

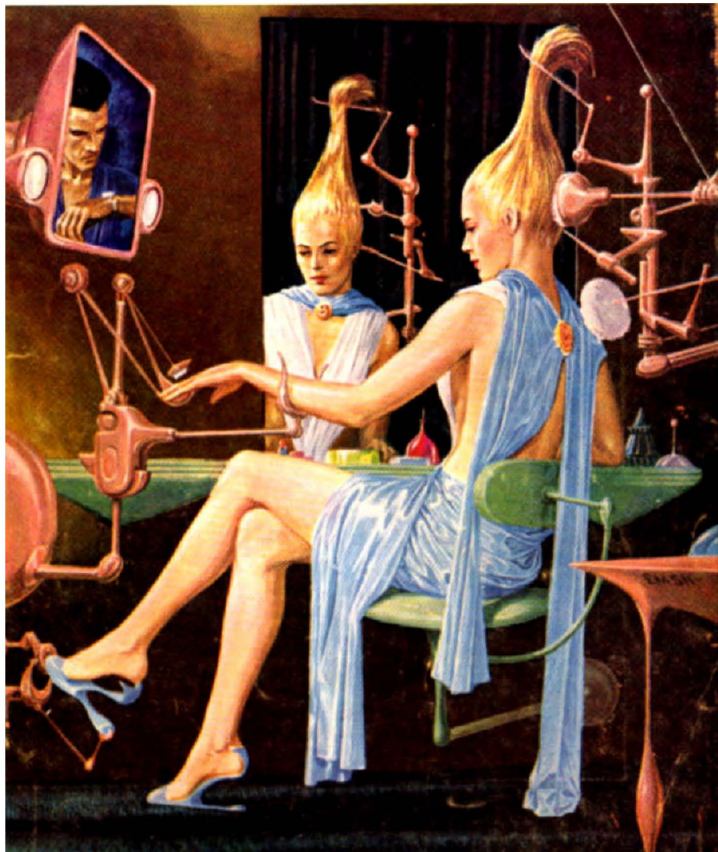
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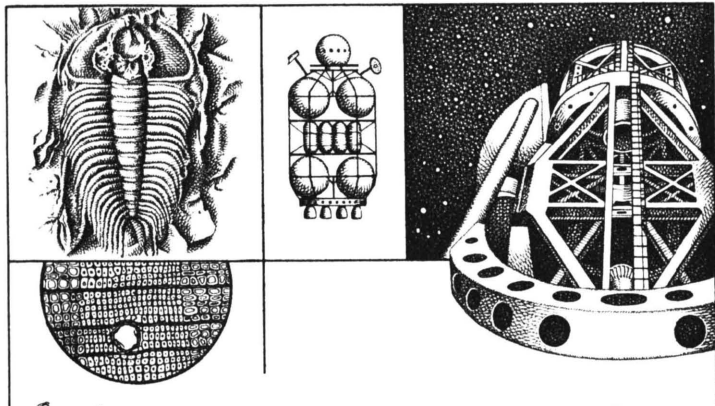
SCIENCE FICTION

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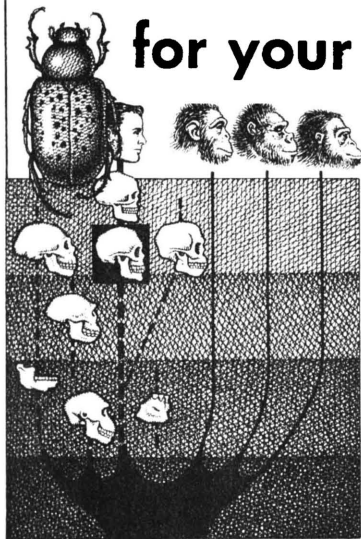
THE TUNNEL
UNDER THE WORLD
By Frederik Pohl





for your information

By WILLY LEY



CALENDAR TROUBLE

READING idly through an old book, Camille Flammarion's *Dreams of an Astronomer*, I happened across the sentence: "As with us, there is no integral number of days in the Martian year. Perhaps their calendar has also been reformed several times without being made perfect. But let us hope that they are not as stupid as we are, with our months of 28, 29, 30 and 31 days and with our three days

of days—the commercial day which begins at midnight, the astronomical day which begins the following noon and the naval day which commenced the previous noon.” This, combined with a letter asking about the meaning of the names of the weekdays, reminded me that, one year ago, I had the best of intentions of devoting the first column of the new year to the appropriate discussion of New Year.

