STONEHENGE

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STONEHENGE

AND OTHER

BRITISH STONE MONUMENTS

Astronomically Considered

BY

Joseph

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PREFACE

In continuation of my work on the astronomical uses of the Egyptian Temples, I have from time to time, when leisure has permitted, given attention to some of the stone circles and other stone monuments erected, as I believed, for similar uses in this country. One reason for doing so was that in consequence of the supineness of successive Governments, and the neglect and wanton destruction by individuals, the British monuments are rapidly disappearing.

Although, and indeed because, these inquiries are still incomplete, I now bring together some of the notes I have collected, as they may induce other inquirers to go on with the work. Some of the results already obtained have been communicated to the Royal Society, and others have appeared in articles published in *Nature*, but only a small percentage of the monuments available has so far been examined. Further observations are required in order that the hypothesis set forth in this book may be rejected or confirmed.

In the observations made at Stonehenge referred to in Chapter VII. I had the inestimable advantage of the collaboration of the late Mr. Penrose. Our work there would not have been possible without the sympathetic assistance of Sir Edmund Antrobus, Bart.; Colonel Duncan A. Johnston, R.E., Director-General of the Ordnance Survey, also was good enough on several occasions to furnish us with much valuable information which is referred to in its place. Messrs. Howard Payn and Fowler skilfully and zealously helped in the observations and computations. To all these I am glad to take this opportunity of expressing my obligations.

With regard to the other monuments besides Stonehenge, I have to tender my thanks to the following gentlemen for most valuable local assistance:—

Brittany—Lieut. de Vaisseau Devoir.

Stenness—Mr. Spence.

Stanton Drew—Professor Lloyd Morgan, Mr. Morrow, and Mr. Dymond.

The Hurlers, and the Merry Maidens—the Right Hon. Viscount Falmouth, Capt. Henderson, Mr. Horton Bolitho and Mr. Wallis.

Tregaseal—Mr. Horton Bolitho and Mr. Thomas.

The Dartmoor Avenues—Mr. Worth.

The following have helped me in many ways, among them with advice and criticism:—Principal Rhys, Dr. Wallis Budge, Dr. J. G. Frazer, and Mr. A. L. Lewis.

The assistance so generously afforded in the case of

Stonehenge by Colonel Johnston, R.E., in furnishing me with accurate azimuths was continued for the monuments subsequently investigated till his retirement. To his successor, Colonel R. C. Hellard, R.E., I am already under deep obligations.

For the use of some of the Illustrations my thanks are due to the Royal Society, the Society of Antiquaries, the Royal Institute of British Architects, Messrs. Macmillan, and Mr. John Murray.

I have to thank Mr. Rolston, F.R.A.S., one of my staff, for assistance in the computations involved.

NORMAN LOCKYER.

Solar Physics Observatory,
17*th May*, 1906.

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STONEHENGE

CHAPTER I

INTRODUCTORY

IN the book I published ten years ago, entitled "The Dawn of Astronomy," I gave a pretty full account of the principles and the methods of observation which enable us to trace the ideas which were in the minds of the ancient Egyptians when they set out the line of a temple they proposed to build.

Numerous references to the ceremonial of laying the foundation-stones of temples exist, and we learn from the works of Chabas, Brugsch, Dümichen[1] and others, that the foundation of an Egyptian temple was associated with a series of ceremonies which are repeatedly described with great minuteness. Amongst these ceremonies, one especially refers to the fixing of the temple-axis; it is called, technically, "the stretching of the cord," and is not only illustrated by inscriptions on the walls of the temples of Karnak, Denderah and Edfu—to mention the best-known cases—but is referred to elsewhere.

[1] "Baugeschichte des Dendera-Tempels." 1877.

During the ceremony the king proceeded to the site where the temple was to be built, accompanied mythically by the goddess Sesheta, who is styled "the mistress of the laying of the foundation-stone."

Each was armed with a stake. The two stakes were connected by a cord. Next the cord was aligned towards the sun on some day of the year, or a star, as the case might be; when the alignment was perfect the two stakes were driven into the ground by means of a wooden mallet. One boundary wall parallel to the main axis of the temple was built along the line marked out by this stretched cord.

If the moment of the rising or setting of the sun or star were chosen, as we have every reason to believe was the case, seeing that all the early observations were made on the horizon, it is obvious that the light from the body towards which the temple was thus aligned would penetrate the axis of the temple from one end to the other in the original direction of the cord.

We learn from Chabas that the Egyptian word which expresses the idea of founding or laying the foundation-stone of a temple is *Senti*—a word which still exists in Coptic. But in the old language another word *Pet-ser*, which no longer remains in Coptic, has been traced. It has been established that *pet* means to stretch, and *ser* means cord, so that that part of the ceremonial which consisted in stretching a cord in the direction of a star was considered of so great an importance that it gave its name to the whole ceremonial.

Dealing with the existing remains of Egyptian temples, it may be said that the most majestic among them was that of Amen-Rā at Karnak, dedicated to the Sun-God, place of rising or setting. Stars at the same distance from the celestial pole or equator will rise or set at the same point of the horizon, and if a star does not change its place in the heavens it will always rise or set in the same place.

The sun as it changes its position each day, in its swing N. and S. of the equator, will rise and set on any day in the same place as a star which permanently has the same distance from the equator as that temporarily occupied by the sun.

Here it will be convenient to introduce one or two technical terms: we generally define a star's place by giving, as one ordinate, its distance in degrees from the equator: this distance is called its *declination.*

Further, we generally define points on the horizon by dividing its whole circumference into 360°, so that we can have *azimuths* up to 90° from the north and south points to the east and west points. We also have *amplitudes* from the east and west points towards the north and south points. We can say, then, that a star of a certain declination, or the sun when it occupies that declination, will rise or set at such an azimuth, or at such an amplitude. This will apply to both north and south declinations.

Then supposing the azimuth to be 39° in the N.E. quadrant, it is written N. 39° E. For the other quadrants we have N. 39° W., S. 39° E., and S. 39° W., respectively.

The following table gives the amplitudes of rising or setting (north or south) of celestial bodies having declinations from 0° to 64°, at Thebes and Stonehenge respectively.

although in each different latitude the inclination of the equator to the horizon as well as the elevation of the pole will vary, there will be a strict relationship between the inclination of the equator at each place and the elevation of the pole. Except at the poles themselves the equator will cut the horizon due east and due west; therefore every celestial body to the north of the celestial equator which rises and sets will cut the horizon between the east and west point and the north point; those bodies which do not rise will of course not cut the horizon at all.

The stars near the equator, and the sun, in such a latitude as that of Thebes, will appear to rise or set at no very considerable angle from the vertical; but when we deal with stars very near to the north or south points of the horizon they will seem to skim along the horizon instead of rising directly.

We now pass on to Stonehenge. To represent the new condition the axis of the globe will now require to be inclined 51° to the horizon. The number of northern stars which do not set and of southern stars which do not rise will be much greater than at Thebes. The most northern and southern stars visible will in their movement hug the horizon more closely than was observed under the Thebes condition.

The sun, both at Thebes and Stonehenge, since it moves among the stars from $23\frac{1}{2}°$ N. to $23\frac{1}{2}°$ S. each year, will change its place of rising and setting at different times of the year.

Now it will at once be obvious that there must be a strict law connecting the position of a star with its globe is turned round, we can get a very concrete idea of the different relations of the observer's horizon to the apparent paths of the stars in different latitudes.

We have next to deal with the astronomical relations of the horizon of any place, in connection with the observation of the sun and stars at the times of rising or setting, when of course they are on or near the horizon; and in order to bring this matter nearer to the ancient monuments, we will study this question for both Thebes and Stonehenge. We may take the latitude of Thebes as 25°, Stonehenge as 51°, and we will begin with Thebes.

To consider an observer on the Nile at Thebes and to adjust things properly we must rectify a celestial globe to the latitude of 25° N., or, in other words, incline the axis of the globe at that angle to the wooden horizon.

Since all the stars which pass between the North Pole and the horizon cannot set, all their apparent movements will take place above the horizon. All the stars between the horizon and the South Pole will never rise. Hence, stars within the distance of 25° from the North Pole will never set at Thebes, and those stars within 25° of the South Pole will never be visible there. At any place the latitude and the elevation of the pole are the same. It so happens that many of those places with which archæologists have to do in studying the history of early peoples—Chaldæa, Egypt, Babylonia, &c.—are in low middle latitudes, therefore we have to deal with bodies in the skies which do set and bodies which do not, and the elevation of the pole is neither very great nor very small. But half of the stars invisible to the observer at the northern one.

If the observer be on the equator, the movements of the stars will appear to be as indicated in this diagram (Fig. 3)—that is, all the stars will rise and set, and each star will be, in turn, twelve hours above the horizon, and the same time below it. But if we consider the position of an observer in a middle latitude, say at Stonehenge, we find that some stars will always be above the horizon, some always below—that is, they will neither rise nor set. All other stars will both rise and set, but some of them will be above the horizon for a long time and below for a short time, whereas others will be a very short time above the horizon and a long time below it, each star completing a circle in a day (Fig. 4).

Wherever we are upon the earth we always imagine that we are on the top of it. The idea held by all the early peoples was that the surface of the earth near them was an extended plain: they imagined that the land that they knew and just the surrounding lands were really in the centre of the extended plain. Plato, for instance, was content to think the Mediterranean and Greece upon the top of a cube, and Anaximander placed the same region at the top of a cylinder.

By the use of a terrestrial globe we can best study the conditions of observation at the poles of the earth, the equator and some place in middle latitude. The wooden horizon of the globe is parallel to the horizon of a place at the top of the globe, which horizon we can represent by a wafer. By inclining the axis of the globe and watching the movement of the wafer as the and oriented to catch the light of the sun setting at the summer solstice, the time of the year at which the all-important rise of the Nile began.

Although the sun is no longer worshipped in Egypt or Britain, sun-worship has not yet disappeared from the world. Professor Gowland has recently[1] brought to notice a surviving form of sun-worship in Japan. I quote his statement:—

"There on the seashore at Fûta-mi-ga-ura (as will be seen in a copy of a print which I obtained at that ancient place) the orientation of the shrine of adoration is given by two gigantic rocks which rise from the sea as natural pillars. The sun as it rises over the mountains of the distant shore is observed between them, and the customary prayers and offerings made in that direction (Fig. 1).

"It is, too, specially worthy of note that the point from which the sun is revered is marked by a structure of the form of a trilithon, but made of wood, placed immediately behind the altar. This representative of the trilithon is of very remote date in Japan, and has been in use there from the earliest times in connection with the observances of the ancient Shintō cult in which the Sun-Goddess is the chief deity. One of its important uses, which still survives, was to indicate the direction of the position of some sacred place or object of veneration, in order that worshippers might make their prayers and oblations towards the proper quarter."

The table of offerings must also be noted.

In the book to which I have referred, I also endeavoured to show that a knowledge of even elementary

[1] "Archæologia," vol. lviii.

astronomy may be of very great assistance to students of archæology, history, folk-lore and all that learning which deals with man's first attempts to grasp the

FIG. 1.—Present sun worship in Japan.

meaning and phenomena of the universe in which he found himself before any scientific methods were available to him; before he had any idea of the origins or the conditionings of the things around him.

It may be well, however, in the present book to restate the underlying astronomical principles in the briefest possible manner; and this is the more easily done because, in the absence of measuring instruments, the horizon was the only circle which the ancient peoples could employ effectively, and we need only therefore consider it.

Indeed, whether we regard the Rig-Veda or the Egyptian monuments from an astronomical point of view, we are struck by the fact that the early worship

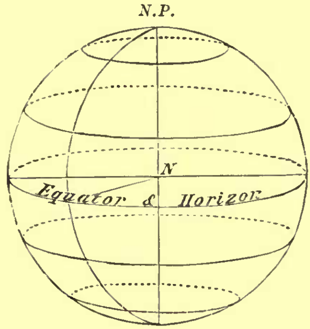

FIG. 2.—The celestial sphere, conditions at the North Pole. A parallel sphere. *N.P.*, North celestial Pole; *N*, position of observer.

and all the early observations related to the horizon. This was true not only for the sun, but for all the stars which studded the general expanse of sky.

We have therefore chiefly to consider the relation of the horizon of any place to the apparent movements of celestial bodies at that place.

We now know that the earth rotates on its axis, but this idea was of course quite unknown to these early peoples. Since the earth rotates, with stars infinitely removed surrounding it on all sides, the apparent movements of the stars will depend very much upon the position we happen to occupy on the earth. An observer at the North Pole of the earth, for instance,

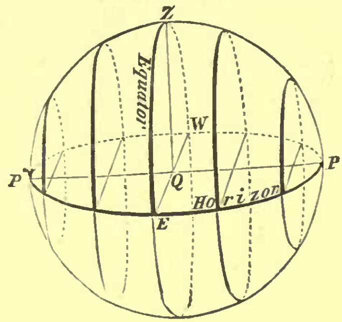

FIG. 3.—The celestial sphere, conditions at the Equator. A right sphere. *Q*, standpoint of observer; *PP*, the celestial poles; *EW*, east and west points.

would see the stars moving round in circles parallel to the horizon (Fig. 2). No star could therefore either rise

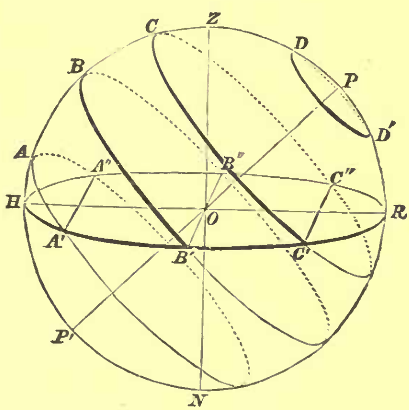

FIG. 4.—The celestial sphere, conditions in a middle latitude. An oblique sphere. In this woodcut *DD'* shows the apparent path of a circumpolar star; *BB'B''*, the path and rising and setting points of an equatorial star; *CC'C''* and *AA'A''*, those of stars of mid declination, one north and the other south; *O*, standpoint of observer.

or set—one half of the heavens would be always visible above his horizon, and the other half invisible. An observer at the South Pole would of course see that

Amplitudes at Thebes and Stonehenge.

Declination.	Amplitude.		Declination.	Amplitude.	
	Thebes.	Stonehenge.		Thebes.	Stonehenge.
0°	0° 0′	0° 0′	33°	37°11′	59°56′
1	1 7	1 36	34	38 21	62 42
2	2 13	3 11	35	39 31	65 44
3	3 20	4 46	36	40 42	69 4
4	4 26	6 22	37	41 53	73 0
5	5 33	7 58	38	43 5	78 4
6	6 40	9 34	39	44 17	90 0
7	7 47	11 10	40	45 30	
8	8 53	12 47	41	46 43	
9	9 59	14 23	42	47 56	
10	11 6	16 1	43	49 10	
11	12 13	17 39	44	50 25	
12	13 20	19 18	45	51 41	
13	14 27	20 57	46	52 57	
14	15 34	22 36	47	54 14	
15	16 41	24 17	48	55 32	
16	17 49	25 58	49	56 51	
17	18 56	27 45	50	58 12	
18	20 3	29 24	51	59 34	
19	21 10	31 10	52	60 58	
20	22 17	32 55	53	62 23	
21	23 25	34 43	54	63 51	
22	24 33	36 32	55	65 21	
23	25 41	38 23	56	66 54	
24	26 49	40 16	57	68 31	
25	27 58	42 11	58	70 12	
26	29 6	44 10	59	71 59	
27	30 15	46 10	60	73 55	
28	31 23	48 15	61	76 1	
29	32 32	50 22	62	78 25	
30	33 41	52 36	63	81 19	
31	34 51	54 55	64	85 42	
32	36 1	57 21			

The amplitude is always the complement of the azimuth, so that amplitude + azimuth = 90°. Later on I shall give amplitudes for latitudes higher than that of Stonehenge, so that still more northerly monuments can be considered.

CHAPTER II

THE ASTRONOMICAL DIVISIONS OF THE YEAR

It is next important to deal with the yearly path of the sun, with a view of studying the relation of the various points of the horizon occupied by the sun at different times in the year. In the very early observations that were made in Egypt, Chaldæa and elsewhere, when the sun was considered to be a god who every morning got into his boat and floated across space, there was no particular reason for considering the amplitude at which the boat left, or came to, shore. But a few centuries showed that this rising or setting of the sun in widely varying amplitudes at different times of the year at the same place obeyed a very definite law.

In its northward passage it reaches the highest point at our summer solstice, and then goes down again till it reaches its greatest southern declination, as it does in our winter. At both these points the sun appears to stand still in its north or south movement, and the Latin word solstice exactly expresses that idea. The change of declination brought about by these movements will affect the place of the sun's rising and setting; this is why the sun sets most to the north in summer and most to the south in winter. At the equinoxes the sun has always 0° Decl., so it rises and sets due east and west all over the world. But at the solstices it has its greatest declination of $23\frac{1}{2}°$ N. or S.; it will rise and set therefore furthest from the east and west points; how far, will depend upon the latitude of the place, as will have been gathered from the preceding table (p. 11).

These solstices and their accompaniments are among the striking things in the natural world. In the winter solstice we have the depth of winter, in the summer solstice we have the height of summer, while at the equinoxes we have but transitional changes; in other words, while the solstices point out for us the conditions of greatest heat and greatest cold, the equinoxes point out for us those two times of the year at which the temperature conditions are very nearly equal, although of course in the one case we are saying good-bye to summer and in the other to winter.

Did the ancients know anything about these solstices and these equinoxes? Dealing with the monumental evidence in Egypt alone, the answer is absolutely overwhelming. Many thousand years ago the Egyptians were perfectly familiar with the solstices, and therefore with the yearly path of the sun.

This fundamental division of the sun's apparent revolution and course which define our year into four nearly equal parts may be indicated as in Fig. 5, 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

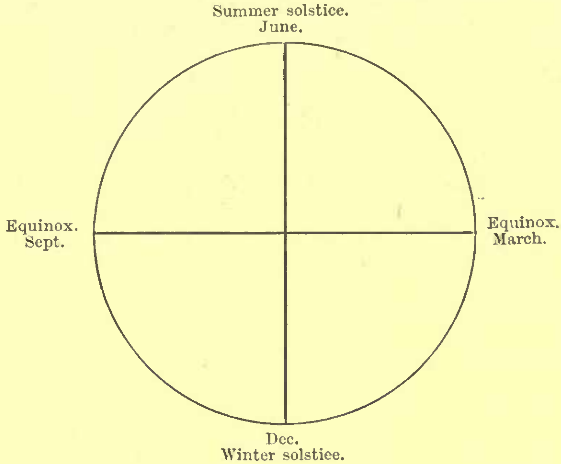

FIG. 5.—The four Astronomical Divisions of the year.

horizon (either at rising or setting) at the times indicated. These points are defined, as we have seen, by

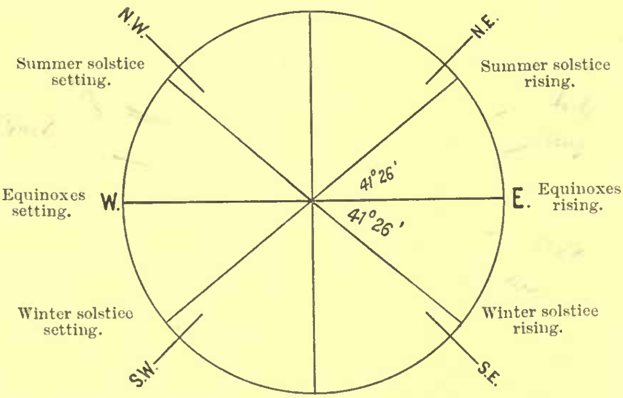

FIG. 6.—The various bearings of the sun risings and settings in a place with a N. latitude of 51°.

their "amplitude" or their distance in degrees from the E. or W. points of the horizon. In the diagram (Fig. 6)

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. 6 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 are seen at the solstices; at the equinoxes they are seen at the E. and W. points. 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, as I shall show later on, 23° 54′ 30″. Its mean value for the present year (1906) is 23° 27′ 5″; it is decreasing very slowly.

It will be obvious from Fig. 6 that in temples built to observe the solstices or equinoxes, if they were open from end to end, 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. I shall show later on that this statement requires a slight modification.

But temples so built interfered with the ceremonial, which required that the light should illuminate a naos —that is, the Sanctuary or Holy of Holies, only entered by the High Priest, and generally kept dark. Usually, therefore, two temples were built back to back, with a common axis, as at Karnak.

And here a very important point comes in; which time of the year and day of the year are most easy to fix by astronomical observation? As a matter of fact the summer solstice, the position of the sun on the longest day, is a point easily fixed. All we have to do is to observe the sun rising more and more to the north as the summer approaches, until at the very height of the summer we have the extreme north-easterly point of the horizon reached, and the sun stands still. We have the solstice. We can then put a row of stakes up, and so fix the solstitial line. Of course we find, as mankind has found generally, that the sun comes back next year to that same solstitial place of rising or setting. So that when we have once got such an alignment for the rising of the sun at midsummer, we can determine the length of the year in days, and therefore the beginning of each year as it comes round.

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.

CHAPTER III

THE AGRICULTURAL DIVISIONS OF THE YEAR

THE early peoples have been very much misrepresented, and held to have been uninstructed, by several writers who have not considered what they were really driving at. It was absolutely essential for early man, including the inhabitants of Britain as it was then—townless, uncivilised—that the people should know something about the proper time for performing their agricultural operations. We now go into a shop and for a penny buy an almanack which gives us everything we want to know about the year, the month and the day, and that is the reason why so few of us care about astronomy: we can get all we want from astronomy for a penny or twopence. But these poor people, unless they found out the time of the year and the month and the day for themselves, or got some one to tell them—and their priests were the men who knew, and they were priests because they knew—had absolutely no means of determining when their various agricultural operations should take place. So that we find all over the world temples erected in the very first flush of civilisation.

On this a point comes in of very considerable interest. If we study the civilisations in Egypt, we find that, so far as we know, one of the first peoples who used this principle of orientation for agricultural purposes was some tribe that came down the Nile about 6400 years B.C. They used the star Canopus, and their determination was that of the autumnal equinox, which practically was the time when the Nile began to go down, and when their sowing might begin. There was another race who, instead of being interested in the sun, and therefore in agriculture, at the time of the autumnal equinox, were interested in the year about the time of Easter as well. This race built the Pyramids about four thousand years B.C. There was an interval of about two or three thousand years between these races. As we shall see there were others, who at Thebes started the solstitial worship—that is to say, the worship of the sun at midsummer—and at Memphis in May, so as to enable them to go on with their agricultural operations with greater certainty. We must not forget that first of all the farmers tried to plough and sow by the moon. We can see how hopeless agriculture must have been under such conditions. The month, indeed, was the only unit of time employed, even of human life. We hear of people who lived 1200 years; that means 1200 months—there is no question whatever about that now.

When we study the history of our own country—when we come back from Egypt to Britain, leaving alone Greece and Rome—we find that in various times in our country we have had a year, a farmer's year, beginning in the month of May; we have had another farmer's year beginning in the month of August; we have had another farmer's year beginning at the longest day; and it appears that the year beginning at the longest day was really the last year to be introduced. So that while we have in Stonehenge a solstitial temple—that is to say, a temple to make observations of the length of the year by observing the rise of the sun on the longest day of the year—in other parts of England there were other temples observing the sun, not on the 21st of June, but early in May and early in August.

Now, as I have indicated, the priest-astronomers in these temples could only have won and kept the respect of the agricultural population with whom 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. For this they must have watched the stars.

A very large part of mythology has sprung out of the temple cults, prayer, sacrifices and thanksgiving connected with these farming operations in different lands and ages.

I wish to show next that by studying the orientation of temples erected to watch the stars and 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-

C 2

or corn-kings or gods who had to be propitiated; and we may even be enabled to understand why the particular divisions of the year were chosen.

In a solstitial temple the sun makes its appearance only 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 Grecques et Romaines," the earlier Gregorian dates on which the seasons were reckoned to commence in ancient Greece were as follows:—

Summer...	May 6.
Autumn (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 was as certainly used for orientation purposes, that is, for recording the lapse of time at night or return of some season important to the tiller of the soil. The advent of the season thus determined could be announced to outlying districts by fire signals at night.

I have already pointed out that any temple, dolmen or cromlech oriented 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 and downward journey, or, in other words, was, *in days*, half-way between the equinox and solstice. Thus, for the 45 days $\left(=\frac{91 \text{ days}}{2}\right)$ from March 22, we have in—

March	9
April	30
May	6
	45

What, then, are the non-equinoctial, 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 decl. N. 16° 20′.

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

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

We get, then, a year symmetrical with the astronomical year, which can be indicated with it as in Fig. 7; 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,

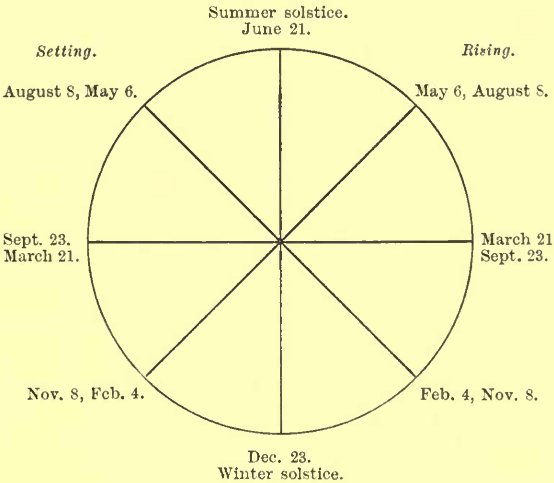

FIG. 7.—The astronomical and vegetation divisions of the year.

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.

To sum up, then, the astronomer-priests had (1) to watch the time at night by observing a star rising near the north point of the horizon. This star would act as a warner of sunrise at some time of the year.

(2) To watch for the rising or setting of other stars in various azimuths warning sunrise at the other critical times of the May or Solstitial years.

(3) To watch the sunrise and sunset.

(4) To mark all rising or setting places of the warning stars and sun by sight-lines from the circle.

CHAPTER IV

THE VARIOUS NEW-YEAR DAYS

WITH regard to the astronomical year it may be stated that each solstice and equinox has in turn in some country or another, and even in the same country at different times, been taken as the beginning of the year.

We have, then, to begin with, the following which may be called *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. 7 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 almost 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, Frazer, 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.

About the mistletoe there is this difficulty. Innumerable traditions associate it with worship and the oak tree. Undoubtedly the year in question was the solstitial year, so that so far as this goes the association is justified. But as a rule the mistletoe does not grow on oaks. This point has been frequently inquired into, especially by Dr. Henry Ball (*Journal of Botany*, vol. ii. p. 361, 1864) in relation to the growth of the plant in Herefordshire, and by a writer in the *Quarterly Review* (vol. cxiv.), who spoke of the mistletoe "deserting the oak" in modern times and stated, "it is now so rarely found on that tree as to have led to the suggestion that we must look for the mistletoe of the Druids, not in the *Viscum album* of our own trees and orchards, but in the *Loranthus Europaeus* which is frequently found on oaks in the south of Europe."

On this point I consulted two eminent botanical friends, Mr. Murray, of the British Museum, and Prof. Farmer, from whom I have learned that the distribution of *V. album* is in Europe universal except north of Norway and north of Russia; in India in the temperate Himalayas from Kashmir to Nepaul, altitude 3000 to 7000 feet.

The *Viscum aureum*, otherwise called *Loranthus Europaeus*, is a near relation of the familiar mistletoe, and in Italy grows on the oak almost exclusively. There are fifty species of Loranthus in the Indian flora, but *L. Europaeus* does not occur.

In the *Viscum aureum* we have the "golden bough," the oak-borne *Aurum frondens* and *Ramus aureus* of Virgil; and it can easily be imagined that when the Druids reached our shores from a country which had supplied them with the *Viscum aureum*, this would be replaced by the *V. album* growing chiefly on apple trees and not on oaks; indeed, Mr. Davies, in his "Celtic Researches," tells us that the apple was the next sacred tree to the oak, and that apple orchards were planted in the vicinity of the sacred groves. The transplanting of the mistletoe from the apple to the oak tree before the mystic ceremonies began was not beyond the resources of priestcraft.

It must not be forgotten that these ceremonies took place at both solstices—once in June, when the oak was in full leaf, and again in December, when the parasitic plant was better visible in the light of the young moon. Mr. Frazer, in his "Golden Bough" (iii. p. 328), points out that at the summer solstice not only was mistletoe gathered, but many other "magic plants, whose evanescent virtue can be secured at this mystic season alone."

It is the ripening of the berries at the winter solstice which secured for the mistletoe the paramount importance the ceremonials connected with it possessed at that time, when the rest of the vegetable world was dormant.

With regard especially to the particular time of the year 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 the vague year in Egyptian chronology makes it a very difficult matter to determine the exact Gregorian dates for the ancient Egyptian festivals, but, fortunately, there is another way of getting at them. Mr. Roland Mitchell, when compiling his valuable "Egyptian Calendar" (Luzac and Co., 1900), found that the Koptic calendar really presents to us the old Egyptian year, "which has been in use for thousands of years, and has survived all the revolutions."

Of the many festivals included in the calendar, the great Tanta fair, which is also a Mohammedan feast, "is the most important of all held in Egypt. Religion, commerce, and pleasure offer combined attractions." As many as 600,000 or 700,000 often attend this great fair, "no doubt the survival of one of the ancient Egyptian national festivals."

It is held so as to end on a Friday, and in 1901 the Friday was August 9!

This naturally suggests that we should look for a feast in the early part of May. We find the Festival of Al-Khidr, or Elias in the middle of the wheat harvest in Lower Egypt; of this we read:—

"Al-Khidr is a mysterious personage, who, according to learned opinion, was a just man, or saint, the Visīr of Dhu'l-Karnên (who was a great conqueror, contemporary with Ibrahīm—Abraham—and identified in other legends with Alexander the Great, St. George, &c.). Al-Khidr, it is believed, still lives, and will live until the Day of Judgment. He is clad in green garments, whence probably the name. He is commonly identified with Elias (Elijah), and this confusion seems due to a confusion or similarity of some of the attributes that tradition assigns to both."

"The 'Festival of El-Khidr and of Elias,' falling generally on May 6, marks the two-fold division of the year, in the Turkish and Armenian calendars, into the Rūz Kāsim and the Rūz Khidr (of 179–80 and 185–6 days respectively."

This last paragraph is important, as it points to ancient sun-worship, Helios being read for Elias; and 179 days from May 6 bring us to November 1. So we find that the modern Turks and Armenians have the old May–November year as well as the ancient Egyptians who celebrated it in the Temple of Menu at Thebes.

The traces of the Ptah worship are not so obvious. Finally, it may be stated that the second Tanta fair occurs at the spring equinox, so that the pyramid worship can still be traced in the modern Egyptian calendar. The proof that this was an exotic[1] is established, I think, by the fact that no important agricultural operations occur at this period in Egypt, while in May we have the harvest, in August and November sowing, going on.

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. Frazer 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

[1] In Babylonia the spring equinox was the critical time of the year because the Tigris and Euphrates then began to rise.

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 Erechtheum	April 29	,,	August 13.
Temple of Diana, Ephesus	April 29	,,	August 13.
,, Min, Thebes	May 1	,,	August 12.
,, Ptah, Memphis	April 18	,,	August 24.
,, ,, Annu	April 18	,,	August 24.
,, Solar Disc, Tell el-Amarna	April 18	,,	August 24.

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 N. 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, 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 of 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 British 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[1] 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 coast-lines which would most easily explain their wide distribution?

[1] See *Dawn of Astronomy*, Plate facing p. 182, for the lines of sphinxes at Karnak.

CHAPTER V

CONDITIONS AND TRADITIONS AT STONEHENGE

After Mr. Penrose, by his admirable observations in Greece, had shown that the orientation theory accounted as satisfactorily for the directions in which the chief temples in Greece had been built as I had shown it did for some in Egypt, it seemed important to apply the same methods of inquiry with all available accuracy to some example, at all events, of the various stone circles in Britain which have so far escaped destruction. Many attempts had been previously made to secure data, but the instruments and methods employed did not seem to be sufficient.

Much time has, indeed, been lost in the investigation of a great many of these circles, for the reason that in many cases the relations of the monuments to the chief points of the horizon have not been considered; and when they were, the observations were made only with reference to the magnetic north, which is different at different places, and besides is always varying; few indeed have tried to get at the astronomical conditions of the problem.

The first, I think, was Mr. Jonathan Otley, who in 1849 showed the "Orientation" of the Keswick Circle "according to the solar meridian," giving true solar bearings throughout the year.

I wrote a good deal in *Nature*[1] on sun and star temples in 1891, and Mr. Lewis the next year expressed the opinion that the British Stone Monuments, or some of them, were sun and star temples.

Mr. Magnus Spence of Deerness in Orkney published a pamphlet, "Standing Stones and Maeshowe of Stenness,[2]" in 1894; it is a reprint of an article in the *Scottish Review*, Oct. 1893. Mr. Cursiter, F.S.A., of Kirkwall, in a letter to me dated 15 March 1894, a letter suggested by my *Dawn of Astronomy* which appeared in that year and in which the articles which had appeared in *Nature* in 1891 had been expanded, drew my attention to the pamphlet; the observations had no pretension to scientific accuracy, and although some of the sight-lines were incorrectly shown in an accompanying map, May year and solstitial alignments were indicated.

So far as I know, there has never been a complete inquiry into the stone circles in Britain, but Mr. Lewis, who has paid great attention to these matters, has dealt in a general manner with them (*Archaeological Journal*, vol. xlix. p. 136), and has further described (*Journal* Anthropological Institute, n.s., iii., 1900) the observations made by him of stone circles in various parts of Scotland. From an examination of the latter he con-

[1] See especially *Nature*, July 2, 1891 p. 201.
[2] Gardner, Paisley and London.

cludes that they may be divided into different types, each of which has its centre in a different locality. The types are—(1) the Western Scottish type, consisting of a rather irregular single ring or sometimes of two concentric rings; (2) the Inverness type, consisting of a more regular ring of better-shaped stones, surrounding a tumulus with a retaining wall, containing a built-up chamber and passage leading to it, or a kist without a passage; (3) the Aberdeen type, consisting of a similar ring with the addition of a so-called "altar-stone" and usually having traces of a tumulus and kist in the middle. In addition to these three types of circles, there are in Britain generally what Mr. Lewis calls sun and star circles, with their alignments of stones, and apparently proportioned measurements. He has shown that there is a great preponderance of outlying stones and hill-tops lying between the circles and the N.E. quarter of the horizon. From what has been stated in Chapter III with regard to the nightly observations of stars it will be gathered that these may have been used for this purpose.

The following list gives some of the bearings of outlying stones and other circles from the centres of the named circles:—

Roll-rich, Oxon.—Kingstone	N. 27°	E.
Stripple Stones, Cornwall—Bastion on bank ...	N. 26	E.
Long Meg, Cumberland—Small circle... ...	N. 27	E.
The Hurlers, Cornwall—Two outlying circles ...	N. 13–16	E.
Trippet Stones—Leaze circle	N. 11	E.

If these alignments mean anything they must of course refer to the rising of *stars*, as the position on the horizon is outside the sun's path.

The many circles in Cornwall have been dealt with by Mr. Lukis in a volume published by the Society of Antiquaries in 1895.[1] A carefully prepared list of circles will be found in Mr. Windle's recently published work entitled "Remains of the Prehistoric Age in England."

It may be useful here to state, with regard to megalithic remains generally, that they may be classed as follows; some details will be discussed later on.

(*a*) Circles. These may be single, double, or multiple, and either concentric or not.

(*b*) Menhirs, large single stones, used to mark sight-lines from circles.

(*c*) Alignments, *i.e.*, lines of stones in single, double, or in many parallel lines. If these alignments are short they are termed avenues.

(*d*) Holed-stones, doubtless used for observing sight-lines, sometimes *over* a circle.

(*e*) Coves. A term applied by Dr. Stukeley and others to what they considered shrines formed by three upright stones, thus leaving one side open. I take them to be partially protected observing places. There are well-marked examples at Avebury, Stanton Drew and Kit's Coity House.

(*f*) Cromlechs. This term generally means a grouping of upright stones; it is applied to irregular circles in Brittany. It also applies to a stone or stones raised on the summits of three or more pillar stones forming the end and sides of an irregular vault generally open at one end ("Dolmens of Ireland," Borlase, p. 429).

[1] "The Prehistoric Stone Monuments of the British Isles—Cornwall."

The top stone is called in S.W. England a "quoit." Cromlechs in most cases have been covered by barrows or cairns.

(*g*) Dolmens, from Dol Men, a table stone. These consist of stones, resting on two or more upright stones forming a more or less complete chamber, some of which are of great length. I note the following subdivisions: "Dolmen à galerie" having an entrance way of sufficient height, and "Galgal," similar but smaller. In the "Dolmen à l'allée couverte" there is a covered passage way to the centre. It is a more elaborate cove. For the relation between cromlechs and dolmens, see Borlase (*loc. cit.* and p. 424 *et seq.*).

With regard to dolmens, I give the following quotation from Mr. Penrose (*Nature*, vol. lxiv., September 12, 1901):—

"Near Locmariaquer in the estuary named Rivière d'Auray, there is an island named Gavr' Inis, or Goat Island, which contains a good specimen of the kind of dolmen which has been named 'Galgal.'

"At the entrance our attention is at once arrested by the profusion of tracery which covers the walls. From the entrance to the wall facing us the distance is between 50 and 60 feet. The square chamber to which the gallery leads is composed of two huge slabs, the sides of the room and gallery being composed of upright stones, about a dozen on each side. The mystic lines and hieroglyphics similar to those above mentioned appear to have a decorative character.

"An interesting feature of Gavr' Inis is its remarkable resemblance to the New Grange tumulus at Meath.

In construction there is again a strong resemblance to Mæs-Howe, in the island of Orkney. There is also some resemblance in smaller details."

While we generally have circles in Britain without, or with small, alignments; in Brittany we have alignments without circles, some of them being on an enormous scale;[1] thus at Menec (the place of stones) we have eleven lines of menhirs, terminating towards the west in a cromlech, and, notwithstanding that great numbers have been converted to other uses, 1169 menhirs still remain, some reaching as much as 18 feet in height.

The alignments of Kermario (the place of the dead) contain 989 menhirs in ten lines. Those of Kerlescant (the place of burning), which beginning with eleven rows are afterwards increased to thirteen, contain altogether 579 stones and thirty-nine in the cromlech, with some additional stones. The adoration paid these stones yielded very slowly to Christianity. In the church history of Brittany the *Cultus Lapidum* was denounced in 658 A.D.

Many of the fallen menhirs in these alignments have been restored to their upright position by the French Government. Some of them may have been overturned in compliance with the decree of 658 A.D. above referred to. Several of the loftier menhirs are surmounted by crosses of stone or iron.

Both circles and alignments are associated with holidays and the lighting of fires on certain days of the

[1] "The French Stonehenge: An Account of the Principal Megalithic Remains in the Morbihan Archipelago." By T. Cato Worsfold, F.R.Hist.S., F.R.S.I. (London: Bemrose and Sons, Ltd.)

year. This custom has remained more general in Brittany than in Britain. At Mount St. Michael, near Carnac, the custom still prevails of lighting a large bonfire on its summit at the time of the summer solstice; others, kindled on prominent eminences for a distance of twenty or thirty miles round, reply to it. These fires are locally called "Tan Heol," and also by a later use, Tan St. Jean. In Scotland there was a similar custom in the first week in May under the name of Bel Tan, or Baal's Fire; the synonym for summer used by Sir Walter Scott in the "Lady of the Lake":—

> Ours is no sapling chance-sown by the fountain,
> Blooming at Beltane in winter to fade.

At Kerlescant the winter solstice is celebrated by a holiday, whilst Menec greets the summer solstice, and Kermario the equinoxes, with festivals. Concerning these fires and the associated customs Mr. Frazer's "Golden Bough" is a perfect mine of information and should be consulted. It may simply be said here that the May and November, and June and December fires seem to be the most ancient. It is stated that the Balder bale fires on Mayday Eve were recognised by the primitive race, and I shall prove this in the sequel when British customs are referred to. On the introduction of Christianity the various customs were either transferred to or reorganised in association with church festivals; but as some of these, such as Easter, are movable feasts, it is difficult to follow the dates.

Regarding both circles and alignments in the light of the orientation theory, we may consider simple circles with a central stone as a collection of sight-lines from the central stone to one or more of the outer ones, or the interval between any two; indicating the place of the rise or setting of either the sun or a star on some particular day of the year, which day, in the case of the sun, will be a new year's day.

Alignments, on the other hand, will play the same part as the sight-lines in the circles.

Sometimes the sight-line may be indicated by a menhir outside, and even at a considerable distance from, the circle; later on tumuli replaced menhirs.

The dolmens have, I am convinced, been in many cases not graves originally, but darkened observing places whence to observe along a sight-line; this would be best done by means of an *allée couverte*, the predecessor of the darkened naos at Stonehenge, shielded by its covered trilithons.

In order to obtain some measurements to test the orientation theory in Britain, I found that Stonehenge is the ancient monument in this country which lends itself to accurate theodolite work better than any other. Mr. Spence's excellent work on astronomical lines at Stenness, where the stones, till some years ago at all events, have been more respected than further south, suggested a beginning there, but the distance from London made it impossible.

Avebury and Stanton Drew are well known to a great many archæologists; there are also other very wonderful stone circles near Keswick and in other parts of England; but unfortunately it is very much more difficult to get astronomical data from these ancient monuments than it is in the case of Stonehenge, one reason being that Stonehenge itself lies high, and the horizon round it in all directions is pretty nearly the same height, so that the important question of the heights of the hills along the sight-line—a matter which is fundamental from an astronomical point of view, although it has been neglected, so far as I can make out, by most who have made observations on these ancient monuments—is quite a simple one at Stonehenge. Hence it was much easier to determine a date there than by working at any of the other ancient remains to which I have referred.

In orientation generally—such orientation as has been dealt with by Mr. Penrose and myself in Egypt and in Greece—the question frequently was a change in direction in the axis of a temple, or the laying down of the axis of a temple, by means of observations of stars. Unfortunately for us as archæologists, not as astronomers, the changes of position of the stars, owing to certain causes, chiefly the precessional movement, are very considerable; so that if a temple pointed to a star in one year, in two or three hundred years it would no longer point to the same star, but to another.

These star observations were requisite in order to warn the priests about an hour before sunrise so that they might prepare for the morning sacrifice which always took place at the first appearance of the sun. Hence the morning star to be visible in the dawn must be a bright one, and the further north or south of the sun's rising place it rose, the more easily it would be seen. Some stars so chosen rose not far from the north point of the horizon. The alignments with small azimuths referred to in the British circles (p. 36) I believe to be connected with the Egyptian and Greek practice.

Acting on a very old tradition, some people from Salisbury and other surrounding places go to observe the sunrise on the longest day of the year at Stonehenge. We therefore are perfectly justified in assuming that it was a solar temple used for observation in the height of midsummer. But at dawn in midsummer in these latitudes the sky is so bright that it is not easy to see stars even if we get up in the morning to look for them; stars, therefore, were not in question, so that some other principle had to be adopted, and that was to point the temple directly to the position on the horizon at which the sun rose on that particular day of the year, and no other.

Now, if there were no change in the position of the sun, that, of course, would go on for ever and ever; but, fortunately for archæologists, there is a slight change in the position of the sun, as there is in the case of a star, but for a different reason; the planes of the ecliptic and of the equator undergo a slight change in the angle included between them. So far as we know, that angle has been gradually getting less for many thousands of years, so that, in the case of Stonehenge, if we wish to determine the date, having no stars to help us, the only thing that we can hope to get any information from is the very slow change of this angle; that, therefore, was the special point which Mr. Penrose and I were anxious to study at Stonehenge, for the reason that we seemed in a position

FIG. 8.—The original tooling of the stone protected from the action of the weather.

to do it there more conveniently than anywhere else in Britain.

But while the astronomical conditions are better at

Stónhenge than elsewhere, the ruined state of the monument makes accurate measurements very difficult.

Great age and the action of weather are responsible for much havoc, so that very many of the stones are now recumbent, as will be gathered from an article

Fig. 9.—View of Stonehenge from the west. *A*, stone which fell in 1900; *BB*, stones which fell in 1797. (Reproduced from an article on the fallen stones by Mr. Lewis in *Man*.)

by Mr. Lewis, who described the condition of the monument in 1901, in *Man*.

Professor Gowland in his excavations at Stonehenge, to which I shall refer in the sequel, found the original tooled surface near the bottom of one of the large sarsens which had been protected from the action of the weather by having been buried in the ground. It enables us to imagine the appearance of the monument as it left the hands of the builders (Fig. 8).

