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THE 400TH ANNIVERSARY OF THE GREGORIAN CALENDAR

The year 1982 is the 40th anniversary of APL. It is also the 400th anniversary of an event important to all who are interested in the measurement of time: 15 October 1982 is the 400th anniversary of the introduction of the Gregorian calendar, which took place by the edict of Pope Gregory XIII in 1582.

However, the preceding day, 14 October 1982, is not the 400th anniversary of anything, because there was no 14 October in 1582. The calendar in 1582 went directly from Thursday, 4 October, to Friday, 15 October, so that the dates 5 October through 14 October 1582 never appeared in the present calendar (Fig. 1). Note, though, that there was no skipping in the sequence of the weekdays, and in fact there has been no interruption in the succession of weekdays as far back as we can trace the history of the week.

The innocent victim who missed his birthday cake in 1582 because his birthday fell, say, on 10 October may well have asked: "What happened? Why was it necessary to omit ten days from the calendar?" The answer, I am afraid, can be traced directly to religious discord. We must go back to the beginning of the fourth century to see what happened.

By the year 300 the stresses that were tearing the Roman Empire apart were readily visible. Because of those stresses, Diocletian in about 286 formalized the practice of having two joint emperors with equal powers, one in the east and one in the west. After him, only a few emperors were strong enough to rule alone over both halves of the Empire. Constantine the Great was one of them. As far as we can make out his motives,[2] he thought that Christianity might supply a unifying force strong enough to hold the splitting Empire together. He first issued an edict in 313 decreeing freedom for all religions within the Empire. That edict, though it applied to all religions, was intended primarily to help the Christians who, as late as 305, had suffered systematic imperial efforts to exterminate them.

October 1582

S	M	T	W	T	F	S
	1	*2*	*3*	*4*	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Figure 1 — The calendar for October 1582. Ten days were omitted from the calendar that month, but without any interruption in the days of the week. The purpose of the omission was to make the vernal equinox[1] in the following years come close to 21 March, the date on which the Church fathers in the year 325 thought the equinox occurred.

Unfortunately for Constantine's purpose, he soon discovered that Christianity was not and never had been a unified religion. It was divided into many regional churches, with differences in ritual and belief, and it included many Christians (such as the Arians) who would ultimately be proclaimed heretics and expelled from the church. Constantine might have chosen one particular section of the church and labelled it the "official" Christian Church of the Roman Empire, but by his own edict of 313 he could not have forced Christians to adhere to it. Even if he could have, he wanted Christians to *feel* unified so that they could unify the Empire, and forcing them to act as one body would not have made them feel as one body.

Constantine summoned the Council of Nicaea in 325 to see if he could get all Christians to unite in a single doctrine and a single organization. He was so interested in the program of the Council that he took part in it even though he was not a Christian.[3]

The Council did not succeed in unifying the Christians, but it did do one thing that is accepted by the majority of Christians today: It adopted rules for the date of Easter, which had previously been determined in a variety of ways. The Council's rules state that Easter must always be on a Sunday and that it must never coincide with Passover. Because the Resurrection, by the Gospel account, was on the Sunday following Passover in a certain year, those rules are equivalent to a simple rule: Easter in all years will be the Sunday following Passover.

This is an easy rule to implement. All we need to do for each year is to convert the date of Passover from the Jewish calendar to the present calendar. The following Sunday is then Easter. (Note that the days of the week are the same for Jews and Christians.) In particular, if Passover happens to come on a Sunday, Easter is the following Sunday.

No Christian church that I know of ever implemented the Nicaean rule for Easter in this simple

and exact manner. Instead, ever since the Council of Nicaea, the church has followed rules that were once fairly accurate but that by now obey the Nicaean rule only about three-fourths of the time. Easter now comes before Passover about one year in four, and it occasionally comes on the same day. I suppose the Christians felt that to depend upon the Jews in determining the date of Easter would be demeaning, even though the Council ruled they should do so (if we take the rule literally). We should remember that by 325, Christianity had changed from being exclusively Jewish to being exclusively Gentile, and many Christians at that time actively hated the Jews, failing to recognize their own religious ancestry.

To understand what the Christians actually did, we must know a few things about the Jewish calendar:

1. It uses true lunar months. That is, a Jewish month is the interval from one new moon to the next.
2. Most years have 12 lunar months with a total of 354 days.
3. To keep the calendar in step with the seasons, which recur at about 365¼ days, the number of months in the year is adjusted so that the vernal equinox never comes after the middle of the month called Nisan. This means that about one year in three has 13 months instead of 12.
4. Passover is the specific date Nisan 14.[4]

The calendar used by Christians at the time of the Council of Nicaea was quite different. That calendar, called the "Julian" calendar (after Julius Caesar, who ordered its adoption in the year −44), had an average year of 365¼ days, which is a close approximation to the solar year. Each year was divided into the twelve conventional months that we still use, which have lost all relation to the motion of the moon. Since the true solar year is slightly less than 365¼ days, the Julian calendar drifts away from an accurate solar calendar by about 3 days every 4 centuries.