I don't remember just what got in my way a year ago, but no matter—one January issue is as good as another January issue to think about the thing we live by: the calendar. I feel quite certain that I am not the only one who is thinking about the problem at this time of the year. Comes New Year's Day, you'll probably read in your daily paper that State Senator Soandso is all in favor of a calendar revision, and if you watch the letter column, you'll find a reply in which the Senator is denounced as a heathen-in-disguise, a man of ill will or at least a moron. This might well be followed by another letter declaring that the original letter writer described himself perfectly.

DISREGARDING such pleasantries, there remains the very simple fact that the calendar is *not* perfect—something I encounter myself roughly once a

day. Somebody wants to know whether I'd be available for a lecture on, say, January 25 or whether I'd prefer January 28. First thing I have to do is see if one of these days is a Monday; for family reasons, Mondays are inconvenient to me. Or a transportation schedule may hinge on the problem of whether there will be four or five Sundays in October. (Don't look it up; try to guess.) I am also slightly tired of the routine—so frequently needed in historical research—of figuring out whether May 1st, 1898, was a Sunday. (It was.)

When I was a small boy, I learned that I had been born on a Tuesday and, remembering that my most recent birthday had not been on a Tuesday, I wanted to know what had happened to my birthday. I am not certain whether I got an explanation I did not understand or whether (as is more likely) I was simply told that I wasn't old enough to understand; at any event, I wished then that a birthday would come on the same day. I still think it should. Now I know, of course, why this isn't the case. But I also know that it could be.

However, let's begin at the beginning. The roots of the trouble are two simple astronomical facts. One is that the Earth needs 365 days, 5 hours, 48 minutes and 46 seconds to go around the Sun

once. If it needed 360 days or 372 days, things would be better—though not yet “fine”—and in the face of natural law, one would even be willing to settle for $365\frac{1}{4}$ days. That is one of the difficulties; the year does not consist of a number of whole days. The other is that we have a moon.

I admit at the outset that it is a very pretty moon. It is one of the biggest in the Solar System and its existence helped to get several sciences and assorted interesting and exasperating superstitions going. It is a challenge to space travel and all that.

The trouble is that primitive peoples, at a time when artificial clocks were still to be invented, used it as a clock. The waxing and waning of the Moon was easily visible and time reckoning based itself almost automatically on the lunar phases.

But the natural rhythm of life is the daily change from light to darkness and back to light again, based on the apparent movement of the Sun. The Moon, large and luminous and conspicuous as it was, could not do away with the day. Time reckoning, as a consequence, became a mixture of solar and lunar phenomena; time expressions were of solar or lunar origin, depending on the time interval to be expressed.

A messenger was to return either when the shadows length-

ened, or else after the Sun had taken two baths in the ocean. That was solar. But if it was a long trip, the messenger might not be back until after the Moon had twice renewed itself. That, of course, was lunar. If the trip was really long, it might happen that the voyagers would not return until two winters had gone by—solar reckoning again.

AS long as you could be lavish with a few days, all this did not matter. The difficulties began when people tried to pin time down a little more accurately, such as for the purpose of a festival. Just how many days are there between two “moons”? Answer (modern): 29.5305879. And how many “moons” between two winters? A disturbing 12.3682668.

Now you either know these unpleasant figures or you don't and believe that you are dealing with $29\frac{1}{2}$ days and $12\frac{1}{2}$ “moons.” If you believe the latter, your calendar will get out of order rapidly. If you do know the figures, you realize that these things do not mesh and you struggle for a compromise which somehow fits the days, the seasons and the phases of the Moon together.

None of the many attempts made at various times by various people was ever completely successful; none can be successful since the actual units are not

commensurable. However, the job can be simplified and the result improved if you throw out one of the incommensurable units, namely, the phases of the Moon.

This, in fact, was done in the oldest calendar we know of, the Egyptian calendar. Life in Egypt was based on the flooding of the Nile, an annual event, and their calendar had three seasons, named Flood Time, Seed Time and Harvest Time.

Each season was subdivided into four months, so that a full year contained twelve months. They used the same figure, twelve, to subdivide night and day into smaller units, the hours. But the early Egyptian hours were based on the actual times of daylight and night, so that the length of an hour changed with the seasons, which accounts for their Latin name of *horae temporales*, the "temporary hours." Each Egyptian month contained 30 days and began with a festival. Each month gradually acquired the name of the festival with which it started.