But the real destructive agent has been man himself; savages could not have played more havoc with

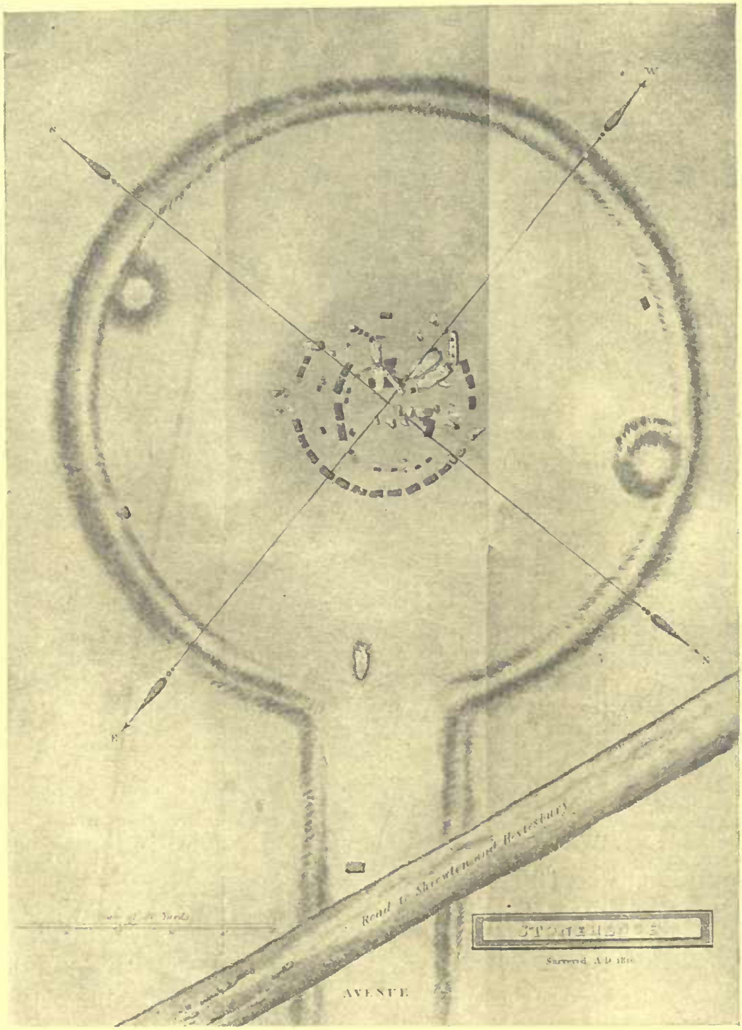

FIG. 10.—Copy of Hoare's plan of 1810, showing the unbroken Vallum and its relation with the Avenue.

the monument than the English who have visited it at different times for different purposes. It is said the fall of one great stone was caused in 1620 by some excavations, but this has been doubted; the fall of another in 1797 was caused by gipsies digging a hole in which to shelter, and boil their kettle; many of the stones have been used for building walls and bridges; masses weighing from 56 lb. downwards have been broken off by hammers or cracked off as a result of fires lighted by excursionists.

It appears that the temenos wall or vallum, which is shown complete in Hoare's plan of 1810, is now broken down in many places by vehicles indiscriminately driven over it. Indeed, its original importance has now become so obliterated that many do not notice it as part of the structure—that, in fact, it bears the same relation to the interior stone circle as the nave of St. Paul's does to the Lady Chapel (Fig. 10).

It is within the knowledge of all interested in archæology that not long ago Sir Edmund Antrobus, the owner of Stonehenge, advised by the famous Wiltshire local society, the Society for the Protection of Ancient Buildings, and the Society of Antiquaries, enclosed the monument in order to preserve it from further wanton destruction, and—a first step in the way of restoration—with the skilled assistance of Prof. Gowland and Messrs. Carruthers, Detmar Blow and Stallybrass, set upright the most important menhir, which threatened to fall or else break off at one of the cracks. This menhir, the so-called "leaning stone," once formed one of the uprights of the trilithon the fall of the other member of which is stated by Mr. Lewis to have occurred before 1574. The latter, broken in two pieces,

FIG. 11.—The Leaning Stone in 1901.

and the supported impost, now lie prostrate across the altar stone.

This piece of work was carried out with consummate skill and care, and most important conclusions, as we shall see in a subsequent chapter, were derived from the minute inquiry into the conditions revealed in the excavations which were necessary for the proper conduct of the work.

Let us hope that we have heard the last of the work of devastators, and even that, before long, some of the other larger stones, now inclined or prostrate, may be set upright.

Since Sir Edmund Antrobus, the present owner, has acted on the advice of the societies I have named to enclose the monument, with a view to guard it from destruction and desecration, he has been assailed on all sides. It is not a little surprising that the "unclimbable wire fence" recommended by the societies in question (the Bishop of Bristol being the president of the Wiltshire society at the time) is by some regarded as a suggestion that the property is not national, the fact being that the nation has not bought the property, and that it has been private property for centuries, and treated in the way we have seen.

Let us hope also that before long the gaps in the vallum may be filled up. These, as I have already stated, take away from the meaning of an important part of one of the most imposing monuments of the world. In the meantime, it is comforting to know that, thanks to what Sir Edmund Antrobus has done, no more stones will be stolen, or broken by sledge-hammers; that fires; that excavations such as were apparently the prime cause of the disastrous fall of one of the majestic trilithons in 1797; that litter, broken bottles and the like, with which too many British sightseers mark their progress, besides much indecent desecration, are things of the past.

If Stonehenge had been built in Italy, or France, or Germany, it would have been in charge of the State long ago.

I now pass from the monument itself to a reference to some of the traditions and historical statements concerning it.

Those who are interested in these matters should thank the Wiltshire Archæological and Natural History Society, which is to be warmly congratulated on its persistent and admirable efforts to do all in its power to enable the whole nation to learn about the venerable monuments of antiquity which it has practically taken under its scientific charge. It has published two most important volumes[1] dealing specially with Stonehenge, including both its traditions and history.

With regard to Mr. Long's memoir, it may be stated that it includes important extracts from notices of Stonehenge from the time of Henry of Huntingdon (twelfth century) to Hoare (1812), and that all extant information is given touching on the questions by whom the stones were erected, whence they came, and what was the object of the structure.

From Mr. Harrison's more recently published bibliography, no reference to Stonehenge by any ancient author, no letter to the *Times* for the last twenty

[1] *The Wiltshire Archaeological and Natural History Magazine:* "Stonehenge and its Barrows." By William Long, M.A., F.S.A. 1876. *The Wiltshire Archaeological and Natural History Magazine:* "Stonehenge Bibliography Number." By W. Jerome Harrison. 1902.

years dealing with any question touching the monuments, seems to be omitted.

It is very sad to read, both in Mr. Long's volume and the bibliography, of the devastation which has been allowed to go on for so many years and of the various forms it has taken.

As almost the whole of the notes which follow deal with the assumption of Stonehenge having been a solar temple, a short reference to the earliest statements concerning this view is desirable; and, again, as the approximate date arrived at by Mr. Penrose and myself in 1901 is an early one, a few words may be added indicating the presence in Britain at that time of a race of men capable of designing and executing such work. I quote from the paper communicated by Mr. Penrose and myself to the Royal Society :—

"As to the first point, Diodorus Siculus (ii., 47, ed. Didot, p. 116) has preserved a statement of Hecatæus in which Stonehenge alone can by any probability be referred to.

"'We think that no one will consider it foreign to our subject to say a word respecting the Hyperboreans.

"'Amongst the writers who have occupied themselves with the mythology of the ancients, Hecatæus and some others tell us that opposite the land of the Celts [ἐν τοῖς ἀντιπέραν τῆς Κελτικῆς τόποις] there exists in the Ocean an island not smaller than Sicily, and which, situated under the constellation of The Bear, is inhabited by the Hyperboreans; so called because they live beyond the point from which the North wind blows. . . . If one may believe the same mythology, Latona was born in

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this island, and for that reason the inhabitants honour Apollo more than any other deity. A sacred enclosure [νῆσον] is dedicated to him in the island, as well as a magnificent circular temple adorned with many rich offerings. . . . The Hyperboreans are in general very friendly to the Greeks.'"

"The Hecatæus above referred to was probably Hecatæus of Abdera, in Thrace, fourth century B.C.; a friend of Alexander the Great. This Hecatæus is said to have written a history of the Hyperboreans: that it was Hecatæus of Miletus, an historian of the sixth century B.C., is less likely.

"As to the second point, although we cannot go so far back in evidence of the power and civilisation of the Britons, there is an argument of some value to be drawn from the fine character of the coinage issued by British kings early in the second century B.C., and from the statement of Julius Cæsar ('De Bello Gallico,' vi., c. 14) that in the schools of the Druids the subjects taught included the movements of the stars, the size of the earth, and the nature of things (multa præterea de sideribus et eorum motu, de mundi magnitudine, de rerum natura, de deorum immortalium vi ac potestate disputant et juventuti tradunt).

"Studies of such a character seem quite consistent with, and to demand, a long antecedent period of civilisation."

Henry of Huntingdon is the first English writer to refer to Stonehenge, which he calls Stanenges. Geoffrey of Monmouth (1138) and Giraldus Cambrensis come next.

In 1771, Dr. John Smith, in a work entitled "Choir Gawr, the Grand Orrery of the Ancient Druids, called

Stonehenge, Astronomically Explained, and proved to be a Temple for Observing the Motions of the Heavenly Bodies," wrote as follows:—

"From many and repeated visits, I conceived it to be an astronomical temple; and from what I could recollect to have read of it, no author had as yet investigated its uses. Without an instrument or any assistance whatever, but White's 'Ephemeris,' I began my survey. I suspected the stone called *The Friar's Heel* to be the index that would disclose the uses of this structure; nor was I deceived. This stone stands in a right line with the centre of the temple, pointing to the north-east. I first drew a circle round the vallum of the ditch and divided it into 360 equal parts; and then a right line through the body of the temple to the Friar's Heel; at the intersection of these lines I reckoned the sun's greatest amplitude at the summer solstice, in this latitude, to be about 60 degrees, and fixed the eastern points accordingly. Pursuing this plan, I soon discovered the uses of all the detached stones, as well as those that formed the body of the temple."

With regard to this "Choir Gawr," translated Chorea Gigantum, Leland's opinion is quoted (Long, p. 51) that we should read Choir vawr, the equivalent of which is Chorea nobilis or magna.[1]

In spite of Inigo Jones's (1600) dictum that Stonehenge was of Roman origin, Stukeley came to the conclusion in 1723 that the Druids were responsible for

[1] Mr. Morien Morgan informs me that Cor y Gawres is correct, and means Choir of the Giantess Cariadwen, the Welsh Neith, Nyth (Nydd).

its building; and Halley, who visited it in 1720—probably with Stukeley—concluded from the weathering of the stones that it was at least 3000 years old; if he only had taken his theodolite with him, how much his interest in the monument would have been increased!

CHAPTER VI

GENERAL ARCHITECTURE OF STONEHENGE

Although I have before hinted that the astronomical use of the Egyptian temples and British circles was the same, there is at first sight a vast difference in the general plan of structure.

This has chiefly depended upon the fact that the riches and population of ancient Egypt were so great that that people could afford to build a temple to a particular star, or to the sun's position on any particular day of the year. The temple axis along the line pointing to the celestial body involved, then became the chief feature, and tens of years were spent in lengthening, constricting and embellishing it.

From one end of an Egyptian temple to the other we find the axis marked out by narrow apertures in the various pylons, and many walls with doors crossing the axis. There are seventeen or eighteen of these apertures in the solar temple of Amen-Rā at Karnak, limiting the light which falls into the Holy of Holies or Sanctuary. This construction gives one a very definite impression that every part of the temple was built to subserve a special object, viz., to limit the sunlight which fell on its front into a narrow beam,

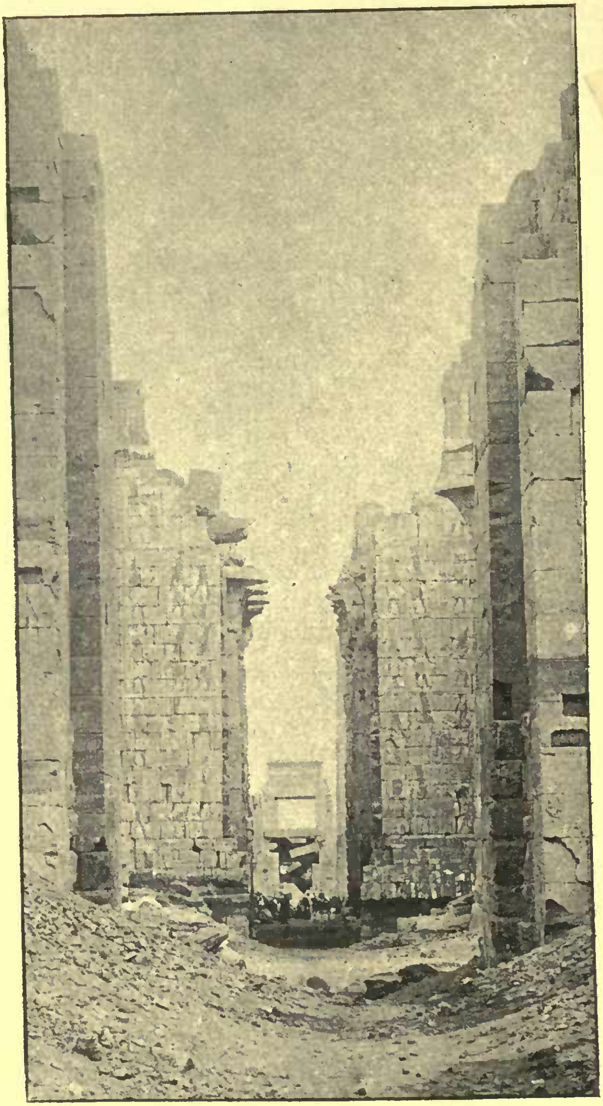

FIG. 12.—The axis of the Temple of Karnak, looking south-east, from outside the north-west pylon (from a photograph by the author).

and to carry it to the other extremity of the temple —into the sanctuary, where the high priest performed his functions. The sanctuary was always blocked. There is no case in which the beam of light can pass absolutely through a temple (Figs. 12 and 13).

In Britain the case was different, there was neither skill nor workers sufficient to erect such stately piles, and as a consequence one structure had to do the work of several and it had to be done in the most economical way. Hence the circle with the observer at the centre and practically a temple axis in every direction among which could be chosen the chief directions required, each alignment being defined by stones, more or less distant, or openings in the circle itself.

Now for some particulars with regard to those parts of Stonehenge which lend themselves to the inquiry.

The main architecture of Stonehenge consisted of an external circle of about 100 feet in diameter, composed of thirty large upright stones, named sarsens, connected by continuous lintels. The upright stones formerly stood 14 feet above the surface of the ground. They have nobs or tenons on the top which fit into mortice holes in the lintels. Within this peristyle there was originally an inner structure of ten still larger upright stones, arranged in the shape of a horseshoe, formed by five isolated trilithons which rose progressively from N.E. to S.W., the loftiest stones being 25 feet above the ground. About one-half of these uprights have fallen, and a still greater number of the imposts which they originally carried.

There is also another circle of smaller upright stones, respecting which the only point requiring notice now is that none of them would have interrupted the line of the axis of the avenue. The circular temple was also

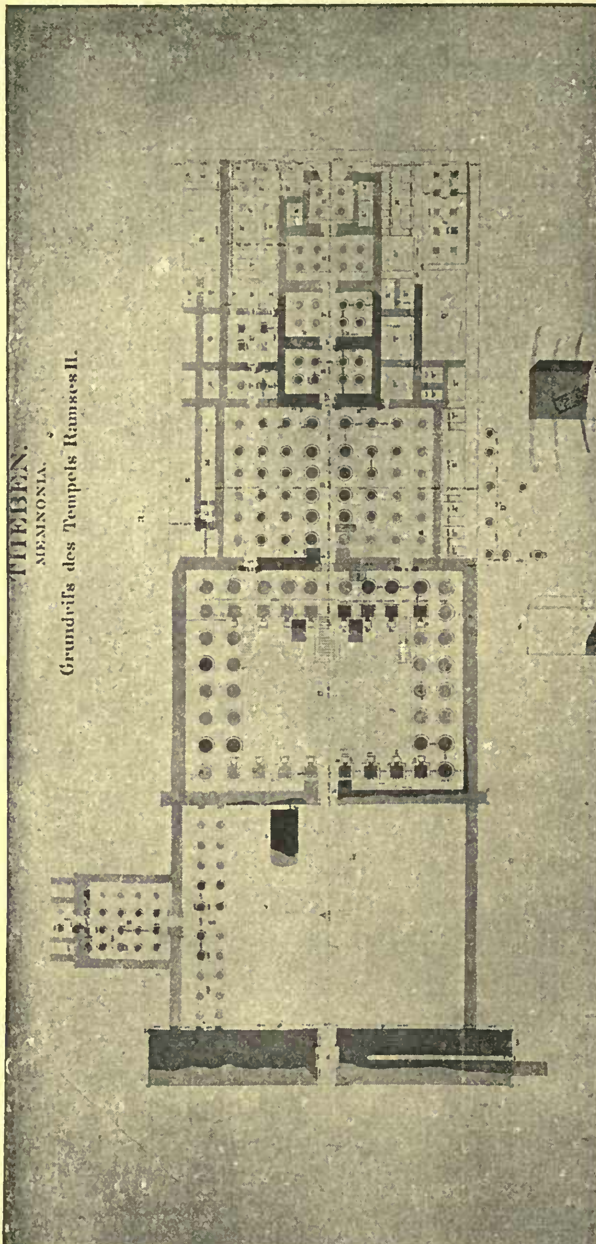

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Fig. 13.—Plan of the Temple of Ramses II. in the Memnonia at Thebes ple
Lepsius), showing the pylon at the open end, the various doors al
axis, the sanctuary at the closed end, and the temple at right angl med

surrounded by the earthen bank, shown in Fig. 15, o 61
about 300 feet in diameter, interrupted towards the ur-

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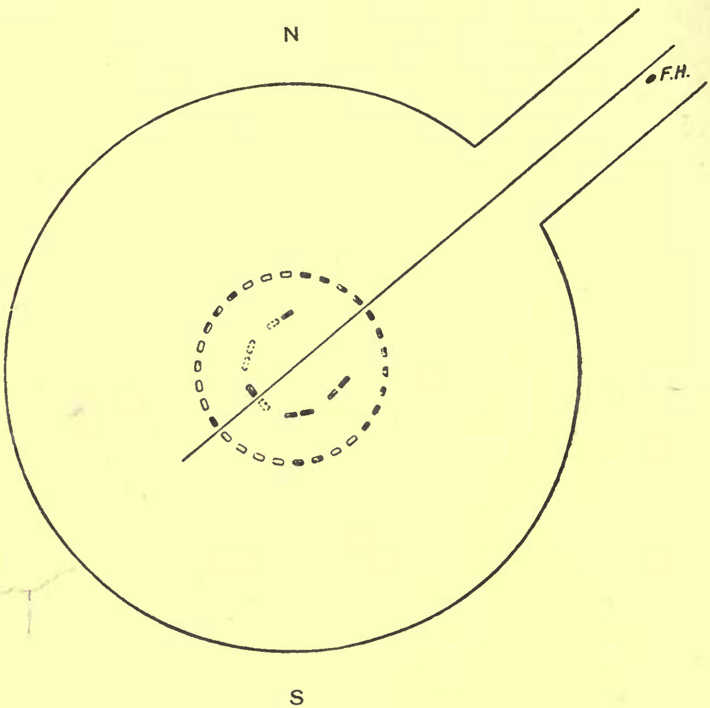
north-east by receiving into itself the banks formin of
avenue before mentioned, which is about 50 feet acr

Vithin this avenue, no doubt an old *via sacra*, and ooking north-east from the centre of the temple, at bout 250 feet distance and considerably to the right and of the axis, stands an isolated stone, which from mediæval legend has been named the Friar's Heel.



. 15.—General plan; the outer circle, naos and avenue of Stonehenge. *F.H.* = Friar's Heel.

e axis passes very nearly centrally through an olumniation (so to call it) between two uprights external circle and between the uprights of the nmost trilithon as it originally stood. Of this on the southernmost upright with the lintel e fell in 1620, but the companion survived as the leaning stone which formed a conspicuous and picturesque object for many years, but happily now restored to its original more dignified and safer condition of verticality. The inclination of this stone, however, took place in the direction of the axis of the avenue, and as the distance between it and its original companion is known both by the analogy of the two perfect trilithons and by the measure of the mortice holes on the lintel they formerly supported, we obtain by bisection the distance, 11 inches, from its edge, of a point in the continuation of the central axis of the avenue and temple.

The banks which form the avenue have suffered much degradation. It appears from Sir Richard Colt Hoare's account that at the beginning of the last century they were distinguishable for a much greater distance than at present, but they are still discernible, especially on the northern side, for more than 1300 feet from the centre of the temple, and particularly the line of the bottom of the ditch from which the earth was taken to form the bank, and which runs parallel to it.

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CHAPTER VII

ASTRONOMICAL OBSERVATIONS AT STONEHENGE IN 1901 [1]

An investigation was undertaken by Mr. Penrose and myself in the spring of 1901, as a sequel to analogous work in Egypt and Greece, with a view to determine whether the orientation theory could throw any light upon the date of the foundation of Stonehenge, concerning which authorities vary in their estimates by some thousands of years. Ours was not the first attempt to obtain the date of Stonehenge by means of astronomical considerations. In Mr. Godfrey Higgins' work [2] he refers to a method of attack connected with precession. This furnished him with the date 4000 B.C.

More recently, Prof. W. M. Flinders Petrie,[3] whose plan of the stones is a valuable contribution to the study of Stonehenge, was led by his measures of the orientation to a date very greatly in the opposite direction, but, owing to an error in his application of the change of obliquity, clearly a mistaken one.

The chief astronomical evidence in favour of the

[1] This chapter and the end of the previous one are mainly based the paper communicated by Mr. Penrose and myself to the Royal ety (see *Proceedings, Royal Society*, vol. 69, p. 137 *et seq.*).

The Celtic Druids. 4to. London. 1827.

Stonehenge, &c. 1880.

solar temple theory lies in the fact that the "avenue," as it is called, formed by two ancient earthen banks, extends for a considerable distance from the structure, in the general direction of the sunrise at the summer solstice, precisely in the same way as in Egypt a long avenue of sphinxes indicates the principal outlook of a temple.

These earthen banks defining the avenue do not exist alone. As will be seen from the sketch plan (Fig. 15), there is a general common line of direction for the avenue and the principal axis of the structure; and the general design of the building, together with the position and shape of the naos, indicates a close connection of the whole temple structure with the direction of the avenue. There may have been other pylon and screen equivalents as in other ancient temples, which have disappeared, the object being to confine the illumination to a small part of the naos. There can be little doubt, also, that the temple was originally roofed in, and that the sun's first ray, suddenly shining into the darkness, formed a fundamental part of the cultus.

With regard to the question of the roof, however, the above suggestion, I now find, is not new, the view having been held by no less an authority than Dr. Thurnham, who apparently was led to it by the representations of the Scandinavian temples as covered and enclosed structures.

Since the actual observation of sunrise was doubtless made within the sanctuary itself, we seem justified in taking the orientation of the axis to be the same as that of the avenue, and since in the present state of the S.W. trilithon the direction of the avenue can probably be determined with greater accuracy than that of the temple axis itself, the estimate of date must be based upon the orientation of the avenue. Further evidence will be given, however, to show that the direction of the axis of the temple, so far as it can now be determined, is sufficiently accordant with the direction of the avenue.

The orientation of this avenue may be examined upon the same principles that have been found successful in the case of Greek and Egyptian temples—that is, on the assumption that Stonehenge was a solar temple, and that the greatest function took place at sunrise on the longest day of the year. This not only had a religious motive; it had also the economic value of marking officially and distinctly that time of the year and the beginning of an annual period.

It is, indeed, possible that the present structure may have had other capabilities, such as being connected with the May year, the equinoxes or the winter solstice; but it is with its uses at the summer solstice alone that we now deal.

There is a difference in treatment between the observations required for Stonehenge and those which are available for Greek or Egyptian solar temples. In the case of the latter, the effect of the precession of the equinoxes upon the stars, which as warning clock stars were almost invariably connected with those temples, offers the best measure of the dates of foundation; but in Britain, owing to the brightness of the dawn at the summer solstice, such a star could not have been employed, so that we can rely only on the secular change of the obliquity as affecting the azimuth of the point of sunrise. This requires the measurements to be taken with very great precision, and as the azimuth of the place of sunrise varies with the latitude, and as a datum point on the horizon in a known position was also required, Colonel Johnston, R.E., the Director-General of the Ordnance Survey, was asked for and obligingly supplied the following particulars:

Centre of stone circle, Stonehenge	Lat.	51° 10′ 42″
	Long. W.	1 49 29
Centre of spire, Salisbury Cathedral... ...	Lat.	51° 3′ 52″
	Long.	1 47 45

The real point was to determine the direction of so-called avenue. Measurements taken from the line of the bottom of the ditch assisted materially those taken from the crown of the bank itself. With this help and by using the southern bank and ditch whenever it admitted of recognition, a fair estimate of the central line could be arrived at. To verify this, two pegs were placed at points 140 feet apart along the line near the commencement of the avenue, and four others at distances averaging 100 feet apart nearer the further recognisable extremity, and their directions were measured with the theodolite, independently by two observers, the reference point being Salisbury Spire, of which the exact bearing had been communicated by Colonel Johnston.

This bearing was also measured locally by observations of the Sun and of Polaris, the mean of which differed by less than 20″ from the Ordnance value. The resulting observations gave for the axis of the avenue nearest the commencement an azimuth of 49° 38′ 48″, and for that of the more distant part

49° 32′ 54″. The mean of these two lines drawn from the central interval of the great trilithon, already referred to, passes between two of the sarsens of the exterior circle, which have an opening of about 4 feet, within a few inches of their middle point, the deviation being northwards. This may be considered to prove the close coincidence of the original axis of the temple with the direction of the avenue.

This value of the azimuth, the mean of which is 49° 35′ 51″, is confirmed by the information, also ·pplied from the Ordnance Survey, that from the ıtre of the temple, the bearing to the N.E. of the principal bench mark on a hill, about 8 miles distant, the bench mark being very near a well-known ancient fortified British encampment named Silbury or Sidbury, is 49° 34′ 18″; and that the same line continued through Stonehenge, to the south-west, strikes another ancient fortification, namely, Grovely Castle, about 6 miles distant, and at practically the same azimuth, viz., 49° 35′ 51″. For the above reasons 49° 34′ 18″ has been adopted for the azimuth of the avenue.

The summer solstice sunrise in 1901 was also watched for by Mr. Howard Payn on five successive mornings, viz., June 21 to 25, and was successfully observed on the last occasion. As soon as the Sun's limb was sufficiently above the horizon for its bisection to be well measured, it was found to be 8′ 40″ northwards of the peak of the Friar's Heel, which was used as the reference point; the altitude of the horizon being 35′ 48″. The azimuth of this peak from the point of observation had been previously ascertained to be 50° 39′ 5″, giving for that of the Sun when measured, 50°

30′ 25″; by calculation that of the Sun, with the limb 2′ above the horizon, should be 50° 30′ 54″. This observation was therefore completely in accordance with the results which had been obtained otherwise.

The time which would elapse between geometrical sunrise, that is, with the upper limb tangential with the horizon, and that which is here supposed, would be about 17 seconds, and the difference of azimuth would be 3′ 15″.

The remaining point was to find what value should be given to the Sun's declination when it appeared showing itself 2′ above the horizon, the azimuth being 49° 34′ 18″.

The data obtained for the determination of the required epoch were as follows:—

(1.) The elevation of the local horizon at the sunrise point seen by a man standing between the uprights of the great trilithon (a distance of about 8000 feet) is about 35′ 30″, and 2′ additional for Sun's upper limb makes 37′ 30″.

(2.) − Refraction + parallax, 27′ 20″.

(3.) Sun's semi-diameter, allowance being made for greater eccentricity than at present, 15′ 45″.

(4.) Sun's azimuth, 49° 34′ 18″, and N. latitude, 51° 10′ 42″.

From the above data the Sun's declination works out 23° 54′ 30″ N., and by Stockwell's tables of the obliquity, which are based upon modern determinations of the elements of the solar system,[1] the date is found to be 1680 B.C.

It is to be understood that on account of the slight uncertainty as to the original line of observation and the

[1] *Smithsonian Contributions to Knowledge*, vol. xviii. No. 232, table 9. Washington. 1873. For curve, see page 130.

very slow rate of change in the obliquity of the ecliptic, the date thus derived may possibly be in error by 200 years more or less; this gives us a date of construction lying between say 1900 and 1500 B.C.

In this investigation the so-called Friar's Heel was used only as a convenient point for reference and verification in measurement, and no theory was formed as to its purpose. It is placed at some distance, as before mentioned, to the south of the axis of the avenue, so that at the date arrived at for the erection of the temple the Sun must have completely risen before it was vertically over the summit of the stone. It may be remarked, further, that more than 500 years must yet elapse before such a coincidence can take place at the beginning of sunrise.

In an Appendix certain details of the observations are given.

In the next chapter I propose to show that an independent archæological inquiry carried out, in a most complete and admirable way, just after Mr. Penrose and myself had obtained our conclusion, entirely corroborates the date at which we had arrived.

CHAPTER VIII

ARCHÆOLOGICAL OBSERVATIONS AT STONEHENGE, 1901

Soon after Mr. Penrose and myself had made our astronomical survey of Stonehenge in 1901, some archæological results of the highest importance were obtained by Professor Gowland. The operations which secured them were designed and carried out in order to re-erect the leaning stone which threatened to fall, a piece of work recommended to Sir Edmund Antrobus by the Society of Antiquaries of London and other learned bodies, and conducted at his desire and expense.

They were necessarily on a large scale, for the great monolith, "the leaning stone," is the largest in England, the Rudston monolith excepted. It stood behind the altar stone, over which it leant at an angle of 65 degrees, resting at one point against a small stone of syenite. Half-way up it had a fracture one-third across it; the weight of stone above this fracture was a dangerous strain on it, so that both powerful machinery and great care and precautions had to be used. Professor Gowland was charged by the Society of Antiquaries with the conduct of the excavations necessary in the work. The engineering operations were planned by Mr. Carruthers, and Mr. Detmar Blow was responsible for the local super-

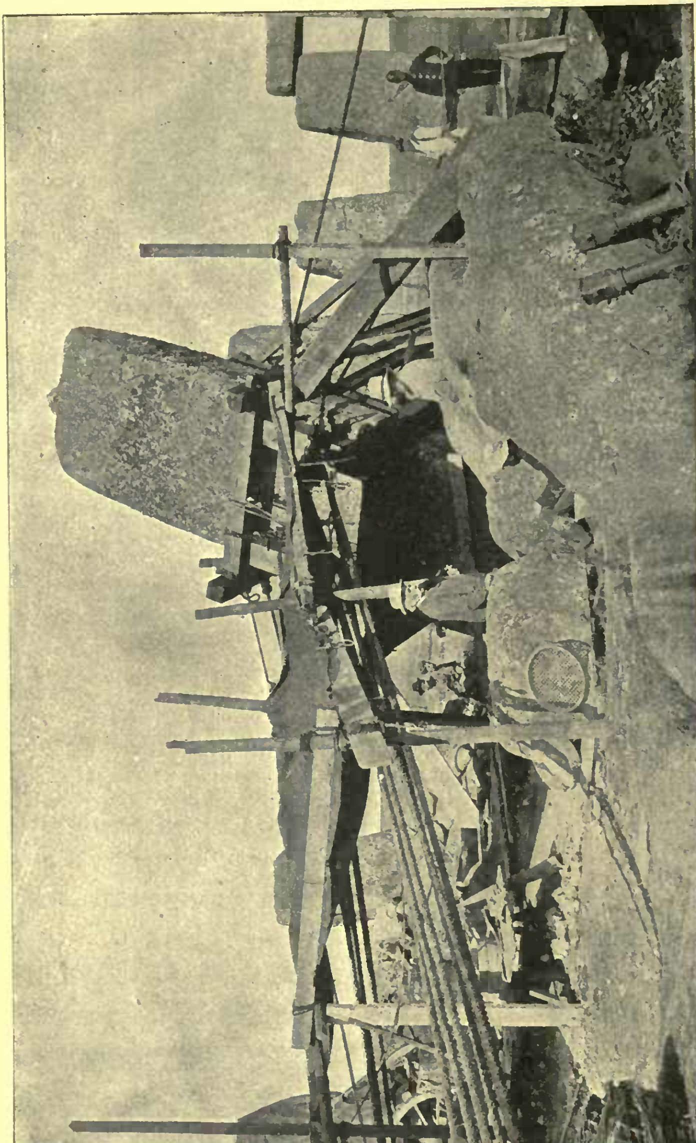

FIG. 16.—The arrangements for raising the stone, looking north-east.

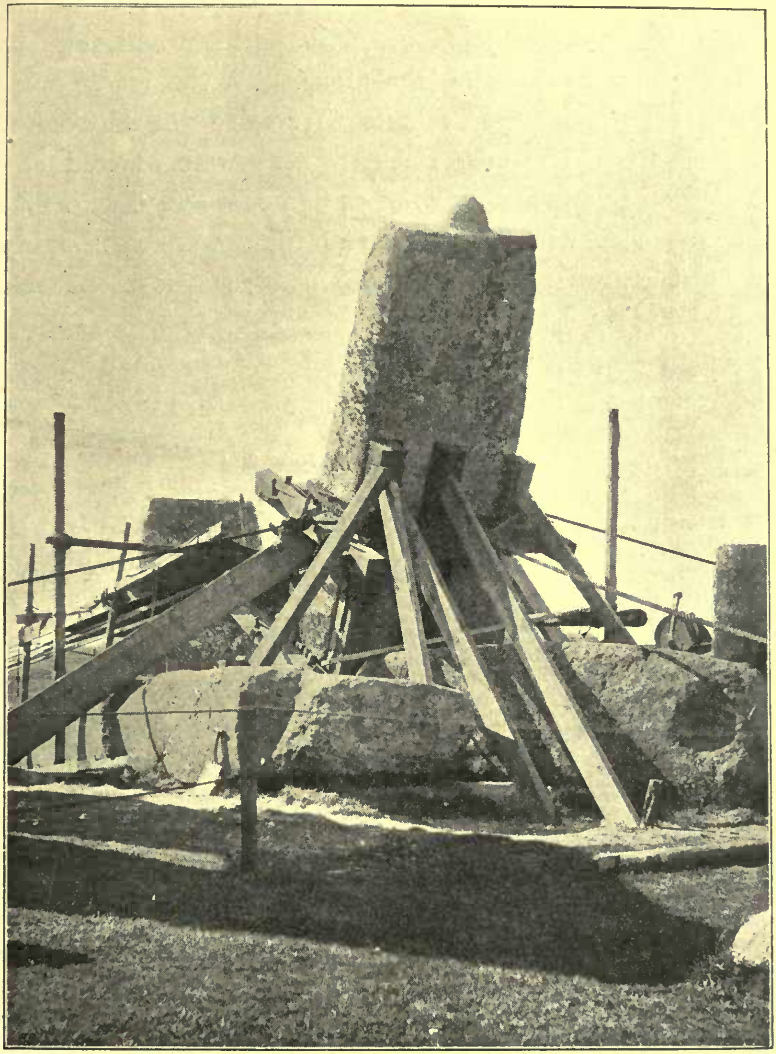

Fig. 17.—The cradle and supports, looking west.

intendence. Mr. Blow thus describes the arrangements (*Journal* Institute of British Architects, 3rd series, ix., January, 1902):—

"A strong cradle of 12-inch square baulks of timber was bolted round the stone, with packing and felt, to prevent any marking of the stone. To the cradle were fixed two 1-inch steel eyebolts to receive the blocks for two six-folds of 6-inch ropes. These were secured and wound on to two strong winches fifty feet away, with four men at each winch. When the ropes were thoroughly tight, the first excavation was made as the stone was raised on its west side."

The method employed by Professor Gowland in the excavation should be a model for all future work of the kind.

Above each space to be excavated was placed a frame of wood, bearing on its long sides the letters A to H, and on its short sides the letters R M L, each letter being on a line one foot distant from the next. By this means the area to be excavated was divided into squares each having the dimension of a square foot. A long rod divided into 6-inch spaces, numbered from 1 to 16, was also provided for indicating the depth from the datum line of anything found. In this way a letter on the long sides of the frame, together with one on the short sides, and a number on the vertical rod, indicated the position of any object found in any part of the excavation.

Excavations were necessary because to secure the stone for the future the whole of the adjacent soil had to be removed down to the rock level, so that it could be replaced by concrete.

All results were registered by Professor Gowland in relation to a datum line 337·4 feet above sea level. The material was removed in buckets, and carefully sifted through a series of sieves 1-inch, $\frac{1}{2}$-inch, $\frac{1}{4}$-inch, and

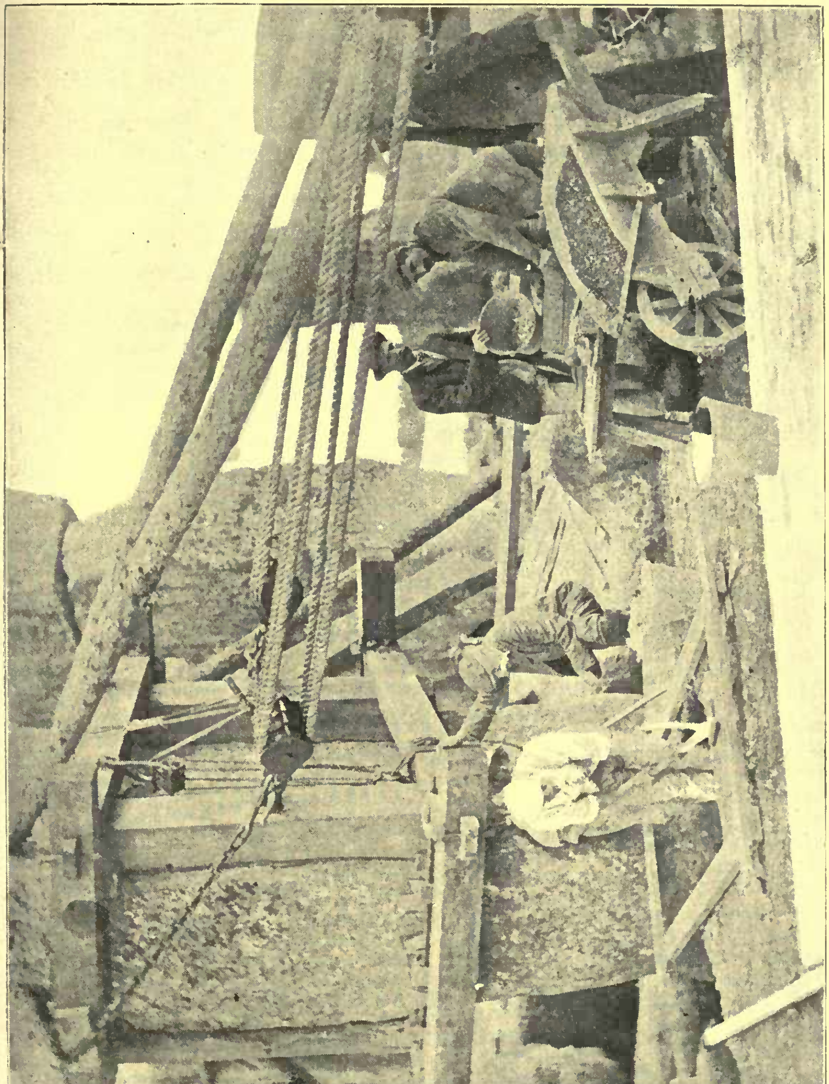

FIG. 18.—The frame used to locate the finds.

$\frac{1}{8}$-inch mesh, in order that the smallest object might not be overlooked.

From the exhaustive account of his work given by Professor Gowland to the Society of Antiquaries (*Archaeologia*, lviii.), I gather three results of the highest importance from the point of view I am considering. These were, first, the finding of an enormous number of implements; secondly, the disposition and relative quantities of the chippings of the sarsen and blue stones; and thirdly, the discovery of the method by which the stones were originally erected.

I will take the implements first. This, in a condensed form, is what Professor Gowland says about them:—

More than a hundred flint implements were found, and the greater number occurred in the stratum of chalk rubble which either directly overlaid or was on a level with the bed rock. They may all be arranged generally in the following classes:—

Class I.—Axes roughly chipped and of rude forms, but having well-defined, more or less sharp cutting edges.

Class II.—Hammerstones, with more or less well-chipped, sharp curved edges. Most may be correctly termed hammer-axes. They are chipped to an edge at one end, but at the other are broad and thick, and in many examples terminated there by a more or less flat surface. In some the natural coating of the flint is left untouched at the thick end.

Class III.—Hammerstones, more or less rounded. Some specimens appear to have once had distinct working edges, but they are now much blunted and battered by use.

In addition to the above flint implements were found about thirty hammerstones, consisting of large pebbles or small boulders of the hard quartzite variety of sarsen. Some have been roughly broken into convenient forms for holding in the hand, whilst a few have been rudely trimmed into more regular shapes. They vary in weight from about a pound up to six and a half pounds. To these we have to add mauls, a more remarkable kind of hammerstone than those just enumerated. They are ponderous boulders of the quartzite variety of sarsen with their broadest sides more or less flat. Their weights range from about 40 lb. to 64 lb.

How came these flints and stones where they were found? Prof. Gowland gives an answer which everybody will accept. The implements must be regarded as the discarded tools of the builders of Stonehenge, dumped down into the holes as they became unfit for use, and, in fact, used to pack the monoliths as they were erected. We read :—"Dealing with the cavity occupied by No. 55 before its fall, the mauls were found wedged in below the front of its base to act together with the large blocks of sarsen as supports" (p. 54). Nearly all bear evidence of extremely rough usage, their edges being jagged and broken, just as we should expect to find after such rough employment. We evidently have to deal with builders doing their work in the Stone and not in the Bronze age. But was the age Palæolithic or Neolithic?

Prof. Gowland writes :—

"Perhaps the most striking features of the flint implements is their extreme rudeness, and that there is not a single ground or polished specimen among them. This, at first sight and without due consideration, might be taken to indicate an extremely remote age. But in this connection it must be borne in mind that in the building of such a stupendous structure as Stonehenge, the tools required must have been numbered by thousands. The work, too, was of the roughest character, and for such only rude tools were required. The highly finished and polished implements which we are accustomed to consider, and rightly so, as characteristic of Neolithic man, would find no place in such work. They required too much labour and time for their manufacture, and, when made, could not have been more effective than the hammer-axes and hammer-stones found in the excavations, which could be so easily fashioned by merely rudely shaping the natural flints, with which the district abounds, by a few well directed blows of a sarsen pebble."

On this ground Prof. Gowland is of opinion that, notwithstanding their rudeness, they may be legitimately ascribed to the Neolithic age, and, it may be, near its termination, that is, before the Bronze age, the commencement of which has been placed at 1400 B.C. by Sir John Evans for Britain, though he is inclined to think that estimate too low, and 2000 B.C. by Montelius for Italy.

Prof. Gowland guardedly writes:—

"The occurrence of stone tools does not alone prove with absolute certainty that Stonehenge belongs to the Neolithic age, although it affords a strong presumption in favour of that view. But, and this is important, had bronze been in general or even moderately exten-

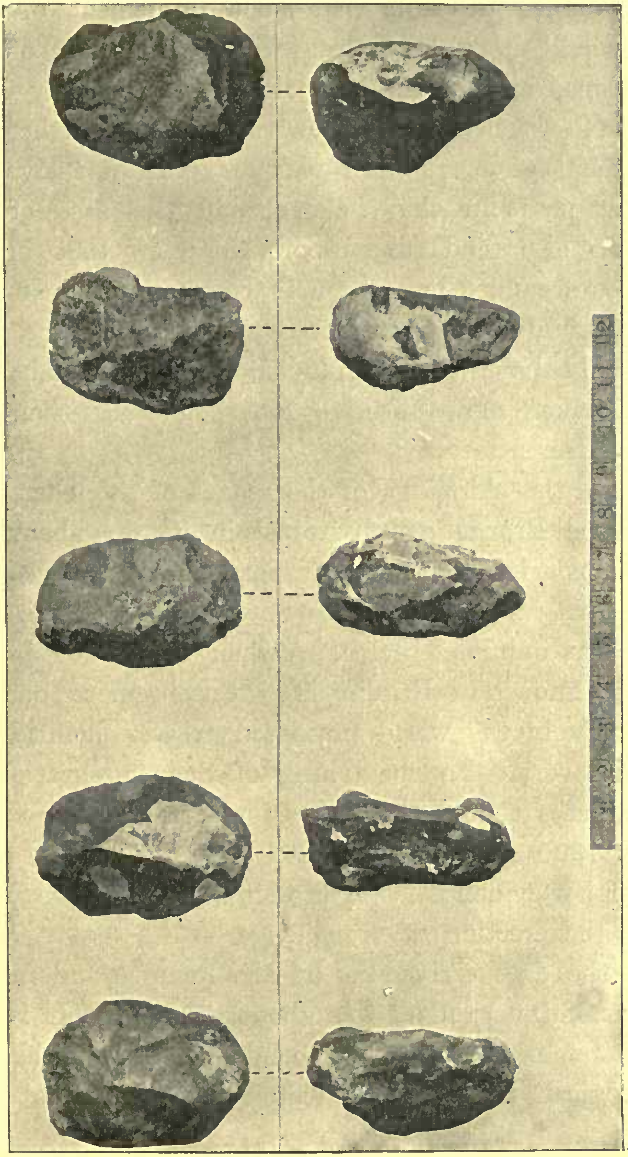

FIG. 19.—Some of the Flint Implements.

sive use when the stones were set up, it is in the highest degree probable that some implement of that metal would have been lost within the area of the excavations, and if so lost, it would certainly have been found together with the stone tools. Further, the employment of deer's horn picks for the extensive excavations made in the chalk around the base of the monoliths also tends to support the view that bronze implements cannot have been in common use. If they had it would seem not unreasonable to assume that they would have been employed, as they would have been so much more effective for such work than the picks of deer's horn.

"Again, the chippings of the stones of Stonehenge in two of the Bronze age barrows[1] in its neighbourhood show that it is of earlier date than they."

And finally:—

"In my opinion, the date when copper or bronze was first known in Britain is a very remote one, as no country in the world presented greater facilities for their discovery. The beginning of their application to practical uses should, I think, be placed at least as far back as 1800 B.C., and that date I am inclined to give, until further evidence is forthcoming, as the approximate date of the erection of Stonehenge."

Now the date arrived at by Mr. Penrose and myself on astronomical grounds was about 1700 B.C. It is not a little remarkable that independent astronomical and archæological inquiries conducted in the same year

[1] Sir Richard Colt Hoare, *Ancient History of South Wiltshire*, p. 127. (London, 1812); W. Stukeley, *Stonehenge*, p. 46. (London, 1740).

should have come so nearly to the same conclusion. If a general agreement be arrived at regarding it, we have a firm basis for the study of other similar ancient monuments in this country.

I have previously in this book referred to the fact that the trilithons of the naos and the stones of the outer circle are all built up of so-called "sarsen" stones. To describe their geological character, I cannot do better than quote, from Mr. Cunnington's "Geology of Stonehenge,"[1] their origin according to Prestwich.

