THE FARMERS' YEARS.

I.

SOME years ago in the "Dawn of Astronomy" I showed how carefully the sun had been observed by the ancient Egyptians, not only when it rose or set at points most to the north or south, as at the solstices, but also when it rose exactly half-way between these points, that is, east and west at the equinoxes.

This fundamental division of the sun's apparent revolution and course which define our year into four

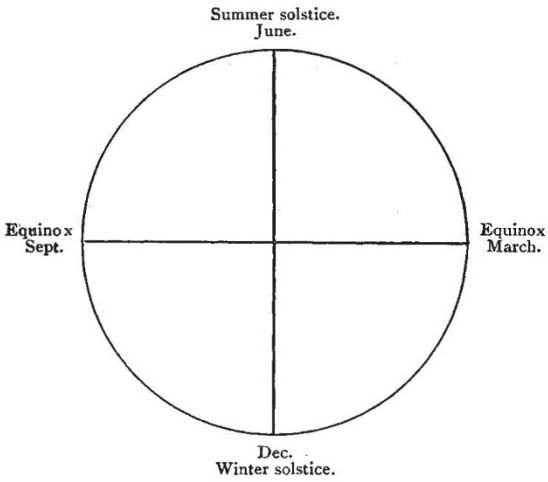

FIG. 1.

nearly equal parts may be indicated as in Fig. 1, the highest point reached by the sun in our northern hemisphere being represented at the top.

In order better to consider the problem as it was presented to the early astronomers who built observatories (temples) to mark these points, we may deal with the bearings of the points occupied by the sun on the horizon (either at rising or setting) at the times indicated.

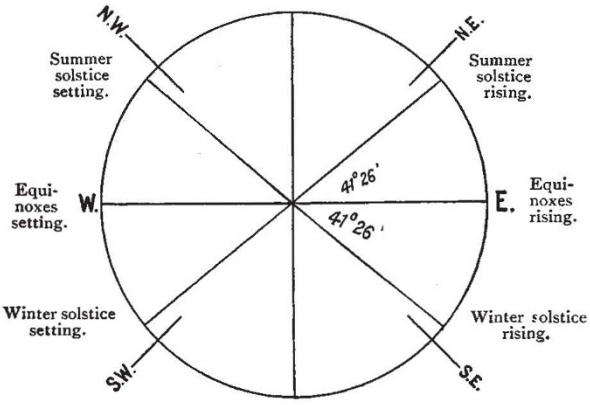

FIG. 2.—The various bearings of the sun risings and settings in a place with a N. latitude of 51°.

These points are conveniently defined by their "amplitude" or their distance in degrees from the E. or W. points of the horizon. In the diagram (Fig. 2) I represent the conditions of our chief British sun-temple, Stonehenge, in latitude 51° N. approximately.

Taking the astronomical facts regarding the solstices and equinoxes for the first year (1901) of the present century, we find:—

Sun enters Aries,		Spring equinox,	March 21.
,,	,, Gemini,	Summer solstice,	June 21.
,,	,, Libra,	Autumn equinox,	September 23.
,,	,, Sagittarius,	Winter solstice,	December 23.

These points, then, are approximately ninety-one days apart ($91 \times 4 = 364$).

In Fig. 2 I deal with the "amplitudes" at Stonehenge, that is, the angular distance along the horizon from the E. and W. points, at which the sunrise and sunset at the solstices are seen, the equinoxes being seen at the E. and W. points themselves. But as these amplitudes vary with the latitude and therefore depend upon the place of observation, a more general treatment is possible if we deal with the declination of the sun itself, that is, its angular distance from the equator.

The maximum declination depends upon the obliquity of the ecliptic, that is, the angle between the plane of the ecliptic and that of the equator at the time of observation. When the Stonehenge Sarsen Stones were erected this angle was 23° 54′ 30″. Its mean value for the present year is 23° 27′ 7″; it is decreasing very slowly.

It will be obvious from Fig. 2 that in temples built to observe the solstices or equinoxes, if they were open at both ends, looking in one direction we should see the sun rising at a solstice or equinox, and looking in the other we should see the sun setting at the opposite one. This, however, interfered with the ceremonial, which required that the light should illuminate a naos generally dark, so, usually, two temples were built back to back, with a common axis, as at Karnak.

