New Year (2021) Thoughts

- Now and again we are intrigued by occurrences which are wholly *random* but which appear, at first sight, to be unusual and even significant. An obvious example is when a supermarket bill comes to an exact number of pounds. The reality, of course, is that there is no more reason to be surprised at a total of, say, £60.00 than one of, say, £60.43. One is neither more nor less probable than the other.

- We may be spuriously impressed not only by purely random occurrences but also by features of our own mental constructs. An example is the standard 'positional' number system we learn from infancy and which is based upon counting in tens. If humans had a thumb and *three* fingers on each hand, we would probably employ an *octal* (base 8) rather than a decimal (base 10) system. If we had a thumb and *five* fingers on each hand, we would probably employ a *duodecimal* (base 12) system.[1] Completed *decades* of life appear significant only because, in a decimal system, they end in 'noughts'. In an octal system, for example, no special significance would be attached to them. Reaching a *decimal* age of 60 is the same as reaching an *octal* age of 74 . A seemingly unremarkable *decimal* 64, on the other hand, would appear an 'impressive' *octal* 100. With an octal system, we would doubtless attach particular significance to completing successive *eight* years of life, perhaps calling them '*octades*', with eight octades making an '*octury*'. Whatever the system, of course, any impression that certain numbers have special significance just because of how they appear when we notate them, is entirely illusory. Particular significance *does* attach to some numbers (such as *prime* numbers) but this has nothing to do with how they might appear when notated.

- The Millennium celebrations back in 2000 evidenced the semi-mystical quality which humans are capable of attaching to arbitrary round numbers produced by particular positional number systems. How much fuss would have been made if our standard number system at the time were octal, duodecimal or binary and the year was, respectively, *octal* 3720, *duodecimal* 11A8 (see footnote[1]) or *binary* 11111010000? An issue at the time was when to start celebrating. In the AD (Anno Domini) year numbering system (devised in 525 but not widely used until after 800)[2], the year starting with the supposed date of Christ's birth is designated year 1, not year zero. Some argued, therefore, that to start celebrating on 1 January 2020 would be premature as not until the *end* of that year would a span of 2000 years be *completed*.

- In the recording of our ages, unlike the numbering of years, we *do* have a year zero. We are age 0 from the date of our birth until we complete our first orbit of the sun. Only *then*, on our first birthday, do we become one year old. Thus, although currently on my 75th orbit of the Sun, I will remain 74 until I complete it. If and when I do, I will have travelled (if my arithmetic is correct) about 44 billion space miles – in spite of having never flown in a plane. Apart from travelling around the Sun, of course, we are moving relative to other parts of the Milky Way galaxy and, with *it*, relative to other galaxies. As an aside, it seems that an increasing proportion of the world's scarce resources are likely to be devoted in the future to enabling a rich and privileged minority to engage in space tourism. The thought occurs that all of us are *already* space tourists. We may not notice that we are moving or be able to choose where we are going, but at least the ride is free and non-polluting!

[1] In terms of mathematical manipulation, twelve has more to offer than ten. It is divisible without remainder by 2, 3, 4 and 6 whereas ten is divisible only by 2 and 5 (*all* numbers, of course, are divisible by 1 and themselves). A duodecimal system obviously needs symbols for ten and eleven. Ⅹ and Ɛ are widely used, as are the letters A and B (handy because easily accessed on standard keyboards). For example, if A is used to denote ten and B eleven, the *decimal* numbers 70 and 1,000 are notated, respectively, as *duodecimal* 5A [i.e. in *decimal*: (5 x 12) + 10] and *duodecimal* 6B4 [i.e. in *decimal*: (6 x 144) + (11 x 12) + 4].

[2] Other calendars are, as they say, available. In the *lunar* Hijri (Arabic) and *solar* Hijri (Persian) calendars (year 1 for both starting during 622AD and the former having 354/355 days in a year), the nearest equivalent to 2000AD (start months being different) are respectively 1420 and 1379.

- Time is meaningful and measurable only in terms of the (assumed) regular and unchanging occurrence of something observable. The orbit of the Earth around the Sun provides an obvious (although not perfect) basis for dividing up the 'passage of time'.[3] Less obvious, is the point in the orbit at which the units involved (i.e. years) should be deemed to start. Given the tilt of the Earth's axis, four physically meaningful points suggest themselves i.e. the winter/summer solstices and the spring/autumn equinoxes. The first day of our modern calendar (1 January), is *near*, but does not *coincide* with, the day (usually 21 or 22 December) which has the *shortest* period of daylight in the northern hemisphere (its *winter* solstice) and the *longest* period of daylight in the southern hemisphere (its *summer* solstice). Arguably, however, it does not matter if the chosen date is arbitrary as long as it is *fixed* and *clear*. Given the arbitrariness involved, it is strange that so many people should attribute to the date a semi-mystical quality making it worthy of celebration. That they continue to do so in spite, year after year, of waking up on New Year's Day only to find everything much the same as before, evidences the triumph of hope over experience and the capacity of humans to be seduced by superstitious nonsense. The seductive power of something as run-of-the-mill as a change in year number is less understandable than that of physically observable events such as the summer and winter solstices – and yet those who gather at Stonehenge each year to observe them, or who take note of them at all, can be numbered in their thousands compared to the millions who celebrate the New Year with almost religious zeal.