"Among the *Lower Tertiaries* (the Eocene of Sir Charles Lyell) are certain sands and mottled clays, named by Mr. Prestwich the Woolwich and Reading beds, from their being largely developed at these places, and from these he proves the sarsens to have been derived; although they are seldom found *in situ*, owing to the destruction of the stratum to which they belonged. They are large *masses of sand concreted together* by a siliceous cement, and when the looser portions of the stratum were washed away, the blocks of sandy rocks were left scattered over the surface of the ground.

"At Standen, near Hungerford, large masses of sarsen are found, consisting almost *entirely* of flints, formed into conglomerate with the sand. Flints are also common in some of the large stones forming the ancient temple of Avebury.

"The abundance of these remains, especially in some of the valleys of North Wilts, is very remarkable. Few persons who have not seen them can form an adequate

[1] *Wilts Archaeological and Natural History Magazine*, xxi. pp. 141–149.

idea of the extraordinary scene presented to the eye of the spectator, who standing on the brow of one of the hills near Clatford, sees stretching for miles before him, countless numbers of these enormous stones, occupying the middle of the valley, and winding like a mighty stream towards the south."

These stones, then, may be regarded as closely associated with the local geology.

The exact nature of the stones, called "blue stones," can best be gathered from a valuable "Note" by Prof. Judd which accompanies Prof. Gowland's paper. These blue stones are entirely unconnected with the local geology; they must, therefore, represent boulders of the Glacial drift, or they must have been brought by man, from distant localities. Prof. Judd inclines to the first opinion.

The distinction between these two kinds of stone are well shown by Prof. Gowland:—

"The large monoliths of the outer circle, and the trilithons of the horse-shoe are all sarsens. [See general plan, Fig. 15.] These sarsens in their composition are sandstones, consisting of quartz-sand, either fine or coarse, occasionally mixed with pebbles and angular bits of flint, all more or less firmly cemented together with silica. They are the relics of the concretionary masses which had become consolidated in the sandstone beds that once overlaid the chalk of the district, and had resisted the destructive agencies by which the softer parts of the beds were removed in geological times. They range in structure from a granular rock resembling loaf sugar in internal appearance to one of great compactness similar to and sometimes passing into quartzite.

"The monoliths and trilithons all consist of the granular rock. The examples of the compact quartzite variety, of which many were found in the excavations, were almost without exception either hammerstones that had been used in shaping and dressing the monoliths, or fragments which had been broken from off them in these operations.

"The small monoliths, the so-called 'blue stones,' which form the inner circle and the inner horse-shoe, are, with the undermentioned exceptions, all of diabase more or less porphyritic. Two are porphyrite (formerly known as felstone or hornstone). Two are argillaceous sandstone.

"Mr. William Cunnington, in his valuable paper, 'Stonehenge Notes,' records the discovery of two stumps of 'blue stones' now covered by the turf. One of these lies in the inner horseshoe between Nos. 61 and 62, and 9 feet distant from the latter. It is diabase. The other is in the inner circle between Nos. 32 and 33, 10 feet from the former, and consists of a soft calcareous altered tuff, afterwards designated for the sake of brevity fissile rock.

"The altar stone is of micaceous sandstone."

I now come to the second point, to which I shall return in the next chapter.

In studying the material obtained from the excavations, it was found in almost every case that the number of chippings and fragments of blue stone largely exceeded that of the sarsens; more than this, diabase (blue stone) and sarsen were found together in the layer overlying the solid chalk (p. 15). Chippings of diabase were the most abundant, but there were few large pieces of it. Sarsen, on the other hand, occurred most abundantly in lumps (p. 20); very few small chips of

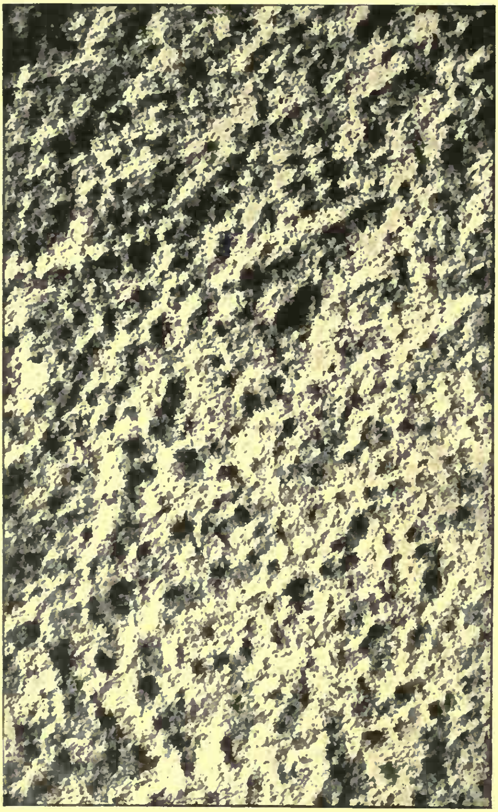

Fig. 20.—Showing the careful tooling of the Sarsens.

sarsen were found (p. 42). Hence Prof. Gowland is of opinion that the sarsen blocks were roughly hewn where they were found (p. 40); the local tooling, executed with the small quartzite hammers and mauls, would produce not chips but dust.

Finally, I reach the third point of importance from the present standpoint; the excavations produced clear evidence touching the mode of erection. Prof. Gowland's memoir deals only with the leaning stone, but I take

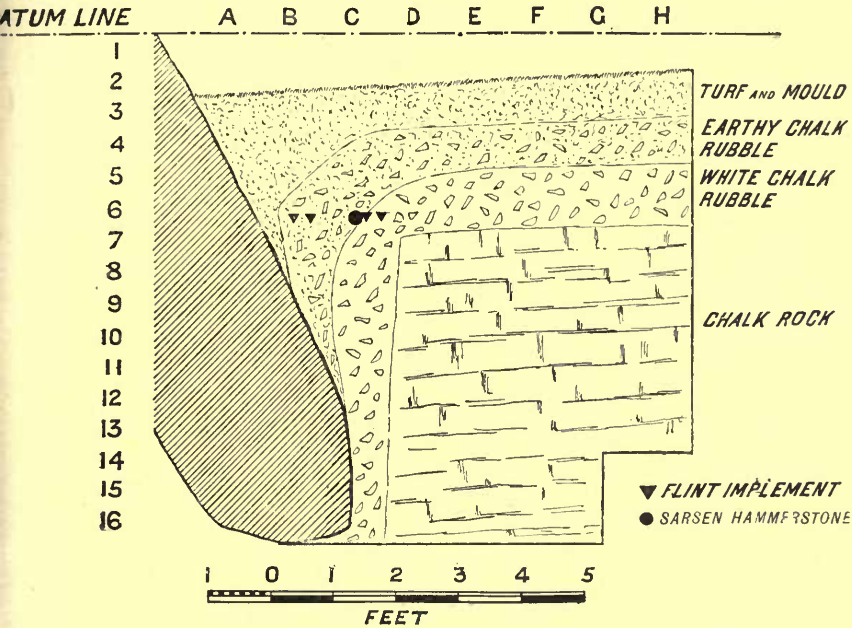

FIG. 21.—Face of rock against which a stone was made to rest.

it for granted that the same method was employed throughout: the method was this.

(1) The ground in the site a stone was to occupy was removed, the chalk rock being cut into in such a manner as to leave a ledge, on which the base of the stone was to rest, *and a perpendicular face rising from it, against which as a buttress* one side would bear when set up. From the bottom of this hole an inclined plane was cut to the surface down which the monolith which

had already been dressed was slid until its base rested on the ledge.

(2) It was then gradually raised into a vertical position by means first of levers and afterwards of ropes. The levers would be long trunks of trees, to one end of which a number of ropes was attached (this method is still employed in Japan); so that the weights and pulling force of many men might be exerted on them. The stronger ropes were probably of hide or hair, but others of straw, or of withes of hazel or willow, may have been in use for minor purposes.

(3) As the stone was raised, it was packed up with logs of timber and probably also with blocks of stone placed beneath it.

(4) After its upper end had reached a certain elevation, ropes were attached to it, and it was then hauled by numerous men into a vertical position, *so that its back rested against the perpendicular face of the chalk which had been prepared for it.* During this part of the operation, struts of timber would probably be placed against its sides to guard against slip, a precaution taken when the leaning stone was raised and until the foundation was properly set.

As regards the raising of the lintels, and imposts, and the placing of them on the tops of the uprights, there would be even less difficulty than in the erection of the uprights themselves.

It could be easily effected by the simple method practised in Japan for placing heavy blocks of stone in position. The stone, when lying on the ground, would be raised a little at one end by means of long wooden levers. A packing of logs would then be placed under

FIG. 22.—The leaning stone upright before the struts were removed.

the end so raised, the other extremity of the stone would be similarly raised and packed, and the raising and packing at alternate ends would be continued

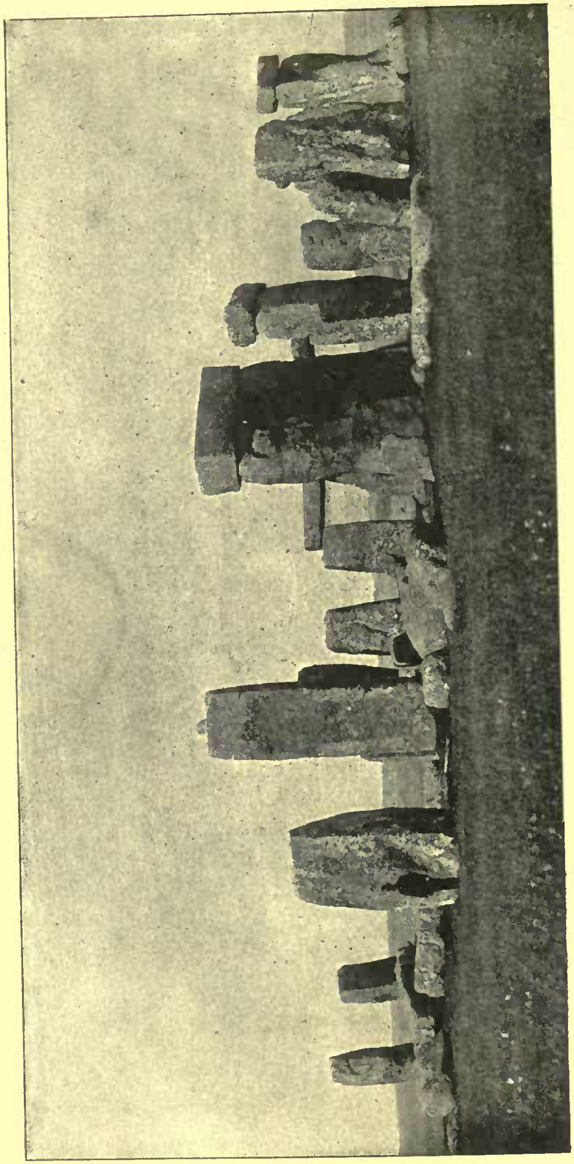

Fig. 23.—Stonehenge, 1905.

until the block had gradually reached the height of the uprights. It would then be simply pushed forward by levers until it rested upon them.

It is not often that an engineering operation has been made so subservient to the interests of science as the one we have dealt with in this chapter. It is satisfactory to know not only that much new knowledge has been acquired by Professor Gowland and his coadjutors, but that the famous leaning stone has now been set upright in such fashion that it will remain upright for hundreds of years. May the other leaning stones soon receive the same treatment.

CHAPTER IX

WAS THERE AN EARLIER CIRCLE?

When we come to examine Stonehenge carefully in relation to the orientation theory, it soon becomes clear that its outer circle of upright stones with lintels, and the inner naos, built of trilithons, oriented in the line of the "avenue" and the summer solstice sunrise, are not the only things to be considered. These stones, all composed of sarsen, which, be it remarked, have been trimmed and tooled, are not alone in question. We have:—

(1) An interior circle broken in many places, and other stones near the naos, composed of stones, "blue stones," which, as we have seen, are of an entirely different origin and composition.

(2) Two smaller *untrimmed* sarsen stones lying near the vallum, *not* at the same distance from it, the line joining them passing nearly, but not quite, through the centre of the sarsen circle. The amplitude of the line joining them is approximately 26° S. of E. and 26° N. of W. Of these stones, the stump of the N.W. one is situated 22 feet from the top of the vallum according to the Ordnance plan. The S.E. stone has fallen, but according to careful observations and

measurements by Mr. Penrose, when erect its centre was 14 feet from the top of the vallum. The centre of the

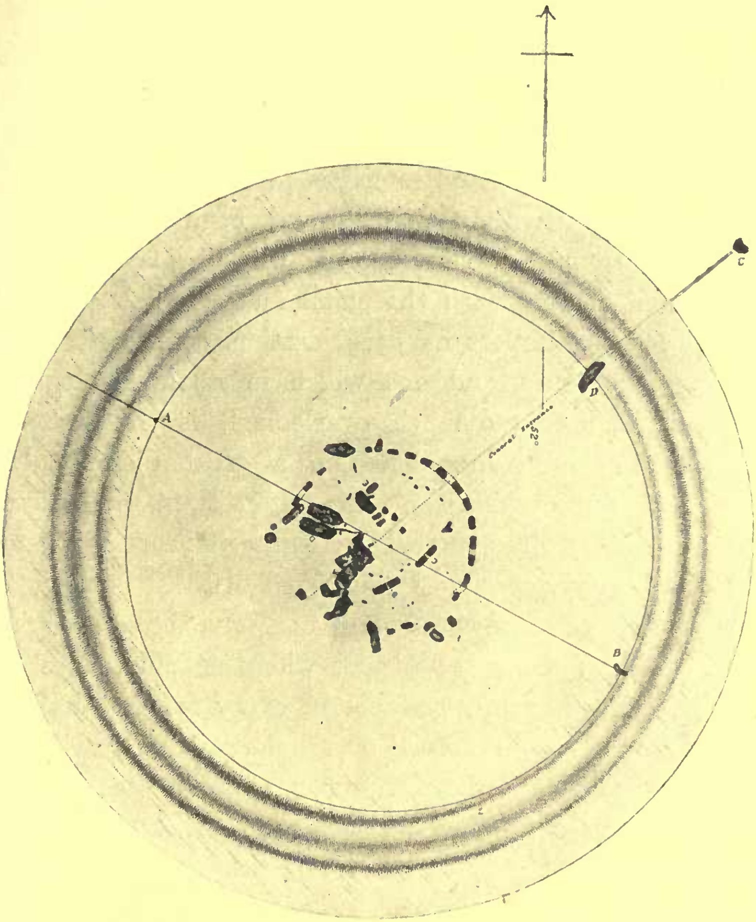

FIG. 24.—Map of the Stones made by the Ordnance Survey.[1] A, N.W. stone; B, S.E. stone; C, Friar's Heel; D, Slaughter stone.

line joining the stones is therefore about 4 feet to the S.E. of the axis of the present circles, which, it may be

[1] Plans and photographs of Stonehenge, &c., by Colonel Sir Henry James, R.E., F.R.S., Director-General of the Ordnance Survey, 1867.

stated, passes 3 feet to the N.W. of the N.W. edge of the Friar's Heel (see Fig. 24).

There are besides these two large *untrimmed* sarsen stones, one standing some distance outside the vallum, one recumbent lying on the vallum; both nearly, but not quite, in the sunrise line as viewed from the centre of the sarsen circle. These are termed the "Friar's Heel" and "Slaughter Stone" respectively.

I will deal with (1) first, and begin by another quotation from Mr. Cunnington, who displayed great acumen in dealing with the smaller stones not sarsens.

"The most important consideration connected with the smaller stones, and one which in its archæological bearing has been too much overlooked, is the fact of their having been brought from a great distance. I expressed an opinion on this subject in a lecture delivered at Devizes more than eighteen years ago, and I have been increasingly impressed with it since. I believe that these stones would not have been brought from such a distance to a spot where an abundance of building stones equally suitable in every respect already existed, unless some special or religious value had been attached to them. This goes far to prove that Stonehenge was *originally a temple*, and neither a monument raised to the memory of the dead, nor an astronomical calendar or almanac.

"It has been suggested that they were Danams, or the offerings of successive votaries. Would there in such case have been such uniformity of design, or would they have been all alike of foreign materials? I would make one remark about the small impost of a trilithon of syenite, now lying prostrate within the circle. One writer has followed another in taking it for granted that there must have been a second, corresponding with it, on the opposite side. Of this there is neither proof nor record, not a trace of one having been seen by any person who has written on the subject. This small impost, not being of sarsen, but syenite, must have belonged to the original old circle ; *it may even have suggested to the builders of the present Stonehenge the idea of the large imposts, and trilithons with their tenons and mortices.*"

In Prof. Gowland's examination of the contents of the holes necessarily dug in his operations, it was found over and over again, indeed almost universally, that the quantity of blue stone chippings was much greater than that from the sarsen stones. While the sarsen stones had only been worked or tooled on their surface, the blue stones had been hewed and trimmed in extraordinary fashion ; indeed it is stated by Prof. Judd that they had been reduced to half their original dimensions in this process, the chippings almost equalling the volume of the stones themselves.

It seems, then, that when the sarsen stones were set up, the sarsen and blue stones were treated very differently. This being so, the following quotation from Prof. Judd's " Note " is interesting (*Archaeologia*, lviii., p. 81) :—

" I may repeat my conviction that if the prevalent beliefs and traditions concerning Stonehenge were true, and the " bluestone " circles were transported from some distant locality, either as trophies of war or as the sacred treasures of a wandering tribe, it is quite inconceivable that they should have been hewed and chipped, as we now know them to have been, and reduced in some cases to half their dimensions, *after having been carried with enormous difficulty over land and water, and over hills and valleys.* On the other hand, in the glacial drift, which once probably thinly covered the district, the glacial deposits dying out very gradually as we proceed southwards, we have a source from which such stones might probably have been derived. It is quite a well-known peculiarity of the glacial drift to exhibit considerable assemblages of stones of a particular character at certain spots, each of these assemblages having probably been derived from the same source.

"I would therefore suggest as probable that when the early inhabitants of this island commenced the erection of Stonehenge, Salisbury Plain was sprinkled over thickly with the great white masses of the sarsen-stones ('grey wethers'), and much more sparingly with darker coloured boulders (the so-called 'blue-stones'), the last relics of the glacial drift, which have been nearly denuded away. From these two kinds of materials the stones suitable for the contemplated temple were selected. It is even possible that the abundance and association of these two kinds of materials so strikingly contrasted in colour and appearance, at a particular spot, may not only have decided the site, but to some extent have suggested the architectural features of the noble structure of Stonehenge."

If we grant everything that Prof. Judd states, the question remains—why did the same men in the same place at the same time treat the sarsen and blue stones so differently?

I shall show subsequently that there is a definite answer to the question on one assumption.

I next come to (2). The important point about these stones is that with the amplitude 26°, at Stonehenge, a line from the centre of the circle over the N.W. stone would mark the sunset place in the first week in May, and a line over the S.E. stone would similarly deal with the November sunrise. We are thus brought in presence of the May-November year.

Another point about these stones is that they are not at the same distance from the centre of the sarsen stone circle, which itself is concentric with the temenos mound; this is why they lie at different distances from the mound. Further, a line drawn from the point of the Friar's Heel over the now recumbent Slaughter Stone with the amplitude determined by Mr. Penrose and myself for the summer solstice sunrise in 1680 B.C. cuts the line joining the stones at the middle point, suggesting that the four untrimmed sarsen stones provided alignments both for the May and June years at about that date.

Nor is this all; the so-called tumuli within the vallum (Fig. 10) may have been observation mounds, for the lines passing from the northern tumulus over the N.W. stone and from the southern tumulus over the S.E. one are parallel to the avenue, and therefore represent the solstitial orientation.

So much, then, for the stones. We see that, dealing only with the untrimmed sarsens that remain, the places of the May sunset and June and November sunrises were marked from the same central point.

Statements have been made that there was the stump of another stone near the vallum to the S.W., in the line of the Friar's Heel and Slaughter Stone, produced backwards, at the same distance from the old centre as the N.W. and S.E. stones. This stone was *not* found in an exploration by Sir Edmund Antrobus, Mr.

Fig. 25.—The rod on the recumbent stone is placed in and along the common axis of the present circle and avenue. It is seen that the Friar's Heel, the top of which is shown in the distance, would hide the sunrise place if the axis were a little further to the S.E.

Penrose and Mr. Howard Payn by means of a sword and an auger. But the question will not be settled until surface digging is permitted, as a "road" about which there is a present contention passes near the spot.

But even this is not the only evidence we have for the May worship in early times. There is an old tradition of the slaughter of Britons by the Saxons at Stonehenge, known as "The Treachery of the Long Knives"; according to some accounts, 460 British chieftains were killed while attending a banquet and conference. Now at what time of the year did this take place? Was it at the summer solstice on June 21? I have gathered from Guest's "Mabinogion," vol. ii. p. 433, and Davies's "Mythology of the British Druids," p. 333, that *the banquet took place on May eve "Meinvethydd."* Is it likely that this date would have been chosen in a solar temple dedicated exclusively to the solstice?

Now the theory to which my work and thought have led me is that the megalithic structures at Stonehenge—the worked sarsens with their mortices and lintels, and above all the trilithons of the magnificent naos—represent a re-dedication and a reconstruction, on a more imposing plan and scale, of a much older temple, which was originally used for worship in connection with the May year.

CHAPTER X

THE MAY AND JUNE WORSHIPS IN BRITTANY

I PURPOSE next to inquire whether in the wonderful series of Megalithic remains in Brittany, remains more extensive than any in Britain, any light is thrown on the suggestion I have made that the May Worship preceded the Solstitial Worship at Stonehenge.

It has long been known that the stones which compose the prehistoric remains in Brittany are generally similar in size and shape to those at Stonehenge, but, as I have already stated, in one respect there is a vast difference. Instead of a few, arranged in circles as at Stonehenge, we have an enormous multitude of the so-called menhirs arranged in many parallel lines for great distances. Some of these are unhewn like the Friar's Heel, some have as certainly been trimmed.

The literature which has been devoted to them is very considerable, but the authors of it, for the most part, have taken little or no pains to master the few elementary astronomical principles which are necessary to regard the monuments from the point of view of orientation.

It is consoling to know that this cannot be said of the last published contribution to our knowledge of this region, which we owe to Monsieur F. Gaillard, a member of the Paris Anthropological Society and of the Polymathic Society of Morbihan at Plouharnel.[1]

M. Gaillard is a firm believer in the orientation theory, and accepts the view that a very considerable number of the alignments are solstitial. But although he gives the correct azimuths for the solstitial points and also figures showing the values of the obliquity of the ecliptic as far as 2200 B.C., his observations are not sufficiently precise to enable a final conclusion to be drawn, and his method of fixing the alignments and the selection of the index menhir are difficult to gather from his memoir and the small plans which accompany it, which, alas! deal with compass bearings only.

All the same, those interested in such researches owe a debt of gratitude to M. Gaillard for his laborious efforts to increase our knowledge, and will sympathise with him at the manner in which his conclusions were treated by the Paris anthropologists. One of them, apparently thinking that the place of sun rising is affected by the precession of the equinoxes, used this convincing argument:—"Si, à l'origine les alignments étaient orientés, comme le pense M. Gaillard, ils ne le pourraient plus être aujourdhui; au contraire, s'ils le sont actuellement, on peut affirmer qu'ils ne l'étaient pas alors!"

M. Gaillard is not only convinced of the solstitial orientation of the avenues, but finds the same result in the case of the dolmens.

I cannot find any reference in the text to any orientations dealing with the farmers' years, that is with ampli-

[1] "L'Astronomie Prehistorique." Published in "Les Sciences Populaires, revue mensuelle internationale," and issued separately by the administration des "Sciences populaires," 15 Rue Lebrun, Paris.

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tudes of about 25° N. and S. of the E. and W. points; but in the diagrams on pp. 78 and 127 I find both avenue and dolmen alignments, which within the limits of accuracy apparently employed may perhaps with justice be referred to them; but observations of greater accuracy must be made, and details of the heights of the horizon at the various points given, before anything certain can be said about them.

I append a reproduction of one of M. Gaillard's plans, which will give an idea of his use of the index menhir. It shows the alignments at Le Ménec, lat. 47½° (Fig. 26). The line A—Soleil runs across the stone alignments and is fixed from A by the menhir B, but there does not seem any good reason for selecting B except that it appears to fall in the line of the solstitial azimuth according to M. Gaillard. But if we take this azimuth as N. 54° E., then we find the alignments to have an azimuth roughly of N. 66° E., which gives us the amplitude of 24° N. marking the place of sunrise at the beginning of the May and November years, and the alignments may have dealt principally with those times of the year.

I esteem it a most fortunate thing that while I have been casting about as to the best way of getting more accurate data, Lieutenant Devoir, of the French Navy and therefore fully equipped with all the astronomical knowledge necessary; who resides at Brest and has been studying the prehistoric monuments in his neighbourhood for many years, has been good enough to give me the results of his work in that region, in which the problems seem to be simpler than further south; for while in the vicinity of Carnac the menhirs were erected in groups numbering five or six thousand, near Brest, lat. 48½°, they are much more restricted in number. I am much indebted to him for permission to use and publish his results.

Lieutenant Devoir, by his many well-planned and

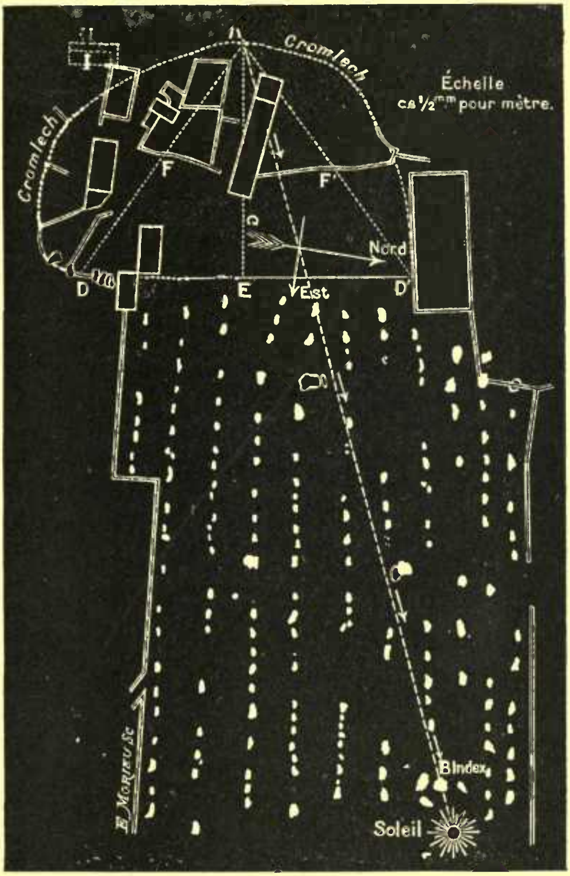

FIG. 26.—Alignments at Le Ménec.

approximately accurate observations, has put the solstitial orientation beyond question, and, further, has made important observations which prove that the May and August sunrises were also provided for in the systems of alignments. I give the following extracts from his letter:—

"It is about twelve years ago that I remarked in the west part of the Department of Morbihan (near Lorient) the parallelism of the lines marked out by monuments of all sorts, and frequently oriented to the N.E., or rather

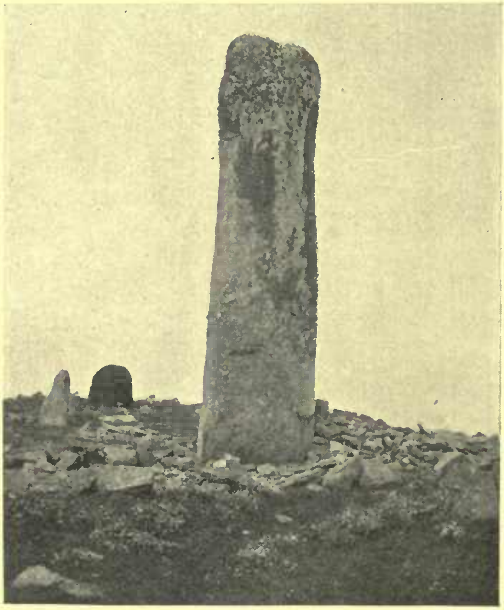

FIG. 27.—Menhir (A) on Melon Island.

between N. 50° E. and N. 55° E. I had ascertained, moreover, the existence of lines perpendicular to the first named, the right angle being very well measured.

"The plans, which refer to the cantons of Ploudalmézeau and of St. Renan (district of Brest) and of Crozon (district of Chateaulin), have been made on a plane-table; the orientations are exact to one or two degrees.

"In the cantons of Ploudalmézeau and of St. Renan, the monuments are generally simple; seven menhirs are visible of enormous dimensions, remarkable by the polish of their surface and the regularity of their section. The roughnesses hardly ever reach a centimetre; the sections are more often ovals, sometimes rectangles with the angles rounded or terminated by semicircles. In the canton of Crozon the monuments are, on the contrary, complex; we find a cromlech with

FIG. 28.—Melon Island, showing Menhir (A) and Cromlech (B and C).

an avenue leading to it of a length of 800 metres, another of 300 metres. Unfortunately, the rocks employed (sandstone and schist from Plungastel and Crozon) have resisted less well than the granulite from the north part of the Department. The monuments are for the most part in a very bad condition; the whole must, nevertheless, formerly have been comparable with that of Carnac-Leomariaquer.

"For the two regions, granitic and schistose, the results of the observations are identical.

"The monuments lie along lines oriented S. 54° W.

→ N. 54° E. (54° = azimuth at the solstices for $L = 48° 30'$ and $i = 23° 30'$) and N. 54° W. → S. 54° E. Some of them determine lines perpendicular to the meridian.

"One menhir (A), 6m. 90 in height and 9m. 20 in circumference, erected in the small island of Melon

D E F

FIG. 29.—Menhirs of St. Dourzal, D, E, F.

(canton of Ploudalmézeau, latitude 48° 29′ 05″) a few metres from a tumulus surrounded by the ruins of a cromlech (B and C), has the section such that the faces, parallel and remarkably plane, are oriented N. 54° E. (Figs. 27 and 28).

"At 1300 metres in the same azimuth there is a line of three large menhirs (D, E, F), of which one (E) is overthrown. The direction of the line passes exactly by the menhir A. Prolonged towards the N.E. it meets at 3k. 700m. an overturned block of 2m. 50 in height, which is without doubt a menhir; towards the S.W. it passes a little to the south some lines of the island of Molène. . . . (Fig. 29).

"There exists in the neighbourhood other groups, forming also lines of the same orientation and that of

G G′

FIG. 30.—Alignment at Lagatjar, G G′.

the winter solstice. It is advisable to remark that orientations well determined for the solstices are much less so for the equinoxes, which is natural, the rising amplitude varying very rapidly at this time of year.

"The same general dispositions are to be found in the complex monuments of the peninsula of Crozon. I take for example the alignments of Lagatjar. Two parallel lines of menhirs, G G′ H H′, are oriented to S. 54° E. and cut perpendicularly by a third line, I I′. There existed less than fifty years ago a menhir at K, 6 metres high, which is to-day broken and overturned. This megalith, known in the country by the name of 'pierre du Conseil' (a bronze axe was found underneath it) gives with a dolmen situated near Camaret the direction of the sunrise on June 21 (Fig. 31).

"I have just spoken of the lines perpendicular to the solstitial one; there exists more especially in the complex monuments another particularity which merits

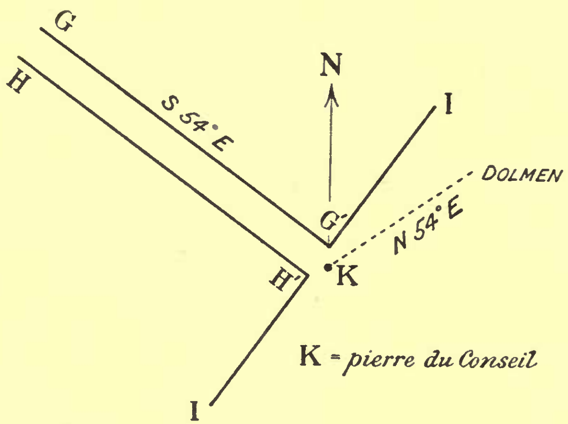

FIG. 31.—Alignments at Lagatjar, showing the pierre du Conseil and the direction of the dolmen. From the pierre du Conseil the dolmen marks the sunrise place at the summer solstice, and the avenue G G′ H H′ the sunset place on the same day.

attention. Between two monuments, M and N, on a solstitial line, sometimes other menhirs are noticed, the line joining them being inclined 12° to the solstitial line, always towards the east" (Fig 32).

I must call particular attention to this important observation of Lieutenant Devoir, for it gives us the amplitude 24° N., the direction of sunrise at the beginning of the May and August years. It shows, moreover, that, as at Le Ménec according to M. Gaillard, the solstitial and May-August directions were both provided for at the monuments in the neighbourhood of Brest so carefully studied by Lieutenant Devoir.

Lieutenant Devoir points out the wonderful regularity of form and the fine polish of many of the menhirs. It will have been gathered from his account that those most carefully trimmed and tooled belong to the solstitial alignments. The one at Kerloas (11 metres high) heads

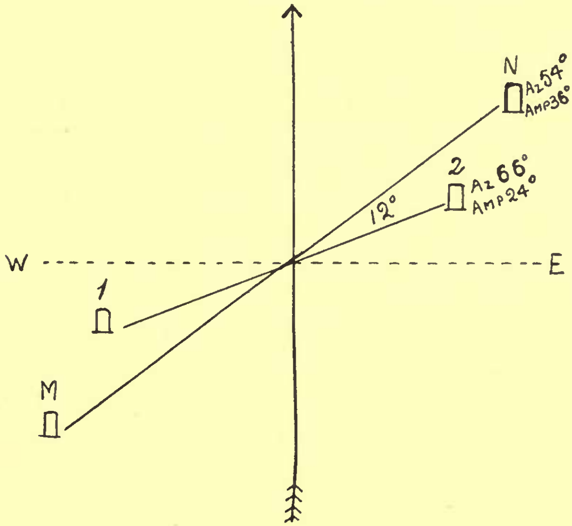

FIG. 32.—Menhirs, M N on N.E.-S.W. solstitial alignment. Menhirs 1, 2, on May-August years alignment, sunrise May-August, sunset November-February.

the list in point of size; others in the island of Melon (7 metres), at Kergadion (8 metres and 10 metres), Kerenneur, Kervaon and Kermabion follow suit. He considers them to have been erected at the time of the highest civilisation of the Megalithic peoples. He also states that these regularly formed menhirs do not exist at Carnac, or in the region of Pont l'Abbé, so rich in other remains which certainly refer chiefly to the May-November year. It seems, then, that in these localities the May-August worship first chiefly predominated, and that the index menhirs of M. Gaillard which indicate the solstice and which do not form part of the alignments were erected subsequently.

Finally, then, the appeal to Brittany is entirely in favour of the May-November year worship having preceded the solstitial one.

I have already stated the evidence at Stonehenge that the sunrise at the beginning of the May and August years was observed in an earlier temple which existed before the present structure existed. Were this so we have another point common to the British and Breton monuments. I therefore think that I may justly claim the Brittany evidence as entirely in favour of the suggestion put forward in Chap. IX with regard to Stonehenge.

CHAPTER XI

ASTRONOMICAL HINTS FOR ARCHÆOLOGISTS

THE foregoing chapters will have shown that in dealing with the ancient monuments from an astronomical point of view, we have to consider chiefly the direction of the sight-lines, whether they are marked as in Brittany by long rows of stones—alignments; as at Stonehenge by an avenue; as in some of our British circles, by two or more circles the direction being indicated from the central stone of one to the central stone of the other, or finally by a single standing stone or barrow.

It is important then that before we proceed further in our inquiries we should consider how a meaning is got out of these directions, and I propose to devote this chapter to this question, so that the full use of the "azimuths" already referred to and others which are to follow may be fully understood.

There is another matter, at which I hinted on pp. 36 and 42. We have to inquire whether there are any stones or barrows marking the direction of the rising or setting of *stars*, as well as those which deal with the rising and setting of the *sun* at different times of the year, which we have already found at Stonehenge and in Brittany. To face this question we have to consider the stellar as well as solar conditions of observations, and as the former are the simpler I will begin with them, especially as now there is no question whatever that the rising and setting of stars were provided for.

In continuation of my work in Egypt in 1891, and Mr. Penrose's in Greece in 1892, I have recently endeavoured to see whether there are any traces in Britain of star observations, including those connected with the worship of the sun at certain times of the year. We both discovered that stars, far out of the sun's course, especially in Egypt, were observed in the dawn as heralds of sunrise—"warning-stars"—so that the priests might have time to prepare the sunrise sacrifice. To do this properly the star should rise while the sun is still about 10° below the horizon. There is also reason to believe that stars rising not far from the north point were also used as clock-stars to enable the time to be estimated during the night in the same way as the time during the day could be estimated by the position of the sun.

I stated (*Dawn of Astronomy*, p. 319) that Spica was the star the heliacal rising of which heralded the sun on May-day 3200 B.C. in the temple of Menu at Thebes. Sirius was associated with the summer solstice at about the same time.

Mr. Penrose found this May-day worship continued at Athens on foundations built in 1495 B.C. and 2020 B.C., on which the Hecatompedon and older Erechtheum respectively were subsequently built, the warning star being now no longer Spica, but the cluster of the Pleiades rising, or Antares setting, in the dawn.

It is generally known that Stonehenge is associated with the solstitial year, and I have suggested that it was originally connected with the May year; but the probable date of its re-dedication, 1680 B.C., was determined by Mr. Penrose and myself by the change of obliquity.

Now if Stonehenge or any other British stone circle could be proved to have used observations of warning stars, the determination of the date when such observations were made would be enormously facilitated. Mr. Penrose and myself were content to think that our date might be within 200 years of the truth, whereas if we could use the rapid movement of stars in declination brought about by the precession of the equinoxes, instead of the slow change of the sun's declination brought about by the change of the value of the obliquity, a possible error of 200 years would be reduced to one of 10 years.

In spite of this enormous advantage, no one so far as I know has yet made any inquiry to connect star observations with any of the British circles.

I have recently obtained clear evidence that some circles in different parts of Britain were used for night work and also in relation to the May year, which we know was general over the whole of Europe in early times, and which still determines the quarter-days in Scotland.

If the Egyptian and Greek practice were continued here, we should expect then to find some indications of the star observations utilised at the temple of Min and at the Hecatompedon for the beginning, or the other chief months, of the May year.

I have found them, and I will now show the method employed.

To begin with, if we assume that the astronomer-priests here did attempt such observations, what is the most likely way in which they would have gone to work?

The easiest way for the astronomer-priests to conduct such observations in a stone circle would be to erect a stone or barrow indicating the direction of the place on the horizon at which the star would rise as seen from the centre of the circle. If the dawn the star was to herald occurred in the summer, the stone or barrow itself might be visible if not too far away, but there was a reason why they should not be too close; in a solemn ceremonial the less seen of the machinery the better.

Doubtless such stones and barrows would be rendered obvious in the dark by a light placed on or near them. Cups which could hold oil or grease are known in connection with such stones, and a light thus fed would suffice in the open if there were no wind; but in windy weather a cromlech or some similar shelter must have been provided for it.

Now if these standing stones or barrows were ever erected and still remain, accurate plans—not the slovenly plans with which Ferguson and too many others have provided us, giving us either no indication of the north or any other point, or else a rough compass bearing without taking the trouble to state the variation at the time and place—will help us.

I have already pointed out that much time has been lost in the investigation of our stone circles, for the reason that in many cases the exact relations of the monuments to the chief points of the horizon, and therefore to the place of sunrise at different times of the year, have not been considered; and when they were, the observations were made only with reference to the magnetic north, which is different at different places, and besides is always varying; few indeed have tried to get at the real astronomical conditions of the problem. The first, I think, was Mr. Jonathan Otley, who in 1849 showed the "orientation" of the Keswick circle "according to the solar meridian," giving true solar bearings throughout the year.

In my opinion the most accurate plans conceivable, in the absence of a long and minute local inquiry, are the 25-inch maps of the Ordnance Survey, on which, I have it on the authority of Colonel Johnston the distinguished Director, each stone may be taken to be shown with a limit of error of 6 feet. With a large circular protractor azimuths can be read to one minute of arc, and in critical cases the true azimuth of the side lines, which are not necessarily meridians as latitudes are not marked, can be found on inquiry at the Ordnance Office, Southampton.

Having then true azimuths, the next question concerns the declinations of the stars which may have been observed.

The work of Stockwell in America, Danckworth in Germany,[1] and Dr. W. J. S. Lockyer in England, has provided us with tables of the changing declinations of stars throughout past time, or enough of it for our purpose.

An accurate determination on the 25-inch map of either the *azimuth* (angular distance from the N. or S. points) or *amplitude* (angular distance from the E. or W. points)

[1] Dr. O. Danckworth, *Vierteljahrschrift der Astronomischen Gesellschaft*, 16 Jahrgang 1881, p. 9. Dr. Stockwell's results have been communicated to me by letter. Some, but not all, of Dr. Lockyer's calculations appeared in *The Dawn of Astronomy.*

of the stone or barrow as seen from the centre of the stone circle will enable us to determine the declination of the star at the time when it was observed.

I give a diagram which enables this determination to be made with the greatest ease for any monuments between Land's End and John o' Groats, whether the direction is recorded by amplitude or azimuth; the declination is read at the side from the value of either indicated, say, by a dot, at the proper latitude.

This, of course, only gives us a first approximation. The angular height of the point on the horizon to which the alignment or sight-line is directed by the stone or barrow from the centre of the circle must be most accurately determined, otherwise the declinations may be one or two degrees out.

In the absence of measurements it is convenient to assume, in the first instance, that the horizon is half a degree high, as with this elevation refraction is compensated, as the following table will show:

Elevation of actual horizon.	Bessel's refraction.	Combined effect.
0°0′0″	34′54″	−34′54″
0°10′	32′49″	−22′49″
20′	30′52″	−10′52″
30′	29′3·5″	+0′56·5″
40′	27′22·7″	+12′37·3″
50′	25′49·8″	+24′10·2″
1°0′	24′24·6″	+35′35·4″

In the absence of theodolite observations the actual elevation of the horizon can be roughly found by a study of the contour lines on the 1-inch map. The following heights will agree with the previous assumption of hills $\frac{1}{2}°$ high:

Distance	1 mile	Height =	46 feet
,,	2 miles	,, =	92 ,,
,,	4 ,,	,, =	184 ,,
,,	8 ,,	,, =	368 ,,
,,	10 ,,	,, =	460 ,,

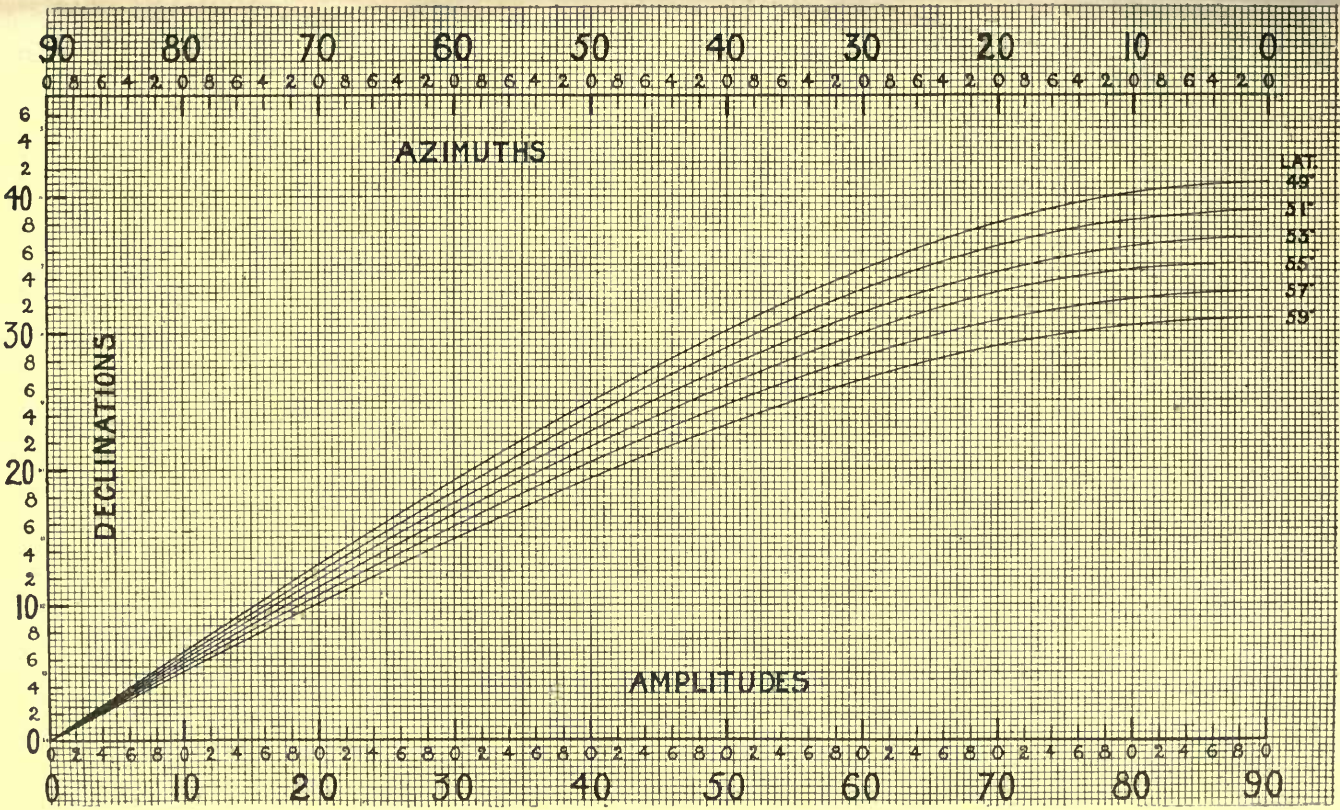

FIG. 33.—Diagram for finding declination from given amplitudes or azimuths in British latitudes.

I

I also give other diagrams showing the changing declinations of the brightest stars, those which would naturally be observed, between the years 150 A.D. and 2150 B.C. These have been plotted from the calculations of the authorities I have named.