In the beginning of astronomical observation it was more easy to align accurately a solstitial temple than an equinoctial one.

So much, then, for the chief points in what we may term the astronomical year, those at which the sun's declination is greatest and least. We see that they are approximately ninety-one days apart—say three months.

Now the priest-astronomers in these temples could only have won and kept the respect of the agricultural population with which alone they were surrounded in early times, and by whom they were supported, by being useful to them in some way or another. This could only have been in connection with what we may term generally the *farming* operations necessary at different times of the year, whether in the shape of preparing the ground or gathering the produce.

A very large part of mythology has sprung out of the temple cults, prayer, sacrifice and thanksgiving connected with these farming operations, in different lands and ages, but it is not my purpose to touch upon this side of the question now at length.

I wish to show, however, that by studying the orientation of ancient temples erected to watch the sunrise and sunset at times other than the solstices or equinoxes an immense amount of information may be gained if we endeavour to find the way in which the problem must have been attacked before the year was thoroughly established, and when it was still a question of grass- or corn-kings or gods who had to be propitiated.

In a solstitial temple the sun only makes its appearance once a year, when it reaches its greatest "north or south" declination: but in the temples dealing with lower declinations the sun appears twice, once on its journey from the summer to the winter solstice, and again on its return.

The first difficulty of the inquiry in the direction I have indicated arises from the fact that the products of different countries vary, and that identical farming operations have to be carried on at different times in these countries. We must, then, begin with some one country, and as the record is fullest for Greece I will begin with it.

The first thing we find is that the chief points in the farmer's year in Greece are about as far from the fixed points in the astronomical year as they well can be.

In the Greek information so admirably collated by M. Ruelle in the article on the calendar in Daremberg and Saglio's monumental "Dictionnaire des Antiquités Grecs et Romains," the earlier Gregorian dates on which the seasons were reckoned to commence in ancient Greece were as follows:—

Summer	May 6
φθινόπωρον	August 11
Winter	November 10
Spring	February 7

I may also add from the same source that in the calendars of the Latins the dates become:—

Summer	May 9
Autumn	August 8
Winter	November 9
Spring	February 7

Now we see at once that these dates are, roughly, half-way between the solstices and equinoxes.

This, then, at once brings us back to the orientation problem, which was to fix by means of a temple in the ordinary way dates nearer to these turning points in the local farmer's years than those fixed by the solstitial and equinoctial temples.

It must be borne in mind that it is not merely a question of stately piles such as Karnak and the Parthenon in populous centres, but of the humblest dolmen or stone circle in scattered agricultural communities, which were as certainly used for orientation purposes, that is, for recording the return of some season of the year important to the tiller of the soil, the advent of which season could be announced to outlying districts by fire signals at night.

I have already pointed out that any temple, dolmen or cromlech pointed to a sunrise or sunset at any dates between the solstices will receive the sunlight twice a year.

If the temple is pointed nearly solstitially the two dates at which the sun appears in it will be near the solstice; similarly, for a temple pointed nearly equinoctially the dates will be near the equinox; but if the ancients wished to divide the ninety-one days' interval between the solstice and equinox, a convenient method of doing this would be to observe the sun at the half-time interval, such that the same temple would serve on both occasions. This could be done by orienting the temple to the sun's place on the horizon when it had the declination 16° 20′ on its upward or downward journey.

What, then, are the non-equinoctial and non-solstitial days of the year when the sun has this declination?

They are, in the sun's journey from the vernal equinox to the summer solstice and back again,

May 6 and August 8 ... ... Sun's decn. N. 16° 20′.

Similarly, for the journey to the winter solstice and return we have

November 8 and February 4 ... Sun's decn. S. 16° 20′.

We get, then, a year symmetrical with the astronomical year, which can be indicated with it as in Fig. 3, a year roughly halving the intervals between the chief dates of the astronomical year.

With regard to the dates shown I have already pointed out that farming operations would not occur at the same time in different lands; that ploughing and seed time and harvest would vary with crops and latitudes; and I must now add that when we wish to determine the exact days of the month we have to struggle with all the difficulties introduced by the various systems adopted by different ancient nations to bring together the reckoning of months by the moon and of years by the sun.