But this accounted for only 360 days. As for the remaining five days, the Egyptians decided that they were not worth much trouble, so they bunched them up at the end of the year and seem to have treated them as a holiday week.

Simple, eh?

In 238 B.C., Ptolemy Euergetes

(not *the* Ptolemy, Claudius Ptolemaeus) pointed out that, every four years, six days should be added instead of five, but his suggestion didn't find any friends. Some two hundred years later, when Cajus Julius Caesar had decreed a calendar for the Roman Empire, the Egyptian officials, knowing what was good for them, finally consented to an extra day every four years. But not all Egyptians felt obliged to do so.

WITH all its shortcomings, the Egyptian calendar was the first "real" calendar, if that term is taken to mean a fixed scheme, a schedule, a time table upon which to base operations.

By contrast, the Babylonian calendar, though probably older, was not "real." It had a year of 12 months, based on actual observation of the Moon. A thirtieth month was added whenever it became necessary to get the lunar phases and the seasons together again.*

*The Mayan calendar, unnecessarily complicated by the introduction of Venus, has been highly overpublicized. It consisted of 18 months of 20 days with five or six "unlucky days" added, so unlucky that only unpostponable things like eating were done. It is true that it was accurate, but the Mayan system of counting was poor and the calendar so intricate that it was described as "wheels within wheels" by more critical archeologists.

Before Caesar issued his calendar decree in 46 B.C., the Romans had struggled along with a calendar of 355 days. Even that, believe it or not, had been an improvement.

The original Roman calendar had consisted of ten lunar months, beginning the year with March and ending in December. The intervening period of about 60 days was simply neglected — why bother counting winter months? (The Vikings are said to have done the same, with a little more justification as to climate, I should think.)

Then the Romans added January and February at the end of the year, but this came out with a total of 354 days. Because even numbers were unlucky to the Romans, a 355th day was tacked on.

Of course, this still did not make the seasons come out evenly, so, every two years, an extra month was added. Its name was *Mercedonius*, which can best be translated as “extra pay” (for the legions) and to show that this was not a normal month, *Extra Pay* began after February 23rd, running for 22 or 23 days, after which the last week of February finished up the year.

Around 300 B.C., one Cneius Flavius changed things around a little more, making all months uneven so that they should be

lucky, taking the needed days away from February to give it an even number of days (ours still remains 28) because the last month of the year should be unlucky.

So the year began with March of 31 days, followed by April with 29 days, May again had 31 and June 29, *Quintilis* (the fifth month) again 31, *Sextilis* (the sixth) 29, September 29, October 31, November, December and January 29 each and the 12th month, February, the same unlucky 28.

Every second year, of course, you had *Mercedonius* interrupting February. Four years in succession, then, had 355, 378, 355 and 377 days, which made every year one day too long.

In the middle of all this, they shifted the beginning of the year to January 1st, since this was the day newly elected consuls took office. The result is that October still means “the eighth” month, but it is actually the tenth, November, the “ninth,” is the eleventh and December, the “tenth,” is, of course, the twelfth.

How's that for sheer infuriating mixup?

CAESAR, having been elected *Pontifex Maximus* in 63 B.C., disliked a calendar in which two successive years could not be compared, either in military op-

erations or in tax collections. His model was the Egyptian calendar, with the "added days" evenly distributed throughout the year and an extra day every fourth year.

Caesar, or maybe his advisors, thought that the solar year was 365 days and 6 hours, making it about $11\frac{3}{4}$ minutes too long, which is a lot.

But the introduction of the new calendar was not enough. The spring equinox had meanwhile strayed some 90 days from the date where it belonged. So Caesar took the year we now call 46 B.C.

It being a "long" year anyway, containing a 23-day *Mercedonius*, Caesar added two more "Decembers," one of 33 and one of 34 days, stretching the year to 445 days. His enemies called it the "Year of Confusion," to which the Caesar's friends replied that it was the "Last Year of Confusion."

When it was all over, the Senate decided to honor him by renaming the month of his birth, *Quintilis*, after him—our July. Later, *Sextilis* was named after Augustus, but the old story that Augustus took a day from another month for his own month is a fable. The length of the months in Caesar's calendar was the same as in ours, except that, in leap year, February acquired

two 24th days, so that it might remain an unlucky month with an even number of days.

