# ON THE CHRONOLOGY OF LEAP YEARS

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## SUMMARY

The connection between contemporary leap years and those used by the Romans is discussed.

The use of dates AD as a chronology for the ancient world is on a Christian view of the Julian Calendar, established looking back in time. Its basis, the Christian era, was introduced in the 6th century by Dionysius Exiguus for the purpose of determining the date of Easter, but it was not used as a system of chronology until more than two centuries later, following the Venerable Bede. The use of dates BC is of surprisingly recent origin, being introduced by Petavius in AD 1627 (1). The leap years in this backward view are, however, the same years that the Romans used – although BC 1 is AUC DCCLIII, a date not divisible by IV, it is a leap year in both schemes.

The Julian calendar was introduced in BC 46, and the very first leap year was BC 45 (2), although it is not certain that the Romans operated it as one (3). In fact, they immediately got into a muddle with their fine new calendar, making every third year a leap year instead of every fourth one (4); the misunderstanding probably came about through their practice of counting by inclusive reckoning (3, 5). If they had operated their system correctly, BC 1 would have been a leap year; as it was, to correct the mistake, there was a gap without any leap years that extended over BC 1, and then AD 8 was a leap year and so it went on.

It is curious that the Christian era runs on from the Roman in just the right way for us to be able to use the very convenient rule that years with dates divisible by 4 are leap years. Is this a coincidence? It is indicated in ref. (2) that it is not known how Dionysius Exiguus, who introduced the Christian era, determined the correspondence with earlier systems (in fact, he set AD 1 a few years later than it should be as a historical date; even now the true correspondence can't be fixed precisely). Although it is hard to imagine that it can have been uppermost in his mind, the possibility may be considered that he chose to do it in such a way that this rule would work. In computing the date of Easter, Dionysius used tables based on those for the era of Diocletian, which started on AD 284 August 29 (6). By chance, leap years have dates in the Diocletian era that are divisible by 4. Could this have given him the idea? We may also note that, BC 776 being the start of the first one (7), leap years are the final years of the four-year Olympiad cycle.

The Gregorian calendar was introduced in AD 1582. As discussed in many popular accounts, the accumulated error in the Julian calendar was by then some ten days, but it seems never to be mentioned from what epoch this error was reckoned. It might be supposed that the logic of the Gregorian reform should have been, on theological grounds, to set the date to be the same as in the time of Christ – the first century AD; or else, on secular grounds, to set it to be the same as in the time of Julius Caesar – the first century BC; these two agree because BC 1 (equivalent to AD 0) is a leap year in both calendars. But, in fact, the Gregorian reform actually restored dates to be the same as in the third century AD. In doing this, the reformers were guided by the decision of the Council of Nicaea (AD 325) that March 21 should be kept as close as possible to the Vernal Equinox (8). This is related to the formula to determine the date of Easter, and obviously was of very great importance to them – but, I suggest, the other procedure would have been more logical.

When the reformed calendar was introduced in Catholic countries in AD 1582, the correction made was therefore 10 days; by AD 1752 when, following Lord Chesterfield's Act, it came to Britain, it had increased to 11. The calendar change led to rioting in London, the populace demanding 'Give us back our eleven days', apparently in the belief that their lives were being shortened. The logic of this is faulty. It could equally well have been argued that, as each individual would survive to a date 11 days later in the new calendar, their span of life was being increased.

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(6) Ref. (1), pp. 72, 81.

(7) Ref. (3), p. 190.

(8) Ref. (5), p. 10.