- During one orbit of the Sun (i.e. a solar year), the Earth spins, with respect to the Sun, about 365.2422 times. If the calendar year is not to get out of step with the solar year, therefore, standard years of 365 days have to be interspersed periodically with leap years of 366 days. In the Julian Calendar (traceable back to a decree by Julius Caesar, hence its name) the rule observed was that three standard years should be followed by a leap year, giving an *average* year length of 365.25 days. This was insufficiently accurate to prevent significant long-term drift of calendar years against true solar years. To remedy this, the Gregorian Calendar (decreed by Pope Gregory XIII, hence its name) was adopted in 1582 by Catholic countries such France, Spain, Portugal and Italy. Under it, every year exactly divisible by four is a leap year unless it is also exactly divisible by 100, an exception being that centurial years exactly divisible by 400 *are* leap years (thus, for example, 1600 and 2000 are leap years but 1700, 1800 and 1900 are not). The result is an average year length of 365.2425 days. To eliminate the drift which had already occurred by 1582, the start date of the new calendar was designated as Friday 15 October, following on immediately from Thursday 4 October of the old calendar.

- Protestant countries were slow to adopt the Gregorian Calendar. England eventually did so in 1752 with Thursday 14 September of the new calendar following on immediately from Wednesday 2 September of the old – sparking riots and the cry of "Give us back our 11 days!" Also, the start of England's civil/legal year was changed to 1 January, having (since 1155) been 25 March (Lady Day), making 1752 a 'short' year. The countries which adopted the Gregorian Calendar in 1582 already counted 1 January as the start of the year. From 1582 to 1752, therefore, England differed from them not only with respect to the *day of the month* but also, for some dates, the *year*. Thus, for example, the date of the execution of Charles I was recorded in England as *30 January 1648* but in continental Europe as *9 February 1649*. Where such differences arise, the practice amongst historians is to give the

[3] Traditionally, so-called Universal Time (UT) was measured by the period of the earth's rotation on its axis. Recognition that this is subject to short-term variation and long-term slowing down led to the adoption in 1952 of the 'ephemeris' second based on the period of earth's orbit around the sun. Since 1968 this has been replaced in the International System of Units (SI) by a second defined as a duration of 9,192,631,770 cycles of radiation corresponding to the transition between two energy levels of the caesium-133 atom (the number of cycles being chosen so that the 'new' second, when introduced, had the same duration as that of the ephemeris second). Non-caesium atomic clocks (e.g. so-called 'quantum logic' and 'optical lattice' clocks) are now being developed that promise even higher levels of accuracy (the holy grail being some measure of *assumed unchanging regularity* that is wholly unaffected by extraneous forces such as gravity).

day/month as recorded in the country where the relevant event occurred but the *year* as recorded in the *Gregorian* Calendar. One historian, for example, describes the trial[4] and execution of Charles I as follows: "When the trial opened in Westminster Hall on 20 January 1649, King Charles refused to plead as he would not recognise the jurisdiction of the Court... On 27 January he was sentenced to die... On Tuesday 30 January, with the winter sun gleaming on him, King Charles I stepped out through a middle window of the Whitehall Banqueting Hall on to the scaffold and... laid his head on the low block. At four minutes past two the blow was struck."[5] The difference until 1752 between the calendars of England and continental Europe explains how William of Orange – without being a time-traveller – was able to set sail from the Netherlands on *11* November 1688 and arrive in England on *5* November in order, with his wife Mary, to depose his father-in-law James II in England's 'Glorious Revolution'.

- The mental brackets we put around, and the labels we attach to, the objects of our fleeting cognitive experiences are aspects of our *intentionality* i.e. the '*aboutness*' of our mental states/processes.[6] Crucially, many of such objects comprise *our own mental constructs*. We inhabit a social/institutional world featuring things such as governments, laws, ownership, marriage, money and organised religions – sometimes attributing semi-mystical qualities to individuals associated with them (e.g. to monarchs and to popes). The maintenance of such features within any human group requires significant commonality in the mental outlook of its members. Such commonality, however, is only partial and battles of ideas/interests may lead to the alteration/replacement of our social/institutional constructs in ways which may be peaceful or violent, evolutionary or revolutionary – examples of the latter being the English Civil War or Great Rebellion of 1642-51 and the Glorious Revolution of 1688. We now have the spectacle of a US President both inciting and condoning a violent attack upon the very democratic institutions he was elected to protect. It remains to be seen whether/how he and his co-conspirators will be sanctioned for an act of treason not too different, in principle at least, from that for which Charles I lost his head back in Gregorian 1649.

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January 2021

[4] The king was accused of *treason* against England by using his powers in pursuit of his own personal interests rather than the good of the country.
[5] Maurice Ashley, *England in the Seventeenth Century* (Book 6 of Pelican History of England), 1967 (4th edition), Penguin Books.
[6] Only by drawing spatial/temporal/quantitative/qualitative 'boundaries' do we achieve the individuation/unitisation required if we are to *count* anything – whether it be electrons, atoms, stars, galaxies, hills, mountains, streams, rivers, towns, cities, pints of beer, pairs of socks, words, syllables, bars of music, votes, money, runs in cricket matches, years, days, hours, or whatever.