ASTRONOMY'S VESTED INTEREST

By **Dr. H. Spencer-Jones. F.R.S.**
Astronomer Royal, London **(1933-1955)**
(From the *Journal of Calendar Reform*, Volume 8, June **1938**, pages 65-67)

ASTRONOMERS are regarded as having a special responsibility for the calendar and for this reason, perhaps, special attention is given to the opinions of astronomers on all matters that affect the calendar. The measurement of time is, of course, a fundamental concern of the astronomer.

It is not generally realized, perhaps, that this is not the simple matter that it may appear to be at first sight. The Earth provides our standard clock and we may define a day as the interval required for the Earth to make one complete rotation on its axis. But we must fix the rotation with reference to one of the heavenly bodies. Suppose we choose the Sun, which regulates the period of day and night and which therefore ultimately controls our daily life. We should then find that the days would not be of equal length throughout the year and serious inconvenience would result. Instead of the sun we should choose the stars. The days would then be of equal length but the day would have no relation to the Sun; for half the year midday would occur during the period of darkness, when the Sun is below the horizon. Our daily activities would begin and end at different times each day.

The civil day is therefore determined by the rotation of the Earth with reference to an *imaginary* mean Sun, defined in such a way that all days are of equal length and such that this length is equal to the *average* length of the days, when we use the true Sun as the reference body. Mean noon, i.e., 12 o'clock, is then never more than about 16½ minutes different from true noon, the instant when the Sun is at its highest in the sky.

There are two other important intervals of time with which human life is closely concerned. One is the tropical year, which determines the return of the seasons; its length is 365.24219 days. The other is the synodic month, which determines the phases of the moon and is of importance in tidal phenomena; its length is 29.5305879 days. The number of synodic months, or lunations, in a tropical year is 12.3682668.

Thus the day, the month and the year are fundamentally based on the Earth, the Moon and the Sun. A calendar is a means of combining these various periods for the purposes of civil and religious life. The difficulties are introduced by the incommensurability of the three fundamental periods. In some of the old calendars, the synodic month was regarded as the most important of these three periods and everything was based on it. The number of days in the month was

either 29 or 30, some rules being necessary to keep the average length of the month approximately correct. The number of months in the year was sometimes 12, sometimes 13. In China a special tribunal fixed the calendar and decided whether in any one year there should be 12 or 13 months, the length of the year being adjusted in this way to prevent the seasons drifting through the year.

The calendar now used by the greater part of the world is the Gregorian calendar, instituted in 1582 by Pope Gregory XIII, but not adopted in England until 1752. This calendar was a modification of the Julian calendar, introduced by Julius Caesar, in framing which he had the assistance of Astronomer Sosigenes of Alexandria; some minor alterations were introduced by Augustus Caesar.

In the Julian calendar, the average length of the year was 365.25 days, one year in four being a leap year with 366 days. In order to have 12 months in a year, the months were given the number of days that they have at present, and therefore ceased to have any relation to the Moon. The month became a purely artificial period, as the week had always been. In the Gregorian calendar, certain leap years were omitted, to reduce the average length of the year, which became 365.2425 days. This is still slightly too long. The dates of the Easter full moons are determined on this calendar by fairly simple rules and with considerable accuracy, though it may be noted that the ecclesiastical full moon is not identical with the astronomical full moon; the former, which is used for fixing Easter and other religious festivals, is essentially based on a fictitious moon.

Proposals for the reform of the calendar do not affect the year, as determined by the Gregorian calendar. They are designed to remedy some of the inconveniences of the present division of the year into months and weeks. Most people can only remember whether any given month has 30 or 31 days by repeating the mnemonic "thirty days hath September, etc." The quarters are unequal and the first half of the year has only 181 days (182 in leap years) as compared with 184 days in the second half. A complete year contains 52 weeks plus one or two days, so that the day of the week on which any particular date falls changes from year to year. To find the day of the week on which any particular date falls in any given year we must refer to a calendar.

Though various schemes of calendar reform have been proposed, the only feasible scheme in my opinion is the one advocated by The World Calendar Association of America and by the Rational Calendar Association of Great Britain, embodying equalized quarters with intercalated days. Each quarter contains 91 days or 13 weeks, beginning with Sunday and ending with Saturday; the months have respectively 31, 30, 30 days. There is an intercalary day at the end of the year and in leap years an additional intercalary day between the first and second halves of the year. These days break the continuity of the week and objection has been taken to this in some quarters. To me the objections do not appear very strong. The advantages of this reformed calendar, combined with a fixed Easter,

would undoubtedly be considerable, in business and to the community at large. The day of the week corresponding to any date in the year can be readily found, without reference to any calendar.

It is as a citizen and not as an astronomer that I am interested in this reform. Astronomers can work independently of any calendar and make much use of a system of reckoning called the Julian Day reckoning, that is never employed for ordinary everyday purposes. The days number consecutively from January 1, 4713 B.C.E. Thus, for instance, Julian Day 2428900 began at Greenwich mean noon on January 1, 1938. A simple table enables them quickly to derive the interval of time, in days, between any two dates within the period of historical chronology, which is what any astronomer is primarily concerned with. By using the Julian Day reckoning, astronomers sidetracks all the inconveniences of the present calendar; they would still continue to use this reckoning because of its great advantages for their special needs, if The World Calendar were adopted.

I welcome this opportunity of making it clear that astronomers, so far as their scientific work is concerned, can have no objection to calendar reform. But as citizens, with many interests in common with other members of the community, they are not indifferent to schemes of calendar reform. They may take, perhaps, even more interest in such schemes than the average member of the community because many astronomers feel that they have, historically, a vested interest in all that pertains to the calendar. Many of the foremost astronomers in all countries have expressed themselves in favor of The World Calendar. I am personally in favor of this plan, including the stabilization of Easter.

~ ~ ~ ~ ~

Links to this document:
www.TheWorldCalendar.org/AstronomyVestedInterest.pdf and
www.TheWorldCalendar.org/AstronomyVestedInterest.htm

E-mail to: TWCA@TheWorldCalendar.org

Rev. 6 August 2009