Fig. 34 deals with the Northern stars. The stars are numbered as follows :—

Number.	Name of star.	Number.	Name of star.
1	β Ursae Minoris.	14	α Coronae.
2	α Ursae Minoris (Polaris).	15	α Geminorum (Castor).
3	α Draconis.	16	β Geminorum (Pollux).
4	α Ursae Majoris (Dubhe).	17	α Boötes (Arcturus).
5	γ Ursae Majoris.	18	β Leonis.
6	η Ursae Majoris (Benetnasch).	19	α Leonis (Regulus).
7	γ Draconis.	20	α Andromedae.
8	β Cassiopeiac.	21	η Tauri (Alcyone).
9	α Cassiopeiae.	22	α Tauri (Aldebaran).
10	α Persei.	23	α Canis Minoris (Procyon).
11	α Aurigae (Capella).	24	α Aquilae.
12	α Cygni.	25	α Orionis (Betelgeuse).
13	α Lyrae (Vega).	26	α Virginis (Spica).

On Fig. 35, dealing with the Southern stars, the names are given along the curves.

Now supposing that we have our plans; that we have determined the azimuth of the sight lines; and have found the declination of the star observed; we may find more than one star occupying that declination at various dates.

Which of these stars, then, must we consider?

Obviously those most conveniently situated for enabling the time to be estimated during the night, or those which could have been used as warning stars.

The warning stars can be conveniently picked up by using a precessional globe. From it we gather that about 1900, 1400 and 800 B.C. they were as follows for the critical

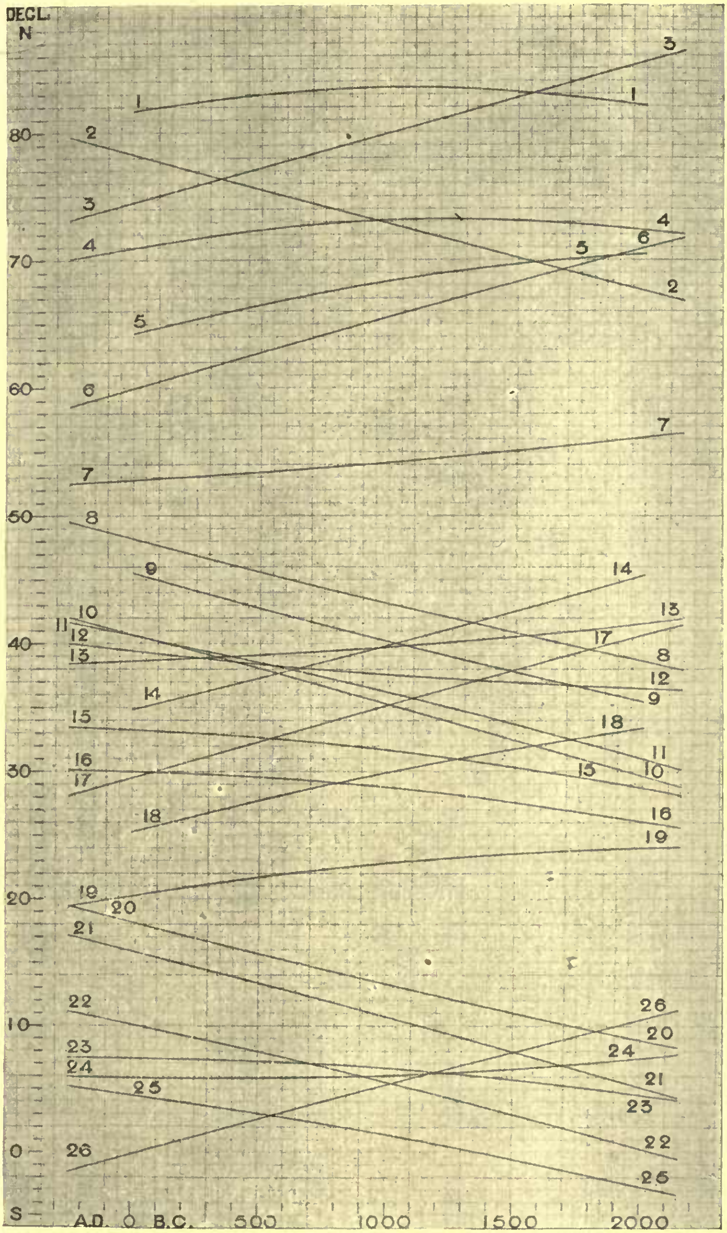

FIG. 34.—Declinations of Northern Stars from 250 A.D. to 2150 B.C.

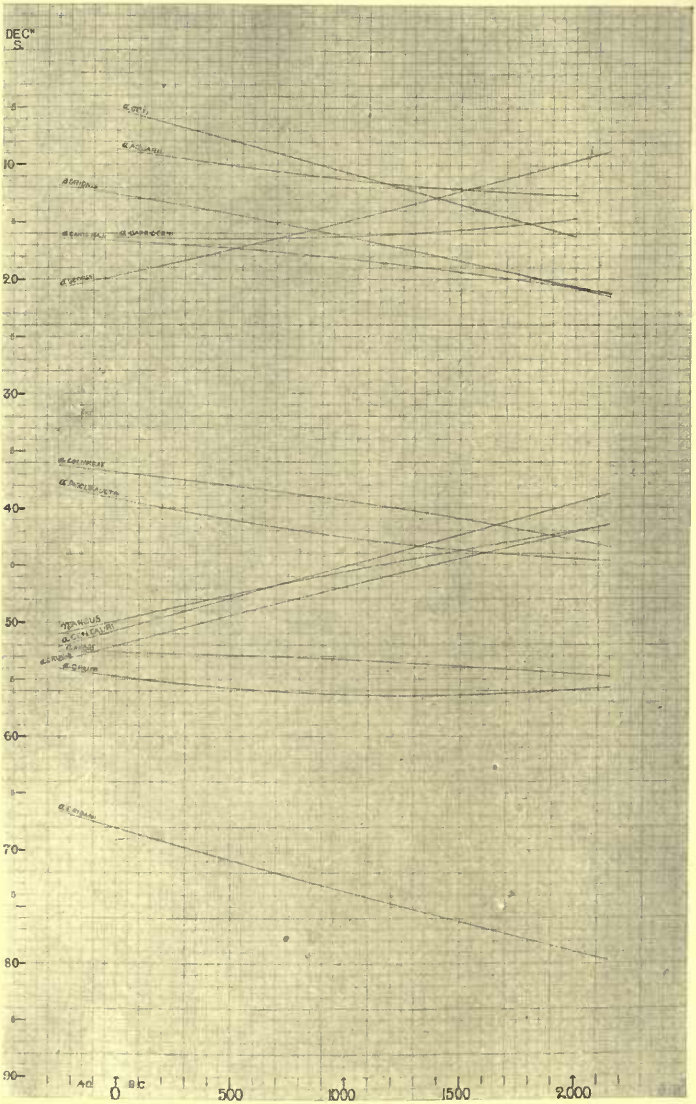

FIG. 35.—Declinations of Southern Stars from 250 A.D. to 2150 B.C.

α Ceti, α Aquarii, β Orionis, α Capricorni, α Canis Majoris, α Scorpii, α Columbæ, α Pisces Austr., η Argûs, α Centauri, α Argûs, α Crucis, α Gruis, and α Eridani.

times of the May year, *i.e.* May, August, November, February :—

	1900 B.C.		1400 B.C.		800 B.C.	
May	Castor rising	N. 41° E.	Pleiades rising	N. 77° E.	Pleiades rising.	N. 71° E.
	Antares setting	S. 75° W.	Antares setting	S. 72° W.		
August	Arcturus circumpolar. With hill 3° high :— Rising.		Arcturus rising	N. 17° E.	Sirius rising	S. 63° E.
	Date 2170 B.C.	N. 11°15′ E.				
	,, 2090 B.C.	N. 14°18′ E.				
	,, 1900 B.C.	N. 18°44′ E.				
November	. . . .				Betelgeuse setting	N. 87° W.
February	Capella rising	N. 36° E.	Capella rising	N. 28° E.	Capella rising	N. 21° E.

For the solstices, that is, June and December, the following stars might be used as warners :—

	1900 B.C.		1400 B.C.		800 B.C.	
Summer Solstice	Betelgeuse rising.	N. 87° E.	Betelgeuse rising	N. 90° E.	γ Geminorum rising	N. 68° E.
	Arcturus setting with hill 3° high	N. 18° W.	Arcturus setting (late)	N. 16° W.	("Alhena" mag. 1·9.)	
			α Serpentis setting	N. 53° W.		
Winter Solstice	Sheat rising (early)	N. 72° E.	Castor setting	N. 37° W.	α Capricorni rising	S. 66° E.
	Markab ,, (late)	S. 89° E.	Pollux setting	N. 42° W.		

It is obvious that a star used all the year round for night work will warn the sunrise at some one of the yearly festivals.

When the stars having the same declinations are considered from this point of view, the star actually used, and *therefore the date of its use*, may generally be gathered. I shall show subsequently that some of the stars in the above lists were actually observed in British as well as in Grecian temples.

CHAPTER XII

ASTRONOMICAL HINTS FOR ARCHÆOLOGISTS—*Continued.*

I NEXT come to the sun observations.

First we must consider the astronomical differences between the rising of a star and of the sun, by which we generally mean that small part of the sun's limb first visible.

It is frequently imagined that for determining the exact place of sunrise or sunset in connection with these ancient monuments we have to deal with the sun's centre, as we should do with the sun half risen. As a matter of fact, we must consider that part of the sun's limb which first makes its appearance above the horizon ; the first glimpse of the upper limb of the sun is in question, say, when the visible limb is 2′ high ; and we must carefully take the height of the hills over which it rises into account.

The accompanying diagram will at once show the difference between the rising conditions we have now to consider. It deals with the summer solstice, as being the most precise case, in Lat. 59° N.

At this time the position of the sun, *that is of the sun's centre*, as given in the "Nautical Almanac," is represented by the double circle on the sea horizon.

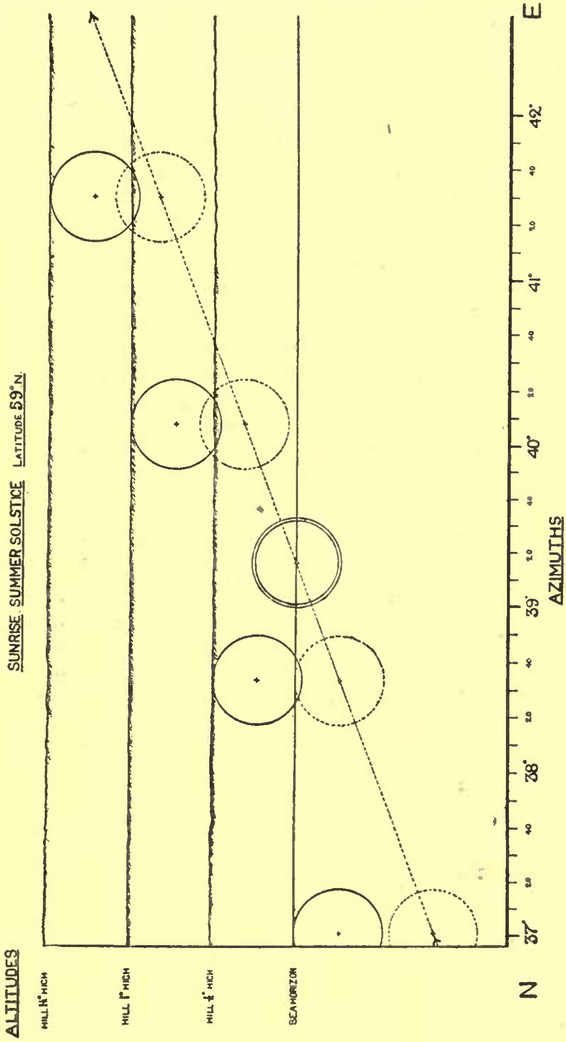

FIG. 36.—The Conditions of "Sunrise" at the Summer Solstice in Lat. 59° N.

The azimuth of this position is N. 39° 16′ E. This is the equivalent of the declination of a star, but it will be seen that the real azimuths we want are very different. The dotted circles represent the actual position of the sun with regard to the horizon, the continuous circles the apparent positions caused by the lifting-up effect of refraction. We have the positions in azimuth of the apparent sun as it appears on a sea horizon, and when the horizon is formed by hills up to $1\frac{1}{2}°$ in vertical height.

To make this quite clear I give a table which has been computed by Mr. Rolston, of the Solar Physics Observatory, showing azimuths with hills up to $1\frac{1}{2}°$ high for lat. 59° N., and 51° N. nearly the latitude of Stonehenge, of the sun's upper limb for the summer solstice :—

Summer Solstice.		Lat. 59° Rising N—E or Setting N—W.	Lat. 51° Rising N—E or Setting N—W.
Sun's centre ; uncorrected		° ′ 39 16	° ′ 50 40
Sun's upper limb ; corrected for semi-diameter and refraction	sea horizon	37 1	49 20
	hill ½° high	38 34	50 16
	,, 1° ,,	40 8	51 12
	,, 1½° ,,	41 30	52 4
Winter Solstice.		**Rising S—E or Setting S—W.**	**Rising S—E or Setting S—W.**
Sun's centre; uncorrected		° ′ 39 16	° ′ 50 40
Sun's upper limb ; corrected for semi-diameter and refraction	sea horizon	41 24	52 0
	hill ½° high	39 54	51 4
	,, 1° ,,	38 23	50 8
	,, 1½° ,,	36 54	49 14

The first important thing we learn from the table is that although at both solstices the azimuths of the rising and setting of the sun's centre are the same, these azimuths of the upper limb at the summer and winter solstices differ in a high northern latitude by some 5°. The difference arises, of course, from the

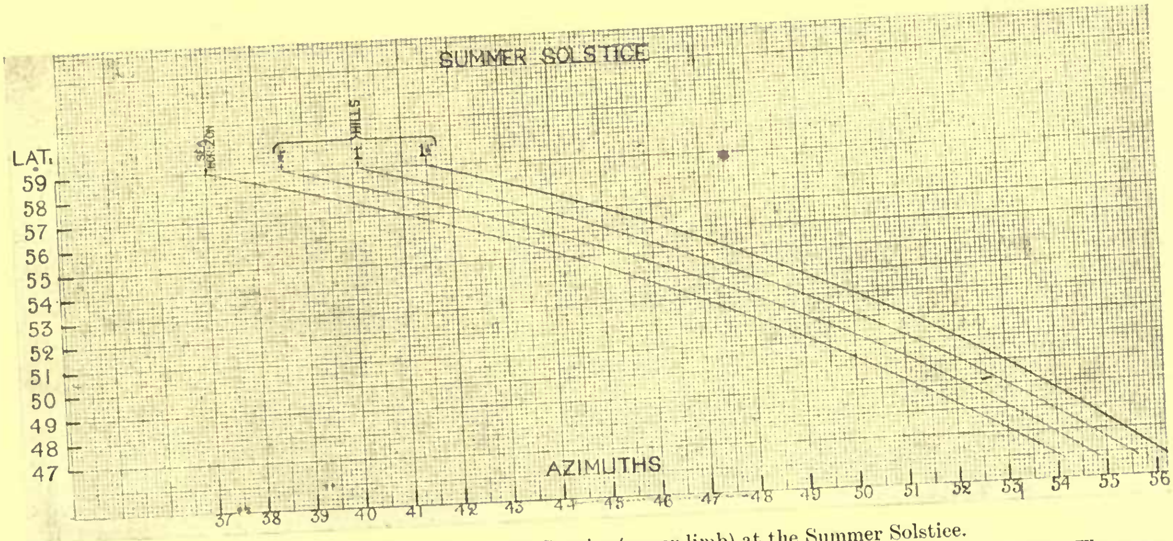

FIG. 37.—The Azimuths of the Sunrise (upper limb) at the Summer Solstice.

The values given in the table have been plotted, and the effect of the height of hills on the azimuth is shown. The range of latitude given enables the diagram to be used in connection with the solstitial alignments at Carnak, Le Ménac, and other monuments in Brittany.

fact that the limb is some 16′ from the sun's centre, so that considering the sun's centre as a star with fixed declination, at rising the limb appears before the centre, and at setting it lags behind it.

It will also be seen that at sunrise hills increase the azimuth from N., and refraction reduces it; while at setting, hills reduce the azimuth from S. and refraction increases it.

This diagram and table should fully explain the variation of azimuth at sunrise caused by the fact that from our present point of view we do not deal with the sun as a star.

To make the foregoing applicable for monuments in all latitudes between Brittany and the Orkneys, I give still another diagram, Fig. 37, also prepared for me by Mr. Rolston which will enable any archæologist to determine approximately, *for the present time*, the azimuth of sunrise at the summer solstice, without waiting for the 21st of June in any year actually to observe it.

As before stated, I have dealt with the solstice in this chapter because it affords us the most precise case. I hope to be able to deal with the May year sun in the same way later on.

CHAPTER XIII

STENNESS (Lat. 59° N.).

I WROTE a good deal in *Nature*[1] on sun and star temples in 1891, and Mr. Lewis the next year expressed the opinion that the British stone monuments, or some of them, were sun and star temples.

Mr. Magnus Spence, of Deerness, in Orkney, published a pamphlet, "Standing Stones and Maeshowe of Stenness,"[2] in 1894; it is a reprint of an article in the *Scottish Review*, October, 1893, showing that the stones were set up for solar worship. Mr. Cursiter, F.S.A., of Kirkwall, in a letter to me dated March 15, 1894, a letter suggested by my "Dawn of Astronomy," which appeared in that year, and in which the articles which had been published in *Nature* in 1891 had been expanded, directed my attention to the pamphlet.

I began the consideration of the Stenness circles and alignments in 1901, but other pressing calls on my time then caused me to break off the inquiry. Quite recently it occurred to me that a complete study of the Stenness circles might throw light on the question of an earlier

[1] See especially *Nature*, July 2, 1891, p. 201.

[2] Gardner: Paisley and London.

FIG. 38.—Maeshowe, in the foreground, and the Stones of Stenness. From "Notice of Runic Inscriptions," by James Farrer, M.P. (1862).

Stonehenge, so I have gone over the old papers, plotting the results on the Ordnance map.

Now that the inquiry is as complete as I can make it without spending some time in Orkney with a theodolite, I will begin my reference to other circles besides Stonehenge by stating the conclusions at which I have arrived with regard to the stones of Stenness.

In the first place I may state that although many of the alignments to which Mr. Spence refers in his pamphlet on Maeshowe prove to be very different from those he supposed and drew on the map which accompanies his paper, the main point of his contention is amply confirmed.

I give a copy of the Ordnance map showing the true orientation of these and of other sight-lines I have made out.

The alignments on which Mr. Spence chiefly depended were two, one running from the stone circle past the entrance of Maeshowe to the place of sunrise at Hallowe'en (November 1), another from the same circle by the Barnhouse standing stone to the mid-winter sunrise at the solstice.

Although the map gives these sight-lines, I shall show that they had not the use Mr. Spence attributes to them; but still observations of the sun were provided for on the days in question, and the circles and outstanding stones were undoubtedly set up to guide astronomical observations relating to the different times of the year. Of course, as I have shown elsewhere, such astronomical observations were always associated with religious celebrations of one kind or another, as the astronomer and the priest were one.

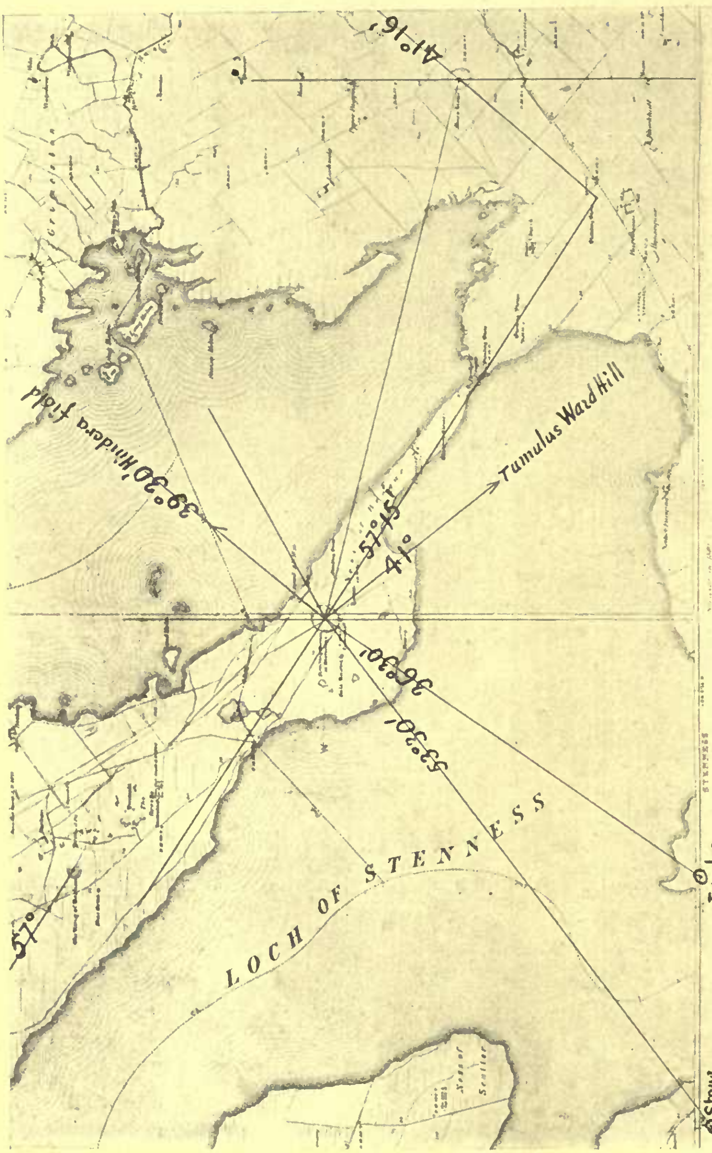

FIG. 39.—Copy of Ordnance Map showing chief sight-lines from the stones of Stenness.

I shall not refer to all the sight-lines indicated, but deal only with those which I have without local knowledge been able to test and justify by means of the 25-inch Ordnance map.

Not only does calculation prove the worship of the May and June years, but I think the facts now before us really go to show that in Orkney the May year was the first established, and that the solstitial (June) year came afterwards, and this was one of the chief questions I had in view.

I will begin with the May year. I have already shown, p. 22, that the half-way time between an equinox and a solstice is when the sun's centre has a declination approximately 16° 20′ N. or S. In Orkney, with the latitude of 59°, assuming a sea horizon, the approximate amplitude of sunrise or sunset is 33° 6′, the corresponding azimuth being 56° 54′.

Now the most interesting and best defined line near this azimuth on the Ordnance map is the one stretching S.E. from the centre of the Stenness circle to the Barnstone, with an azimuth of 57° 15′. The line contains between the two points I have named another stone, the Watchstone, $18\frac{1}{2}$ feet high, in the precise alignment; and from the statements made and measures given it is to be inferred that a still more famous and perforated stone, the "Stone of Odin," demolished seventy years since, was also in the same line within the extremities named.

If we may accept this we learn something about perforated stones, and can understand most of the folk lore associated with them, and few have more connected with them than the one at Stenness. I suggest that the perforation, which was in this case 5 feet from the ground, was used by the astronomer-priest to view the sunrise in November over the Barnhouse stone in one direction, and the sunset in May over the circle in the other. I hope to be able to return to this question subsequently.

There is another echo of this fundamental line; that joining the Ring of Bookan and the Stones of Via has the same azimuth and doubtless served the same purpose for the May year.

But this line, giving us the May sunset and November sunrise, *not* the December solstitial sunrise as Mr. Spence shows it, is not the only orientation connected with the May year at the stones of Stenness. The November sunset is provided for by a sight-line from the circle to a stone across the Loch of Stenness with an azimuth of S. 53° 30′ W.

To apply the table, given on p. 120, to the solstitial risings and settings at Stenness, and the sight-lines which I have plotted on the map, it will be seen that the table shows us that the lines marked

	S. 41° 0′ E.
N. 41° 16′ E.	S. 36° 30′ W.

are solstitial lines; to get exact agreement with the table the heights of the hills must be found and allowed for.

I have roughly determined this height from the 1-inch map in the case of the Barnstone-Maeshowe alignment. On the N.E. horizon are the Burrien Hills, four miles away, 600 feet high at the sunrise place, gradually ascending to the E., vertical angle = 1° 36′ 30″. The near alignment is on and over the centre of Maeshowe. Colonel Johnston, the Director-General of the Ordnance Survey, has informed me that the true azimuth of this bearing is N. 41° 16′ E., and in all probability it represents the place of sunrise as seen from the Barnstone when Maeshowe was erected. What is most required in Orkney now is that some one with a good 6-inch theodolite should observe the sun's place of rising and the angular height of the hills at the next summer solstice in order to determine the date of the erection of Maeshowe. Mr. Spence and others made an attempt to determine this value with a sextant in 1899, but not from the Barnstone.

In the absence of this observation we may use the diagram given on p. 121. With the height of hill previously given the sun should rise according to calculation at about the azimuth N. 41° 50′ E.

The difference between the new and old azimuth then, on the assumption that az. N. 41° 16′ E. really represents an observation over Maeshowe, gives us the difference of date.

Treating these figures then as we have done in the case of Stonehenge in Chapter VII, the result is as follows. The Barnhouse—Maeshowe line was established about 700 B.C., when the obliquity had a value of 23° 48′ according to Stockwell's tables. (Fig. 40.)

I confess the late date does not surprise me. The masonry of Maeshowe differs widely from that of other similar structures in that the sides of the gallery and chamber, instead of being composed of upright stones, are built in regular courses.

I do not believe that the Maeshowe structure was built to observe a winter sunrise twenty days from the solstice, nor can I think it was set up at midsummer by someone who had only dealt with a high sun and a sea horizon, and imagined that the sunrise and sunset points were exactly opposite to each other. It was a priest's house, and the alignment of the passage to the

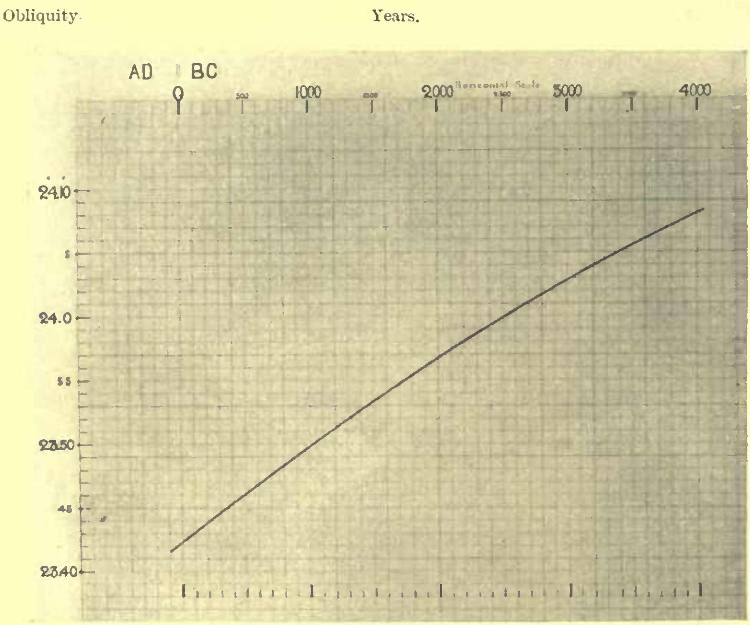

Fig. 40.—Variation of the Obliquity of the Ecliptic, 100 A.D.—4000 B.C. (Stockwell's Values.)

Barnstone was for the exchange of signals, probably by lights in Maeshowe itself.

The Ordnance maps give no indication of stones, &c., by which the direction of the midsummer setting or the midwinter rising and setting might have been indicated from either the Maeshowe or the Barnstone.

To sum up the solar alignments from the circle.

We have the May sunrise marked by the top of Burrien Hill, from 600 to 700 feet high, Az. 59° 30′.

We have the November sunset marked by a standing stone on the other side of the Loch of Stenness, Az. 53° 30′.

June rising, Line from Barnstone over Maeshowe tumulus.

December rising, tumulus (Az. 41°) on Ward Hill.

December setting, tumulus Onston 36° 30′.

It is not a little remarkable that the summer solstice rising and the winter solstice rising and setting seem to have been provided for at the Stenness circle by alignment on the centres of tumuli, two of them, across the Loch, one the Onston tumulus to the S.W. (Az. 36° 30′), the other tumulus being on Ward Hill to the S.E., Az. 41° (rough measurement).

If the Maeshowe tumulus was a structure erected at the time I have suggested to use the Barnstone for the summer solstice rising; then these two other tumuli, to deal with the winter solstice at Stenness circle, may have been built at the same time. All these provided for a new cult.

There are also tumuli near the line (which cannot be exactly determined because the heights of the hills are unknown) of the summer solstice setting; none was required for the sunrise at this date, as the line passes over the highest point of Hindera fiold, a natural tumulus more than 500 feet high, and on that account a triangulation station.

Another argument in favour of the tumuli being additions to the original design is that the place of the *November* setting from the Stenness circle is marked, *not* by a tumulus, but by a standing stone. As this stone, near Deepdale, and the tumulus at Onston are only about 1200 yards apart, the suggestion may be made that under certain unknown conditions and possibly in later times tumuli in some cases replaced stones as collimation marks.

With regard to the clock-star, it is to be feared that the stones in the N.E. quadrant as viewed from the circle which might have given us a clue have been removed. As the latitude of Stenness is N. 59°, some star with a less declination than N. 31° would have been chosen, assuming that the sky-line towards the N. point is not very high.

CHAPTER XIV

THE HURLERS (Lat. 50° 31′ N.)

THE sight-lines to which I have drawn attention in relation to the stones of Stenness had to do with the places of sunrise and sunset in the May and Solstitial years. I now pass to another group of circles in which we deal chiefly with the places of star-rise and star-set, some of the stars being used as warners for sunrise at the critical times of the two years in question.

Following the clue given me in the case of the Egyptian temples, such as Luxor, by successive small changes of the axis necessitated by the change in a star's place due to precession, I began this stellar branch of the inquiry by looking out for this peculiarity in an examination of many maps and plans of circles.

I very soon came across two examples in which the sight-line had been changed in the Egyptian manner. The first is the three circles of the Hurlers, some 5 miles to the north of Liskeard, a plan of which is given in "Prehistoric Stone Monuments of the British Isles: Cornwall," by W. C. Lukis, Rector of Wath, Yorkshire, published by the Society of Antiquaries, who were so good as to furnish me with a copy, and also some *unfolded* plans on which sight-lines could be accurately drawn and their azimuths determined. I am anxious to express my obligations to the council and officers of the society for the help thus afforded me.

The three circles are thus referred to by Lukis in the valuable monograph which I have already mentioned.

"On the moor, about a mile to the south of the singular pile of granite slabs, which rest upon and overlap each other, and is vulgarly called the Cheese-wring, there are three large circles of granite stones placed in a nearly straight line in a north-north-east, and south-south-west direction, of which the middle one is the largest, being 135 feet in diameter, the north 110 feet, and the south 105 feet.

"The north Circle is 98 feet, and the south 82 feet from the central one. If a line be drawn uniting the centres of the extreme Circles, the centre of the middle ring is found to be 12 feet 6 inches to the west of it.

"These Circles have been greatly injured. The largest consists of 9 erect and 5 prostrate stones; the north Circle has 6 erect and 6 prostrate, and a fragment of a seventh; and the south has 3 erect and 8 prostrate. In Dr. Borlase's time they were in a slightly better condition. A pen-and-ink sketch made by him, which is extant in one of Dr. Stukeley's volumes of original drawings, represents the middle Circle as consisting of 7 erect and 10 prostrate stones; the north of 10 erect and 6 prostrate; and the south of 3 erect and 9 prostrate. The stone to the east of that marked C in the plan of the middle Circle is the highest, and is

5 feet 8 inches out of the ground, and appears to have been wantonly mutilated recently. Two of the prostrate stones of the north Circle are 6 feet 6 inches in length.

"About 17 feet south from the centre of the middle Circle there is a prostrate stone 4 feet long and 15 inches wide at one end. It may possibly have been of larger dimensions formerly, and been erected on the spot where it now lies, but as Dr. Borlase has omitted it in his sketch it is probably a displaced stone of the ring.

"If we allow, as before, an average interval of 12 feet between the stones, there will have been about 28 pillars in the north, 26 in the south, and 33 in the middle Circle.

"At a distance of 409 feet westwards from K in the middle Circle there are 2 stones, 7 feet apart, both inclined northwards. One is 4 feet 11 inches in height out of the ground, and overhangs its base 2 feet 7 inches; the other is 5 feet 4 inches high, and overhangs 18 inches."

I now pass from a general description of the circles to the azimuths of the sight-lines already referred to, so far as they can be determined from the published Ordnance maps.

To investigate them as completely as possible without local observations in the first instance, I begged Colonel Johnston, R.E., C.B., the Director-General of the Ordnance Survey, to send me the 25-inch maps of the site giving the exact azimuth of the side lines. This he obligingly did, and I have to express my great indebtedness to him.

In Fig. 41 I show the sight-lines from the south and north Circles as determined by the stones and barrows marked on the map. The sight-lines on Arcturus are from

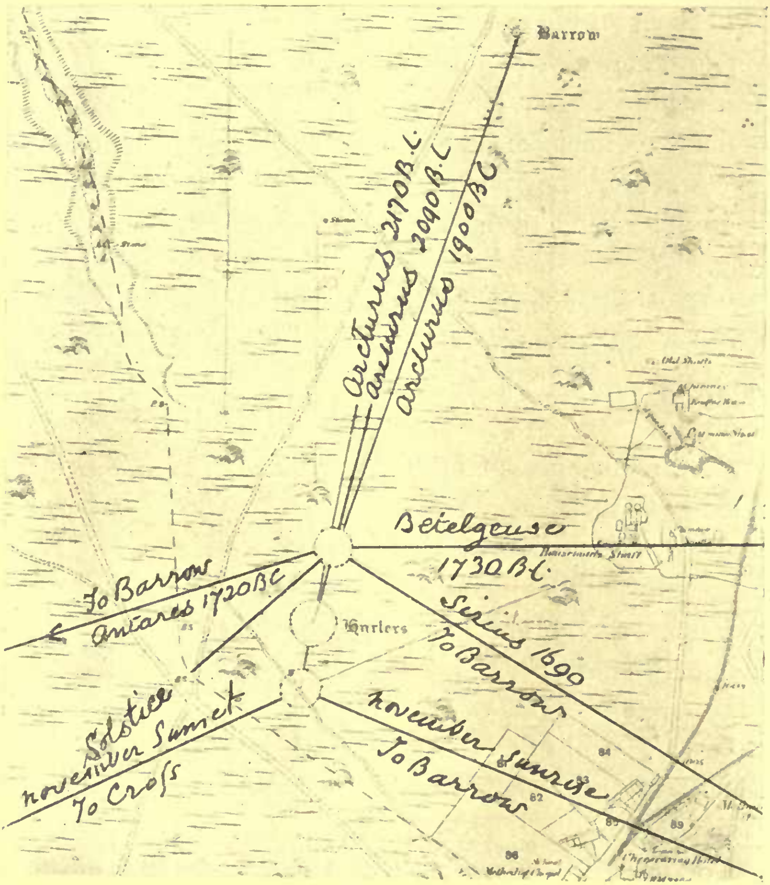

FIG. 41.—The Sight-lines at the Hurlers.

the centres of the three circles in succession. I shall point out later the significance of the fact that the November alignments are from the south, the solstitial ones from the north Circle.

Of the various sight-lines found, those to which I wish to direct attention in the first instance, and which led me to the others, are approximately, reading the azimuths to the nearest degree,

Lat. 50° 31′ N.	Az.
S. circle to central circle	N. 12° E.
Central to N. circle	N. 15° E.
N. circle to tumulus	N. 19° E.

In a preliminary inquiry in anticipation of the necessary local observations with a theodolite, I assumed hills half a degree high, for the reason given on p. 112. We have the following declinations approximately :—

Dec. N.	$38\frac{1}{2}$°
,,	38°
,,	37°

Here, then, we have declinations to work on, but declinations of what star? To endeavour to answer this question I studied the declinations of the three brightest stars in the northern heavens, having approximately the declinations in question some time or other during the period 0 to 2500 B.C.

Vega is ruled out as its declination was too high. The remaining stars Capella and Arcturus may have been observed so far as the declinations go. For time limits we have :—

Dec. N.	Capella.	Arcturus.
$38\frac{1}{2}$°	500 B.C.	1600 B.C.
36°	1050 ,,	1150 ,,

Now there is no question as to which of these two stars we have to deal with, for the northern circle is evidently less ancient than the others, for some of the stones are squared and the others are less irregular than those in the S. circle.

This being so, the approximate dates of the use of the three circles at the Hurlers can be derived. They are, with the above assumption :—

					B.C.
Southern circle	aligning	Arcturus	over	centre of central circle	1600
Central	,,	,,	,,	N. circle	1500
Northern	,,	,,	,,	tumulus	1300

The next step was to obtain, by means of a large circular protractor, more accurate readings of the Ordnance Map. This I could do, but the all important question of the angular height of the horizon remained. As it was impossible for me to leave London when the significance of the alignments was made out, I appealed to the authorities of the Royal Cornwall Polytechnic Society for aid in obtaining the necessary angles, and as a result, Captain J. S. Henderson, of Falmouth, an accomplished surveyor, volunteered his aid and shortly sent me the angular heights along some of the alignments, the means of eight readings obtained with a 6-inch theodolite, both verniers and reversed telescopes being employed. Other students of science besides myself will, I am sure, feel their indebtedness for such opportune help.

The combination of the large protractor and theodolite work gives the following final values. The difference between them and the provisional ones given above speaks volumes as to the necessity of a local study of the height of the horizon, a point I believe invariably neglected by archæologists.

FINAL VALUES.

Arcturus from S. circle to central circle.

Az. N. 11° 15′ E.	Hills, 3° 23′ 52″ high.
Dec. = 41° 38′	DATE, 2170 B.C.

Arcturus from central circle to N. circle.

Az. N. 14° 18′ E.	Same hills.
Dec. = 41° 9′	DATE, 2090 B.C.

Arcturus from N. circle to Barrow.

Az. N. 18° 14′ E.	Same hills.
Dec. = 40° 6′	DATE, 1900 B.C.

Now before this evidence of star worship, so important if it can be depended on, could be accepted, it was necessary to make a special inquiry as to the existence of similar star observations in other places. Many have been found of which more in the sequel.

The next point which arose was that Arcturus used as a clock-star (p. 108) would serve as a warner for August. This necessitated another inquiry into the chief festivals in Cornwall: among these the August (Harvest) festival is one.

Another point to consider was whether there was any evidence of a local August festival. It happens that the Hurlers are in the parish of St. Cleer, and some of the other Arcturus sight-lines are in that of St. Just. Now, a local festival in old days was often associated with the local Saint. As most of the Cornish Saints are common to Cornwall and Brittany, I looked up the Calendar of the *Annuaire* of the *Institut de France*, and found that the days dedicated to SS. Justin and Claire are the 9th and 12th of August. It seems, then, that at the Hurlers it was really a question of a clock-star also used as a warning star for the August festival. I think we have at last, then, run to earth the origin of some of the northerly alignments referred to on pages 36 and 43.

It will have been noted that the last sight-line on Arcturus was marked by a barrow. Captain Henderson inspected it and found it much ruined by explorers, remains of a chamber inside being visible.

In a subsequent visit, in which Captain Henderson was accompanied by Mr. Horton Bolitho, my wife and myself, we not only visited this barrow, but found that the whole hill had been honeycombed to such an extent by mining operations that it was very difficult to discriminate between "investigated" barrows and other heaps and holes, unless the barrow showed the remains of a chamber.

Our examination was not limited to barrows. Captain Henderson had spent a long bleak day in examining and measuring the stones marked on the Ordnance Map, to which I had called his special attention. We went over part of the ground with him, and came to the conclusion that the whole question of the Cornish treatment of "ancient stones" would have to be gone into—an inquiry which Mr. Bolitho is now carrying on.

It must be remembered that any stone or barrow used in the sight-lines we are now considering must have been put up nearly 4,000 years ago, so long ago, in fact, that many of the chief barrows have been reduced to the skeletons of their former selves, the enclosed stone chamber, built of mighty stones, alone remaining.

Cromlechs and standing stones then formed important points in the landscape long before ecclesiastical divisions were thought of, or any attempt was made to indicate the boundaries of private property.

We should expect then to find these ancient monuments freely made use of to mark what we now term "parish boundaries." This is so. Four parishes have thus used one of the larger cromlechs, and it is more than probable that something beside the denunciation of the *cultus lapidum*, which we have seen at work in Brittany (p. 39), has been responsible for the many stone crosses in Cornwall. Of some of them near circles I have gathered the astronomical use, while now they "mark the bounds," as do some of the stone rows in Dartmoor.

I believe that in later times this practice of the Church was followed by those among whom the land was distributed, and this has gone on till at last there are many ancient stones trimmed on one side and bearing initials and so having a modern appearance. The astronomer, and even the archæologist, may regret this practice, but as the habit in Cornwall appears to be for anybody to use the nearest uncrossed and uninitialled stone for a wall or a pigsty, Mr. Bolitho's inquiry may show that in some cases, at all events, it has been a blessing in disguise, for the stones are still there.

In the case of a long chambered barrow, the top of which nearly touches the horizon, as seen from a circle near it, there is less danger of being misled.

In my notes on the stones of Stenness (Chapter XIII) I pointed out that the chambered Cairns at Onston and Maeshowe suggested that such structures were later variants of the more ancient standing stones. Some barrows at the Hurlers lend further confirmation of this view. I will deal with them first. Of one the data are Az. from N. Circle S. 72° 49′ W., height of horizon 12′ (Capt. Henderson). The resulting declination is S. 11° 5′, the declination of Antares 1720 B.C. But why should Antares be thus singled out? The table on page 117 shows the reason. At the date involved the setting of Antares in the dawn was the warner of the sunrise on May morning, the greatest day in all the year.

Is there any precedent for this use of Antares?

I have already pointed out (p. 108) that Mr. Penrose found the warning stars for May morning at the dates of foundation of the Hecatompedon, and the older Erechtheum, to be the group of the Pleiades rising and *Antares* setting. As the foundations of the Hecatompedon were built only some few years after the stones of the central circle of the Hurlers were used, we ought to find traces of the observations of the same May-morning stars.

We have, then, now a third term in the astronomical use of stars to herald the sunrise on May morning.

Temple of Min	. Thebes .	. 3200 B.C. .	. Spica.
Temple at the Hurlers . .	. Liskeard .	. 1720 ,, . .	. Antares.
Older Erechtheum	. Athens .	. 1070 ,, . .	,,

The next barrow to be referred to—it is shown to be a long one on the Ordnance Map—is situated near the top of Caradon Hill, and is visible on the sky-line from the circles. Data : Az. from N. Circle S. 65° E., height of horizon 1° 38′ (Henderson). This corresponds almost exactly with the azimuth of the rise of the sun's upper limb with declination S. 16° 20′ on the two critical dates in November and February of the May-year (Halloween and Candlemas, see p. 23), so I am inclined to consider it more than a mere coincidence that the azimuths coincide so closely. It, however, may be urged that there are other barrows on Caradon Hill, but judging from the Ordnance Map they seem to be of the round variety used for burials, perhaps a thousand years after the circles were in use, and in my opinion by a different race of men ; but this matter must not detain us now, I hope to return to it later.

Still one more barrow and a stone, uncrossed and uninitialled, in the same sight-line, data : Az. from N. circle S. 59° 35′ E. Height of horizon 1° 38′ 23″ (Henderson), resulting declination S. 19° 50′. This was the declination of Sirius 1690 B.C. Why Sirius? The table on p. 117 gives us the answer. Sirius replaced Arcturus as a warning star for the August festival, and we have seen that the last use of Arcturus was connected with the sight-line to the barrow about 1900 B.C.

I pass now from barrows to stones. There is one about which there can be no question. It is a famous Cross, a "Longstone" at which all travellers stop on their way from St. Cleer to the Hurlers. It occupies nearly the same position on the S.W. horizon as does the long tumulus on Caradon Hill in the S.E. quadrant. From the *South* Circle, and this is important, its

Azimuth, S. 64° W., is nearly the same; it marked, and still marks, the sunset point on the critical days of the May year in November and February.

There is another stone marked on the Ordnance Map Az. N. 88° E. from the N. circle. It has been removed, so I may fairly assume that it was really an ancient stone. Captain Henderson's value for the height of the horizon is 11′ 31″. The table on p. 117 will show that in this direction we have to deal with Betelgeuse as a warner for the summer solstice. The resulting date is 1730 B.C.

It would appear that possibly this is not the only stone dealing with (later) solstitial alignments. Lukis gives two stones on the west side of the circles which on the Ordnance Map are classed as boundary stones: they lie on a boundary beyond all question, but also beyond all question they are as ancient as the stones of the circles themselves. From the N. circle they are almost but not quite in a line, and the azimuth of the south stone is S. 49° W. This is a solstitial azimuth. I think, therefore, that we may accept this as another evidence of the worship of the setting sun at the winter solstice, *from the N. circle*, and in this we have still further evidence that to the worship of the May year in the south circle was added later one dealing with the solstitial year which was chiefly carried on in the N. circle.

CHAPTER XV

THE DARTMOOR AVENUES

In Chapter XI. I referred to the very numerous alignments of stones in Brittany, and I was allowed by Lieutenant Devoir, of the French Navy, to give some of his theodolite observations of the directions along which the stones had been set up.

The conclusion was that we were really dealing with monuments connected with the worship of the sun of the May year, a year which the recent evidence has shown to have been the first used after the length of the year had been determined; thus replacing the lunar unit of time which was in vogue previously, and the use of which is brought home to us by the reputed ages of Methuselah and other biblical personages, who knew no other measurer of time than the moon.

There was also evidence to the effect that in later times solstitial alignments had been added, so that the idea that we were dealing with astronomically oriented rows of stones was greatly strengthened, not to say established.

