the calendar

The year used in civil life is based on the *tropical year*, defined as the interval of time between successive passages of the Sun through the first point of Aries. Because of precession, the first point of Aries moves along the ecliptic at an average rate of about 50 arcseconds per year in the direction opposite to that in which the Sun moves. The tropical year, of length 365.2422 mean solar days, is therefore shorter than the *sidereal year*, of length 365.2564 mean solar days, defined to be the time it takes the Sun to make one complete circuit of the ecliptic.

For convenience, the calendar year contains an integral number of days, either 365 or 366. Every fourth year, called a *leap year*, has 366 days, February 29th being the extra day, excepting those century years (such as 1900 AD) which are indivisible by 400 exactly. These rules give a mean civil year equal in length to 365.2425 mean solar days, a figure very close to the number of mean solar days in a tropical year.

The calendar described above was introduced by Pope Gregory in 1582 and is known as the *Gregorian* calendar. Previously, the *Julian* calendar had been used in which *every* fourth year was a leap year of 366 days. This gave an average value for the length of the civil year of 365.25 mean solar days. By 1582, the discrepancy between this number and the length of the tropical year had led to the considerable error of over 12 days. The introduction of the Gregorian calendar removed this error, although not all countries introduced it at the same time (e.g. the change did not take place in Great Britain until 1752).

The irregularities in the present calendar (unequal months, days of the week having different dates from year to year) and the changes from the Julian to the Gregorian calendar make it difficult to compare the lengths of time between observations made many years apart. The *Julian Date* system was therefore introduced to reduce the computational labour in determining historical time intervals. Noon on January 1st 4713 BC was chosen as the starting point, time being measured from that epoch by the number of days that have elapsed since then. For example, the Julian Date for midnight on September 22nd, 2006 was 2 454 000.5.