The Romans not only gave us the names of the months, but also the names of the days, based on complicated astrological reasoning.

The seven astrological planets were thought to influence the hours, with the most distant having first influence. So the first hour of a day would be influenced by Saturn, the next by Jupiter, the next by Mars, the next by the Sun and so on down the list through Venus, Mercury and the Moon.

This cycle repeated twice, but there were still three hours left in the day for another repeat to start, so that the first hour of the next day would be "influenced" by the Sun. In the same manner, the Moon succeeded to the first hour of the third day, the planet Mars to the first hour of the fourth day, Mercury started the fifth, Jupiter the sixth and Venus the seventh day. The first hour of the next day was again ruled by Saturn and the cycle started over.

All this did not originate in Rome. Some of these astrological ideas go back as far as there are records, but it was the Latin expression of these thoughts which resulted in the actual names of the days.

LATIN	FRENCH	SAXON	ENGLISH	GERMAN
Dies Solis	Dimanche	Sunnan-daeg	Sunday	Sonntag
Dies Lunae	Lundi	Monan-daeg	Monday	Montag
Dies Martis	Mardi	Tiwes-daeg	Tuesday	Dienstag
Dies Mercurii	Mercredi	Wodans-daeg	Wednesday	Mittwoch
Dies Jovis	Jeudi	Thors-daeg	Thursday	Donnerstag
Dies Veneris	Vendredi	Frigas-daeg	Friday	Freitag
Dies Saturni	Samedi	Saeter-daeg	Saturday	Sonnabend } Samstag }

French differs from Latin only with respect to the name of Sunday, where Dieu (God) has been substituted for Sol (Sun). Modern English follows the Saxon system, using Sun and Moon and five Saxon gods, Tiw (Tioo), Wodan, Thor (or Donar) and Frigga (or Freya), but the characteristics and attributes of these gods correspond closely to the Roman gods. (In Latin, of course, the word may refer to the god as well as to the planet.)

The similarity between Saeter-daeg or Saturday and Dies Saturnis is accidental. Behind the Saxon name is the Norse divinity Saeter—although some etymologists consider the alternate (and more prosaic) explanation of Thvatt-daeg as “wash day” or “bath day!”

Modern German follows the same usage as Saxon except for Wednesday, which is Mittwoch (Middle of the Week), and Saturday. The North German form Sonnabend means Sunday Eve; the South German form of Samstag is an adaptation of the French Samedi.

SLOWLY, the much older week—a lunar month quartered into four weeks of seven days each—crept back into Caesar's calendar and Emperor Constantine introduced it officially, replacing the older method of reckoning by the *calends*, *nones* and *ides* of the months. This interrupted the continuity that might otherwise have existed, for neither 365 nor 366 is divisible by seven. Hence the new year did not start with

the same weekday with which the previous year had begun.

Moreover, as time went by, it turned out that the “Julian Year” itself did not fit precisely. Remember that it was about $11\frac{1}{4}$ minutes too long. That does not sound like much, but in the course of ten centuries, the error accumulates to a very noticeable eight days. By the year 1580, the vernal equinox, put by Caesar on March 25th, had drifted to

March 11th. If this was not corrected somehow, Easter would land in mid-winter and all other holidays would be dislocated, too. It was clearly time for another revision.

Pope Gregory XIII, after most careful consideration, cleared the matter up by issuing a papal bull which decreed that the day following October 4, 1582, was to be called October 15th. This change brought the vernal equinox back to the 21st of March, where it had been in 325 A.D., the year of the Council of Nicaea, which had issued the rules for computing the date of Easter.

To avoid a recurrence of the drifting of the vernal equinox, the leap year rule was modified. Caesar had decreed that every fourth year was a leap year. The papal bull added that full centuries could not be leap years, unless they were divisible by 400. The year 1600, then, was a leap year and the year 2000 will be one; but 1700, 1800 and 1900 were not. This correction of the leap year rule, coupled with the elimination of ten days in 1582, constitutes what is now called the Gregorian calendar. Its average year works out as being 26 seconds longer than is accurate, but this error is so small that more than 33 centuries have to pass before a single day will have to be dropped.

THE revision of the calendar was adopted at once in Italy, France, Spain, Portugal and Poland. Holland, Flanders and the Catholic sections of Germany followed a year later. Protestant Germany refused and so did England, because the rule came from the Pope. Hungary followed suit in 1587.