What the Christians did was to adopt formal computational rules that closely approximate the Jewish calendar, so that henceforth they could calculate the date of Passover (and of Easter) without reference to the Jews. To start with, they thought that the vernal equinox came on 21 March in 325, and they used this date in deciding which "Jewish" years would have 13 months instead of 12 months. In addition, they decreed that 19 Julian years would be exactly equal to 235 of what they called "Jewish" months.

These formal devices give rise to what I call the Christian Jewish calendar, which is obviously not the same thing as the true Jewish calendar. Easter, instead of being the Sunday following the true Nisan 14, became the Sunday following Nisan 14 in this artificial Christian Jewish calendar.

The Nicaean fathers, if they consulted any astronomers at all, or if they studied any astronomical writings, knew that these formal rules were approximations. I suspect that they did know this and took the common-sense approach that the calendar would be shifted to agree with reality as it became necessary. They did not realize the ease with which rules adopted for convenience can turn into dogma. As it happened, dogma kept the "vernal equinox" frozen to the date 21 March in the Christian calendar for centuries after Christians knew it was seriously in error.

At last, more than 1200 years later, Pope Gregory XIII decided to correct matters. By his time, the equinox was coming about 11 March instead of the statutory 21 March, so he simply skipped 10 days in 1582 in order to bring the equinox to 21 March. At the same time he made minor changes in the method of calculating the Christian Jewish calendar.

In addition, after he dropped the 10 days in 1582, he replaced the Julian calendar by what we now call the Gregorian calendar. This differs from the Julian calendar in only one way: In the Julian calendar, all years that are divisible by four when referred to the common era are leap years. In the Gregorian calendar, years divisible by 100 are not leap years unless they are divisible by 400. Thus 1700, 1800, and 1900 were not leap years in the Gregorian calendar, but 1600 was and 2000 will be.

Two ironies should be pointed out. First, as I said above, the Nicaean fathers thought that the vernal equinox came on 21 March in their time. They undoubtedly used Ptolemy's astronomy as the basis for this. However, we know now that Ptolemy fabricated his solar observations, and that his observations made the equinox appear to be later than it really was by more than a day. Thus, at the time of the Council, the equinox actually came on 20 March or earlier, and it steadily moved still earlier in the Julian calendar with the passing of the centuries. It never came on 21 March in any year in which the original Nicaean methods were followed. When Gregory put the equinox on 21 March, he was not restoring it to the date it had at the time of the Council, as he thought he was. He was restoring it to the date given by Ptolemy's fabricated observations, a date we still use!

Second, when Pope Gregory promulgated the new calendar in 1582, many Christians who did not follow his communion turned his new calendar into an additional point of religious controversy. As a result, many Christian countries did not adopt it for varying periods of time. The British, for example, along with their colonies, resolutely stuck to the Julian method of fixing the leap years, and they also stuck to 25 March instead of 1 January as the first day of the year. This made the number of the year "wrong" for dates through 24 March. They finally adopted the Gregorian calendar in 1752, by which time 11 instead of 10 days had to be left out. At the same time, they changed the first of the year to 1 January. Thus George Washington was actually born on 11 February 1731 rather than 22 February 1732. The list of times at which various governments

adopted the Gregorian calendar for civil purposes takes up three printed pages.

All countries that use the Roman calendar for civil purposes now use the Gregorian calendar, as far as I know. Certainly any exceptions are minor. However, important branches of Christianity still do not use the Gregorian calendar for religious purposes, and Easter for those Christians does not come when it does for Catholics and most Protestants. There is no indication that Christians are any closer to being unified now than they were before the Council of Nicaea. But neither is any other religion.

NOTES

[1]The sun is directly over some point in the Southern Hemisphere half the year and directly over some point in the Northern Hemisphere the other half. The vernal equinox is the instant in March when the sun passes over the Equator on its way north.

[2]In writing about Constantine's motives, I am deducing them from his actions, not taking them from documentary sources.

[3]He was baptized on his deathbed in 337. Constantine played some role in the proceedings of the Council, and some scholars even say that he presided over some of its sessions. However, the exact nature of his participation cannot be determined from the surviving evidence.

[4]Before my Jewish friends rise up in wrath, I hasten to point out that Passover has not always had either the same date (or the same nature of its observance) for all Jews. Most Jews now take it to begin on Nisan 15. In all the early literature concerning the date of Easter, Passover is taken to be the specific date Nisan 14.