So long as the Brittany alignments were things of mystery, their origin, as well as that of the more or less similar monuments in Britain, was variously explained;

they were models in stone of armies in battle array, or they represented funeral processions, to mention only two suggestions. I should add that Mr. H. Worth, who has devoted much time to their study, considers that some sepulchral interest attaches to them, though he thinks it may be argued that that was secondary, even as are interments in cathedrals and churches. About burials associated with them, of course, there is no question, for the kistvaens and cairns are there; but my observations suggest that they were added long after the avenues were built, because some cairns *block* avenues. Perhaps a careful study of the modes of burial adopted may throw light on this point.

The equivalents of the Brittany alignments are not common in Britain; they exist in the greatest number on Dartmoor, whither I went recently to study them. The conditions on high Dartmoor are peculiar; dense blinding mists are common, and, moreover, sometimes come on almost without warning. From its conformation the land is full of streams. There are stones everywhere. What I found, therefore, as had others before me, was that as a consequence of the conditions to which I have referred, directions had been indicated by rows of stones for quite other than ceremonial purposes. Here, then, was another possible origin. It was a matter of great importance to discriminate most carefully between these alignments, and to endeavour to sort them out. My special inquiry, of course, was to see if they, like their apparent equivalents in Brittany, could have had an astronomical origin. The first thing to do, then, was to see which might have been erected for worship or which for practical purposes.

In doing this there is no difficulty in dealing with extremes. Thus one notable line of large flat stones has been claimed by Messrs. R. N. Worth and R. Burnard as a portion of the Great Fosseway (Rowe's *Perambulation*, third edition, p. 63); it has been traced for eighteen miles from beyond Hameldon nearly to

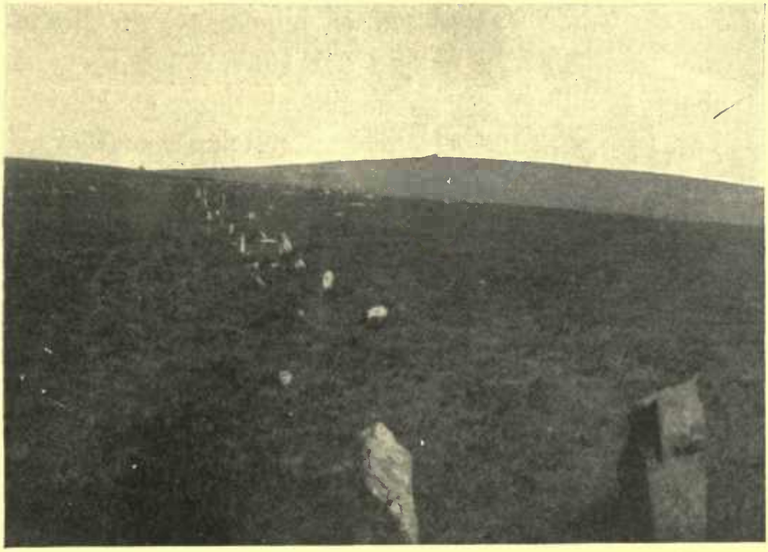

Photo. by Lady Lockyer.

FIG. 42.—The Southern Avenue at Merrivale, looking East.

Tavistock, the stones being about 2 feet thick and the road 10 feet wide.

There are two notable avenues of upright stones at Merrivale; they are in close connection with a circle, and could have had no practical use. These stones, then, we may claim as representing the opposite extreme of the Fosseway and as suggesting an astronomical, as opposed to a practical, use; the adjacent circle, of course greatly strengthens this view.

L 2

It is between these extremes that difficulties may arise, but the verdict can, in a great many cases at all events, be settled without any very great hesitation, especially where practical or astronomical uselessness can be established. But even here care is necessary, as I shall show.

The stones now in question, originally upright, are variously called avenues, rows, alignments or parallelithons. Their study dates from 1827, when Rowe and Colonel Hamilton Smith examined those at Merrivale (Rowe, *op. cit.*, p. 31). Their number has increased with every careful study of any part of the moor, and doubtless many are still unmapped.[1] The late Mr. R. N. Worth, of Plymouth, and his son, Mr. H. Worth, have given great attention to these monuments, and the former communicated a paper on them to the Devonshire Association for the Advancement of Science in 1892 (*Trans.*, xxv. pp. 387–417).

A word of caution must be said before I proceed. We must not take for granted that the stone-rows are now as they left the hands of the builders. The disastrous carelessness of the Government in the matter of our national antiquities is, I am locally informed, admirably imitated by the Devonshire County and other lesser councils, and, indeed, by anybody who has a road to mend or a wall to build. On this account, any of the rows may once have been much longer and with an obvious practical use; and those which now appear

[1] On June 15, 1905, that excellent guide of the Chagford part of the moor, Mr. S. Perrott, showed me an avenue (Azimuth N. 20° E. true) near Hurston Ridge which is not given in the 1-inch map.

to be far removed from circles may once have been used for sacred processions at shrines which have disappeared.

Again, the rows of stones we are now considering must not be confounded with the "track lines" or "boundary banks" which are so numerous on Dartmoor, and are represented in Wiltshire according to Sir R. C. Hoare; these serve for bounds and pathways, and for connecting and enclosing fields or houses.

Dealing, then, with stone rows or avenues, which may be single, double, or multiple; any which are very long and crooked, following several directions, are certainly not astronomical; and it is easy to see in some cases that they might have been useful guides at night or in mist in difficult country with streams to cross. This possible utility must not be judged wholly by the present conformation of the ground or the present beds of streams.

For multiple avenues it is hard to find practical uses such as the above, and we know how such avenues were used in Brittany for sun worship. Mr. Baring Gould considers there were eight rows in an avenue on Challacombe Down 528 feet long; of these only three rows remain, the others being represented by single stones here and there (Rowe, p. 33). I shall have something to say about this avenue further on.

Although, as I have said, long rows bending in various directions are not likely to have had an astronomical origin, it must not be assumed that all astronomical avenues must be *exactly* straight. This, of course, would be true for level ground, but if the avenue has to pass over ridges and furrows, the varying height of the horizon must be reckoned with, and therefore the azimuth of the avenue at any point along it.

I think it possible that in the Stalldon Moor row we have the mixture of religious and practical intention at which I have before hinted. Both Mr. Lukis and Mr. Hansford Worth have studied this monument, which is two miles and a quarter long. There is a circle at the south end about 60 feet in diameter, while at its northern end there is a cairn.

Where the line starts from the circle the direction of the row is parallel to many sight-lines in Cornwall, and Arcturus would rise in the azimuth indicated. But this direction is afterwards given up for one which leads towards an important collection of hut circles, and it crosses the Erme, no doubt at the most convenient spot. More to the north it crosses another stream and the bog of Red Lake. All this is surely practical enough, although the way indicated might have been followed by the priests of the hut circles to the stone circle to prepare the morning sacrifice and go through the ritual.

But there is still another method of discrimination. If any of these avenues were used at all for purposes of worship, their azimuths should agree with those already found in connection with circles in other parts of Britain, for we need not postulate a special race with a special cult limited to Dartmoor; and in my inquiries what I have to do is to consider the general question of orientation wherever traces of it can be found. The more the evidences coincide the better it is for the argument, while variations afford valuable tests.

Now, speaking very generally (I have not yet compared all my numerous notes), in Cornwall the chief alignments from the circles there are with azimuths N. 10°—20° E. watching the rise of the clock-star, N. 64°—68° E. watching the rise of the May sun, N. 75°—82° E. watching the rise of the Pleiades. The variation in the azimuths is largely due to the different heights of the horizon towards which the sight-lines are directed.

The conclusion I have come to is that these alignments, depending upon circles and menhirs in Cornwall, are all well represented on Dartmoor associated with the avenues; and further, so far as I have learned at present, in the case of the avenues connected with circles, there are not many alignments I have not met with in connection with circles in Cornwall and elsewhere.

This is not only a *prima facie* argument in favour of the astronomical use underlying the structures, but it is against the burial theory, for certainly there must have been burials in Cornwall.

In order, therefore, to proceed with the utmost caution, I limit myself in the first instance to the above azimuths, and will begin by applying a test which should be a rigid one.

If the avenues on Dartmoor had to deal with the same practices and cults as did the circles in Cornwall, they ought to prove themselves to have been in use at *about* the same time, and from this point of view the investigation of the avenues becomes of very great importance, because of the destruction of circles and menhirs which has been going on, and is still going on, on Dartmoor. We have circles without menhirs and menhirs without circles, so that the azimuths of the avenues alone remain to give us any chance of dating the monuments if they were used in connection with star worship. The case is far different in Cornwall, where both circles and menhirs have in many cases been spared.

On Dartmoor, where in some cases the menhirs still remain, they have been annexed as crosses and perhaps as boundary stones, and squared and initialed; hence the Ordnance surveyors have been misled, and they are not shown as ancient stones on the map. In some cases the azimuth of the stones suggests that this has been the sequence of events.

It will be seen from the above that I have not tackled a question full of pitfalls without due caution, and this care was all the more necessary as the avenues have for long been the meeting ground of the friends and foes of what Rowe calls "Druidical speculations"; even yet the war rages, and my writing and Lieut. Devoir's observing touching the similar but grander avenues of Brittany have so far been all in vain; chiefly, I think, because no discrimination has been considered possible between different uses of avenues, and because the statements made by archæologists as to their direction have been quite useless to anybody in consequence of their vagueness, and last of all because the recent work on the Brittany remains is little known.

I began my acquaintance with the Dartmoor monuments by visiting Merrivale, and the result of my inquiries there left absolutely no doubt whatever on my mind. I was armed, thanks to the kindness of Colonel Johnston, the Director of the Ordnance Survey, with the

25-inch map, while Mr. Hansford Worth had been so good as to send me one showing his special survey.

The Merrivale avenues (lat. 50° 33′ 15″) are composed of two double rows, roughly with the azimuth N. 82° E.; the northern row is shorter than the other. Rowe, in his original description (1830), makes the northern 1143 feet long; they are not quite parallel, and the southern row has a distinct "kink" or change of direction in it at about the centre. The stones are mostly 2 or 3 feet high, and in each row they are about 3 feet apart; the distance between the rows is about 80 feet.

I have before pointed out (p. 149) that an avenue directed to the rising place of a star, if it is erected over undulating ground, cannot be straight. I may now mention another apparent paradox. If two avenues are directed to the rising place of the same star *at different times*, they cannot be parallel. It is not a little curious that absence of parallelism has been used against avenues having had an astronomical use!

Both the Ordnance surveyors and Mr. Worth have shown the want of parallelism of the two avenues, and Mr. Worth has noted the kink in the southern one. The height of the horizon, as determined from my measures, is 3° 18′. The results of these inquiries, assuming the Pleiades to have been observed warning May morning, are as follows:—

Azimuth.	Authority.	N. Declination.	Date B.C.
N. 83°15 E.	Worth	6° 47′ 47″	1710
82·30	Worth	7 16 20	1630
82·10	Ordnance	7 32 0	1580
80·40	Worth	8 26 0	1420
80·30	Ordnance	8 30 0	1400

To simplify matters we may deal with the Ordnance values and neglect the small change of direction in the southern avenue. We have, then, the two dates 1580 B.C. and 1420 B.C. for the two avenues. The argument for the Pleiades is strengthened by the fact that at Athens the Hecatompedon was oriented to these stars in 1495 B.C. according to Mr. Penrose's determination of the azimuth.

Now this is not the first time I have referred to

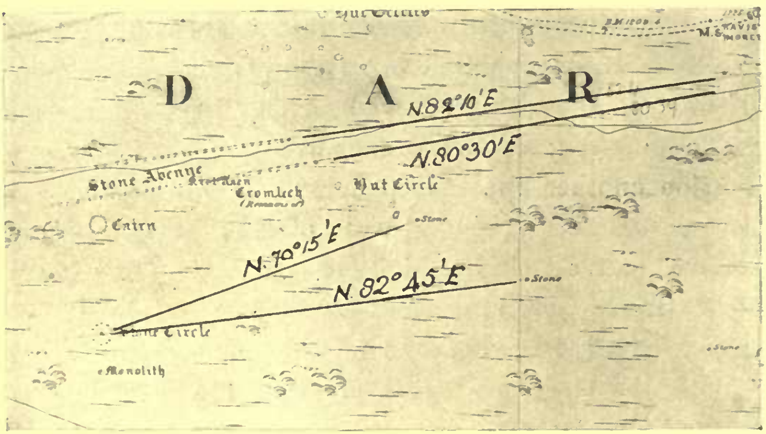

FIG. 43.—Plan, from the Ordnance Map, showing the avenues, circle and stones at Merrivale, with their azimuths.

avenues in these notes. The azimuth of one at Stonehenge was used to fix the date at which sun worship went on there. That avenue, unlike the Dartmoor ones, was built of earth, and it is not alone. There is another nearly two miles long called the Cursus. So far, I have found no solstitial worship on Dartmoor, so there are no avenues parallel to the one at Stonehenge leading N.E. from the temple. But how about the other? *It is roughly parallel to the avenues at*

Merrivale, and I think, therefore, was, like them, used as a processional road, a via sacra, to watch the rising of the Pleiades.

I said roughly parallel; its azimuth is about the same (N. 82° E. roughly); but the horizon is only about 1° high; it was therefore in use before those at

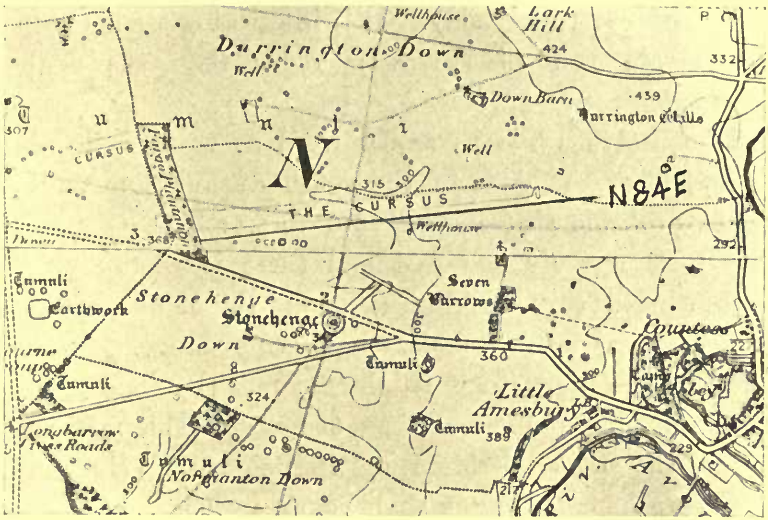

FIG. 44.—Reprint of Ordnance Map showing that the Cursus at Stonehenge is nearly parallel to the Merrivale Avenue. The azimuth is 82° and not 84° as shown in the figure.

Merrivale; the exact date of use must wait for theodolite values of the height of the horizon, but in the meantime we can see from the above estimates that the declination of the Pleiades was about N. 5° 28′ 30″ and the date of use 1950 B.C., that is some 300 years before the solstitial restoration.

Mr. Worth's survey gives another line of stones. It is undoubtedly, I think, an ancient line, although it is not shown in the Ordnance map, a clear indication of the difficulty of discriminating these avenues on land cumbered with stones in all directions. Its azimuth is N. 24° 25′ E., and the height of the horizon 5° 10′. This gives us Arcturus at the date 1860 B.C., showing that, as at the Hurlers, Arcturus was used as a clock-star. Hence a possible *astronomical* use is evident, while this row, like the others, could have been of no *practical* use to anybody. It is interesting to note that this single row of stones is older than the double ones; this seems natural.

It is worth while to say a word as to the different treatment of the ends of the south avenue now that it seems probable that it was used to watch the rising of the Pleiades. At the east end there is what archæologists term a "blocking stone"; these observations suggest that it was really a *sighting* stone. At the west end such a stone is absent, but the final stones in the avenue are longer than the rest. This may help us in the true direction of the sight-lines in other avenues; and, indeed, I shall show in the sequel that this consideration affords a criterion which, in the cases I have come across, is entirely in harmony with others.

CHAPTER XVI

THE DARTMOOR AVENUES (*continued*)

My inquiries began at Merrivale because there is a circle associated with the avenues a little to the south of the west end of the longest; and again nearly, or quite, south of this there is a fine menhir, possibly used to give a north-south line. There is another menhir given on the Ordnance map, azimuth N. 70° 30′ E., which, with hills 3° high, points out roughly the place of sunrise from the circle in May (April 29). Although this stone has been squared and initialed, I think I am justified in claiming it as an ancient monument. There is still another, azimuth N. 83° E., giving a line from the circle almost parallel to the avenue. I hope some local archæologist will examine it, for if ancient it will tell us whether the N. avenue or the circle was built first, a point of which it is difficult to overrate the importance, as it will show the strict relationship between the astronomy of the avenues and that of the circle, and we can now, I think, deal with the astronomical use of circles after the results obtained at Stonehenge, Stenness and the Hurlers as an accepted fact. With the above approximate values the date comes out 1750 B.C., the declination of the Pleiades being N. 6° 35′.

I now pass on from Merrivale as an example of those avenues the direction of which lies somewhere in the E.-W. direction. Others which I have not seen, given by Rowe, are at Assacombe, Drizzlecombe and Trowlesworthy; to these Mr. Worth adds Harter or Har Tor (or Black Tor).

The avenues which lie nearly N. and S. are more numerous. Rowe gives the following:—Fernworthy, Challacombe, Trowlesworthy, Stalldon Moor, Battendon, Hook Lake, and Tristis Rock. Of these I have visited the first two, as well as one on Shovel Down not named by Rowe, and the next two I have studied on the 6-inch Ordnance map.

Fernworthy (lat. 50° 38′).—Here are two avenues, one with azimuth N. 15° 45′ E., hills 1° 15′. There is a sighting stone at the N. end. We appear to be dealing with Arcturus as clock-star 1610 B.C. This is about the date of the erection of the N. avenue at Merrivale.

The second avenue has its sighting stone built into a wall at the south end. Looking south along the avenue, the conditions are azimuth S. 8° 42′ W., hills 3° 30′.

Both these avenues are aligned on points within, but *not* at the centre of, the circle.

Challacombe (lat. 50° 36′).—This is a case of a triple avenue, probably the remains of eight rows, in a depression between two hills, Challacombe Down and Warrington. There is no circle. The azimuth is 23° 37′ N.W. or S.E., according to direction. The northern end has been destroyed by an old stream work; there is no blocking stone to the south on either of the remaining avenues, but one large menhir terminates one row of stones. The others may have been removed. So it is probable that the alignment was to the north. If so, we are dealing with the setting of Arcturus, warning the summer solstice sunrise in 1860 B.C. To the S. the hills are 4° 48′, to the N. 4° 50′.

FIG. 45.—The remains of the eight rows of the Challacombe Avenue. Looking North of East. Terminal Menhir on the extreme right.

To this result some importance must be attached, first, because it brings us into presence of the cult of the solstitial year, secondly, because it shows us that the system most in vogue in Brittany was introduced in relation to that year. In Brittany, as I have before shown, the complicated alignments, there are 11 parallel rows at Le Ménac (p. 99) (there *were* 8 parallel rows at Challacombe), were set up to watch the May and August sunrises, and the solstitial alignments came afterwards. The Brittany May alignments, therefore, were probably used long before 1860 B.C., the date we have found for Challacombe, where not the sunrise but the setting star which gave warning of it was observed.

It is worth while to point out that at Challacombe, as elsewhere, the priest-astronomers so located their monuments that the nearly circumpolar stars which were so useful to them should rise over an horizon of some angular height. In this way the direction-lines would be available for a longer period of time, for near the north point the change of azimuth with change in the declination of the star observed is very rapid.

Shovel Down, near Batworthy (lat. 50° 39′ 20″).—A group of five rows of stones, four double, one single, with two sets of azimuths.

One set gives az. 22°, 25°, and 28°. They seem to be associated. I will call them A, B, and C. A is directed to the circle on Godleigh Common. Its ends are free. B is a single line of stones to the E. of the triple circle, about which more presently. It is not marked on the Ordnance map; its ends are also free. C has its south end blocked, I think in later times, by a kistvaen. The astronomical direction may be, therefore, either N.W. or S.E. We find a probable use in the N.W. quadrant, as at Challacombe, Arcturus setting at daybreak as a warner of the summer solstice.

The height of hills is 46′; we have then:—

Az.	N. Dec.	Star.	Date.
N. 22° W.	36° 19′ 40″	Arcturus	1210 B.C.
N. 25° W.	35° 23′ 20″	,,	1040 ,,
N. 28° W.	34° 19′ 30″	,,	850 ,,

Adjacent to A, B, C, is another avenue, which I will call D. Unlike the others, its northern end points 2° E. of N. Its southern end is blocked by a remarkable triple circle, the end of the avenue close to it being defined by two tall terminal stones. We are justified, then, in thinking that its orientation was towards the north; the height of the horizon I measured as 45′. It may have been an attempt to mark the N. point of the horizon.

The triple circle to which I have referred is not an ordinary circle. I believe it to be a later added, much embellished, cairn. According to Ormerod, the diameters are 26, 20, and 3 feet, and there are three small stones at the centre.

All the above avenues are on the slope of the hill to the north. On the south slope we find the longest of all, as shown on the Ordnance map survey of 1885. There is a "long stone" in its centre, and at the southern end was formerly a cromlech, the "three boys." Part of this avenue, and two of the three "boys," have been taken to build a wall. The long stone remains, because it is a boundary stone!

The azimuth is 2° 30′ W. of north or E. of south. Looking N. from the long stone, the height of the horizon is 2° 30′. I think this avenue was an attempt to mark the S. point.

Trowlesworthy (lat. 50° 27′ 30″).—The remains here are most interesting. This is the only monument on Dartmoor in which I have so far traced any attempt to locate the sun's place at rising either for the May or solstitial year. But I will deal with the N.-S. avenue first, as it is this feature which associates it with Fernworthy and Challacombe.

As at Merrivale, the avenue has a decided "kink" or change of direction. The facts as gathered from the 6-inch map are as follows:—

	Az.	Hills.	Dec. N.	Star.	Date.
S. part of Avenue	N. 7° E.	2° 52′	41° 29′ 10″	Arcturus	2130 B.C.
N. " "	N. 12° E.	2° 52′	41° 6′ 20″	"	2080 B.C.

This date is very nearly that of the use of the S. circle at the Hurlers, and it is early for Dartmoor; but it is quite possible that local observations on an associated avenue a little to the west of the circle which terminates the N.-S. avenue will justify it.

Fig. 46.—The sight-lines at Trowlesworthy, showing high northern azimuths. From the Ordnance map.

This is not far from parallel to that at Merrivale, but its northern azimuth is greater, so that if it turns out to have been aligned on the Pleiades its date will be some time before that of Merrivale, that is, before 1580 B.C. I can say nothing more about it till I have visited it.

The new features to which I have referred are two tumuli which in all probability represent more recent additions to the original scheme of observation, as we have found at Stenness, and show that Trowlesworthy was for long one of the chief centres of worship on Dartmoor. Their azimuths are S. 64° E. and S. 49° W., dealing, therefore, with the May year sunrises in November and February and the solstitial sunset in December. It is probable that, as at the Hurlers, tumuli were used instead of stones not earlier than 1900 B.C.

Stalldon Moor (lat. 50° 27′ 45″) I have already incidentally referred to. The azimuth of the stone row as it leaves the circle, *not* from its centre as I read the 6-inch map, is N. 3° E.; as the azimuth gradually increases for a time, we may be dealing with Arcturus, but local observation is necessary.

The differences between the Cornish and Dartmoor monuments give much food for thought, and it is to be hoped that they will be carefully studied by future students of orientation, as so many questions are suggested. I will refer to some of them.

(1) Are the avenues, chiefly consisting of two rows of stones, a reflection of the sphinx avenues of Egypt? and, if so, how can the intensification of them on Dartmoor be explained?

(2) Was there a double worship going on in the avenues and the circles at the same time? If not, why were the former not aligned on the circles? On a dead level, of course, if the avenues were aligned on the centre of the circle towards the rising or setting of the sun or a star, the procession in the *via sacra* would block the view of those in the circle. We have the

M 2

avenue at Stonehenge undoubtedly aligned on the centre of the circle, but there the naos was on an eminence, so that the procession in the avenue was always below the level of the horizon, and so did not block the view.

(3) Do all the cairns and cists in the avenues represent later additions, so late, indeed, that they may have been added after the avenues had ceased to be used for ceremonial purposes? The cairn at nearly the central point of the S. avenue at Merrivale was certainly not there as a part of the structure when the avenue was first used as a *via sacra* for observing the rising of the Pleiades. I have always held that these ancient temples, and even their attendant long and chambered barrows, were for the living and not for the dead, and this view has been strengthened by what I have observed on Dartmoor.

There was good reason for burials after the sacred nature of the spot had been established, and they may have taken place at any time since; the most probable time being after 1000 B.C. up to a date as recent as archæologists may consider probable.

Mr. Worth, whose long labours on the Dartmoor avenues give such importance to his opinions, objects to the astronomical use of those avenues because there are so many of them; he informs me that he knows of 50; I think this objection may be considered less valid if the avenues show that they were dedicated to different uses, some practical and others sacred, at different times of the year. For instance, Challacombe is not a duplicate of Merrivale; one is solstitial, the other deals with the May year; and a complete examination of them—I have only worked on the fringe—may show other differences having the same bearing.

In favour of the astronomical view it must be borne in mind that the results obtained in Devon and Cornwall are remarkably similar, and the dates are roughly the same. Among the whole host of heaven from which objectors urge it is free for me to select any star I choose, at present only six stars have been considered, two of which were certainly used, as in Egypt, as clock-stars as they just dipped below the northern horizon, and other two afterwards at Athens; and these six stars are shown by nothing more recondite than an inspection of a precessional globe to have been precisely the stars, the "morning stars," wanted by the priest-astronomers who wished to be prepared for the instant of sunrise at the critical points of the May or solstitial year.

CHAPTER XVII

STANTON DREW (Lat. 51° 10′ N.)

OTHER circles to which I have given some attention are at Stanton Drew in Somerset. I regret to say that I have not as yet had an opportunity of visiting them. But a cursory inspection on the Ordnance map of the possible sight-lines from circle to circle, for there are three, suggested at once that we were dealing with the same problem as that worked out, if somewhat differently, at the Hurlers.

The three circles, two avenues leading from two of the circles towards the river, and some outstanding stones were most carefully surveyed by Mr. C. E. Dymond some years ago. He was good enough to send me copies of his plans and levelling sections. I have not had the advantage of perusing his memoir, but I have studied the monuments as well as I could by means of the 25-inch Ordnance map. This, combined with an azimuth which Colonel Johnston, the Director-General of the Ordnance Survey, was kind enough to send me, should give me bearings within a degree.

I will begin by giving a short account of the stones which remain, abridged from the convenient pamphlet prepared for the British Association meeting at Bristol in 1898 by Prof. Lloyd Morgan.

The circles at Stanton Drew, though far less imposing than those of Avebury and Stonehenge, are thought to be more ancient than are the latter, for the rough-hewn uprights and plinths of Stonehenge bear the marks of a higher and presumably later stage of mechanical development. Taken as a group, the Somersetshire circles are in some respects more complex than their better known rivals in Wiltshire. There are three circles, from two of which "avenues" proceed for a short distance in a more or less easterly direction; there is a shattered but large dolmen—if we may so regard the set of stones called "the cove"; and there are outlying stones—the "quoit," and those in Middle Ham—which bear such relations to the circles as to suggest that they too formed parts of some general scheme of construction.

From the photograph of the Ordnance map (Fig. 47) it will be seen, as pointed out by Prof. Lloyd Morgan,

(1) That the centre of the great circle, that of the S.W. circle, and that of the quoit, are nearly in the same straight line.

(2) That the cove, the centre of the great circle, and that of the N.E. circle, are nearly in the same straight line.

The quoit, which generally means the covering stone of a cromlech—"Hautville's Quoit," as it is named on the Ordnance map—looms large in Stanton Drew tradition; it is locally as much respected as the circles themselves. It is pointed to most unmistakably by the fact that a line from it to the S.W. circle passes nearly through the centre of the great circle.

If the observation line, then, meant anything astronomically, it can only have had to do with the rising of a star far to the north, in a position far more northerly than the sun ever reaches.

The "quoit," lying in an orchard by the roadside, has nothing very impressive about its appearance—a recumbent mass of greyish sandstone; but it seems to be a brick in the Stanton Drew building. By some regarded as a sarsen block from Wiltshire, it is, in Prof. Lloyd Morgan's opinion, more probably derived from the Old Red Sandstone of Mendip. In any case it is not, geologically speaking, *in situ;* nor has it reached its present position by natural agency.

With regard to two of the megalithic circles, at first sight the constituent stones seem irregularly dotted about the field; but as we approach them the unevenly spaced stones group themselves.

The material of which the greater number of the rude blocks is composed is peculiar and worthy of careful examination. It is a much altered rock consisting, in most of the stones, of an extremely hard siliceous breccia with angular fragments embedded in a red or deep brown matrix, and with numerous cavities which give it a rough slaggy appearance. Many of these hollows are coated internally with a jasper-like material, the central cavity being lined with gleaming quartz-crystals.

The majority of the stones were probably brought from Harptree Ridge on Mendip, distant some six

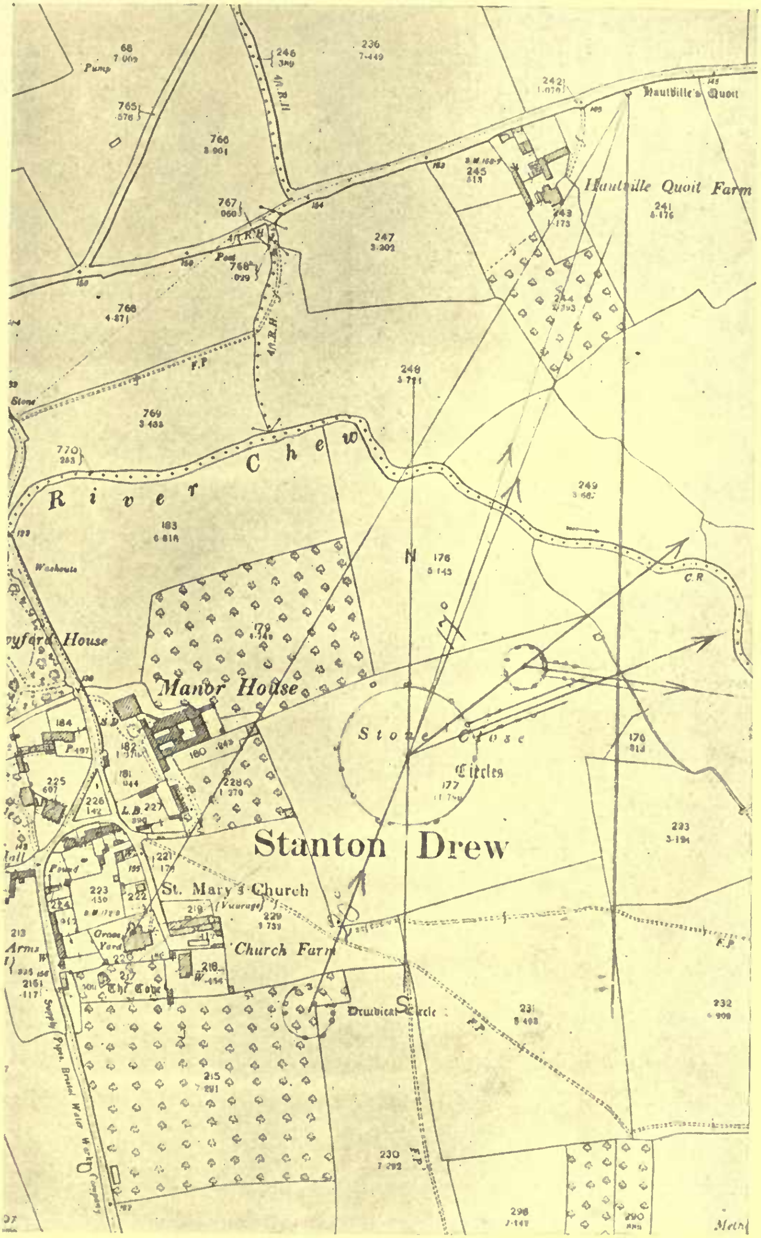

Fig. 47.—The Circles and Avenues at Stanton Drew. Photograph of 25-inch Ordnance map, shewing approximate azimuths of sight-lines.

miles. Weathered blocks of Triassic breccia, showing various stages of silicification, there lie on the surface; and there probably lay the weathered monoliths which have been transported to Stanton Drew. It is important to note that they were erected unhewn and untouched by the tool. A few stones are of other material—sandstone, like the "quoit," or oolite from Dundry.

In the great circle, of the visible stones some retain their erect position, others are recumbent, several are partially covered by accumulation of grass-grown soil. Others are completely buried, their position being revealed in dry seasons by the withering of the grass above them.

To the east of this circle a short avenue leads out, there being three visible stones and one buried block on the one hand, and two visible stones on the other. But one's attention is apt to be diverted from these to the very large and massive megaliths of the small N.E. circle. This is composed of eight weathered masses, one of which (if indeed it do not represent more than one), Prof. Lloyd Morgan tells us, is recumbent and shattered. From this circle, all the stones of which are of the siliceous breccia, a short avenue of small stones also opens out eastwards.

The third or S.W. circle lies at some little distance from the others. The average size of the stones is smaller than in either of the other circles, and not all are composed of the same material.

"The Cove," which has been variously regarded as a dolmen, a druidical chair of state, and a shelter for sacrificial fire, is close to the church.

The dimensions and numbers of the stones are as follow:

Great circle,	diameter	368	feet,	30 stones.
N.E. ,,	,,	97	,,	8 ,,
S.W. ,,	,,	145	,,	12 ,,

As I was not able to visit Stanton Drew when the significance of the northerly alignments struck me, I made an appeal to Prof. Lloyd Morgan, of whose pamphlet I have so largely made use, to obtain some theodolite observations. As a result such observations have been made by himself and Mr. Morrow, from whom I have recently received a report with full permission to make use of it in this place.

The monuments are not easy to measure, as the centres of the circles are not readily determined, as so many of the stones are either absent, recumbent or buried.

In my rough reading of the Ordnance map given in Fig. 47, I thought I might be guided by taking centres, such that the avenues would be aligned on them as at Stonehenge. I had not then seen the Dartmoor avenues, which in some cases are not aligned on the centres. In this it is possible that I was wrong, as both Mr. Dymond's and Mr. Morrow's observations suggest that the avenues are really of the Dartmoor pattern. Mr. Morrow writes: "The centres of the circles are (to a certain small extent) a matter of choice, a difference of a few minutes may easily occur. In dealing with the avenues a larger discrepancy may occur. I have taken what, in my opinion, was the best centre line of each avenue and thus determined its azimuth. But I believe that originally the southern line of stones forming each avenue was directed towards the centre of the corresponding circle, and that the avenue was then completed by the erection of a parallel line of stones. A difference of a few degrees may thus be accounted for in the azimuth supposed to have been originally marked out."

About Mr. Morrow's azimuths there can be no question. He writes:

"The instruments used were, first, a 6″ theodolite, and second, a 6″ transit theodolite. The final results were obtained with the latter. It cannot be reversed when measuring elevations. I tested it very carefully for the adjustments of (*a*) line of collimation at right angles to the horizontal axis, (*b*) horizontal axis perpendicular to vertical axis, and (*c*) line of collimation and spirit level parallel to each other. The instrument was in first-rate order, the error in elevation, for example, being within that corresponding to a slope of 1 in 40,000; that is well within the limit of 20″ to which vertical angles can be read.

"The meridian was obtained by two different methods applied several times, the results agreeing very closely. Readings of azimuths and altitude of sun were taken between three and four hours after noon, corrected for semi-diameter, &c., and the true bearing obtained with the aid of the latitude and the declination given in Nautical Almanac (corrected for time).

"With regard to the elevations of the horizon, the existence of trees on or just below the sky-line renders readings to the nearest minute uncertain. In all cases

I have tried to give the most probable value, supposing the trees to be absent. In some places the heights will have altered slightly during recent years owing to the construction of railways.

"The values given are the means of observations. They are not corrected for height of instrument above ground, which might increase the angles by about 5 mins. Trees on the sky-line appear to make a difference of some 35 mins."

The azimuths as found by Mr. Morrow and myself are as under:

	Morrow.	Lockyer.	Height of horizon (excluding trees). Morrow.
[1] From centre of great circle to Hauteville's quoit	N. 17° 59′ E.	17°	2° 23′
From centre of great circle to N.E. circle	53° 0′	51°	1° 5′
From centre of great circle along great circle avenue	68° 43′	65°	0° 38′
From centre of N.E. circle along N.E. circle avenue	S. 83° 52′ E.	79°	1° 40′
From centre of S.W. circle to centre of great circle	19° 51′ E.	20°	1° 44′

The azimuths to which I first direct attention are these:

	Az.
Great circle to quoit	N. 17° E
S.W. circle to great circle	N. 20° E.

These azimuths indicate that at Stanton Drew as at

[1] With regard to these values Mr. Morrow writes: "At present Hauteville's quoit is not visible from the centre of great circle. If the stone were erect, however, and any intervening trees and walls removed, the top of the stone would no doubt be within view. The Hauteville quoit line is thus rather a difficult one to obtain with accuracy, but the azimuth given should be correct to the nearest minute."

the Hurlers and elsewhere we are dealing with Arcturus as a clock-star. The facts are :

Az.	N. Decln.	Height of hills.	Star.	Date.
N. 17° E.	38° 59′ 0″	2° 23′	Arcturus	1690
20°	37° 26′ 50″	1° 44′	"	1410

One of the greatest differences between Mr. Morrow's local observation and my reading of the 25-inch Ordnance map occurs in the case of the direction of the avenue from the great circle. It may be suggested that the use of this avenue was to observe the May and August sunrises of the May year. If we take the sun's declination at 16° 20′ N., see p. 22, the azimuth should be about N. 64° E.; this is 1° from my value and 5° from that given by Mr. Morrow, but it must not be forgotten that the choice of a day in May and August slightly differing from the normal date might easily produce such a variation.

It seems probable that the great circle was one of the first erected, and the fact that, like Stonehenge, it had an avenue, but that, unlike Stonehenge, the avenue was directed towards the May and not the June (solstitial) sunrise further, I think, suggests that the May worship was considered the most important and was the first provided for.

There is reason for supposing that the great circle was at all events built before the S.W. one. The great circle is situated at a lower level than the S.W. one. The angular elevation of the hills over which Arcturus rose would appear, therefore, to be higher from the great than from the S.W. circle. Arcturus has been reducing its declination for centuries in consequence of the precessional movement. It would therefore rise gradually in a greater azimuth, that is, nearer the east. An observer in the centre of the great circle, to follow this more easterly rising over the quoit, would have to change his position gradually to the westward. But there was another way. The original direction could be nearly maintained if the observation were made at a higher level near the original line, as then the relative elevation of the rising-place would be reduced.

This is what possibly was done, and this indeed may be the *vera causa* of the building of the S.W. circle.

This view of the possible function of the "quoit" is, of course, strengthened by the fact that we find traces of high northerly alignment in other stone circles. I have already shown that there are such alignments in Cornwall.

The "quoit" is nearly on a level with the great circle, while the hills rise behind it. It has been suggested that it would have been more useful on the top of the hill, but this suggestion cannot be accepted for a moment if it were used in the way I have indicated. On a dark night it would have been invisible, and it also would have prevented the observation of star-rise if it were truly aligned. Being comparatively near the circle it could easily have been illuminated at the critical time, and thus have anticipated the bright line micrometer of more modern times.

So far I have found no obvious use for the avenue attached to the N.E. circle. The conditions are :

Az.		Height of Hills.	Dec.	
Morrow.	Lockyer.	Morrow.	Morrow.	Lockyer.
S. 83° 52′ E.	S. 79° E.	1° 40′	3° 52′ 30″ S.	5° 49′ 30″ S.

With regard to this N.E. circle, in relation to the large circle, the data are as follows:

Az.		Height of Hills.	Dec. N.	
Morrow.	Lockyer.	Morrow.	Morrow.	Lockyer.
N. 53° E.	N. 51° E.	1° 5′	22° 43′ 50″	23° 48′ 46″

As Mr. Morrow states, the choice of centre of the circle may alter the azimuth obtained by as much as "a few degrees," but the value obtained from the Ordnance map is, definitely, N. 51° E., and with the height of hills determined by Mr. Morrow this would suggest that the N.E. circle was really erected to provide the alignment, from the centre of the great circle, or from the Cove, to the summer solstitial sun, about the year 870 B.C., Stockwell's values for the obliquity being taken. This result is the more striking as it gives a date for the substitution of the June for the May worship at Stanton Drew, which is in full accordance with that obtained for the similar change at Stenness.

There is other evidence, to which I attach importance, as it deals with a method and policy found in many temple fields in Egypt, that of blocking the alignment of an older star- or sun-cult, which the astronomer-priests replaced by their own. The stones of the avenue of the solstitial N.E. circle I expect once blocked the May sunrise line from the great circle; judging from the Ordnance map, and remembering the number of stones that have disappeared, this is probable if not certain.

If this were so, then the N.E. circle was the last to be erected, and this suggestion is strengthened by Mr. Lewis's statement that it is the most perfect of the three.

Prof. Lloyd Morgan concludes his interesting account of which I have made so much use with the following remarks:

"In what order the circles were constructed we do not know. Whether the small N.E. circle with its more massive megaliths preceded or succeeded the great circle with its more numerous but, on the average, less massive stones, is a matter of mere conjecture. They may have been contemporaneous: but it is more likely that so large a work took a long time in execution; nor does the unity of plan of the final product preclude a gradual process of development. Finally as to the purpose of the erection, and its hidden astronomical, mythological, or social meaning (if it have one), we are once more at the mercy of more or less plausible conjecture. There stand the circles in a quiet Somersetshire valley, silent memorials of a race concerning whose modes of life, of labour, and of thought we can but speculate."

It is to be hoped that before the monument has disappeared like so many of its fellows, some student with more knowledge and time to devote to the inquiry than myself will endeavour to answer more of the questions raised by it.

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CHAPTER XVIII

FOLKLORE AND TRADITION

We have so far considered the circles at Stonehenge, Stenness, the Hurlers and Stanton Drew, and the avenues in Brittany and on Dartmoor. Before I refer to my later work in the south-west of England or attempt to present a summary of the results of the inquiry, I think it will be convenient to turn for a time to another branch of it, for that there is another closely connected series of facts to be considered in relation to the monuments folklore and tradition abundantly prove.

So far in this book I have dealt chiefly with stones—as I hold, associated with, or themselves composing, sanctuaries. We have become acquainted with circles, menhirs, dolmens, altars, viæ sacræ, various structures built up of stones. Barrows and earthern banks represented them later.

The view which I have been led to bring forward so far is that these structures had in one way or another to do with the worship of the sun and stars; that they had for the most part an astronomical use in connection with religious ceremonials.

The next question which concerns us in an attempt to get at the bottom of the matter is to see whether there are any concomitant phenomena, and, if there be any, to classify them and study the combined results.

Tradition and folklore, which give dim references to the ancient uses of the stones, show in most unmistakable fashion that the stones were not alone; associated with them almost universally were many practices referred to on p. 26, such as the lighting of fires, passing through them, and dancing round them; in the neighbourhood of the stones and associated with the fire practices were also sacred trees and sacred wells or streams.

Folklore and tradition not only thus may help us, but I think they will be helped by such a general survey, brief though it must be. So far as my reading has gone each special tradition has been considered by itself; there has been no general inquiry having for its object the study of the possible origin and *connection* of many of the ancient practices and ideas which have so dimly come down to us in many cases and which we can only completely reconstruct by piecing together the information derived from various sources.

I now propose to refer to all these matters with the view of seeing whether there be any relation between practices apparently disconnected in so many cases if we follow the literature in which they are chronicled. We must not blame the literature, since the facts which remain to be recorded now here, now there, are but a small fraction of those that have been forgotten. Fortunately, the practices forgotten in one locality have been remembered in another, so that it is possible the picture can be restored more completely than one might have thought at first.

It will be seen at once that from the point of view with which we are at present concerned, one of the chief relations we must look for is that of time, seeing that my chief affirmation with regard to the stone monuments is that they were used for ceremonial purposes at certain seasons, those seasons being based first upon the agricultural, and later upon the astronomical divisions of the year, to which I drew attention in Chapter III. In Chapter IV., when referring to the agricultural and astronomical new years' days, I indicated a possible relation between the temple worship and the floral celebrations of that time, and later on (p. 40), in connection with the monuments in Brittany, I pointed out the coincidence of fire customs at the same time of the year.

But in a matter of this kind it will not do to depend upon isolated cases; the general trend of all the facts available along several lines of inquiry must be found and studied, first separately and then *inter se*, if any final conclusion is to be reached.

This is what I now propose to do in a very summary manner. It is not my task to arrange the facts of folklore and tradition, but simply to cull from the available sources precise statements which bear upon the questions before us. These statements, I think, may be accepted as trustworthy, and all the more so as many of the various recorders have had no idea either of the existence of a May year at all or of the connection between the different classes of the phenomena which ought to exist if my theory of their common origin in connection with ancient worship and the monuments is anywhere near the truth.

This question of time relations is surrounded by difficulties.

I gave in Fig. 7 the Gregorian dates of the beginning of the quarters of the May year, if nothing but the sun's declination of 16° 20′ N. or S., four times in its yearly path, be considered. These were :—

	May Year.		Greek Calendar.		Roman Calendar.
End of Winter ... ... / Beginning of Spring	Feb. 4	...	Feb. 7	...	Feb. 7
,, Summer... ...	May 6	...	May 6	...	May 9
End of Summer ... ... / Beginning of Autumn... ...	Aug. 8	...	Aug. 11	...	Aug. 8
,, Winter	Nov. 8	...	Nov. 10	...	Nov. 9

In the table I also give, for comparison, the dates in the Greek and Roman calendars (p. 20).

There is no question that on or about the above days festivals were anciently celebrated in these islands; possibly not all at all holy places, but some at one and some at another; this, perhaps, may help to explain the variation in the local traditions and even some of the groupings of orientations.

The earliest information on this point comes from Ireland.

