moon day)	*Chitra*

*According to Prof G M Ballabh's software programme

We therefore conclude that the manner in which dates are calculated in the historical time scales have carried the error of Julian Dates and Gregorian calendar dates. Hence care must be taken while calculating the English calendar dates of the past events from periods earlier than late eighteen century.

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