Switzerland presented the strangest picture, for there the revision was accepted canton by canton; for centuries, it was as if Connecticut had one calendar, Wisconsin another and Florida a third. The Catholic cantons accepted the revision at once, but the Protestant cantons stubbornly refused.

In 1700, Denmark and Protestant Germany turned "Gregorian." That pulled a few more cantons along. But the last of them did not yield until 1812, for they were stout Calvinists. They would not accept anything papal under any circumstances, but they found themselves forced to by commercial necessity and utter confusion.

When England followed suit in 1752, the discrepancy had grown into eleven days. Simultaneously, New Year's Day was changed from March 25 to January 1st. There was rioting and there were stories that cattle still kneeled on "true Christmas," but refused to kneel on "Papal Christmas"

and for a long time letters and legal documents were dated

$\frac{19}{30}$ June 1753

$\frac{30\text{th June}}{11\text{th July}}$ 1753

$\frac{23\text{rd Feb.}}{6\text{th March}}$ 1754

England had no monopoly on calendar riots. Poland had experienced them and so had some German states. People refused "to give up" eleven days of their lives. Of course the longer a country waited, the more days had to be dropped. Japan experienced that in 1873, Albania in 1912 and Rumania in 1924. The most sturdy opposition was found in Russia.

For many centuries, Russia had lacked a calendar completely, the peasants getting along with reference to the Moon and to seasons, the educated people using a western calendar while in western countries.

The first Russian calendar is stated to have been written in 1670 under the reign of Czar Alexis Mikhailovitch. But it stayed in manuscript form. Under the reign of the next Czar, Peter the Great, the first printed Russian calendar was published, naming Yakov Williamovitch Brus as the author.

Unfortunately for Peter the Great and all the Russians, Yakov Williamovitch Brus was really James William Bruce, an Englishman whose father had fled from Oliver Cromwell's England and entered the Russian Civil Service. Consequently, the calendar was the Julian calendar, not the Gregorian revision.

Around 1790, the Russian Foreign Office, the Merchant Marine and the Navy grew tired of putting two dates on every letter and asked for a change of policy. Prince Lieven was to submit the proposal to Czar Nicholas I, but Prince Lieven was worried because he had heard about the English calendar riots. Russia couldn't afford riots. The matter languished until the Czar finally decided, in 1829, to forbid reform.

At a later date, Professor Dimitri Mendeleeff, armed with the latest astronomical figures supplied by Simon Newcomb in Washington, did try to cause a reform, and he and his friends even formed a society for the purpose. But the old *ukas* stood; it needed the "October Revolution" (which took place on November 7) to bring about a revision. After a short period of investigation—some city soviets meanwhile wondered whether they should not use the French Revolutionary calendar—the offi-

cial Russian calendar jumped 13 days.

Oh, yes, that French Revolutionary calendar. Nothing ever miscarried so completely in so short a time. And it had not even been conceived by the revolutionary parties!

Though they coined the term "First Year of the Republic," their calendar was ready more than one year preceding the revolution. It bore originally the name of *Calendar of Honest Men* and its author had been Monsieur Pierre Sylvain Maréchal. As a piece of calendar-making, it was feeble indeed. There were 12 months of 30 days apiece, each month subdivided into three *décades* and five or six holidays, one after every second month, to be named after Honest Men.

The King of France made the tactical error of ordering Monsieur Maréchal's almanac seized and burned, thereby calling attention to it. Since it seemed to be—or, better, could be made out to be—an early martyr of the *révolution*, it was later adopted.

The revolutionary year began on the day declared to be the Birthday of the Republic, "by lucky coincidence, the day of the autumnal equinox, September 22nd, old style." The month beginning on that day was named *Vendémiaire* (Vintage), followed by *Brumaire* (Fog), *Frimaire*

(Sleet), *Nivôse* (Snow, beginning Dec. 21st), *Pluviôse* (Rain) and *Ventôse* (Wind). The first of the spring months was *Germinal* (Seed, beginning March 21st). *Floréal* and *Prairial* (Blossom and Pasture) followed. The three summer months were the last of the year, named, in proper order, *Messidor*, *Thermidor* and *Fructidor*—Harvest, Heat and Fruit.

I am not even certain whether Monsieur Maréchal invented all these names himself. They bear much resemblance to the so-called German Peasant's Calendar which is the Gregorian calendar with different names. December, for example, is *Yule*, January is *Hartung* (hard month), February is *Hornung* (because animals shed their "horns," i.e., antlers), November is *Nebelung* (from *Nebel*, meaning fog, etc.) About half of these names are the same in meaning as those of the French revolutionary calendar. I suspect that French peasants may have used them before they got into print in 1788.