Cormac, Archbishop of Cashel in the tenth century, states, according to Vallancey, that "in his time four great fires were lighted up on the four great festivals of the Druids, viz., in February, May, August and November."[1]

I am not aware of any such general statement as early as this in relation to the four festivals of the May year in Great Britain, but in spite of its absence the fact is undoubted that festivals were held, and many various forms of celebration used, during those months.

[1] Hazlitt, *Dictionary of Faiths and Folklore*, under Gule of August.

From the introduction of Christianity attempts of different kinds were made to destroy this ancient time system and to abolish the so-called "pagan" worships and practices connected with it. Efforts were made to change the date and so obliterate gradually the old traditions; another way, and this turned out to be the more efficacious, was to change the venue of the festival, so to speak, in favour of some Christian celebration or saint's day. The old festivals took no account of week-days, so it was ruled that the festivals were to take place on the first day of the week; later on some of them were ruled to begin on the first day of the month.

When Easter became a movable feast, the efforts of the priests were greatly facilitated, and indeed it would seem as if this result of such a change was not absent from the minds of those who favoured it.

The change of style was, as I have before stated, a fruitful source of confusion, and this was still further complicated by another difficulty. Piers[1] tells us that consequent upon the change "the Roman Catholics light their fires by the new style, as the correction originated from a pope; and for that very same reason the Protestants adhere to the old."

I will refer to each of the festivals and their changes of date.

February 4.

Before the movable Easter the February festival had been transformed into Ash Wednesday (February 4). The eve of the festival was Shrove Tuesday, and it is

[1] *Survey of the South of Ireland*, p. 232.

quite possible that the ashes used by the priests on Wednesday were connected with the bonfires of the previous night.

It would seem that initially the festival, with its accompanying bonfire, was transferred to the first Sunday in Lent, February 8.

I quote the following from Hazlitt[1]:—

"Durandus, in his 'Rationale,' tells us, Lent was counted to begin on that which is now the first Sunday in Lent, and to end on Easter Eve; which time, saith he, containing forty-two days, if you take out of them the six Sundays (on which it was counted not lawful at any time of the year to fast), then there will remain only thirty-six days: and, therefore, that the number of days which Christ fasted might be perfected, Pope Gregory added to Lent four days of the week before-going, viz., that which we now call Ash Wednesday, and the three days following it. So that we see the first observation of Lent began from a superstitious, unwarrantable, and indeed profane, conceit of imitating Our Saviour's miraculous abstinence. Lent is so called from the time of the year wherein it is observed: Lent in the Saxon language signifying Spring."

Whether this be the origin of the lenten fast or not it is certain that the connection thus established between an old pagan feast and a new Christian one is very ingenious: 24 days in February plus 22 days in March (March 22 being originally the fixed date for Easter) gives us 46 days $(6 \times 7) + 4$, and from the point of view of priestcraft the result was eminently satisfactory, for thousands of people still light fires on

[1] Under Ash Wednesday.

Shrove Tuesday or on the first Sunday of Lent, whether those days occur in February or March. They are under the impression that they are doing homage to a church festival, and the pagan origin is entirely forgotten not only by them but even by those who chronicle the practices as "Lent customs."[1]

Finally, after the introduction of the movable Easter, the priests at Rome, instead of using the "pagan" ashes produced on the eve of the first Sunday in Lent or Ash Wednesday in each year, utilised those derived from the burning of the palms used on Palm Sunday of the year before.

Further steps were taken to conceal from future generations the origin of the "pagan" custom due on February 4. February 3 was dedicated to St. "Blaze." How well this answered is shown by the following quotation from Percy.[2] "The anniversary of St. Blazeus is the 3rd February, when it is still the custom in many parts of England to light up fires on the hills on St. Blayse night: *a custom antiently taken up perhaps for no better reason than the jingling resemblance of his name to the word Blaze.*"

This even did not suffice. A great candle church festival was established on February 2. This was called "Candlemas," and Candlemas is still the common name of the beginning of the Scotch legal year. In the Cathedral of Durham when Cosens was bishop he "busied himself from two of the clocke in the afternoone till foure, in climbing long ladders to stick up wax candles in the said Cathedral Church; the number of all the candles burnt that evening

[1] Frazer, *Golden Bough*, iii., 238 *et seq.*

[2] *Notes to Northumberland Household Book*, 1770, p. 333.

was 220, besides 16 torches; 60 of those burning tapers and torches standing upon and near the high altar."[1]

There is evidence that the pagan fires at other times of the year were also gradually replaced by candles in the churches.

May 6.

The May festival has been treated by the Church in the same way as the February one. With a fixed Easter Sunday on March 22, 46 days after brought us to a Thursday (May 7), hence Holy Thursday[2] and Ascension Day. With Easter movable there of course was more confusion. Whit Sunday, the Feast of Pentecost, was only nine days after Holy Thursday, and it occurred, in some years, on the same day of the month as Ascension Day in others. In Scotland the festival now is ascribed to Whit Sunday.

It is possibly in consequence of this that the festival before even the change of style was held on the 1st of the month.

In Cornwall, where the celebrations still survive, the day chosen is May 8.

August 8.

For the migrations of the dates of the "pagan" festival in the beginning of August from the 1st to the 12th, migrations complicated by the old and new style, I refer to

[1] Quoted by Hazlitt.

[2] Much confusion has arisen with regard to the Holy Thursday in Rogation week because there is another Holy or Maundy Thursday in Easter week. Archæologists have also been often misled by the practice of many writers of describing the May festivals as midsummer festivals. The first of May, of course, marked the beginning of summer.

Prof. Rhys' Hibbert Lectures, p. 418, in which work a full account of the former practices in Ireland and Wales is given. The old festival in Ireland was associated with Lug, a form of the Sun-God; the most celebrated one was held at Tailetin. This feast—Lugnassad—was changed into the church celebration Lammas, from A.S. hl'áfmaesse—that is loaf-mass or bread-mass, so named as a mass or feast of thanksgiving for the first fruits of the corn harvest. The old customs in Wales and the Isle of Man included the ascent of hills in the early morning, but so far I have found no record of fires in connection with this date.[1]

November 8.

The facts that November 11 is quarter day in Scotland, that mayors are elected on or about that date, show, I think, pretty clearly that we are here dealing with the old "pagan" date.

The fact that the Church anticipated it by the feast of All Souls' on November 1 reminds us of what happened in the case of the February celebration; later I give a reference to the change of date; and perhaps this date was also determined by the natural gravitation to the first of the month, as in the case of May, and because it marked at one time the beginning of the Celtic year.

But what seems quite certain is that the feast which should have been held on November 8 on astronomical grounds was first converted by the Church into the feast of St. Martin on November 11. The *Encyclopædia Britannica* tells us: "The feast of St. Martin (Martinmas) took the place of an old pagan festival,

[1] Mr. Frazer informs me that the 13th August was Diana's day at Nemi and there was a fire festival.

and inherited some of its usages, such as the Martinsmännchen, Martinsfeuer, Martinshorn, and the like, in various parts of Germany."

St. Martin lived about A.D. 300. As the number of saints increased, it became impossible to dedicate a feast-day to each. Hence it was found expedient to have an annual aggregate commemoration of such as had not special days for themselves. So a church festival "All Hallows," or "Hallowmass," was instituted about A.D. 610 in memory of the martyrs, and it was to take place on May 1. For some reason or another this was changed in A.D. 834; May was given up, and the date fixed as November 1. This was a commemoration of all the saints, so we get the new name "All Saints' Day."

There can be little doubt that the intention of the Church was to anticipate, and therefore gradually to obliterate the pagan festival still held at Martinmas, and it has been successful in many places. In Ireland, for instance; at Samhain,[1] November 1, "the proper time for prophecy and the unveiling of mysteries." . . . It was then that fire was lighted at a place called after Mog Ruith's daughter Tlachtga. From Tlachtga all the hearths in Ireland are said to have been annually supplied, just as the Lemnians had once a year to put their fires out and light them anew from that brought in the sacred ship from Delos. The habit of celebrating *Nos Galan-galaf* in Wales by lighting bonfires on the hills is possibly not yet extinct.

Here, then, we find the pagan fires transferred from the 8th to the 1st of November in Ireland, but in

[1] *Rhys' Hibbert Lectures*, p. 514.

the Isle of Man this is not so. I will anticipate another reference to Rhys by stating that Martinmas had progressed from the 11th to the 24th before the change of style brought it back, "old Martinmas," November 24, being one of the best recognised "old English holidays," "old Candlemas" being another, at the other end of the May year; this last had slipped from February 2 to February 15 before it was put back again.

With regard to the Isle of Man Rhys writes[1] that the feast is there called Hollantide, and is kept on November 12, a reckoning which he states "is according to the old style." The question is, are we not dealing here with the Martinmas festival *not* antedated to November 1? He adds, "that is the day when the tenure of land terminates, and when serving men go to their places. In other words it is the beginning of a new year." This is exactly what happens in Scotland, and the day is still called Martinmas.

There is a custom in mid-England which strikingly reminds us of the importance of Martinmas in relation to old tenures, if even the custom does not carry us still further back. This is the curious and interesting ceremony of collecting the wroth silver, due and payable to his Grace the Duke of Buccleuch and Queensbury on "Martinmas Eve." The payment is made on an ancient mound on the summit of Knightlow Hill, about five miles out of Coventry, and in the parish of Ryton-on-Dunsmore. One feature about this singular ceremonial is that it must take place before sun-rising.

[1] *Celtic Folklore*, p. 315.

CHAPTER XIX

SACRED FIRES

THE magnificent collection of facts bearing on this subject which has been brought together by Mr. Frazer in *The Golden Bough* renders it unnecessary for me to deal with the details of this part of my subject at any great length.

We have these records of fires :—

(1) In February, May, August and November of the original May year.

(2) In June and December on the longest and shortest days of the solstitial year, concerning which there could not be, and has not been, any such change of date as has occurred in relation to the May year festivals.

(3) A fire at Easter, in all probability added not long before or at the introduction of Christianity. I find no traces of a fire festival at the corresponding equinox in September.

We learn from Cormac that the fires were generally double and that cattle were driven between them.

Concerning this question of fire, both Mr. Frazer and the Rev. S. Baring-Gould[1] suggest that we are justified

[1] *Strange Survivals*, p. 120 *et seq.*

in considering the Christian treatment of the sacred fire as a survival of pagan times. Mr. Baring-Gould writes as follows :—"When Christianity became dominant, it was necessary to dissociate the ideas of the people from the central fire as mixed up with the old gods; at the same time the central fire was an absolute need. Accordingly the Church was converted into the sacred depository of the perpetual fire."

He further points out that there still remain in some of our churches (in Cornwall, York, and Dorset) the contrivances—now called cresset-stones—used. They are blocks of stone with cups hollowed out. Some are placed in lamp-niches furnished with flues. On these he remarks (p. 122) :—

"Now although these lamps and cressets had their religious signification, yet this religious signification was an afterthought. The origin of them lay in the necessity of there being in every place a central light, from which light could at any time be borrowed; and the reason why this central light was put in the church was to dissociate it from the heathen ideas attached formerly to it. As it was, the good people of the Middle Ages were not quite satisfied with the central church fire, and they had recourse in times of emergency to other, and as the Church deemed them unholy, fires. When a plague and murrain appeared among cattle, then they lighted need-fires from two pieces of dry wood, and drove the cattle between the flames, believing that this new flame was wholesome to the purging away of the disease. For kindling the need-fires the employment of flint and steel was forbidden. The fire was only efficacious when extracted in prehistoric fashion, out of wood. The lighting of these need-fires was forbidden by the Church in the eighth century. What shows that this need-fire was distinctly heathen is that in the Church new fire was obtained at Easter annually by striking flint and steel together. It was supposed that the old fire in a twelvemonth had got exhausted, or perhaps that all light expired with Christ, and that new fire must be obtained. Accordingly the priest solemnly struck new fire out of flint and steel. But fire from flint and steel was a novelty; and the people, Pagan at heart, had no confidence in it, and in time of adversity went back to the need-fire kindled in the time-honoured way from wood by friction, before this new-fangled way of drawing it out of stone and iron was invented."

The same authority informs us that before Christianity was introduced into Ireland by St. Patrick there was a temple at Tara "where fire burned ever, and was on no account suffered to go out."

Mr. Frazer,[1] quoting Cerbied, shows that in the ancient religion of Armenia the new fire was kindled at the February festival of the May year, in honour of the fire-god Mihr. "A bonfire was made in a public place, and lamps kindled at it were kept burning throughout the year in each of the fire-god's temples." This festival now takes place at Candlemas, February 2.

We must assume, then, that the pagan fires were produced by the friction of dry wood, and possibly in connection with an ever-burning fire. In either case the priests officiating at the various circles must have had a place handy where the wood was kept dry or the

[1] *Golden Bough*, iii. 248.

fire kept burning, and on this ground alone we may again inquire whether such structures as Maeshowe at the Stenness circle, the Fougou at that of the Merry Maidens, and indeed chambered barrows and cairns generally, were not used for these purposes amongst others; whether indeed they were not primarily built for the living and not for the dead, and whether this will explain the finding of traces of fires and of hollowed stones in them, as well as some points in their structure. Mr. MacRitchie[1] has brought together several of these points, among them fireplaces and flues for carrying away smoke.

At both solstices it would appear that a special fire-rite was practised. This consisted of tying straw on a wheel and rolling it when lighted down a hill. There is much evidence for the wheel at the summer, but less at the winter, solstice; still, we learn from the old Runic *fasti* that a wheel was used to denote the festival of Christmas. With regard to the summer solstice I quote the following from Hazlitt (under John, St.):—

"Durandus, speaking of the rites of the Feast of St. John Baptist, informs us of this curious circumstance, that in some places they roll a wheel about to signify that the sun, then occupying the highest place in the Zodiac, is beginning to descend. 'Rotam quoque hoc die in quibusdam locis volvunt, ad significandum quod Sol altissimum tunc locum in Cœlo occupet, et descendere incipiat in Zodiaco.' Harl. MSS. 2345 (on vellum), Art. 100, is an account of the rites of St. John Baptist's Eve, in which the wheel is also mentioned.

[1] *The Testimony of Tradition.*

In the amplified account of these ceremonies given by Naogeorgus, we read that this wheel was taken up to the top of a mountain and rolled down thence; and that, as it had previously been covered with straw, twisted about it and set on fire, it appeared at a distance as if the sun had been falling from the sky. And he further observes, that the people imagine that all their ill-luck rolls away from them together with this wheel. At Norwich, says a writer in *Current Notes* for March, 1854, the rites of St. John the Baptist were anciently observed, 'when it was the custom to turn or roll a wheel about, in signification of the sun's annual course, or the sun, then occupying the highest place in the Zodiac, was about descending.'"

At Magdalen College, Oxford, the May and June years are clearly differentiated. There is a vocal service at sunrise on May morning, followed by boys blowing horns. At the summer solstice there is a sermon preached during the day in the quadrangle.

One of the most picturesque survivals of this ancient custom takes place at Florence each year at Easter. This is fully described by Baring-Gould. The moment the sacred fire is produced at the high altar a dove (in plaster) carries it along a rope about 200 yards long to a car in the square outside the west door of the cathedral and sets fire to a fuse, thus causing the explosion of fireworks.

The car with its explosives is the survival of the ancient bonfire.

It would appear that the lighting of these fires on a large scale lingered longest in Ireland and Brittany.

A correspondent of the *Gentleman's Magazine*

(February, 1795) thus describes the Irish Beltane fires in 1782, "the most singular sight in Ireland":—

"Exactly at midnight, the fires began to appear, and taking the advantage of going up to the leads of the house, which had a widely extended view, I saw on a radius of thirty miles, all around, the fires burning on every eminence which the country afforded. I had a farther satisfaction in learning, from undoubted authority, that the people danced round the fires, and at the close went through these fires, and made their sons and daughters, together with their cattle, pass through the fire; and the whole was conducted with religious solemnity."

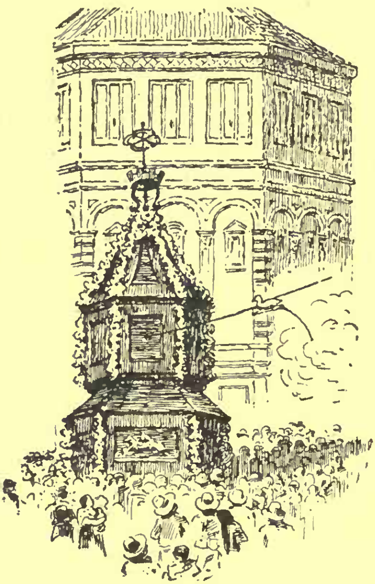


Fig. 48.—The Carro, Florence. From Baring-Gould's *Strange Survivals.*

It will have been observed with reference to these fire festivals that although there were undoubtedly four, in May, August, November and February, those in May and November were more important than the others. This no doubt arose from the fact that at different times the May and November celebrations were *New Year* festivals. With regard to the New Year in November in Celtic and later times, Rhys writes as follows (*Hibbert Lectures*, p. 514):—

"The Celts were in the habit formerly of counting winters, and of giving precedence in their reckoning to night and winter over day and summer (p. 360); I should argue that the last day of the year in the Irish story of Diarmait's death meant the eve of November or All-halloween, the night before the Irish *Samhain*, and known in Welsh as *Nos Galan-gaeaf*, or the Night of the Winter Calends. But there is no occasion to rest on this alone, as we have the evidence of Cormac's Glossary that the month before the beginning of winter was the last month; so that the first day of the first month of winter was also the first day of the year."

That the November bonfire was recognised as herald-ing the dominion of the gods and spirits of darkness,[1] that the old ideas surrounding Horus and Set in Egypt were not forgotten, is evidenced by the fact that when it was extinct the whole company round it would suddenly take to their heels, shouting at the top of their voices:—

Yr hwch ddu gwta A gipio 'r ola'!	The cropped black sow Seize the hindmost!

A piecing together of the folklore and traditions of different districts suggests that sacrifices were made in connection with the fire festivals, in fact that the fire at one of the critical times of the May year at least was a sacrificial one.

I will quote two cases given by Gomme[2] for May Day and All Souls' Day respectively:—

"At the village of Holne, situated on one of the spurs of Dartmoor, is a field of about two acres, the

[1] *Hibbert Lectures*, p. 516; *Dawn of Astronomy*, p. 215.

[2] *Ethnology in Folklore*, pp. 32 and 163.

property of the parish, and called the Ploy Field. In the centre of this field stands a granite pillar (Menhir) six or seven feet high. On May-morning, before day-break, the young men of the village used to assemble there, and then proceed to the moor, where they selected a ram lamb, and after running it down, brought it in triumph to the Ploy Field, fastened it to the pillar, cut its throat and then roasted it whole, skin, wool, &c. At midday a struggle took place, at the risk of cut hands, for a slice, it being supposed to confer luck for the ensuing year on the fortunate devourer. As an act of gallantry the young men sometimes fought their way through the crowd to get a slice for the chosen amongst the young women, all of whom, in their best dresses, attended the Ram Feast, as it was called. Dancing, wrestling, and other games, assisted by copious libations of cider during the afternoon, prolonged the festivity till midnight."

In the parish of King's Teignton, Devonshire, "a lamb is drawn about the parish on Whitsun Monday in a cart covered with garlands of lilac, laburnum and other flowers, when persons are requested to give something towards the animal and attendant expenses; on Tuesday it is then killed and roasted whole in the middle of the village. The lamb is then sold in slices to the poor at a cheap rate."

The popular legend concerning the origin of this custom introduces two important elements—a reference to "heathen days" and the title of "sacrifice" ascribed to the killing of the lamb (p. 31).

"At St. Peter's, Athlone, every family of a village on St. Martin's Day kills an animal of some kind or other; those who are rich kill a cow or sheep, others a goose or turkey, while those who are poor kill a hen or cock; with the blood of the animal they sprinkle the threshold and also the four corners of the house, and 'this performance is done to exclude every kind of evil spirit from the dwelling where the sacrifice is made till the return of the same day the following year'" (p. 163).

Other traditions indicate that human sacrifices were in question, and that lots were drawn, or some other method of the choice of a victim was adopted. I quote from Hazlitt (i., 44) the following report of the Minister of Callender in 1794:—

"The people of this district have two customs, which are fast wearing out, not only here, but all over the Highlands, and therefore ought to be taken notice of, while they remain. Upon the first day of May, which is called Beltan, or Bàl-tein-day, all the boys in a township or hamlet meet in the moors. They cut a table in the green sod, of a round figure, by casting a trench in the ground of such a circumference as to hold the whole company. They kindle a fire, and dress a repast of eggs and milk in the consistence of a custard. They knead a cake of oatmeal, which is toasted at the embers against a stone. After the custard is eaten up, they divide the cake into so many portions, as similar as possible to one another in size and shape, as there are persons in the company. They daub one of these portions all over with charcoal, until it be perfectly black. They put all the bits of the cake into a bonnet. Everyone, blindfold, draws out a portion. He who holds the bonnet is entitled to the last bit. Whoever draws the black bit is the devoted person, who is to be sacrificed to Baal, whose favour they mean to implore in rendering the year productive of the sustenance of man and beast. There is little doubt of these inhuman sacrifices having been once offered in this country as well as in the East, although they now pass from the act of sacrificing, and only compel the devoted person to leap three times through the flames; with which the ceremonies of the festival are closed."

I may conclude this chapter by referring to similar practices in Brittany, where Baring-Gould[1] has so successfully studied them.

The present remnants of the old cult in the different parishes are now called "pardons";[2] they are still numerous. I give those for the May and August festivals (p. 83).

May.

Ascension Day.	Bodilis, Penhars, Spezet (at the well of S. Gouzenou), Landevennec, Plougonnec.
Sunday after Ascension Day.	Trégoat, S. Divy.
Whit Sunday.	Kernilis; Plouider; Edern; Coray; Spezet (Chapel of Cran).
Whit Monday.	Quimperlé (Pardon des Oiseaux); Pont l'Abbé (Pardon des Enfants); Ergué-Armel, La Forêt, Landudal, Ploneis, Landeleau, Carantec.
Whit Thursday.	Gouezec (Les Fontaines).

[1] *A Book of Brittany.*

[2] These "pardons" run strangely parallel with the "Feast Days" in E. and W. Penrith, in Cornwall, where of 26 feasts, 13 occur around the chief days of the May year.

August.

1st Sunday in August. . .	Pleyben (horse races); Plébannalec; Pouldreuzic; Plougomelin; Huelgoët; S. Nicodème in Plumeliau (M.) (Cattle blessed; second day horse fair, and girls sell their tresses to hair merchants).

Judging by the "pardons," the solstitial celebrations are not so numerous as those connected with the May year; the bonfire is built up by the head of a family in which the right is hereditary. The fire has to be lighted only by a pure virgin, and the sick and feeble are carried to the spot, as the bonfire flames are held to be gifted with miraculous healing powers.

When the flames are abated, stones are placed for the souls of the dead to sit there through the remainder of the night and enjoy the heat. "Every member of the community carries away a handful of ashes as a sovereign cure for sundry maladies. The whole proceeding is instinct with paganism" (p. 75). With regard to the accompanying sacrifices we read: "In ancient times sacrifices were made of cocks and oxen at certain shrines—now they are still presented, but it is to the chapels of saints. S. Herbot receives cow's tails, and these may be seen heaped upon his altar in Loqeffret. At Coadret as many as seven hundred are offered on the day of the "pardon." At S. Nicolas-des-Eaux, it is S. Nicodemus who in his chapel receives gifts of whole oxen, and much the same takes place at Carnac.

CHAPTER XX

SACRED TREES

THE subject of tree-worship is a vast one, as anyone may gather who will read the *Golden Bough*. Fortunately for my readers it is not necessary to discuss the whole or even any great part of it in connection with the inquiry which now concerns us. I may say that only rarely is the old tree-worship considered with its concomitant of temple-worship, so that I now have to bring together information widely separated because the connection which I have to show was intimate has not been enlarged upon; indeed, in many cases it has not been suspected.

There is another limitation of the inquiry. We have only to deal chiefly with those plants and trees recorded as worshipped at the chief festival times of the year, which have already been marked out for us by the fire ceremonials. These fires were like the chronofer installed in modern days at the General Post Office, their practical function being to give the time; they announced the beginning of a new season.

In Chapter IV. I referred to the association of Mistletoe with the Solstitial worship. When we deal with the May year we meet constantly with references to the Rowan and the Hawthorn in the folklore connected with it. We seem in presence, then, not only of tree cult generally, but of sacred trees special to each of the two worships we have been considering. I propose now, therefore, to bring together some of the information to be gathered from a very cursory reference to the vast literature which exists on the subject.

In the first instance I begged my friend, Professor Bayley Balfour, Keeper of the King's Garden at Edinburgh, to give me some particulars of the Rowan Tree, which I imagined (1) to have been chosen on account of its flowers being prominent about May Day (Beltane) and its berries in early November (Hallowe'en), and (2) to have a different habitat from the Mistletoe. I have to thank my friend for much valuable information.

The Rowan Tree, called also the Mountain Ash (*Pyrus Aucuparia*), seems to grow pretty freely all over the *Northern* parts of Europe. Professor Balfour tells me: "Rowan is essentially a Northern plant—an immigrant to Europe from N.W. Asia—and now is spread all over North and Central Europe in abundance, with only some 'feelers' passing south into the Mediterranean Basin. It does not go south of Cappadocia in Asia Minor. It does not reach Greece. In Italy it occurs on the Eastern Apennines, and also in N.E. Sicily. In Spain it runs over the higher regions in the N. and into the centre, passing just into Portugal. Its occurrence in Madeira is not certainly established as a natural phenomenon; perhaps it is only introduced there. In all these Southern outruns the tree cannot be said to have any dominance, and its area and abundance are infinitely less than in the North. Scandinavia is one of its best homes. Everywhere it is found right north to 71°, there becoming a bush only, but yet ripening seed. It reaches Iceland, where trees of some size occur. All over Great Britain and Ireland it is generally spread. You may certainly say there is much in Norway, and there is equally certainly less, even little, in Italy."

In Pratt's *Flowering Plants of Great Britain* (vol. 2, p. 260) it is stated, "The flowers, which grow in dense clusters, and are greenish-white, appear in May. . . . . In autumn, however, the tree is more beautiful than in summer, for at that season the rich cluster of red fruits gleams among the foliage, each berry having the form of a tiny apple, and containing a little core and seeds within."

At Christiania the mean of ten years' flowering is given by Professor Schübeler[1] as—first flowers, June 19; general flowering, June 30. This, then, is later than in Britain. On high grounds the fruit is conspicuous here on November 1; on lower levels the birds attack it and reduce its striking appearance before that date.

Associated with the Rowan in the folklore connected with temple worship is the Hawthorn, Whitethorn or "May" (*Crategus oxyocantha*), which also flowers at the beginning of May, while its berries or "haws," like those of the Rowan, are conspicuous in November. We see, then, that there is a most obvious reason in this for the association of the two trees. According to Rhys,[2] the English

[1] Schübeler, *Die Pflanzenwelt Norwegens*, Christiania, 1873–75, p. 439.

[2] *Hibbert Lectures*, p. 358.

name appears to be of Scandinavian origin, the Old Norse being *reynir*, Danish *rönne*, Swedish *rönn*; and the old Norsemen treated the tree as holy and sacred to Thor.

These two trees interest us from three points of view. We find them connected with:—

1. May and November celebrations.
2. Superstitions concerning witchcraft, &c.
3. Holy wells.

In this chapter I shall deal with the two former.

I. *The May Celebrations.*

Seeing that the year beginning in May was established because that month really opened the vegetation year, it is little to be wondered at that among the chief features of New Year's Day was what we may term a flower worship; it is probable that we are here dealing with the sacred-tree side of the general festival at all the monuments erected in connection with the May year worship. The old traditions have lingered longest around the things we have still with us, the trees and flowers; and it is in connection with this side of the worship that most information is available. From the facts I have already stated, for Britain the Rowan and Hawthorn were most naturally selected as the typical forms.[1]

Many poets have written of this festival[2]: Chaucer,

[1] The Rowan had to be cut on Ascension Day, *Golden Bough*, III, p. 448.

[2] Pratt's *British Flowering Plants*, vol. 2, p. 266.

Shakspere, Milton, Bourne, Herrick and others. Chaucer writes:

> "Fourth goeth al the Court both most and lest,
> To fetch the flouris fresh and branche and blome,"

when not the courtiers only, but lowliest of men and maidens sallied forth

> "To do observaunce to a morn of May."

There is a vast literature connected with May Day celebrations, among it references to Celtic customs, and I may add that, besides May Day, August, November and February had their flower festivals also. I shall, however, deal chiefly with May in this book to keep it within bounds.

May Day in Manx was termed *Shenn Laa Boaldyn;* it is the *belltaine* of Cormac's *Glossary*, the Scotch Gaelic equivalent of which is *bealtuinn.*

The traditions and customs connected with May Day in Great Britain have survived longest in the West of England; even now, as will be seen by the account of recent celebrations at Helston in Cornwall, given below, they are still continued.

Altogether the customs, ancient and modern, of which the flower worship formed a part, may be summed up as follows:—

1. Lighting of bonfires,[1] and, in the evening, houses

[1] The word bonfire, according to the *Century Dictionary*, comes from the "early modern English, boonfire, bondfire, bounfire, later burnfire; Scotch, banefire; the earliest known instance is banefyre, 'ignis ossium,' in the *Catholicon Anglicum*, A.D. 1483; from bone (Scotch, bane, Middle English, bone, bon, bane, &c.) + fire."

Hence the word seems formerly to have meant a fire of bones; a funeral pile, a pyre. And it has gradually developed into a fire out in the open, whatever its object.

illuminated with candles, torches carried about, and fireballs played with.

2. Man and beast passed through the fire or between two fires.

3. Going out at daybreak to gather Whitethorn or May (Sycamore in Cornwall), and making whistles of the branches for the May-music and merry-making. Blowing of tin horns at daybreak by boys, and from money received getting breakfast at a farmhouse.

4. Flower-bedecked girls dance round a Maypole, and one chosen as "Queen of the May."

5. In Cornwall the custom prevailed till lately of going out with buckets or any available vessels full of water and thoroughly wetting anyone who was not wearing a piece of May.

6. The "Furry Dance" (in Cornwall), which consists in dancing through the town and also through as many houses as desired. If resistance is offered it is permitted to break open the door, and no penalty can be imposed.

7. Sacrifices made (Isle of Man) at a very ancient date, and probably human ones still earlier (Scotland).

8. Special worship at holy wells.

Flowers are public property on Flora Day, and this custom of dancing through the *houses* is supposed to have originated probably for the purpose of picking the flowers in the gardens behind.

The following is a short abstract of a very interesting account given in *The Western Weekly News*, May 13th, 1905, of the "Flora Day" at Helston, Cornwall, which took place this year. It gives us an idea of former festivals which are so quickly dying out:—

The Furry Dance is always the feature of the day. The first part took place at seven o'clock in the morning, at which hour two couples started out and danced through the streets and through some houses of residents. The great dance was at noon, and those taking part in it assembled in the Corn Exchange.

When all was ready the whole company, headed by a band playing the old Furry Dance, started out and danced through the town and through many houses.

The rest of the day was given over to a Horse Show and to much merry-making. Excursions had been run from all parts.

II. *The Rowan Tree and Witchcraft.*

There is little doubt that in the constant association of the Rowan with the May worship and the holy wells which were adjacent to the stone circles where the worship was conducted, we find the reason of the selection of the wood of the Rowan Tree as an antidote to all the ills which witchcraft was supposed to bring about. Rhys tells us that "The tree has also the old names of Quicken-tree, Roddon, and Witchen-tree."

To quote again from Pratt (*op. cit.* vol. 2, p. 261): "The old notion that the Mountain Ash, or Rowan Tree, as it is called in the North, was efficacious against witchcraft and the evil eye, still prevails in the North of England and the Scottish Highlands. Pennant remarks, in his *Tour of Scotland*, that the farmers carefully preserve their cattle against witchcraft by placing branches of Honeysuckle and Mountain Ash in their cowhouses on the 2nd of May. The milkmaid in Westmorland may often be seen, even now, with a branch of this tree either in her hand or tied to her milking-pail, from a similar superstition; and in earlier days crosses cut out of its wood were worn about the person. In an old song called "Laidley Wood," in the *Northumberland Garland*, we find a reference to this:

> "The spells were vain, the hag return'd
> To the Queen in sorrowful mood,
> Crying, that witches have no power
> Where there is Rown-tree wood."

Rhys, referring to May Day customs in the Isle of Man, writes[1]: "This was a day when systematic efforts were made to protect man and beast against elves and witches; for it was then that people carried crosses of rowan in their hats and placed may-flowers over the tops of their doors and elsewhere as preservatives against all malignant influences. With the same object in view, crosses of rowan were likewise fastened to the tails of the cattle, small crosses which had to be made without the help of a knife."

In connection with this last reference, Rhys quotes a passage showing that a similar thing is done in Wales on May Eve.[2] "Another bad papistic habit which prevails among some Welsh people is that of placing some of the wood of the rowan-tree (*coed cerdin* or criafol) in their corn lands (*ttafyrieu*) and their fields on May-eve (*Nos Glamau*) with the idea that such a custom brings a blessing on their fields, a proceeding

[1] *Celtic Folklore*, vol. i. p. 308. [2] Vol. ii. p. 691.

which would better become atheists and pagans than Christians."

Rhys also tells us that in Lincolnshire,[1] "a twig of the rowan-tree, or wicken, as it is called, was effective against all evil things, including witches. It is useful in many ways to guard the welfare of the household, and to preserve both the live stock and the crops; while placed on the churn it prevents any malign influence from retarding the coming of the butter."

We also read (p. 358): "Not only the Celts, but some also of the Teutons, have been in the habit of attaching great importance to the rowan or roan tree, and regarding it as a preservative against the malignant influence of witches and all things uncanny. . . . Moreover, the Swede of modern times believes the rowan a safeguard against witchcraft, and likes to have on board his ship something or other made of its wood, to protect him against tempests and the demons of the water world."

In the Hibbert Lectures, 1886, we have another interesting reference to this tree. Rhys first relates an old Irish fairy story, the scene of which is supposed to have been "on the plain near the Lake of Lein of the Crooked Teeth, that is to say, the Lake of Killarney." In it we are told that the scarlet quicken-berries were first brought from the "Land of Promise," that one was accidentally dropped and took root, and "from the berry there grew up a tree which had the virtues of the quicken-tree growing in fairy-land, for all the berries on it had many virtues." Then we learn (page 358) that these berries "formed part of the sustenance of the

[1] *Celtic Folklore*, vol. i. p. 325.

gods, according to Goidelic notions; and the description which has been quoted of the berries makes them a sort of Celtic counterpart to the soma-plant of Hindu mythology."

This suggests that at the November Celebration a decoction or brew of Rowan berries was used for curative or superstitious purposes.

I have thought it desirable to enter at some length into the use of the Rowan as a protection against witchcraft and as the basis of a brew used for different purposes, because the Mistletoe has been dealt with in exactly the same manner; indeed, it was to the later Solstitial worship what the Rowan and Maythorn were to the earlier May worship.

Mr. Frazer has collected in his *Golden Bough*[1] much information bearing on these points.

In Sweden, on Midsummer Eve, Mistletoe is sought after, the people "believing it to be, in a high degree, possessed of mystic qualities; and that if a sprig of it be attached to the ceiling of the dwelling-house, the horse's stall, or the cow's crib, the 'Troll' will then be powerless to injure either man or beast." The Oak Mistletoe, we are told, is "held in the highest repute in Sweden, and is commonly seen in farmhouses hanging from the ceiling to protect the dwelling from all harm, but especially from fire; and persons afflicted with the falling sickness think they can ward off attacks of the malady by carrying about with them a knife which has a handle of Oak Mistletoe.

[1] Second Edition, vol. iii. pp. 343 *et seq.*

"A Swedish remedy for other complaints is to hang a sprig of Mistletoe round the sufferer's neck, or to make him wear on his finger a ring made from the plant."

It would appear from Mr. Frazer's inquiries that the Mistletoe was *en évidence* at both the summer and winter solstice—precisely as the Rowan and Hawthorn were associated with the May and November festivals.

He writes :—

"The sacred mistletoe may have acquired, in the eyes of the Druids, a double portion of its mystic qualities at the solstice in June, and accordingly they may have regularly cut it with solemn ceremony on Midsummer Eve. The conjecture is confirmed when we find it to be still a rule of folklore that the mistletoe should be cut on this day. Further, the peasants of Piedmont and Lombardy still go out on Midsummer-morning to search the oak-leaves for the 'oil of St. John,' which is supposed to heal all wounds made with cutting instruments. Originally, perhaps, the 'oil of St. John' was simply the mistletoe, or a decoction made from it. For in Holstein the mistletoe, especially oak-mistletoe, is still regarded as a panacea for green wounds; and if, as is alleged, 'all-healer' is the name of the plant in the modern Celtic speech of Brittany, Wales, Ireland and Scotland, this can be nothing but a survival of the name by which, as we have seen, the Druids addressed the oak, or rather, perhaps, the mistletoe. At Lacaune, in France, the old Druidical belief in the mistletoe as an antidote to all poisons still survives among the people; they apply the plant to the stomach of the sufferer, or give him a decoction of it to drink."

If we attempt to collate the different festivals with the vegetation most striking or abundant at each, in different countries naturally possessing different floras, a great variety of plants and trees has to be considered. It is probable that the Rowan-tree was chiefly taken here as the representative of the ash in more southern and eastern lands, and the ash indeed did not always take second rank, especially in the worship connected with wells, as we shall see. Grimm [1] calls the ash "a world tree which links heaven, earth and hell together; of all trees the greatest and holiest."

In the same way at the later established Vernal Equinox festival, the palm which grows in lower latitudes was replaced here by the willow. Coles, in his *Adam in Eden*,[2] writes: "The willow blossoms come forth before any leaves appear, and are in their most flourishing state usually before Easter, divers gathering them to deck up their houses on Palm Sunday, and therefore the said flowers are called palme." Willows are still used to deck churches at this time.

As in the case of the Rowan, the willow (or palm) was a protection against witchcraft; small crosses and palm were carried about in the purses and placed upon doors. These crosses had to be made on Palm Sunday out of the wood used in the church. Sometimes box replaced the willow.

We are driven to the conclusion that practices connected with magic, the precursor of the later "witchcraft," were associated with the festivals now in question,

[1] *Teutonic Mythology*, Stallybrass's translation, ii. 796.
[2] Quoted by Hazlitt under Palm Sunday.

and that the products of the vegetable world at the different seasons were utilized for these purposes.

The putting on of a special garb by the vegetable world at each season in turn would be one of the first things to be manifested, and the close association of it with the stars and the sun in their yearly course would cause the representatives of it to be worshipped together with them, and it would appear from the records that the astronomer priests did not neglect those magical arts which were practised by man in the early stages of civilisation.

Indeed, these magical practices seem to have taken such firm root that it was difficult to get rid of them even in much later times. Newton[1] writes: "I once knew a foolish cock-brained priest which ministered to a certaine young man the ashes of boxe, being (forsooth) hallowed on Palme Sunday, according to the superstitious order and doctrine of the Romish Church, which ashes he mingled with their unholie holie water using to the same a kind of . . . . exorcisme; which . . . . medicine (as he persuaded the standers by) had vertue to drive away any ague."

Among the virtues attributed to the May thorn was that of preserving the beauty of those maidens who at daybreak on May morning each year would wash themselves in hawthorn dew. As late as 1515 it was recorded that Catherine of Aragon, accompanied by twenty-five of her ladies, sallied out on May morning for this purpose.

[1] *Herbal for the Bible*, p. 207.

CHAPTER XXI

HOLY WELLS AND STREAMS

I HAVE thought it most important to look up this subject with a view of seeing whether any clues were available which could help us to associate the introduction of the well ceremonials with the worshippers of the May or of the Solstitial year. For shortness I will call the ceremonial "baptism," not necessarily baptism in the modern sense, but as implying the use of water for purifying or other religious purpose.

That baptism was pre-Christian is shown by John the Baptist using the Jordan for this purpose before Christ's ministration began. (Matt. 3. 6.)

There is a tremendous literature [1] dealing with the folklore of holy wells and streams. The number of

[1] The literature that I have chiefly consulted is as follows :—

R. C. Hope . . .	*Holy Wells; their Legends and Traditions.*
R. L. Quiller-Couch .	*Ancient and Holy Wells of Cornwall.*
W. G. Wood-Martin .	*Traces of the Elder Faiths of Ireland.*
G. L. Gomme . . .	*Ethnology in Folklore.*
Prof. Rhys	*Celtic Folklore, Manx and Welsh.*
W. C. Borlase . .	*Dolmens of Ireland.*
S. Baring-Gould . .	*A Book of the West.*

holy wells and streams in Britain is legion; there are 3,000 in Ireland alone, and the first thing which strikes us in a casual study of the folklore is the close association of the wells with sacred trees. Almost equally distinctly we gather that both were situated near holy stones, and that the worship included ceremonials connected with all three.

The folklore dealing with holy wells and well-worship is so various that it will be useful for our present purpose to classify the portions we need under the following headings.

1. Well-worship outcome of pre-Christian days and customs.

2. Wells generally situated near circles, dolmens, cromlechs or cairns, or churches which have replaced them.

3. Association with sacred trees.

4. Well-worship and offerings.

5. Time of the chief festivals.

1. *Pagan origin.*—It seems to be accepted now that well-worship in Britain originated long before the Christian era; that it was not introduced by the Christian missionaries, but rather they found it in vogue on their arrival, and tolerated it at first and utilized it afterwards, as they did a great many other Pagan customs.

With regard to this point Wood-Martin writes:[1]

"In many Irish MSS. there are allusions to this pre-Christian worship. For example, Tirehan relates that

[1] *Traces of the Elder Faiths of Ireland, A Folklore Sketch*, ii., p. 47.

St. Patrick, in his progress through Ireland, came to a fountain called Slaun, to which the Druids offered sacrifices, and which they worshipped as a God; and in Adamnan's *Life of St. Columkille* it is recounted that this saint, when in the country of the Picts, heard of a notable fountain to which the Pagans paid divine honour."

He adds (p. 50):

"It evidently did not originate in the blessing of wells by early saints and thus spread downwards, until it became almost, if not quite, universal; on the contrary, it began from the people, who were being Christianized, and thence permeated the entire system of Irish Christianity."

Baring-Gould tells us much concerning the transitional state (pp. 28 *et seq.*). Wood-Martin divides holy wells into three classes: (1) those which "derive their reputed virtues from Pagan superstition"; (2) those which were "transferred from Pagan to so-called Christian uses," and (3) "a few which may lay claim to a merely Christian origin."[1]

It is very easy to understand how the purely devout custom developed in course of time, in the case of some wells at any rate, into a more superstitious one, how some wells came to be called "wishing-wells" and others were regarded as prophetic. Rhys gives us several instances of these two classes in Wales.[2]

Wishing-wells are known all over the United Kingdom; many authors give accounts of them.[3]

[1] Pp. 11, 47.

[2] *Celtic Folklore, Manx and Welsh*, ii., p. 366.

[3] Wood-Martin, *loc. cit.*, ii., p. 80.

There can be no doubt that in the most ancient times magical practices were carried on at wells or at the religious centre of which the well formed a constituent part. Local practices of witchcraft would be a natural survival of these. Gomme (p. 87) thus refers to the well of St. Aelian, not far from Bettws Abergeley, in Denbighshire.

"Near the well resided a woman who officiated as a kind of priestess. Anyone who wished to inflict a curse upon an enemy resorted to this priestess, and for a trifling sum she registered, in a book kept for the purpose, the name of the person on whom the curse was wished to fall. A pin was then dropped into the well in the name of the victim, and the curse was complete."

The magical associations with wells appear in the following extract (given by Quiller-Couch, p. 134) of a letter from Dr. O'Connor, the author of the letters of Columbanus, to his brother.

"I have often inquired of your tenants what they themselves thought of their pilgrimages to the wells of *Kill-Aracht*, *Tobbar Brighde*, *Tobbar Muir*, near Elphin, *Moor*, near *Castlereagh*, where multitudes annually assembled to celebrate what they, in broken English, termed *Patterns* (Patron's days); and when I pressed a very old man, Owen Hester, to state what possible advantage he expected to derive from the singular custom of frequenting in particular such wells as were contiguous to an old blasted oak, *or an upright hewn stone*, and what the meaning was of the yet more singular custom of *sticking rags* on the branches of such trees and spitting on them, his answer, and the answer of the oldest men, was that their ancestors always did it, and that it was a preservation against *Geasa Draoidecht*, *i.e.*, the sorceries of the Druids, and that their cattle were preserved by it from infectious disorders; that the *daoini maithe*, *i.e.*, the fairies, were kept in good humour by it; and so thoroughly persuaded were they of the sanctity of these Pagan practices that they would travel bareheaded and barefooted from ten to twenty miles for the purpose of crawling on their knees round these wells, upright stones, and oak trees, westward, as the sun travels, some three times, some six, some nine, and so on in uneven numbers until their voluntary penances were completely fulfilled."

2. *Wells generally situated near stone monuments or churches which have replaced them.*—We find many instances of wells near stone circles and dolmens.

It may even be that the existence of the spring determined the position of the circle, for the officiating astronomer-priest must like other mortals have had a water supply available. "Where a spring or a river flows," says Seneca, "there should we build altars and offer sacrifices" (Hope, p. 47). The following shows how closely connected they were.[1]

"Closely associated with the circles, and occupying an equally important position in the religious rites and ceremonies of the ancient inhabitants, were sacred wells. These were more numerous than circles, no doubt owing to the fact that their acquisition was more easily accom-

[1] *Standing Stones and Maeshowe of Stenness*, by Magnus Spence, p. 13.

plished: but amongst sacred wells we find some, as we find certain circles, occupying a position of pre-eminence in the religious cult of their votaries, and these, as a rule, in close proximity to sun and moon temples. At Tillie Beltane, in Aberdeenshire, in close proximity to the remains of a larger and smaller circle, is a well which was held sacred by the people. According to Col. Leslie, on Beltane and Midsummer days, those on whom the dire hand of disease had fallen, or those desirous of averting that calamity, went seven times round the sacred wells sunwise (deasil)[1] and then proceeded to the circles, where a like ceremony was performed."