In more recent times there is an additional difficulty owing to the incomplete reconstruction of the calendar by Julius Cæsar, who gave us the Julian year. Thus, while the spring equinox occurred on March 21 at the time of the Council of Nice, in 325 A.D., by the year 1751 the dating of the year on which it took place had slipped back to the 10th. Hence the Act 24 George II. c. 23, by which September 2, 1752, was followed by September 14 instead of by the 3rd, thus regaining the eleven days lost. This change from the so-called "old style" to the "new style" is responsible for a great deal of confusion.

Another cause of trouble was the forsaking by the Jews of the solar year, with which they commenced, in favour of the Babylonian lunar year, which has been continued for the purposes of worship by Christians, giving us "movable feasts" to such an extent that Easter Day, which once invariably marked the spring equinox, may vary from March 22 to April 25, and Whit Sunday from May 10 to June 13. It is at once obvious that no fixed operations of Nature can be indicated by such variable dates as these.

Hence in what follows I shall only deal with the months involved; these amply suffice for a general statement, but a discussion as to exact dates may come later.

With regard to the astronomical year it may be stated that each solstice and equinox has in turn in

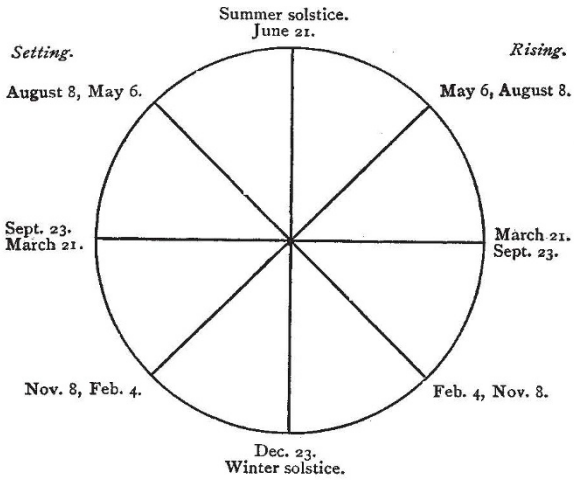

FIG. 3.

some country or another, and even in the same country, been taken as the beginning of the year.

We have, then, the following, so to speak, astronomical years:—

Solstitial Year.	June	December	June
	December	June	December
Equinoctial Year.	March	September	March
	September	March	September

Next, if we treat the intermediate points we have found in the same way, we have the following vegetation years:—

Flower Year.	May	November	May
	November	May	November
Harvest Year.	August	February	August
	February	August	February

It will have been gathered from Fig. 3 that the temples or cromlechs erected to watch the first sunrise of the May–November–May year could also perform the same office for the August–February–August year; and in a

stone circle the priests, by looking along the axis in an opposite direction, could note the sunsets marking the completion of the half of the sun's yearly round in November and February.

Now to those who know anything of the important contributions of Grimm, Rhŷs, Fraser, and many others we might name, to our knowledge of the mythology, worships and customs in the Mediterranean basin and western Europe, an inspection of the first columns in the above tables will show that here we have a common meeting ground for temple orientation, vegetation and customs depending on it, religious festivals and mythology. From the Egyptian times at least to our own a generic sun god has been specifically commemorated in each of the named months. Generic customs with specific differences are as easily traced in the same months; while generic vegetation with specific representatives proper to the season of the year has been so carefully regarded that even December, though without May flowers or August harvests, not to be outdone, brings forward its offering in the shape of the berries of the mistletoe and holly.

With regard especially to the particular time chosen for sun-worship and the worship of the gods and solar heroes connected with the years to which I have referred, I may add that a cursory examination of Prof. Rhŷs' book containing the Hibbert lectures of 1886, in the light of these years, used as clues, suggests that in Ireland the sequence was May–November (Fomori and Fir Bolg), August–February (Lug and the Tuatha Dé Danann), and, lastly, June–December (Cúchulainn). Should this be confirmed we see that the farmers' years were the first to be established, and it is interesting to note that the agricultural rent year in many parts of Ireland still runs from May to November. It is well also to bear in mind, if it be established that the solstitial year did really arrive last, that the facts recorded by Mr. Fraser in his "Golden Bough" indicate that the custom of lighting fires on hills has been in historic times most prevalent at the summer solstice; evidently maps showing the geographical distribution of the May, June and August fires would be of great value.

