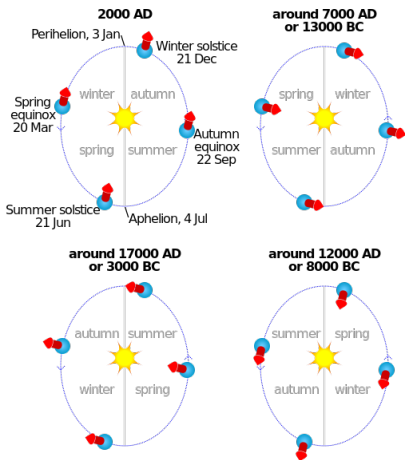


About calendars, calendar changes and a tiny bit of Astronomy.

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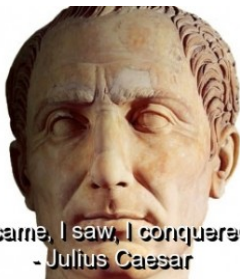
February 5, 2015

Introduction. The tiny bit of Astronomy.



- **Tropical (solar) year:** time that the Sun takes to return to the same position in the cycle of seasons, as seen from Earth. Typically from vernal equinox to vernal equinox.
- About 20 minutes shorter than the time it takes Earth to complete one full orbit around the Sun as measured with respect to the fixed stars (the sidereal year).
- The **approximation of 365.25 days for the tropical year:** known for a long time but not used directly, since ancient calendars were not solar (except Egyptian and Iranian)

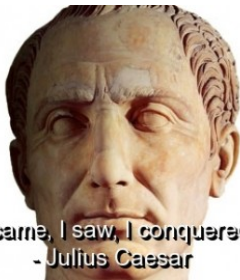
The Julian calendar. A little bit of history



I came, I saw, I conquered.
-Julius Caesar

- Introduced by Julius Caesar in 46 BC. It was a reform of the Roman calendar.
- The ordinary year in the previous Roman calendar consisted of 12 months, for a total of 355 days. In addition, a 27-day intercalary month, the *Mensis Intercalaris*, was sometimes inserted between February and March, resulting in an intercalary year of 377-378 days.
- With some refinements, this system averages the length of the year to **365.25 days**. However...
- The last years of the pre-Julian calendar were later known as "**years of confusion**".

The Julian calendar. A little bit of history



I came, I saw, I conquered.
-Julius Caesar

- Caesar's reform was intended to solve this problem permanently, by creating a calendar that remained aligned to the sun without any human intervention.
- First step of the reform: realign the start of the calendar year (1 January) to the tropical year by making 46 BC 445 days long.
- This extra-long year was, and is, referred to as...
- The "**last year of confusion**".

The Julian calendar

- Julian calendar: 365 days, 12 months
- A leap day is added to February every four years. The Julian year is **on average 365.25 days long**.
- Twelve months: Ianuarius, Februarius, Mercedonius/Intercalaris (abolished), Martius, Aprilis, Maius, Iunius, Quintilis (Iulius), Sextilis (Augustus), September, October, November, December.
- in AD 65, Nero renamed April as "Neroneus", May as "Claudius" and June as "Germanicus".
- Commodus renamed all 12: "Amazonius", "Invictus", "Felix", "Pius", "Lucius", "Aelius", "Aurelius", "Commodus", "Augustus", "Herculeus", "Romanus", and... "Exsuperatorius".

From the Julian to the Gregorian calendar

- It was known that the tropical year was a few minutes shorter than 365.25 days.
- The calendar did not compensate for this difference.
- Reform was required because too many leap days are added with respect to the astronomical seasons on the Julian scheme.
- As a result, the calendar year gained about three days every four centuries compared to observed equinox times and the seasons.
- The calculated date of Easter gradually moved out of alignment with the March equinox.
- By 1582, it was ten days out of alignment from where it supposedly had been in 325 during the Council of Nicaea: from 21st March to 11th March.
- This discrepancy was corrected by the Gregorian reform of 1582.

The Gregorian calendar.

- The difference in the average length of the year between Julian (365.25 days) and Gregorian (365.2425 days) is 0.002%.
- It reduces the number of leap years: "Every year that is exactly divisible by four is a leap year, except for years that are exactly divisible by 100, but these centurial years are leap years if they are exactly divisible by 400. For example, the years 1700, 1800, and 1900 are not leap years, but the year 2000 is."



The Gregorian calendar.

- Among the last countries to convert to the Gregorian calendar were Greece (in 1924), Turkey (in 1926) and Egypt (in 1928).



- 1755 in Britain: "**Give us our Eleven days**".

The Gregorian calendar nowadays.

- The Julian calendar is currently 13 days behind the Gregorian calendar.
- 1 January in the Julian calendar is 14 January in the Gregorian.
- Most branches of the Eastern Orthodox Church still use the Julian calendar for calculating the dates of movable feasts, including Easter (Pascha).
- The Orthodox Churches of Jerusalem, Russia, Serbia, Poland, Macedonia, Georgia and Ukraine, continue to use the Julian calendar, thus they celebrate the Nativity on **25 December Julian** (which is **7 January Gregorian** until 2100).