"In Stenness we find the same association of the well and the circles. But in harmony with the unrivalled completeness of these monuments . . . we find the sacred well here in a closer and deeper connection with the circles than elsewhere."

"In the parish of Stenness there is a district called Bigswell, in the centre of which is a sacred well, and from which the district takes its name, Big(s)well. . . . Be that as it may, we know from tradition that down to the time when the Stone of Odin was demolished, parents came to the well with children, on Beltane and Midsummer, passed round it sunwise, and having bathed their little ones (a healthy ordeal), carried them thence to the Stone of Odin, and passed them through the hole as a divine protection against the malignant influences of the evil one."

Borlase records an instance of a well near a stone-

[1] That is from W. to E. through N., or E. to W. through S.; in the same direction as the hands of a clock.

circle in Ireland in the Townland of Ballyferriter, in County Kerry.[1]

The same author also gives examples in Ireland of wells near dolmens and of wells *covered* by dolmens.[2]

It may be remarked that in Cornwall Chapel Euny well is associated with the circles at Bartinné and Carn Euny; St. Cleer with the three circles at the Hurlers, and Alsia well is near the Bolleit circle. Mr. Horton Bolitho is my authority for these statements.

A well is often found near a cell, cairn or *keeill*. Rhys gives us two examples in the Isle of Man.[3] At Ardmore Bay the holy well is within the ruined chapel of the saint.[4] A vast pile of stones surrounds the holy well in Glencolumbkille in Donegal.[5]

It might be useful to add here that it is a very common thing to find a well by a so-called tomb of a saint.

Let us turn now to wells situated near churches.

It is very generally known that many churches have been built on the sites of stone-circles, menhirs, &c. This leads us to think that some form of worship must have taken place at the "ancient-stones" originally. The following extract from Wilson's *Archæology* (page 110) is given in *Stonehenge* by Sir Henry James (page 17):

"The common Gaelic phrase—Am bheil thu dol don chlachan—Are you going to the stones?—by which the Scottish Highlander still enquires at a neighbour if he

[1] *The Dolmens of Ireland*, i., p. 3. [2] *Ibid.*, pp. 95, 765.

[3] *Celtic Folklore, Manx and Welsh*, i., p. 332.

[4] Borlase, *loc. cit.*, p. 760. [5] *Ibid.*, p. 426.

is bound for church, seems in itself no doubtful tradition of ancient worship within the monolithic ring."

Rhys gives us many instances of wells near churches, and here it may be useful to add that the Welsh for well is Ffynnon.

Ffynnon Faglan is described as being near a church, also Ffynnon Fair, a wishing-well. Criccieth Church is supposed to have had a well near it at one time. Again, Ffynnon Beris is near the parish church of Llanberis (p. 366), and Ffynnon Elian near to the church of Llanelian, Denbighshire. Then there are St. Teilo's Church and Well at Llandeilo Llwydarth, near Maen Clochog, North Pembrokeshire.

Wood-Martin[2] refers to the rites at the well of Tubberpatrick, part of the ceremony taking place in the church near by.

3. *Association of sacred wells with sacred trees.*—Rhys, and many other authors, give us several instances of a tree by the side of a well.[3]

When we come to deal with well offerings we shall find, in fact, that in almost every case a tree has been a necessary companion of the well, as the well offerings were hung on them.

In many cases, of course, the kind of tree is not specified. When it is, it is almost invariably the rowan or hawthorn. Rhys tells us: "The tree to expect by a sacred well is doubtless some kind of thorn."[4]

[1] Rhys, *Celtic Folklore, Manx and Welsh*, p. 363.

[2] *Pagan Ireland*, p. 160.

[3] Rhys, *Celtic Folklore, Manx and Welsh*, i., pp. 354, 356, 357, &c.

[4] Rhys, *ibid.*, p. 332.

Then again, with reference to Ireland, Rhys, p. 335, quotes a passage from a letter by the late Mr. W. C. Borlase, on Rag Offerings and Primitive Pilgrimages in Ireland, to the effect that a hawthorn almost invariably stands by the brink of the typical Irish "holy well."

There are also many references to thorn trees in the same position in Wales.

There are thorn trees at St. Madron's well in Cornwall, and at Chapel well St. Breward in the same county near Bodmin, there is a thorn tree over the well.

Not only are wells often recorded as near sacred trees, but in the case of some we learn that at the chief annual festival they were decked with flowers and garlands, and "encircled with a jovial band of young people celebrating the day with song and dance." This is recorded of the "blessing of the Brine" at Nantwich (Hope, p. 7).

4. *Well worship and offerings.*—Although the traditions and superstitions connected with wells are fast becoming things of the past, in certain parts they are still believed and practised.

Gomme[1] informs us that well-worship prevails in every county of the three kingdoms. He finds it "most vital in the Gaelic countries, somewhat less so in the British, and almost entirely wanting in the Teutonic south-east. In some cases wells were resorted to for the cure of diseases; in others to obtain change of weather or good luck. Offerings were made to them to propitiate their guardian gods and nymphs. Pennant tells us that in olden times the rich would sacrifice

[1] *Ethnology in Folklore*, p. 78.

one of their horses at a well near Abergelen to secure a blessing upon the rest.[1] Fowls were offered at St. Tegla's Well, near Wrexham, by epileptic patients,[2] but of late years the well spirits have had to be content with much smaller tributes—such trifles as pins, rags, coloured pebbles and small coins."

In consequence of this dwindling down of the offering we have chiefly to do with rags, but I think we may learn from the traditions that originally it was an offering of a garment, and to the officiating priest, at the well, or temple with which the well was connected. It is also a question whether the almost universal association of pins with the garment or part of it might not have originated at a time when such an offering—it was probably originally a skin—to a priest without a pin (of bone) to fasten it on would not have been complete. In Kent's cavern pins of bone have been found associated with bones of palæolithic mammals.

Mr. Gomme tells us,[3] "In the case of some wells, especially in Scotland, at one time the whole garment was put down as an offering. Gradually these offerings of clothes became less and less till they came down to rags." He also points out, as we have already seen, that "the geographical distribution of rag-offerings coincides with the existence of monoliths and dolmens."

As has been noted, almost invariably by the side of every well there grows the "sacred tree," a rowan or thorn for the most part; on this tree the rags are hung, then the bent pin is dropped in. If there happens to be no tree, or if it is so old that only the stump is

[1] Sikes: *British Goblins*, p. 351. [2] Sikes, *idem.*, p. 329.

[3] *Folklore*, 1892, p. 89.

left, then the rags may sometimes be seen wedged in between the stones of the well.

Quiller-Couch (p. 135) tells us that at Ahagour in Mayo is a well much frequented by pilgrims, for penance chiefly, where among other offerings they cut up their clothes, be they ever so new, and tie them to the two old trees growing near, "lest, on the day of judgment," thinks the superstitious peasant, "the Almighty should forget that he came there, and in order that the tokens should be known, when St. Patrick should lay them before the tribunal."

When the original well-worship in relation with the temples became disestablished, if the well-worship were kept up at all, reasons other than the old one would soon be invented, and many of these would naturally be connected with magic and sorcery. In the oldest days the priest would be a physician as well as an astronomer and a magician, and his advice might be good for various disorders, but after he had disappeared there was only magic to depend upon; and this atmosphere is reflected in the traditions.

I will now give a few extracts to show what goes on at present in certain localities with regard to the offerings, and the frame of mind of the devotees.

With reference to the reasons for the offerings made in the present day, Wood-Martin writes:[1]

"Wells were the haunts of spirits that proved to be propitious if remembered, but were vindictive if neglected, and hence no devotee approached the sacred precincts empty-handed, the principle being no gift no cure; therefore the modern devotee, when tying up a fragment

[1] *Pagan Ireland*, p. 145.

from the clothing, or dropping a cake, a small coin, or a crooked pin into the well, is unconsciously worshipping the old presiding spirit of the place."

Rhys[1] gives us a great deal of information on this. The ritual varies at some of them. People came from far and near; it is the custom to make some sort of offering, rags and pins being the most modern, and about these we have most information as a matter of course.

Rhys quotes statements he has received about three wells in the county of Glamorgan (Vol. 1, p. 356). At the first it was the custom "that the person who wishes his health to be benefited should wash in the water of the well, and throw a pin into it afterwards." At another "the custom prevails of tying rags to the branches of a tree growing close at hand"; and at the third, "it is the custom for those who are healed in it to tie a shred of linen or cotton to the branches of a tree that stands close by; and there the shreds are almost as numerous as the leaves."

Further (p. 363) we read of another Ffynnon Faglan, and of this Rhys says, "One told me his mother used to take him to it when he was a child for sore eyes, bathe them with the water, and then drop in a pin. The other man, when he was young, bathed in it for rheumatism." Of this well it is recorded that when it was cleaned out about fifty years ago "two basinfuls of pins were taken out," which were all bent, but no coins were found in it.

Wood-Martin[2] also gives an interesting account of the rite performed at a certain well in Ireland; it is a

[1] *Celtic Folklore, Manx and Welsh.*

[2] *Pagan Ireland*, p. 160.

little more elaborate than at some, but affords an idea of what was probably at one time a very usual ceremony in connection with stones in other places.

"In a statistical account of the parish of Dungiven, written in 1813, it is stated that at the well of Tubberpatrick, after performing the usual rounds, devotees wash their hands and feet with the water and tear off a small rag from their clothes, which they tie on a bush overhanging the well; from whence they all proceed to a large stone in the River Roe, immediately below the old church, and having performed an oblation they walk round the stone, bowing to it, and repeating prayers as at the well. Their next movement is to the old church, within which a similar ceremony goes on, and they finish this rite by a procession and prayers round the upright stone."

5. *Time of the chief festival.*—On this point there is not a great quantity of precise information, but what we have points to May 1 as being about the time when the holy wells are most frequented and considered most efficacious.

This lack of information arises from the fact that the existence of the May year in prehistoric times has not been even dreamt of by those who have compiled the various accounts of the fast fading traditions, and in very many instances a reference to an unknown saint's day is the only information given as to the time of the annual celebration. Wide generalisation, therefore, from the material at hand is risky.

I will refer in the first instance to the May worship, and begin with the famous Madron well in Cornwall, the walls of which I found to be oriented to the May sunrise, so that the priest officiating at the altar would face the sunrise. Quiller-Couch (p. 137) thus refers to what happened there.

"Children used to be taken to this well on the first three Sunday mornings in May to be dipped in the water, that they might be cured of the rickets, or any other disorder with which they were troubled. Three times they were plunged into the water, after having been stripped naked; the parent, or person dipping them, standing facing the sun; after the dipping they were passed nine times round the well from east to west; then they were dressed and laid on St. Madern's bed; should they sleep, and the water in the well bubble, it was considered a good omen. Strict silence had to be kept during the entire performance, or the spell was broken. At the present time the people go to the well in crowds on the first Sunday in May, when the Wesleyans hold a service there, and a sermon is preached; after which the people throw in two pins or pebbles to consult the spirit, or try for sweethearts; if the two articles sink together, they will soon be married.

"Here divination is performed on May morning by rustic maidens anxious to know when they are to be married. Two pieces of straw about an inch long are crossed and transfixed with a pin. This, floated on the waters, elicits bubbles, the number of which, carefully counted, denotes the years before the happy day."

Chapel Euny in Cornwall, near the Bartinné circle, has a wishing (lucky) well near it. It was used on one of the three first Wednesdays in May. Children suffering from mesenteric disease are dipped three times "widderschynnes," that is contrary to the sun's motion, and dragged round the well three times in the same direction.[1]

Edmunds[2] thus refers to this well:—

"Some years since I had the curiosity to go with a friend to Chapel Euny on one of these Wednesdays, and, whilst watching at a distance, we saw two women come to the well at the appointed hour, and perform this ceremony on an infant."

Alsia Well, in the parish of Buryan, same parish as Bolleit circle, has its well ceremonials on the first three Wednesdays in May.

In Cornwall the May bathing ceremonial is even carried out in salt water.[3] The time chosen is the same as that at Madron and Chapel Euny, the first three Sundays in May.

This Sunday in May celebration is not confined to Cornwall. At Eden Hall, Giant's Cave, water with sugar is drunk on the third Sunday in May. A vast concourse of both sexes is present.[4]

At Rorrington, a township in the parish of Chirbury, was a holy well at which a wake was celebrated on Ascension Day.

In the account of this well given by Gomme (p. 82) we get a glimpse of many associated usages.

"The well was adorned with a bower of green boughs, rushes, and flowers, and a may-pole was set up. The people walked round the well, dancing and frolicking as they went. They threw pins into the well to bring good luck and to preserve them from being bewitched, and they also drank some of the water. Cakes were also

[1] Hope, p. 14. [2] *The Land's End District*, p. 72.
[3] Edmunds, p. 72. [4] Hope, p. 40.

eaten; they were round flat buns from three to four inches across, sweetened, spiced, and marked with a cross, and they were supposed to bring good luck if kept."

The legend given by Quiller-Couch (p. 55) respecting St. Cuthbert's well in North Cornwall is that "in olden times mothers on Ascension Day brought their deformed or sickly children here, and dipped them in, at the same time passing them through the aperture connecting the two cisterns; and thus, it is said, they became healed of their disease or deformity. It would seem that other classes also believed virtue to reside in its water; for it is said that the cripples were accustomed to leave their crutches in the hole at the head of the well."

At the village of Tissington, near Ashbourne, in Derbyshire, the custom of well-flowering is still observed on every anniversary of the Ascension (Hope, p. 48).

We may gather from these associated observances at different places that the wells themselves were situated near circles, for the worshippers would not be distributed at such a time. This argument is strengthened by the custom of "waking the well" which took place on the patron saint's day.

With regard to the time of the day or night at which well-worship took place, there seems little doubt that for the most part it was carried on at night. The practices connected with the "waking of the well" indicate this clearly, and when it is remembered that these ancient worships were carried on at a time when marriage had not been instituted, we can understand that many 'pagan' rituals savoured of sensualism as we should now think and call it.

The particular times when it was considered most propitious for the *sick* to visit the wells appear anciently to have been at daybreak or sunrise.

At the well at Farr, in Sutherlandshire, it is held that the patient, after undergoing his plunge, drinking of the water, and making his offering, " must be away from the banks so as to be fairly out of sight of the water before the sun rises, else no cure is effected." At Roche Holy-well, in Cornwall, before sunrise on holy Thursday was the appointed time.

Sometimes the moment of sunrise is chosen. To bathe in the well of St. Medan, at Kirkmaiden in Wigtonshire, as the sun rose on the first Sunday in May was considered an infallible cure for almost any disease.

On the other hand, in some cases, as at St. Madron's well, noon is chosen on the first three Sundays in May, " not believing that these waters have any virtue if resorted to on any other days of the year, or at any other hour of the day."

With regard to the August festival, there is a holy well at St. Cleer, near the Hurlers ; the festival is held on August 9th.[1] I have no special references to August wells in Ireland, but there is evidence given by Piers [2] that at that time cattle were bathed.

" On the first Sunday in harvest, viz., in August, they will be sure to drive their cattle into some pool or river and therein swim them ; this they observe as inviolable as if it were a point of religion, for they think no beast will live the whole year thro' unless they be thus drenched.

[1] St. Cleer = St. Cledod, A.D. 482. The arms of St. Cleer are the Sun in its glory.

[2] Description of Westmeath, 1682, quoted by Vallencey, i., 121.

I deny not but that swimming cattle, and chiefly in this season of the year, is healthful unto them, as the poet hath observed :—

> "Balantemque gregem fluvio mersare salubri."—*Virg.*
>
> In th' healthful flood to plunge the bleating flock.

but precisely to do this on the first Sunday in harvest, I look on as not only superstitious but profane."

I next come to the solstice in June.

There is evidence concerning wells quite akin to that furnished by the astronomical use of the circles, that the May year festivals were subsequently changed to solstitial dates. The well worship does not appear to have been carried on in the cold weather—hence the absence of references to February and November; for the same reason we have only now to do with the summer solstice.

Hazlitt quotes the following from the Irish Hudibras (1689) concerning June worship at a well in the North of Ireland :—

> " Have you beheld, when people pray
> At St. John's well on Patron-Day,
> By charm of priest and miracle,
> To cure diseases at this well ;
> The valleys filled with blind and lame,
> And go as limping as they came."

At Barnwell (Beirna-well = youths' well), near Cambridge, the festival took place on St. John's Day.[1]

Brand, in his history of Newcastle (ii. 54), refers to a well still called Bede's Well, near Jarrow. "As late as 1740 it was a prevailing custom to bring children troubled with any disease or infirmity ; a crooked pin was put in, and the well laved dry between each dipping.

[1] Hazlitt, ii., 616.

My informant has seen twenty children brought together on a Sunday, to be dipped in this well, at which also, on Midsummer Eve, there was a great resort of neighbouring people, with bonfires, music, etc."

Hope gives references to seven wells dedicated to "St. John," one to "St. John the Baptist," and four to St. Peter. These *may* have been solstitial wells, but the information given is very slight and not to the present point. He states (xxii) that the most important celebrations were first held in May and at the summer solstice. He then adds, "later Easter and Ascensiontide were the favoured seasons." May, Summer Solstice and Easter was, I think, the true order.

Finally, I may refer to the earliest holy well known to history. This is the famous well at Heliopolis where Rā used to wash himself, and Piankhi, B.C. 740, went and washed his face in it. At this same well the Virgin sat and washed her Son's swaddling bands in it. Its water made the balsam trees to grow. It is now called by the Arabs "The Fountain of the Sun" 'Êyn ash-Shems.

CHAPTER XXII

WHERE DID THE BRITISH WORSHIP ORIGINATE?

THE recent chapters have, I think, established, by the evidence derived from folklore and tradition, that there was in the long past a combined worship of trees, wells and streams in the neighbourhood of sacred places, the sacred place being a stone circle or some other monument built up of stones.

We have gathered also that the chief times of worship were on or near the most important dates defined for us by the May year, the original year marked out by the various agricultural and other operations proper to the various seasons.

It is again imperative that I should point out that if the basis of this worship was not utility it must have been started by men sufficiently skilled to indicate by their astronomical knowledge the proper times for the various operations to which I have referred. In this we see the reason for the local combination of the worship in the neighbourhood of the stones, for the stones were really the instruments which enabled the astronomer-priest to be useful to the community; that he in process of time became powerful and sacred because he was wise, and added medicine and magic to his other qualifications, was only what was to be expected.

I am not the first to have been driven by the facts to note the close association to which I have referred, that the cults were not separate but were parts of one whole.

Wood-Martin speaks with the most certain sound on this point. "It will be seen that, from a review of the whole subject, stone, water, tree, and animal-worship are intimately connected."[1]

What the analysis in the recent chapters, taken in connection with the astronomical results previously stated, has done is perhaps to give a clear reason for the connection. Not only were the cults started together, but they remained together for a long time; it is only in quite late years that the traditions have become so dim that practices once closely connected are now dealt with apart from the rest.

Hope points out (p. xxii) that the 16th of the canons of the reign of Edgar, A.D. 963, which enjoins the clergy to be diligent, advance Christianity, and extinguish heathenism, mentions especially the worship of stones, trees, and fountains. The laws of Knut (A.D. 1018) specify the worship "of heathen gods, the sun, moon, fire, rivers, fountains, rocks, or trees."

Now, although the folklore evidence I have brought together has been gathered for the most part from the British Isles, my inquiries have not been limited to that area.

[1] Wood-Martin, p. 265.

It was natural that when the study of folklore had suggested that there was a close connection between the worship carried on in Britain at stone monuments, sacred trees, and sacred wells an attempt should have been made to see whether these three cults had been associated out of Britain with the ceremonials of any of the early peoples for which complete and trustworthy information is available.

On this point the traditions of widely sundered countries is amazingly strong.

The folklore of the Pyrenees, France, Spain and Portugal regarding sacred wells is very similar to that of Ireland. Borlase writes:[1]

"It is interesting to notice that the pre-Christian custom called *dessil*, or circuit around a venerated spot, which is practised in Ireland in the case of one dolmen at least, as well as at wells and Churches innumerable, is found also in Portugal."

In the Pyrenees, too, fairies and spirits are thought much of in this connection. Borlase tells us:[2] "They are the presiding genii of certain wells." He adds:

"It is not in Ireland alone that dolmens are associated with the notion of wells and water springs. The Portuguese names, Anta do Fontao, Fonte Coberta, Anta do Fonte-de Mouratao, and the French names, Fonte de Rourre, and Fonte nay le Marmion, show this to be the case."[3]

In Persia Sir Wm. Ouseley saw a tree covered with rags, and similar trees in the Himalayas are associated with large heaps of stones (Gomme, p. 105).

[1] *Dolmens of Ireland*, ii., p. 696.
[2] *Ibid.*, ii., p. 580. [3] *Ibid.*, p. 772.

The late General Pitt-Rivers affirms that the customs of well-offerings I referred to in the last chapter are invariably associated with cairns, megalithic monuments or some such early Pagan institutions, and he adds that the area in which traces of well-offerings are found is conterminous with the area of the megalithic monuments.[1]

The idea that the waters of certain wells have marvellous healing powers is also not confined to the British Isles, for in a great many parts of Europe, perhaps more especially in France, Spain and Portugal, we find instances.

The practice of worshipping in connection with wells and the sacred stones and sacred trees which were associated with them, as we have seen, was indeed in ancient days almost, if not quite, universal wherever man existed. The traditions of the past, therefore, are to be gathered over a very wide area. I quote a summary of the universality of this practice given by the late General Pitt-Rivers in the paper already noticed:

"Burton says it extends throughout northern Africa from west to east; Mungo Park mentions it in western Africa; Sir Samuel Baker speaks of it on the confines of Abyssinia, and says that the people who practised it were unable to assign a reason for doing so; Burton also found the same custom in Arabia during his pilgrimage to Mecca; in Persia Sir William Ouseley saw a tree *close to a large monolith* covered with these rags, and he describes it as a practice appertaining to a religion long since proscribed in that country; in the Dekkan and Ceylon Colonel Leslie says that the trees in the neighbourhood of

[1] *Journal Eth. Soc.*, N.S., i., 64.

wells may be seen covered with similar scraps of cotton; Dr. A. Campbell speaks of it as being practised by the Limboos near Darjeeling in the Himalaya, where it is associated, as in Ireland, with large heaps of stones; and Huc in his travels mentions it among the Tartars."

The astronomical facts given in this book, gathered from a study of the monuments in these islands, can only give us information touching the introduction of the combined worship here.

My investigations have strongly suggested, to say the least, that there were men here with knowledge enough to utilise the movements of the sun and stars for temple, and no doubt practical purposes before 2000 B.C., that is, a thousand years before Solomon was born, and at about the time that the Hecatompedon was founded at Athens.

If this is anywhere near the truth, these men must have been representatives of a very old civilisation.

Now the civilisation principally considered by archæologists in connection with the building of the monuments which I have studied is the Aryan, of which the Celts formed a branch. This view, however, is not universally held; the late General Pitt-Rivers, and I know of no higher authority, stated his opinion that "The megalithic monuments . . . take us back to pre-Aryan people, and suggest the spread of this people over the area covered by their remains." [1]

Mr. Gomme is of the same opinion (p. 27):

"Ceremonies which are demonstrably non-Aryan in India, even in the presence of Aryan people, must in origin have been non-Aryan in Europe, though the

[1] *Journ. Eth. Soc.*, N.S., i., 64.

race from whom they have descended is not at present identified by ethnologists."

Sergi also points out :—

"Indo-Germanism led to almost entire forgetfulness of the most ancient civilisations of the earth, those born in the valleys of the Euphrates and the Tigris, and in the valley of the Nile; no influence was granted to them over Greco-Roman classic civilisation, almost none anywhere in the Mediterranean."[1]

It is not necessary for me to deal at length with the great Aryan controversy in this book, even if the subject were within my competence, which it is not; but now that we have a large number of monuments dated, say, within twenty years of their use, it is important to bring forward some dates arrived at by archæologists and philologists to compare with those which the astronomical method of inquiry has revealed.

Hall[2] gives evidence to show that the Aryans did not reach Greece till after the earlier period of the Mycenæan age, which he dates at about 1700 B.C.

With regard to the date of the Aryan invasion of Britain, Mr. Read, of the Department of Ethnography, British Museum, informs me that it may be taken as about 1000 B.C.; it was associated with cremation. It is highly probable that these Aryans were the Goidels or the Gael. These were followed some 700 years later by another Aryan sept—the Brythons. Mr. Read is also of opinion that the Goidels reached Britain from the country round the South Baltic, and the Brythons from or through north-east France.

[1] *The Mediterranean Races*, p. 4.

[2] *The Oldest Civilisation of Greece*, p. 105.

Archæologists, however, recognise a pre-Aryan invasion, about 1800 B.C. (a date determined by the introduction of bronze), of a brachycephalic folk who built covered barrows, different in these respects from the neolithic folk, who were long-skulled and built long barrows. Now, in relation to the stone structures to which this book especially refers, the question arises, are we then dealing with this swarm or the people whom they found on the soil?

There are some indications in the traditions which imply that we are really dealing with an early stone age, when flints were the only weapons, and there were no clothes to speak of. I will give one or two examples of these traditions. Gomme (p. 53) refers to a singular fact preserved among the ceremonies of witchcraft in Scotland:

"In order to injure the waxen image of the intended victim, the implements used in some cases by the witches were stone arrowheads, or elf-shots, as they were called, and their use was accompanied by an incantation. Here we have, in the undoubted form of a prehistoric implement, the oldest untouched detail of early life which has been preserved by witchcraft."

Gomme (p. 39) also tells us that one of the May practices at Stirling is for boys of ten and twelve years old to divest themselves of their clothing, and in a state of nudity to run round certain natural or artificial circles. "Formerly the rounded summit of Demyat, an eminence in the Ochil range, was a favourite scene of this strange pastime, but for many years it has been performed at the King's Knot, in Stirling, an octagonal mound in the Royal Gardens. The performances are not infrequently repeated at Midsummer and Lammas." He adds, "The fact that in this instance the practice is continued only by 'boys of ten and twelve years old,' shows that we have here one of the last stages of an old rite before its final abolition."

Baring-Gould (p. 21) provides us with a practice in Brittany which would seem to be a remnant of a pre-clothing age.

Near Carnac is a menhir, at which a singular "ceremony took place till comparatively recently, and may perhaps still be practised in secret. A married couple that have no family repair to this stone when the moon is full, strip themselves stark naked and course one another round it a prescribed number of times, whilst their relations keep guard against intrusion at a respectful distance."

Now it is in connection with this question that I am in hopes that some help may be got from the astronomical results recorded in the present volume. The dates revealed by the orientation of the circles and outstanding stones already dealt with (and there is a large number to follow) indicate that it is among the records of some people of whom the civilisation is very ancient that we must look in the first instance with a view of tracing the origin of our British monuments.

Further, now that we have been able to follow their astronomical methods, to note how sound they were, and to gather the purposes of utility they were intended to serve, it is simply common sense to inquire, in the first instance, if they may have been connected with these ancient peoples whose astronomical skill is universally recognised, and whose records and even observations have come down to us.

Now, while we know nothing of the astronomy of the Aryans generally, or that of the Celts in particular, the astronomical knowledge of the Babylonians and Egyptians is one of the wonders of the ancient world.

Hence Babylonia and Egypt are at once suggested, and the suggestion is not rendered a less probable one when we remember that both these peoples studied and utilised astronomy at least some 8,000 years ago.

But here we are dealing with two peoples. It is more than probable that they both were associated more or less near the origin with one race, the ideas of which permeated both civilisations.

I have it on the highest authority, that of Dr. Budge, that in Babylonia there were originally the Sumerians and the Semites. The primitive race which conquered the Egyptians seems to have been connected with the former as regards civilisation, and with the latter as regards some aspects of the Egyptian language.

This race was Semitic, and as the pyramids, built some 6,000 years ago, are a proof of the interaction of the two civilisations at that time, for the Easter festival celebrated on the banks of the Nile came from the valleys of the Tigris and Euphrates, we may omit the pre-Semites from our consideration.

There is other evidence that the connection between the Semites and Egyptians was close astronomically, so that any Semitic influence in later times or in other lands would be sure to show traces of this connection, and in temple worship it would be traceable. While the carefully oriented Egyptian temples built of stone remain and have been carefully studied, those erected in the centres of Semitic power, built of unbaked brick, have for the most part disappeared, but for the most part only; some stone structures remain, but in regard to them there has been no Lepsius; of their orientation, too, little is known. This is all the more to be regretted since Layard, in addition to many E. and N. buildings found at Nimrood, noted at the mound of Kouyunjik, the site of Nineveh, lat. 36° 20′ N., that Sennacherib's palace, which appears to have been built round a central temple, was oriented to the May year.[1] (Az. N. 68° 30′ E. = Dec. N. 16°.)

Now, calling in the Babylonians as the originators of what went on in Britain 4,000 years ago may seem to some to be far-fetched in more ways than one; but the Babylonians were a remarkable people; according to some they originated all the voyaging of the early world, though other authorities point out that the first ships in the eastern seas must have been Indian.

Ihering[2] adduces a series of facts which indicate clearly that the Babylonians carried on maritime navigation at least as early as about 3500 B.C. But, whatever this time was, the Semites and Egyptians had already a rich culture behind them at a time when the Aryans, whatever or wherever their origin, had not made themselves a place in the world's history. An ancient

[1] This I gather from the plan prepared by Lieut. Glascott, R.N., who apparently accompanied Mr. Layard. He indicates the true north point with a sailor's precision in such matters. (See p. 305).

[2] *Evolution of the Aryan*, Translation by Drucker, § 32.

sea connection between Babylonia and India may explain the similarity of the British and Indian folklore.

Some facts with regard to long distance ancient travel are the following. Our start-point may be that Gudea, a Babylonian king who reigned about 2500 B.C., brought stones from Melukhkha and Makan, that is, Egypt and Sinai (Budge, *History of Egypt*, ii., 130). Now these stones were taken coastwise from Sinai to Eridu, at the head of the Persian Gulf, a distance of 4,000 miles, and it is also said that then, or even before then, there was a coast-wise traffic to and from Malabar, where teak was got to be used in house- and boat-building. The distance from Eridu coastwise to Malabar, say the present Cannanore, is 2,400 miles.

The distance, coastwise, from Alexandria to Sandwich, where we learn that Phœnicians and others shipped the tin extracted from the mines in Cornwall, is only 5,300 miles, so that a voyage of this length was quite within the powers of the compassless navigators of 2500 B.C.

The old idea that the ancient merchants could make a course from Ushant to, say, Falmouth or Penzance need no longer be entertained; the crossing from Africa to Gibraltar and from Cape Grisnez to Sandwich were both to visible land, *i.e.* coastwise. The cliffs on the opposite land are easily seen on a clear day.

Hence it would have been easier before the days of astronomical knowledge and compasses to have reached England, and therefore Ireland and the Orkneys, than to get to some of the islands in the Mediterranean itself.[1]

It is seen then that it is possible that Semites might have built our stone monuments between 2000 and 1200 B.C., while it is quite certain that the Aryans did not build them, if the archæologists are not widely wrong in their dates.

Let us, then, begin our inquiries by considering the information available with regard to the Semites. Let us see in the first instance whether they had stone monuments, and sacred trees and sacred wells; a system of worship; and whether this worship was connected with the sun and stars.

It is fortunate for us in this matter that one of the most fully equipped scholars which the last century produced, Robertson Smith, devoted his studies for many years to *The Religion of the Semites*, and information on the points raised is to our hand; all I need do is to give as shortly as possible a statement of the various conclusions he had reached on the points to which our attention may in the first instance be confined. I quote from his book *The Religion of the Semites.*

The Semites include the Babylonians, who spoke a Semitic dialect, for there were Sumerian speaking peoples among them, Assyrians, Phœnicians, Hebrews, Arabs and Aramæans, who in ancient times occupied the

[1] The prevalence of solstitial customs in Sardinia and Corsica, with apparently no trace of the May year, tends to support this view, which is also strengthened by the fact that the solstitial customs in Morocco are very similar to those we read of in Britain: the May year is unnoticed, and there is a second feast at Easter (March 16th). See Westermarck in *Folk-lore*, vol. xxi., p. 27.

fertile lands of Syria, Mesopotamia and Irak from the Mediterranean coast to the base of the mountains of Iran and Armenia. They also embrace the inhabitants of the great Arabian peninsula, which is believed to have been the centre of dispersion.

The ordinary artificial mark of a Semitic sanctuary was the sacrificial pillar, cairn, or rude altar (p. 183); it was a fixed point where, according to primitive rule, the blood of the offering was applied to the sacred stones; or where a sacred tree, as we shall see presently, was hung with gifts; the stones and tree being symbols of the God (p. 151).

Further, it is certain that the original altar among the northern Semites was a great unhewn[1] stone, or a cairn, at which the blood of the victim was shed (p. 185).

Monolithic pillars or cairns of stones are frequently mentioned in the more ancient parts of the Old Testament as marking sanctuaries; Shechem, Bethel, Gilead, Gilgal, Mizpah, Gibeon, and En-Rogel are referred to (p. 186).

There is evidence that in very early times the sanctuary was a cave (p. 183). The obvious successors of a natural cave are, (1) an artificial cave made in the earth like the natural one, and (2) a model or representation of a cave built of stone, with a small entrance which would be barred, and covered over with earth, thus protecting the priests from wild animals and the weather.

The dolmens and cromlechs which are found in the Semitic area where there are stones doubtless had this origin.

[1] And if thou wilt make me an altar of stone, thou shalt not build it of hewn stone: for if thou lift up thy tool upon it, thou hast polluted it.—Exodus, xx., 25.

The use of a cave was probably borrowed both by the Egyptians and Greeks (there is a cave, for instance, at Eleusis) from the Semites.

In later times, when caves or their equivalents were no longer in vogue and temples were erected, they enclosed a Bit-ili or Beth-el, an upright stone, consecrated by oil.[1]

We next learn (pp. 170 and 183) that no Canaanite high place was complete without its sacred tree standing beside the altar.

In tree-worship pure and simple as in Arabia, the tree is adored at an annual feast (? May), when it is hung with clothes and women's ornaments (p. 169).

The tree at Mecca to which offerings are made is spoken of as a "tree to hang things on."

The references to "groves" given in the Bible as associated with temple worship are misleading, "groves" being a wrong translation of the word Asherah, which was a pole made of wood which the Jews adopted from the Canaanites. It was ornamented and perhaps draped, and was most probably originally a tree. It may have been used in the "high places" because single trees would not grow there in the East any more than on the moors in Devon and Cornwall.

The antiquity of this emblem is proved by Smith's statement (p. 171) that in an Assyrian monument from

[1] And Jacob rose up early in the morning, and took the stone that he had put for his pillows, and set it up for a pillar, and poured oil upon the top of it.

And this stone, which I have set for a pillar, shall be God's house; and of all that thou shalt give me I will surely give the tenth unto thee.—Genesis, xxviii., 18, 22.

Khorsābād an ornamental pole is shown beside a portable altar. "Priests stand before it engaged in an act of worship and touch the pole with their hands or perhaps anoint it with some liquid substance."

The draping of the tree seems to be proved by the passage which suggested the mistranslation to me before I wrote to some Hebrew scholars among my friends who allowed me to consult them. The passage is as follows (II. Kings, xxiii., 6, 7) :—

"And he brought out the grove from the house of the Lord, without Jerusalem, unto the brook Kidron, and burned it at the brook Kidron, and stamped it small to powder, and cast the powder thereof upon the graves of the children of the people.

"And he brake down the houses of the Sodomites, that were by the house of the Lord, where the women wove hangings for the grove."

To show how little variation there was in the Semitic practices to those recorded in British folklore I may state that one of my friends—one of the revision committee—informed me that his impression was that the Asherah was furnished with pegs or hooks, so that the garments, &c., might be easily hung on it.

I next come to the sacred waters. A sacred fountain, as well as the sacred tree, was a common symbol at Semitic sanctuaries (p. 183). Nevertheless, they were sometimes absent, the main place being given to altar worship. Further, Robertson Smith was of opinion that this altar worship did not originate with tree [? or water] worship (p. 170); but still, sacred wells are among the oldest and most ineradicable objects of reverence among all the Semites, and were credited with oracular powers (pp. 128, 154). The fountain or stream was not a mere adjunct to the temple, but was itself one of the principal *sacra* of the spot (p. 155).

Undoubtedly there were ordeals among other things at these wells (p. 163). One case is given in Numbers, v., 17, where the words "holy water" occur, and other water "that causeth the curse" is referred to. Ordeal by water is not unknown among British customs.

It is interesting to note that special sanctity was attached to groups of seven wells (p. 167), and that one such group was called Thorayga = Pleiades (p. 153).[1] We may gather from this that one of the most sacred times for Semitic worship was at the May festival, marked by the rising of the Pleiades.

Although I do not find many references in Robertson Smith's book as to great festival days, there is other evidence which shows that the May festival was the greatest, and represented New Year's Day. I have already shown that the May-November year is the one recognised in the present Turkish, Armenian and I believe Persian calendars (p. 29). As this was the year used at Thebes 3200 B.C., we may take it that at that time it was universal in W. Asia and the adjacent lands. The Jews afterwards adopted the equinoctial year.

It seems highly probable that we may learn from

[1] Herodotus, iii., 8, refers to an Arabian rite in which seven stones are smeared with blood among peoples whose only gods were Dionysos and Urania, whom they called Orotalt and Alilat.

many passages in the Old Testament what the Semitic temple practices were generally. There were sacrifices of men and beasts, burnt offerings, and lighting of fires, through which the children were made to pass. I give some references to these fire practices.

"And thou shalt not let any of thy seed pass through the fire to Molech."—Leviticus, xviii., 21.

"There shall not be found among you any one that maketh his son or his daughter to pass through the fire, or that useth divination, or an observer of times, or an enchanter, or a witch,

"Or a charmer, or a consulter with familiar spirits, or a wizard, or a necromancer."—Deuteronomy, xviii., 10, 11.

"He walked in the way of the kings of Israel, yea, and made his son to pass through the fire."—II. Kings, xvi., 3.

"And they caused their sons and their daughters to pass through the fire, and used divination and enchantments."—II. Kings, xvii., 17.

"And he defiled Topheth, which is in the valley of the children of Hinnom, that no man might make his son or his daughter to pass through the fire to Molech."—II. Kings, xxiii., 10. (See also 4 and 5.)

Fire sacrifices which were interpreted as offerings of fragrant smoke were prevalent among the settled Semites (p. 218). Sacrificial fat was burned on the altar. Smith remarks: "This could be done without any fundamental modification of the old type of sacred stone or altar pillar, simply by making a hollow on the top to receive the grease, and there is some reason to think that fire-altars of this simple kind, which in certain

Phœnician types are developed into altar candlesticks, are older than the broad platform altar proper for receiving a burnt offering" (p. 364).

With regard to the worship of the sun and stars by the Semites, we read that the Semite addressed his God as Baal or Bal. The simple form of Baal was the sun.[1]

By the Semites the stars were, on account of their movements, held to be alive; they were therefore gods, and it was in consequence of this widespread belief that the stars were worshipped (p. 127). The worshippers "burned incense unto Baal, to the sun, to the moon and to the planets, and to all the hosts of heaven" (II. Kings, xxiii., 5). Job congratulated himself that "his heart had not been enticed, nor his mouth kissed his hand, if he beheld the sun when it shined, or the moon walking in her brightness" (Job, xxxi., 26–27). The worship of the morning star as a god is the old Semitic conception (Isa., xiv., 12), "Lucifer son of the Dawn."

We gather from the later practices of the Saracens that the sacrifices to the morning star could not be made after the star had disappeared in the dawn.[2] The God had to be in the presence of the worshippers.

The Semitic worship was generally carried on in "high places"; in the Babylonian temples built in a river valley the "high places" were secured by building towers with the sanctuary on the top.

[1] Sayce, *Babylonians and Assyrians*, p. 234.

[2] *Nili op. quaedam* (Paris, 1639), pp. 28, 117, quoted by Robertson Smith, p. 151.

These high places were necessary because exact observations of the risings of the heavenly bodies formed part of the ceremonial, and a clear horizon was absolutely imperative. That this was generally understood and acted on is well evidenced by the fact that in the Old Testament the mention of high places is nearly always associated with the references to the religion of the Canaanites and other Semitic nations as if the high places were among the most important points in it.

Other arguments may be founded upon linguistic considerations. Prof. J. Morris Jones[1] finds that the syntax of Welsh and Irish differs from that of other Aryan languages in many important respects, *e.g.* the verb is put first in every simple sentence. Prof. Rhys had suggested that these differences represented the persistence in Welsh and Irish of the syntax of a pre-Aryan dialect, and as the anthropologists hold that the pre-Aryan population of these islands came from North Africa, it seemed to Prof. Jones that that was the obvious place to look for the origin of these syntactical peculiarities. He finds the similarities between Old Egyptian and neo-Celtic syntax to be astonishing; he shows that practically all the peculiarities of Welsh and Irish syntax are found in the Hamitic languages.

This conclusion practically implies that the bulk of the population of these islands, before the arrival of the Celts, spoke dialects allied to those of North Africa. The syntactical peculiarities must have repre-

[1] "Pre-Aryan Syntax in Insular Celtic," in the *Welsh People*, by Rhys and Brynmor-Jones, pp. 617–641.

sented the habits of thought of the people, which survived in the Celtic vocabulary imposed upon them.

These conclusions were not known to me when I began to see the necessity of separating the cult of the June from that of the May year, and the identity of the conclusions drawn from astronomical and linguistic data is to me very striking and also suggests further special inquiries.

It is also worth while to state that the Semites, including the Hebrews and Phœnicians, did not burn their dead. Finally, I may quote a remark made by General Pitt-Rivers in the paper already referred to:—"If we do not accept one old civilization as the origin of the various practices, then we must assume accidental origins in each country."

CHAPTER XXIII

THE SIMILARITY OF THE SEMITIC AND BRITISH WORSHIPS

I PROPOSE in this chapter to bring into juxtaposition the various British and Semitic-Egyptian practices which we have so far considered.

I confess I am amazed at the similarities we have come across in the first cast of the net; we have found so much that is common to both worships in connection with all the points we considered separately. I will, for convenience, deal with the various points seriatim.

1. The cult of sacred stones or cairns.

The only objection which, so far as I can see, may be raised to these practices being absolutely common is the idea among many British archæologists that the cairns, in which term I include chambered barrows or dolmens and their skeletons, the cromlechs and stone passages, were set up for burial and not for worship. This idea has arisen because some of them have been used for burials. But I cannot accept this argument, because since the burials might have taken place at any time subsequent to their erection they prove nothing as to the reason of the erection; and further, if these chambered cairns were meant for burials, there should be burials in all of them, and yet there are none in the most majestic of them all, Maeshowe.

Let us consider a few facts in relation to the Semitic use of cairns referred to on p. 244.

That the cromlechs found both in Britain and Syria—there are 780 in Ireland and 700 in Moab—are the remains of chambered cairns is pretty clear from the evidence brought forward by Borlase.[1]

Mr. John Bell, of Dundalk, disinterred over sixty cromlechs from cairns in Ulster. All dolmens were covered by tumuli according to Mr. Bell and Mr. Lukis. Monuments called cairns in the earliest Ordnance Survey have been marked dolmens in subsequent surveys (*e.g.* Townland of Leana in Clare) because the earth covering the stones had disappeared in the meantime.

Among the evidences of natural and artificial caves preceding cairns which replaced them are the twenty-four caves which have been explored in France (*op. cit.*, p. 568).[2]

Borlase points out with regard to the Irish dolmens

[1] *Dolmens of Ireland*, p. 426.

[2] "France, indeed, furnishes us with a stepping-stone, as it were, between the natural cave and the dolmen in certain artificial caves which offer comparison both with the former and the latter . . . . the natural cave was scooped out into a large chamber or chambers either by the swirling of water pent up in the limestone or other yielding rock and finding its way out through some narrow crevice. The ground plan and section, therefore, is that of an *allée couverte* with a vestibule . . . . the artificial cave is modelled on the natural one, and yet bears, as M. Mortillet points out, a close resemblance to the dolmen."

that large tumuli were not essential; all that was necessary was that the walls of the cell or crypt should be impervious to the elements and to wild animals. A creep or passage communicating with the edge of the mound is common to Ireland, Wales, Portugal and Brittany (*op. cit.*, p. 428).

The facts that the cairns so often had their open ends facing the N.E. or S.E., and that the west end was generally higher, like the naos trilithons at Stonehenge, must be borne in mind.

Most of what we know of earliest man has been obtained from their lives in caves; what they ate, the contemporary fauna and their art are thus known to us, but caves have not been considered as tombs, though men have died and left their remains in them.

In the case of a dolmen, however, an artificial cave, as we shall see, the possibility of people living in them appears never to have been considered seriously, and the tomb theory has led to bad reasoning and forced argument.

When burials are absent it has been suggested that "owing to some peculiarity of the soil, the entire of the human remains have become decomposed, only the imperishable stone implements entombed with the body remaining."[1]

Mr. Spence has pointed out the extreme improbability of Maeshowe being anything but a temple, and I may now add on the Semitic model. There were a large central hall and side rooms for sleeping, a stone door which could have been opened or shut *from the inside*, and a niche for a guard, janitor or hall porter! So

[1] Wandle, *Remains of Prehistoric Age in England*, p. 147.

high an authority as Colonel Leslie has pointed out that neither Maeshowe, New Grange and Dowth on the Boyne, nor Gavr Innis in Brittany bear any internal proof of being specially prepared as tombs.[1]

There is another point connected with these dolmens and cromlechs. An origin in the Semitic area easily explains why in Asia and Britain the dolmens are so alike, down to small details, such as the perforation of one of the side stones. Borlase has remarked also upon the similarity of Indian and Irish dolmens (*op. cit.*, p. 755), similar holes also being common to them. The curious concentric circles, &c., found on some dolmen stones are common to Assyrian vessels.[2]

The most philosophical study of this question I have seen[3] certainly suggests that much light may be expected from this source.

Part of the cult of the sacred stones was the ceremony of *anointing them.* Robertson Smith (p. 214) gives us the meaning and history of anointing among the Semites, and notes its continuation from Jacob's pouring oil on sacred stones at Bethel, through the time of Pausanias to that of the Pilgrims of the fourth century A.D.