Some customs of the May and August years are common to the solstitial and equinoctial years. Each was ushered in by fires on hills and the like; flowers in May and the fruits of the earth in August are associated with them; there are also special customs in the case of November. In western Europe, however, it does not seem that such traditions exist over such a large area as that over which the remnants of the solstitial practices have been traced.

I have pointed out that both the May and August years began when the sun had the same declination (16° N.) or thereabouts; once, on its ascent from March to the summer solstice in June, again in its decline from the solstice to September. Hence it may be more difficult in this case to disentangle and follow the mythology, but the two years stand out here and there.

With regard to August, Mr. Penrose's orientation data for the panathenæa fix the 19th day (Gregorian) for the festival in the Hecatompedon; similar celebrations were not peculiar to western Europe and Greece, as a comparison of dates of worship will show.

Hecatompedon	April 28	and	August 16
Older Erectheum	April 29	,,	August 13
Temple of Min, Thebes ...	May 1	,,	August 12
,, Ptah, Memphis ...	April 18	,,	August 24
,, ,, Annu ...	...,,	,,	,,
,, Diana, Ephesus...	April 29	,,	August 13

In the above table I have given both the dates on which the sunlight (at rising or setting) entered the temple, but we do not know for certain, except in the case of the Hecatompedon, on which of the two days the temples were used; it is likely they were all used on both days, and that the variation from the dates proper to the sun's declination of 16° indicates that they were very accurately oriented to fit the local vegetation conditions in the most important and extensive temple fields in the world.

This is the more probable because the Jews also after they had left Egypt established their feast of Pentecost fifty days after Easter = May 10,[1] on which day loaves made of newly harvested corn formed the chief offering.

With regard to the equinoctial year, the most complete account of the temple arrangements is to be found in Josephus touching that at Jerusalem. The temple had to be so erected that at the spring equinox the sunrise light should fall on, and be reflected to the worshippers by, the sardonyx stones on the high priest's garment. At this festival the first barley was laid upon the altar.

But this worship was in full swing in Egypt for thousands of years before we hear of it in connection with the Jews. It has left its temples at Ephesus, Athens and other places, and with the opening of this year as well as the solstitial one the custom of lighting fires is associated, not only on hills, but also in churches.

Here the sequence of cult cannot be mistaken. We begin with Isis and the young sun-god, Horus, at the pyramids and we end with "Lady day," a British legal date; while St. Peter's at Rome is as truly oriented to the equinox as the pyramids themselves, so that we have a distinct change of cult with no change of orientation.

If such considerations as these help us to connect Egyptian with Celtic worships we may hope that they will be no less useful when we go further afield. I gather from a study of Mr. Maudslay's admirable plans of Palenque and Chichén-Itzá that the solstitial and farmers' years' worships were provided for there. How did these worships and associated temples with naos and sphinxes get from Egypt to Yucatan? The more we know of ancient travel the more we are convinced that it was coastwise, that is, from one point of visible land to the next. Are the cults as old as differences in the coastlines which would most easily explain their wide distribution?

NORMAN LOCKYER.

(*To be continued.*)

HABITS OF INSECTS.[2]

SEVEN volumes of M. Fabre's observations on insects have been published between 1879 and 1890, under the title of "Souvenirs Entomologiques," containing the results of long and patient investigations into the habits of insects of the south of France; and we are glad to see the first volume translated into English in its entirety. It is much better to begin at the beginning, rather than to issue merely a selection from the seven volumes, which was what we had expected to find when we opened the book. The English edition is tastefully got up, and the illustrations are attractive. We may say that there are none in the French except a few text-illustrations in some of the later volumes of the series. The English title, "Insect Life," is, however, somewhat objectionable, as there are already other English and American books bearing the same title.

The first volume, now to be noticed, includes twenty-two chapters, relating to the habits of the Sacred Beetle,

[1] Compare this with the fifty maidens who ran away from the Ultonian court (Rhŷs, "Hibbert Lectures," p. 434).

[2] "Insect Life: Souvenirs of a Naturalist." By J. H. Fabre, Docteur ès Sciences. Translated from the French by the author of "Mademoiselle Mori." With a preface by David Sharp, M.A., F.R.S., and edited by F. Merrifield. With illustrations by M. Prendergast Parker. Pp. xii+320 (London: Macmillan and Co., Ltd., 1901.) Price 6s.