The French revolutionary calendar was actually not used by the revolutionaries. Even their official *Moniteur* added the Gregorian dates for the sake of clarity. Napoleon threw it out in 1806 to the extreme delight of everybody, friend and foe, and

nothing is left of it but a name on the menu: Lobster Thermidor.

A CALENDAR like the Gregorian, which will not drift by more than a single day in 3300 years, is a remarkable accomplishment and nobody in his right mind ever suggested doing anything further to its main unit, the year. But there have been suggestions of rearranging the smaller units inside the year.

The main problem is posed by the week. A normal year has 52 weeks and one extra day; a leap year has 52 weeks and two extra days. As early as 1834, an Italian priest, the Abbé Marco Mastrofini, suggested that this extra day should simply be "removed" from the year so that the calendar year would consist of a year (of 364 days) and a day—reminiscent of the British guinea, which is a pound and a shilling.

If we tack one "bland day" at the end of each year (two at the end of a leap year), every year would begin with a Sunday and consequently every date would always fall on the same weekday.

Father Mastrofini's suggestion was taken up by the French Astronomical Society in 1887 . . . but in the meantime, a French philosopher, Auguste Comte, had confused the issue. In 1849, he published his plan for a 13-month

calendar. Each month was to have 28 days (the nearest thing to one lunation) and there were to be one (or two) blank days at the end of the year. It was an attempt to combine solar and lunar elements, but apparently Comte failed to realize that even if 13 months of 28 days were 13 "moons," the blank days would throw the calendar out of gear again as far as the lunar elements were concerned.

In addition to the 13 months, August Comte also proposed renaming them after Moses, Aristotle, Shakespeare, Buddha, Plato, Socrates, Newton, etc. Although rejected by almost everybody, the Comte calendar retained a small fellowship, presumably composed of people who wanted to prove that they were not afraid of the figure 13.

After the First World War, the proposal was revived under the sponsorship of George Eastman and dubbed the "businessman's calendar." Of course Eastman did not want Comte's fancy names; he needed only a single new name, one for the 13th month. *Mercedonius* would have been especially suited for a businessman's calendar, but the most serious contenders were *Sol* and *Liberty*. To most people, however, it was still a 13th month and they liked it even less when, with the fixed weekday dates, it turned out that

it produced a Friday the Thirteenth thirteen times a year.

WHAT was more important was that the thing simply was not practical. A 13-month calendar, no matter how well advertised, is *not* a businessman's calendar. One large firm is said to have used it internally for an experiment, with complete chaos resulting. The businessman wants to compare the first week of March in two years, or the first fall month of two years, and he is used to quarterly statements and semi-annual inventories or accountings. You cannot do that with a 13-month calendar unless you tear a month apart.

A German "improvement," the Blochmann calendar, suggested just that. It took the quarter as the important business unit, each quarter consisting of three months of 28 days each, plus one separate "unattached" week, called Spring, Summer, Fall and Winter Week, respectively. Plus one Year End day. Plus, every fourth year, one Leap Year Day.

The revision now under discussion—it got as far as the United Nations—is the so-called World Calendar, which goes back to Mastrofini's simple proposal, improved by an adjustment of the months.

January is to have 31 days, February 30 and March 30. This

rhythm of 31/30/30 repeats each quarter. Each 31-day month has five Sundays; every other month, four Sundays. January 1st is always a Sunday and each quarter begins with a Sunday and ends with a Saturday. Not counting special holidays, every month has 26 working days, if you count Saturdays and working days. But the holidays will always fall on the same weekday—July 4th on a Wednesday, for example. The extra day would be Year End Day between December 30th and January 1st. In leap years, Leap Year Day would come in the middle of the year, between June 30th and July 1st.

This World Calendar would be much more a businessman's calendar than Eastman's, which merely bore that name.

The adoption of the World Calendar is opposed *on principle* by three religious groups: the Seventh Day Adventists, the Seventh Day Baptists and Orthodox Judaism. But the example of Orthodox Judaism shows how discrepancies between everyday necessity and religious convictions can be overcome, namely by following one calendar for everyday business and another for religious purposes.

No room for letters and discussions this month. They'll be back in the February issue.

—WILLY LEY