The anointing of stones was certainly carried on in

[1] It is interesting to point out in relation to the fact that different swarms successively introduced the May and solstitial years that the "sleeping rooms" of the May year cairns at New Grange are about 3 feet square, while at the solstitial Maeshowe, built very much later, the dimensions are 6 feet × 4½ feet. There were differences of sleeping posture in the old days among different peoples as well as different methods of burial.

[2] Borlase, p. 617.

[3] "The Builders and the Antiquity of our Cornish Dolmens," by Rev. D. Gath Whitley (*Journal R.I. Cornwall*, No. 4).

ancient times in Britain and Brittany. Baring-Gould tells us:[1]

"Formerly the menhir was beplastered with oil and honey and wax, and this anointing of the stones was condemned by the bishops. In certain places the local clergy succeeded in diverting the practice to the Churches. There are still some in Lower Brittany whose exterior walls are strung with wax lines arranged in festoons and patterns.

"In some places childless women still rub themselves against menhirs, expecting thereby to be cured of barrenness, but in others, instead, they rub themselves against stone images of saints."

When I visited the Cave of Elephanta in 1871 I was told that the barren women of Bombay visit the cave once a year and anoint the standing stone in the chief chamber. In Egypt they still rub their bodies on the Colossi.

2. Sacred fires.

Among the Semites the sacrificial fat was burned on the altar. And we have seen that "this could be done without any fundamental modification of the old type of sacred stone or altar pillar, simply by making a hollow on the top to receive the grease."[2]

Baring-Gould[3] has written on the question of sacrificial and sacred fires in ancient times in Britain, and points out that there still remain in some of our churches (in Cornwall, York and Dorset) the contrivances—now called cresset-stones—used. They are

[1] *Book of Brittany*, p. 21. [2] *History of the Semites*, p. 364.
[3] *Strange Survivals*, p. 122.

blocks of stone with cups hollowed out precisely as described by Robertson Smith. Some are placed in lamp-niches furnished with flues. On these he remarks (p. 122):—

"Now although these lamps and cressets had their religious signification, yet this religious signification was an afterthought. The origin of them lay in the necessity of there being in every place a central light, from which light could at any time be borrowed."

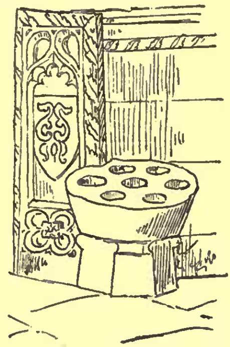


FIG. 49.—Cresset-stone, Lewannick. From Baring-Gould's *Strange Survivals.*

3. The cult of the sacred tree.

I have shown that the sacred trees in Britain, whether rowan, thorn or mistletoe, were at their best at the times of the festivals at which they were chiefly worshipped. Mrs. J. H. Philpot, in her valuable book on "the sacred tree," gives us the names of some used in different countries; it would be interesting to inquire whether the same consideration applies to them in the Semitic and other areas.

There seems to be no doubt that the Semitic Asherah was the precursor of the British Maypole, even to its dressing of many coloured ribands, and from the Maypole customs we may infer something of the Semitic practices which have not come down to us. Even "Jack o' the Green" may eventually be traced to Al-Khidr (p. 29) of the old May festivals.

4. The cult of the sacred well.

Here we find only trifling differences. The chief one is the use of pins in Britain. If we knew more about the Asherah with its hooks this difference might disappear.

It has been pointed out by several authors that the worship of wells and water would be most likely to arise in a dry and thirsty land.

5. The time of the chief festivals.

Here we find beyond all question that the festival times were the same to begin with. May is the chief month both in West Asia and West Europe.

It was not till a subsequent time that June and December were added in Egypt and Britain, and April and September among the Jews.

6. The characteristics of the festivals.

Here again is precise agreement. The list I gave on p. 205 of what can be gathered from British folk-lore is identical with the statements as to Semitic practices which I quoted from Robertson Smith in the last chapter.

7. The worship in high places.

Absolute identity; and from this we can gather that the ancient condition of the high places wherever selected for temple worship was as treeless as it is now; otherwise the observations of sun- and star-rise and -set would be greatly interfered with.

Of course, there may have been "groves" associated with, but away from, sanctuaries in both Semitic and British areas; but it is not impossible that much which has been written on this subject with regard to Britain and the "Druids" may have been suggested in part by the erroneous translation of Asherah to which I have referred. It has also been stated that an early transcriber who, in error, substituted lucus for locus may also be held partly responsible, even if lucus does not mean a clearing in a grove, as some maintain.

8. The god or gods worshipped.

The year-gods in Babylonia and Egypt respectively were Baal and Thoth. It is worth while to inquire whether either name has made its appearance as a loan-word in the traditions of Western Europe.

About Baal there can be no question as to the coincidence, whether accidental, as some philologists affirm, or not.

We find Bel or Baal common to the two areas. Mr. Borlase informs us (*op. cit.*, p. 1164) that in Western Europe Bel, Beal, Balor, Balder, and Phol, Fal, Fáil are the equivalents of the Semitic Baal. Balus, indeed, is named as the first king of Orkney. A May worship is connected with all the above. Beltaine and many variants describe the fires lighted at the festival, and it is worthy of note that although this fire worship has been extended to the solstitial ceremonials in June, the name Baltaine has never been applied to it at that time except by writers who think that the term "midsummer" may be applied indiscriminately to the beginning of May and the end of June.

I next deal with the Egyptian year-god Thoth. In Greece he became Hermes, among the Romans Mercury. In this connection I can most usefully refer to Rhys's Hibbert Lectures and his chapter on the Gaulish

Pantheon. He tells us (p. 5) that "Mercury is the god with whom the monuments lead one to begin." There is also mention of a god Toutates or Teutates, and a Toutius, who might have been a public official (? priest of Toutates). Only Celtic or other later origins of the words are suggested; it is not said whether the possible Egyptian root has been considered.

We may even, I think, go further and ask whether some of the constellations were not figured as in Egypt, otherwise it is difficult to account for the horror of the black pig (p. 195) at Hallowe'en. The whole Egyptian story is told in my *Dawn of Astronomy* [1] in connection with the worship of Set, that is the stars visible at night, blotted out at dawn by the rising sun, or becoming predominant after sunset.

9. The worship of the sun and stars.

Here also, as I have shown, is complete agreement. The same astronomical methods have been employed for the same purpose. The chief difference lies in the fact that by lapse of time the precessional movement caused different stars to be observed as clock stars or to herald the sunrise on the chief ceremonial days.

[1] Pp. 146, 215, and elsewhere.

CHAPTER XXIV

THE MAY-YEAR IN SOUTH-WEST CORNWALL

The previous pages of this volume have apparently dealt with two distinct subjects; the use of the British monuments on the orientation theory, and the folklore and tradition which enable us to get some glimpses into the lives, actions, habits and beliefs of the early inhabitants of these islands, and the region whence these early inhabitants had migrated.

But although these subjects are apparently distinct, I think my readers will agree that the study of each has led to an identical result, namely, that in early times it was a question of the May year, and that the solstitial year was introduced afterwards. This was the chief revelation of the monuments when they were studied from the astronomical point of view.

Without confirmation from some other sources this result might have been considered as doubtful, and the orientation theory might have been thought valueless. It has, however, been seen that folklore and tradition confirm it up to the hilt. I think it may be said, therefore, that the theory I put forward in this book touching the astronomical use of our ancient temples is so far justified.

The British monuments I had considered before this appeal to tradition was made were the circles at Stonehenge, Stenness, The Hurlers and Stanton Drew, and the avenues on Dartmoor. These were studied generally, the main special result being that to which I have referred; we not only found alignments to sunrise and sunset on the critical quarter-days of the May years, but we found alignments to the stars which should have been observed either at rising or setting to control the morning sacrifices.

But this inquiry had left out of account several circles in south-west Cornwall, of which I had vaguely heard but never seen. When I had written the previous chapters showing how fully May-year practices are referred to in the folklore of that part of the country, I determined to visit the circles, dealing with them as test objects in regard to this special branch of orientation. I had not time to make a complete survey; this I must leave to others; but with the help so readily afforded me, which I shall acknowledge in its proper place, I thought it possible in a brief visit to see whether or not there were any May-year alignments. In the following chapters I will give an account of the observations made, but before doing so, in order to prove how solid the evidence afforded by the Cornish monuments is, I will state the details of the local astronomical conditions depending upon the latitude of the Land's End region, N. 50°. In the chapter containing some astronomical hints to archæologists I referred (p. 122) to the solstice conditions for Stenness beyond John o' Groat's, because those conditions afforded a special case, the solstice being determined by the arrival of the sun at its highest or lowest declination, which happens on particular dates which recur each year. But with regard to the

May year, during the first week of May the sun's declination is changing by over a quarter of a degree daily, so that we must not expect to find the declination of 16° 20′ (see p. 22) rigidly adhered to.

As I have shown (p. 23), the sun's passage through this declination four times on its annual path on the dates stated accurately divides the year into four equal parts. But this accuracy might have been neglected by the early observers, so that, for instance, the sun's position on the 4th or 8th of May instead of that on the 6th might have been chosen as being in greater harmony with the agricultural conditions at the place.

The conditions of the sunrise from John o' Groat's to Land's End, 2′ of the sun being visible above the sky-line, can be gathered from the following diagram :—

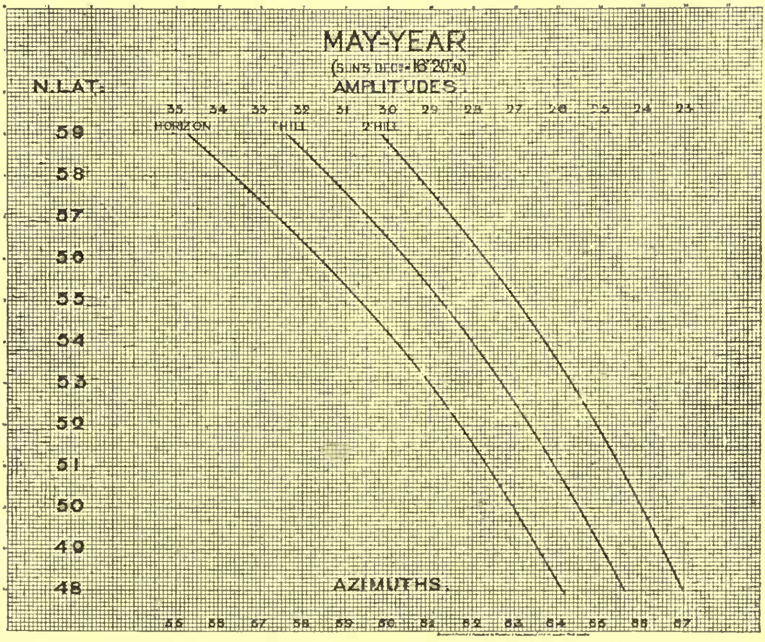


FIG. 50.—Place of first appearance of the May sun, in British latitudes.

The exact azimuths for this sunrise in the Land's End region (Lat. 50°) in relation to the place of the sunrise when half the sun has risen, with a sea horizon, are shown in Fig. 51.

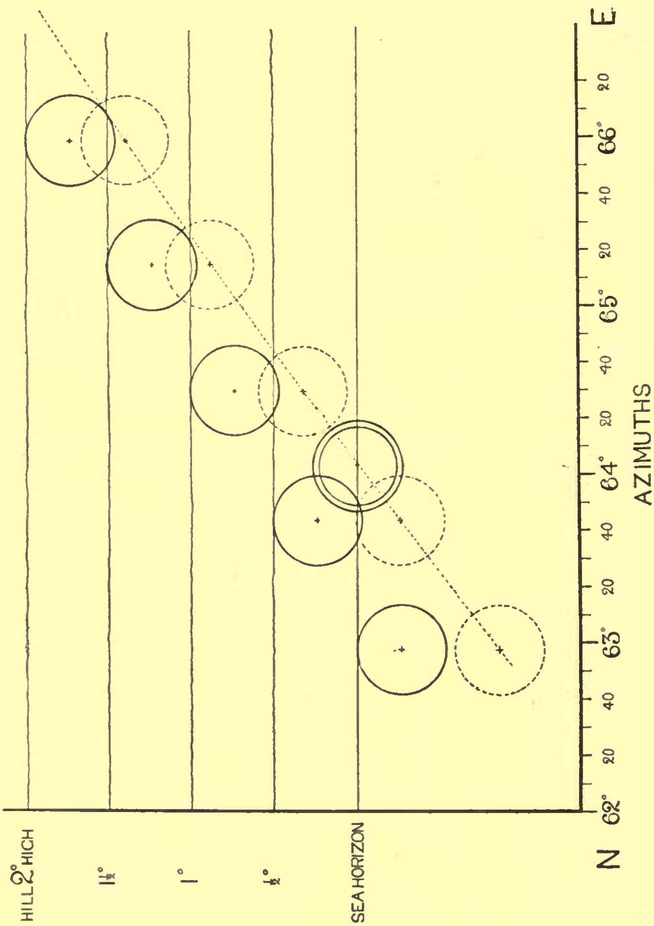


Fig. 51.—Showing the influence of the height of the sky-line on the apparent place of sunrise in May and August. The double circle shows the tabular place of sun's centre.

CHAPTER XXV

THE MERRY MAIDENS CIRCLE (LAT. 50° 4′ N.)

ONE of the best preserved circles that I know of is near Penzance. It is called the Merry Maidens[1] (Dawns-Maen), and is thus described by Lukis[2] (p. 1):—

"This very perfect Circle, which is 75 feet 8 inches in diameter, stands in a cultivated field which slopes gently to the south.

"It consists of 19 granite stones placed at tolerably regular distances from each other, but there is a gap on the east side, where another stone was most probably once erected.

"Many of the stones are rectangular in plan at the ground level, vary from 3 feet 3 inches to 4 feet in height, and are separated by a space of from 10 to 12

[1] I may here remark that "9 maidens" is very common as a name for a circle in Cornwall. It is a short title for 19 maidens. Lukis implies that Dawns-Maen once consisted of 20 stones. If all the circles followed suit it would be interesting to note if the present number of 19 is always associated with a gap on the eastern side. The "pipers" are, of course, the musicians who keep the maidens merry, as does the "blind fiddler" at Boscowen-un Circle.

[2] *Prehistoric Stone Monuments, Cornwall.*

feet. There is a somewhat shorter interval between four of the stones on the south side.

"In the vicinity of this monument are two monoliths called the Pipers; another called Goon-Rith; a holed stone (not long ago there were two others); and several [5] Cairns."

Lukis thus describes the "Pipers":—

"Two rude stone pillars of granite stand erect, 317 feet apart, and about 400 yards to the north-east of the Circle of Dawns-Maen. No. 1 is 15 feet high, 4 feet 6 inches in breadth, and has an average thickness of 22 inches, and is 2 feet 9 inches out of the perpendicular. The stone is of a laminated nature, and a thin fragment has flaked off from the upper part. No. 2 is 13 feet 6 inches high, and is much split perpendicularly. At the ground level its plan in section is nearly a square of about 3 feet."

Goon-Rith is next described:—"No. 3 is naturally of a rectangular form in plan, and is 10 feet 6 inches in height. The land on which it stands is called Goon-Rith, or Red Downs. The upper part of the stone is of irregular shape."

Borlase, in his *History of Cornwall* (1769), only mentions the circle, but W. C. Borlase, in his *Nænia Cornubiæ* (1872), gives a very rough plan including the stones before mentioned and several barrows, some of which have been ploughed up.

At varying distances from the circle and in widely different azimuths are other standing stones, ancient crosses and holed stones, while some of the barrows can still be traced.

The descriptions of the locality given by Borlase and Lukis, however, do not exhaust the points of interest. Edmonds[1] writes as follows:—

"A cave still perfect . . . is on an eminence in the tenement of Boleit (Boleigh) in St. Buryan, and about a furlong south-west of the village of Trewoofe (Trove). It is called the 'Fowgow,' and consists of a trench 6 feet deep and 36 long, faced on each side with unhewn and uncemented stones, across which, to serve as a roof, long stone posts or slabs are laid covered with thick turf, planted with furze. The breadth of the cave is about 5 feet. On its north-west side, near the south-west end, a narrow passage leads into a branch cave of considerable extent, constructed in the same manner. At the south-west end is an entrance by a descending path; but this, as well as the cave itself, is so well concealed by the furze that the whole looks like an ordinary furze break without any way into it. The direction of the line of this cave is about north-east and south-west, which line, if continued towards the south-west, would pass close to the two ancient pillars called the Pipers, and the Druidical temple of Dawns Myin, all within half of a mile."

This fougou is situated on a hill on the other side of the Lamorna Valley, near the village of Castallack, and the site of the Roundago shown in the 1-inch Ordnance map.

Borlase[2] says that many similar caves were to be seen "in these parts" in his time, and others had been destroyed by converting the stones to other uses.

There is evidence that the circle conditions at the Merry Maidens were once similar to those at Stenness,

[1] *The Land's End District*, p. 46. [2] *Antiquities*, p. 274.

Stanton Drew, the Hurlers, Tregaseal and Botallack, that is that there was more than one, the numbers running from 2 to 7. Mr. Horton Bolitho, without whose aid in local investigations this chapter in all probability would never have been written, in one of his visits came across "the oldest inhabitant," who remembered a second circle. He said, "It was covered with furze and never shown to antiquarians"; ultimately the field in which it stood was ploughed up and the stones removed. It is to prevent a similar fate happening to the "Merry Maidens" themselves that Lord Falmouth will not allow the field in which they stand to be ploughed, and all antiquarians certainly owe him a debt of gratitude for this and other proofs of his interest in antiquities. Mr. Bolitho carefully marked the site thus indicated on a copy of the 25-inch map. I shall subsequently show that the circle which formerly existed here, like the others named, was located on an important sight-line.

Mr. Horton Bolitho was good enough to make a careful examination of the barrows A and B of Borlase.[1] In A (S. 69° W.) he found a long stone still lying in the barrow, suggesting that the barrow had been built round it, and that the apex of the barrow formed a new alignment. In B there is either another recumbent long stone or the capstone of a dolmen. This suggests work for the local antiquarians.

I should state that there may be some doubt about barrow A, for there are two not far from each other with approximate azimuths S. 69° W. and S. 64° W.

[1] *Nænia*, p. 214.

The destruction of these and other barrows was probably the accompaniment of the reclamation of waste lands and the consequent interference with antiquities which in Cornwall has mostly taken place since 1800.

But it did not begin then, nor has it been confined to barrows. Dr. Borlase, in his parochial memoranda under date September 29, 1752, describes a monolith 20 feet above ground, and planted 4 feet in it, the "Men Peru" (stone of sorrow) in the parish of Constantine. A farmer acknowledged that he had cut it up, and had made twenty gate-posts out of it.

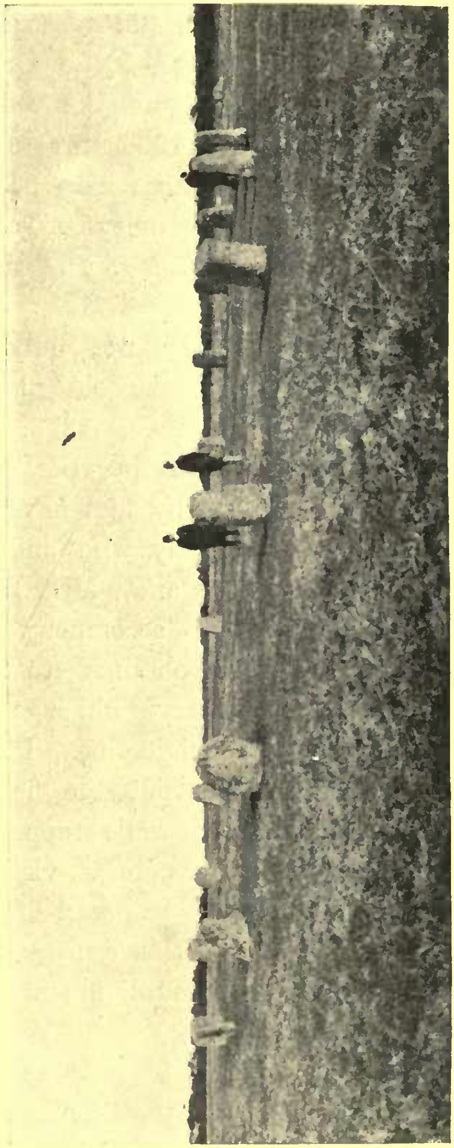


Photo. by Lady Lockyer.

FIG. 52.—The Merry Maidens (looking East).

My wife and I visited the Merry Maidens at Easter, 1905, for the purpose of making a reconnaissance. Mr. Horton Bolitho and Mr. Cornish were good enough to accompany us.

On my return to London I began work on the 25-inch Ordnance map, and subsequently Colonel R. C. Hellard, R.E., director of the Ordnance Survey, was kind enough to send me the true azimuths of the Pipers. In October, 1905, Mr. Horton Bolitho and Captain Henderson, whose help at the Hurlers I have already had an opportunity of acknowledging, made a much more complete survey of the adjacent standing stones and barrows.

In this survey they not only made use of the 25-inch map, but of the old plan given by W. C. Borlase dating from about 1870. Although the outstanding stones shown by Borlase remain, some of the barrows indicated by him have disappeared.

In January, 1906, my wife and I paid other visits to the monuments, and Mr. Horton Bolitho was again good enough to accompany us. Thanks to him permission had been obtained to break an opening in the high wall-boundary which prevented any view along the "Pipers" sight-line. I may here add that unfortunately in Cornwall the field boundaries often consist of high stone walls topped by furze, so that the outstanding stones once visible from the circles can now no longer be seen from them; another trouble is that from this cause the angular height of the sky-line along the alignment cannot be measured in many cases.

I will now proceed to refer to the chief sight-lines seriatim. The first is that connecting the circle which still exists with the site of the ancient one. On this line exactly I found four points, a barrow (L) which Borlase had missed (further from the circle than his barrow A), the site, the present circle, and the fougou; azimuth from centre of circle N. 64° E. and S. 64° W. This is the May-year line found at Stonehenge, Stenness, the Hurlers and Stanton Drew.

In connection with this there is another sight-line which must not be passed over; from the circle the bearing of the church of St. Burian is about N. 64° W.; like the fougou it is situated on a hill, and near it are ancient crosses which I suspect were menhirs first and crosses afterwards.[1] However this may be, we see in this azimuth of 64° three times repeated that the May and August sunrises and sunsets and the February and November sunsets were provided for.

With regard to the other sight-lines I will begin with that of the Pipers, as it is quite obviously connected with the eastern circle only; the stones could not have been seen from the other on account of rising ground. The barrow shown in this direction by Borlase has now entirely disappeared, and the earth has evidently been spread over the surrounding

[1] In A.D. 658 a council assembled at Nantes decreed:—"As in remote places and in woodlands there stand certain stones which the people often worship, and at which vows are made, and to which oblations are presented—we decree that they be all cast down and concealed in such a place that their worshippers may not be able to find them."

"Now the carrying out of their order was left to the country parsons, and partly because they had themselves been brought up to respect these stones, and partly because the execution of the decree would have brought down a storm upon their heads, they contented themselves with putting a cross on top of the stones."—*Book of Brittany*, by Baring-Gould, p. 20.

field; its surface is therefore higher than formerly, so that when the opening was made in the wall the top of the nearest piper could not be seen from the centre of the circle; an elevation of about 2 feet from the ground level was necessary. Walking straight from the circle to the first piper, the second piper was exactly in a line, though at a much lower level. This showed that the Ordnance values were not quite accurate, which was not to be wondered at as no direct observation had been possible. I therefore adopted the mean of the Ordnance values as the true azimuth:—

Piper 1.—	N. 37° 58′ 36″ E.
Piper 2.—	38 52 36
Mean	38 25 36

The sky-line from the centre of the circle was defined by the site of the vanished barrow, angular elevation 20′, and it is highly probable that the function of the barrow when built was to provide a new sight-line when the star-rise place was no longer exactly pointed out by the piper line.

With these data the star in question was Capella, dec. 29° 58′ N., heralding the February sunrise, 2160 B.C.

I next come to the famous menhir Goon-Rith. The conditions are as follows:—from the circle Az. S. 81° 35′ W. Altitude of sky-line 34′.

Concerning this alignment from the circle, it may be stated that it cuts across many ancient stones, including one resembling a rock basin or laver, and another either a holed stone or the socket of a stone cross. I suspect also the presence in old days of a holy well attached to the circle, for there is a pool of water in a depression which is shown in the 25-inch map.

I regard it as quite possible that we are here in presence of the remains of a cursus, an old *via sacra*, for processions between the circle and the monolith.

I have not been able to find any astronomical use for this stone from the circle or from the site of the old one, but if we suppose it to have been used like the Barnstone at Stenness for observations *over* the circle its object at once becomes obvious.

From the azimuth given, the declination of the star was 5° 24′ N. Now this was the position of the Pleiades B.C. 1960, when they would have warned the rising of the May sun.

So that it is possible that the erection of the Pipers and of Goon-Rith took place at about the same time, and represent the first operations.

The next alignment has an azimuth of S. 69° W. from the circle; it would be the same within a degree from the site of the one which has disappeared; altitude of sky-line 32′; this line is to a stone cross on rising ground,[1] doubtless a re-dressing of an old menhir, and on the line nearer the circle are the remains of a barrow.

With these data the star in question was Antares, dec. S. 13° 18′, heralding the May sunrise 1310 B.C.

[1] With regard to this Mr. Horton Bolitho has sent me the following note:—"The rising ground here is called locally 'Lanine Hill' (spelt Lanyon and pronounced Lanine); this is worth noticing, as it is the same name as the dolmen six or seven miles away from Boleit, and in the same district as the Men an Tôl and Boskednan Circle, to say nothing of Lannion in Brittany. Lan signifies something sacred, the place of the saint, or belonging to the saint."

T

There is another stone cross defining a line az. N. 11° 45′ E. from the circle, altitude of sky-line about the same as along the Piper azimuth; an intervening house prevents measurement. These values give us N. dec. 38° 46′, referring to Arcturus warning the August sunrise in 1640 B.C.

The three alignments already referred to, then, give us the warning stars for three out of the four quarter-days of the May year.

There is still another stone cross, Az. N. 82° 5′ W., hills about 34′. This has no connection with the May year, but may refer to the equinoctial one.

W. C. Borlase refers to several holed stones. The data for two of these, supplied by Capt. Henderson, are as follows:—

	Az.	Alt. of sky-line
Stone in hedge N. of road ...	S. 50°33′ E. ...	45′
Stone, half still standing ...	S. 79 25 W. ...	49

Azimuths near these have been noted before at other circles, and it must not be forgotten that as the holed stones on my view were used for observation, these azimuths must be reversed, since it is probable that the observations were made over the circle. If this were so, then S.E. would be changed into N.W., and we should get N. 50° 33′ W. indicating the solstitial sunset. Similarly, S.W. would become N.E., and we should have N. 79° 25′ E., possibly a Pleiades alignment.

I have brought together in the following table all the sight-lines so far referred to. Where the altitude of the sky-line has been measured it is marked with a *.

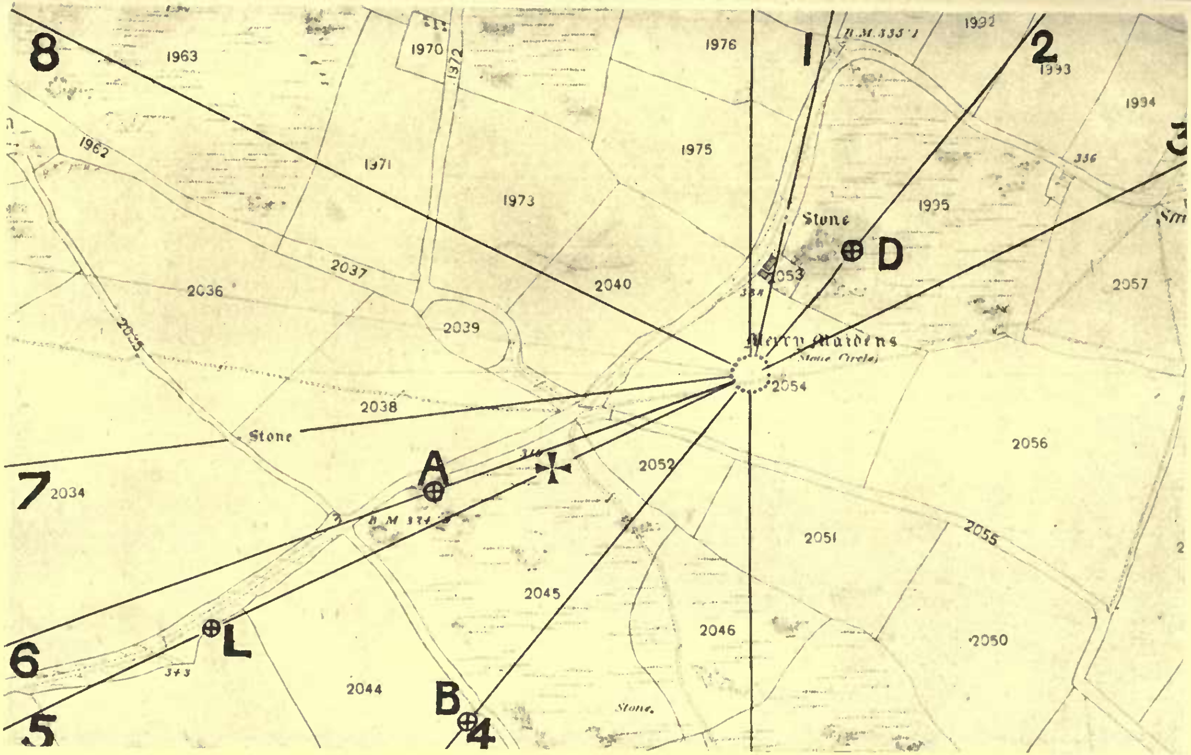


FIG. 53.—25-inch Ordnance Map of Merry Maidens, showing alignments.

In the map the probable site of the second circle and the barrows have special marks attached to them. The numbers of the alignments in the table are also shown in the map.

TABLE OF ALIGNMENTS.

Alignment.	Azimuth.	Hill.	Decl.	Sun or Star.	Date.	Mark.
1	N. 11° 45′ E.	20′	38° 46′ N.	Arcturus (warning August)	B.C. 1650	Stone in road.
2	N. 38° 25′ E.	20′*	29° 58′ N.	Capella (warning February)	2160	The Pipers and barrow.
3	N. 64° E.	½°	16° 21 N.	May year . . .	—	Fougou.
4	S. 38° 22′ N.	20′	30° 27′ S.	Pipers line . .	—	Barrow B.
5	S. 64° W.	20′	16° 26′ S.	May year (February-November setting)	—	Barrow L.
6	S. 69° W.	32′*	13° 18′ S.	Antares (warning May)	1310	Stone cross on hill and Barrow A.
7	S. 81° 35′ W.	32′*	5° 24′ N.	*Reversed line.* Pleiades elev. ½° (warning May)	1960	Goon-Rith.
8	N. 64° W.	42′	16° N.	May year (May eve setting)	—	St. Burian Church.

CHAPTER XXVI

THE TREGASEAL CIRCLES (LAT. 50° 8′ 25″ N., LONG. 5° 39′ 25″ W.)

THERE are two circles situated on Truthwall Common near to Tregaseal and not far from St. Just; the one is nearly to the east of the other, and there are outstanding stones, including four holed stones, and several barrows. The eastern temple has a diameter of 69 feet, and includes, at the present time, nine erect and four prostrate stones; the original structure seems to have contained twenty-eight stones according to Lukis.

My wife and I visited the region in January, 1906, but previously to our going Mr. Horton Bolitho, accompanied by Mr. Thomas, whose knowledge of the local antiquities is very great, had explored the region and taught us what to observe.

The chief interest appears to lie on the N.E. quadrant, where, in addition to a famous longstone on a hill about a mile away, the nest of holed stones and several of the barrows are located. Carn Kenidjack, a famous landmark, lies to the north.

Of the two circles, I confined my attention almost exclusively to the eastern one, as the other is in a fragmentary condition, though it is still traceable. It is hidden almost entirely from the eastern circle by a modern hedge.

Mr. Horton Bolitho, who accompanied us in January, has again visited the spot, with Mr. Thomas, for the purpose of further exploration, and determining the angular height of the sky-line along the different alignments, which I have plotted from the 6-inch and 25-inch maps. My readers will therefore see that my part of the work has been a small one, and that they are chiefly indebted to those I have named.

No theodolite survey has as yet been made for determining the azimuths and the height of the hills. The following approximate azimuths have been determined by myself from a 25-inch map, and the elevations by Mr. Horton Bolitho by means of a miner's dial.

	Alignments.	Azimuth.	Elevation.
1.	Apex of Carn	N. 12° 8′ E.	4° 0′
2.	Barrow 800′ distant	N. 20 8 E.	3 50
3.	Two barrows 900′ distant	N. 50 8 E.	1 50
4.	Holed stones	N. 53 20 E.	1 15
5.	Longstone	N. 66 38 E.	2 10
6.	Stone	N. 76 13 E.	

The carn referred to in the above table is Carn Kenidjack, called "the hooting cairn." The rocks on the summit, in which there is a remarkable depression, are still by local superstition supposed to emit evil sounds by night.

Of the sight-lines studied so far, those to and from the Longstone and the holed stones seem the most important. The Longstone,[1] 1½ miles to the N.E., is a monolith 10 feet high on the western side of a

[1] In Cornwall this is the name generally given to a monolith.

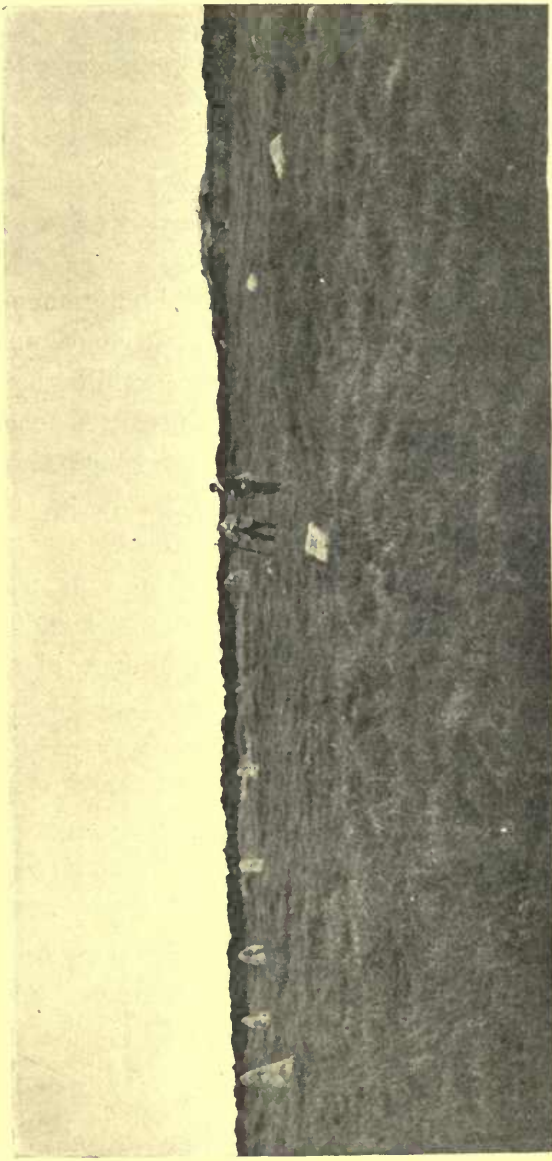


Photo. by Lady Lockyer.

FIG. 54.—The Eastern Circle at Tregaseal.

hill; it is visible from the circle though furze has grown round and partly hidden it.

The meanings of the various alignments seem to be as follows:—

	Decl. N.	Star.	Date.
1. Apex of Carn	42° 33′ 0″	Arcturus	2330 B.C.
2. Barrow 800′ distant	40 29 0	,,	1970 ,,
3. Two barrows 900′ distant	25 20 21	? Solstitial	
4. Holed stones	23 2 20	? ,,	
5. Longstone	16 2 0	May sun	
6. Stone	9 15 0	Pleiades	1270 B.C.

Regarding the possible solstitial alignments, the declinations obtained may be neglected until the azimuths and angular heights of the hills have been determined with a good theodolite. A change of $-10'$ in the angular elevation, and hence about that in the resulting declination, would bring the date given by the barrows to about 2000 B.C.

The position of the Longstone is well worthy of attention. Several very fine monuments which mark the surrounding horizon are visible from it in azimuths with which other monuments have made us familiar. They are as follows:—

Alignment.	Az.	Hills.
Longstone to Mên-an-tol	N. 50° 30′ E.	0° 34′
,, Nine Maidens (Boskednan)	N. 54 0 E.	1 0
,, W. Lanyon Quoit	N. 67 0 E.	0 0
,, Lanyon Quoit	N. 72 45 E.	0 0

These values, of which the angular heights of the hills were determined approximately from the contours on the 1-inch Ordnance map, lead us to the following declinations:—

Alignment.	Decl.	Star.	Date.
Longstone to Mên-an-tol	24° 7′ N.	Solstitial sun.	
,, Nine Maidens (Boskednan)	22 37 N.	,,	
,, W. Lanyon Quoit	14 3 N.	May sun.	
,, Lanyon Quoit	10 30 N.	Pleiades	1030 B.C.

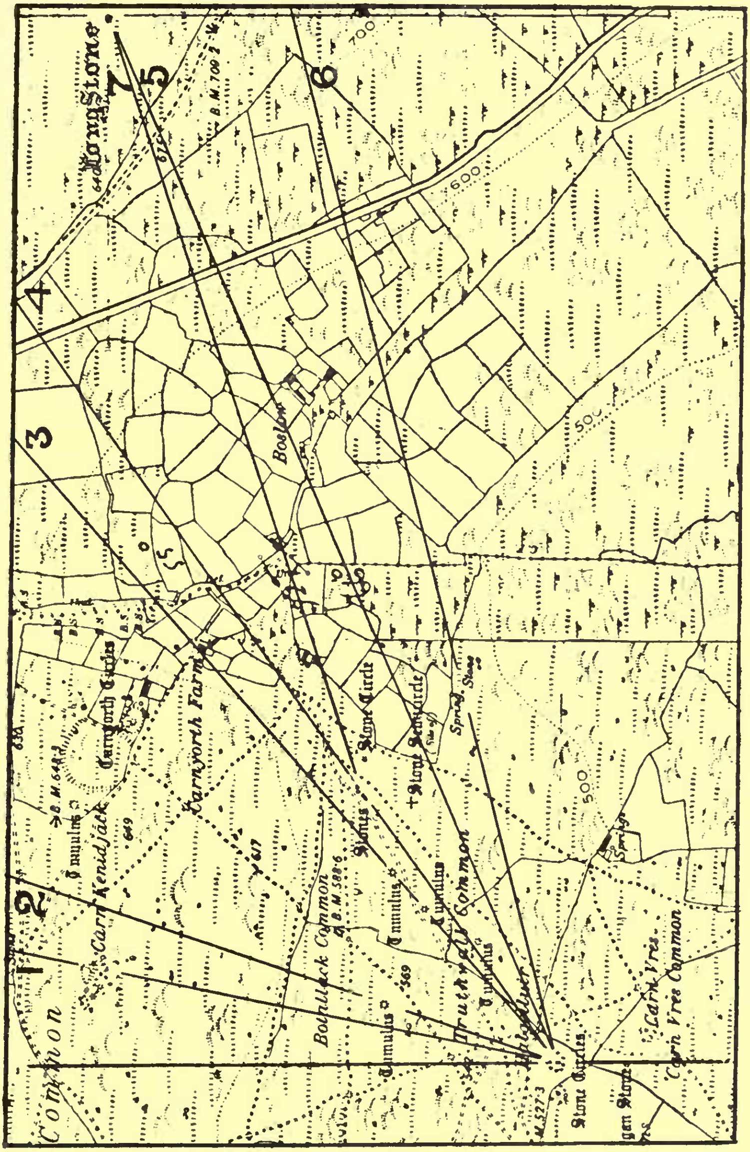


FIG. 55.—Photograph of Ordnance Map, showing sight-lines.

The May-sun alignment, it may be noted, differs from that from the circle. The heights of hills when determined may give us the same solar declination; that now used gives the declination for April 28 and August 15 in our present calendar.

Regarding the alignment on Lanyon Quoit, it need only be pointed out that the Pleiades date obtained is some 200 years after the date obtained for the analagous alignment from the circle, showing that if these two monuments—the Tregaseal circle and the Longstone—have any relationship, the removal to the high plain, now known as Woon Gumpus and Boswen Commons, was an afterthought improvement.

I next come to the holed stones, not only the nest of them not far from the circle, but the famous Mên-an-tol itself.

I had heard before going to Tregaseal that the four holed stones shown on the Ordnance map had been knocked down and set up again (not necessarily in their old places) two or three times. Mr. Horton Bolitho and Mr. Thomas, however, in their examination were convinced that the largest of them has never been moved. They also express the belief that the others are not more than a foot or so from their original positions, and that this change is only due to their re-erection by Mr. Cornish after they had fallen down. So far I have heard nothing of the direction of the hole in the stone which retains its original position.

Another interesting matter is that the explorers in question were able to trace an ancient stone alignment from the circle to the holed stones.

I have long held that these holed stones were arrangements for determining an alignment. The famous Odin stone at Stenness, long since disappeared,

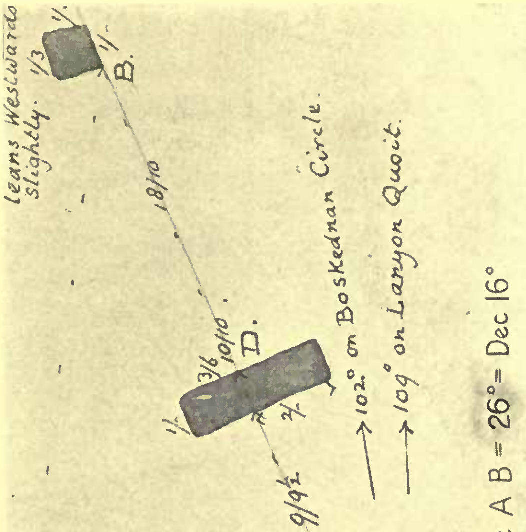


Fig. 56.—Plan of the Mên-an-tol from Lukis, showing that it was an apparatus for observing the sunrise in May and August in one direction and the sunset in February and November in the other. Sun's declination, 16° N. or S.

was, if we may trust the very definite statements made about its position, used to observe the Barnstone in one direction and the chief circle in the other.

The azimuths suggest that theodolite measures may show that the Tregaseal stones might have been used in the same way; they, the Longstone and Lanyon Quoit, are in nearly the same straight line, the alignment, holed stones to Longstone and Lanyon Quoit,

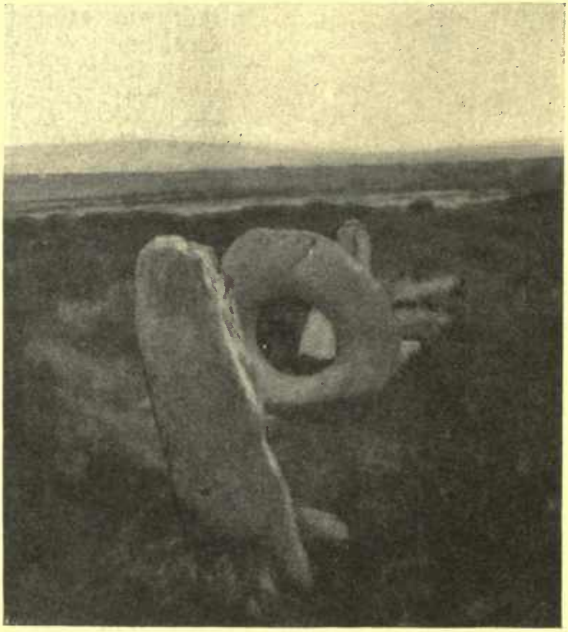


Photo. by Lady Lockyer.

FIG. 57.—The Mên-an-tol.

being N. 67° E., so that the May sunrise may have been noted in this way.

Several other monuments, *e.g.*, Chûn Castle and Cromlech, are to be found in the immediate neighbourhood of the Tregaseal circle and the Longstone, but these will have to await further investigation as to their character and antiquity before any conclusions concerning their astronomical use can be deduced.

Not only do we find in this neighbourhood the nest of holed stones to which I have referred, but the Mên-an-tol, the most famous of them all, in England at all events. This, then, is the place to say a few words about them. I have before stated my opinion that these stones, instead of being used as slaughter stones or posts at which to tie up the victim before sacrifice,

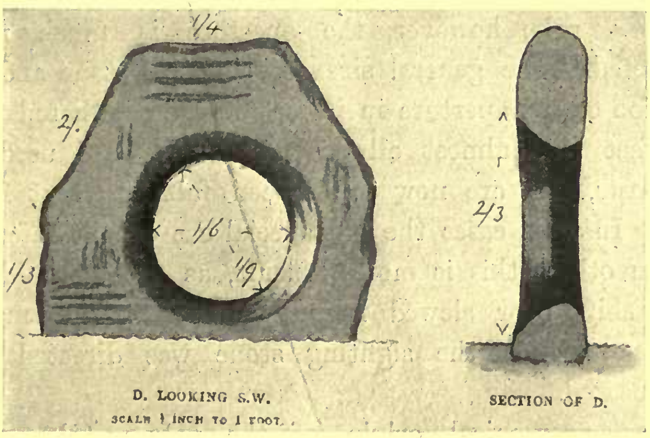


FIG. 58.—The Mên-an-tol. Front view and section, from Lukis.

or in any other similar employment, were really sighting stones to enable an alignment to be easily picked up. As such these were, of course, treated as sacred, and hence the folk-lore connected with them. This folk-lore seems to be most complete in the case of the famous stone of Odin at Stenness, so I condense Mr. Spence's account of it.

Children brought to the stone at Beltaine and Midsummer, after being carried sunwise round the holy well were passed through the hole as a protection against the powers of the evil one. Marriage ceremony consisted of joining hands through the hole, a vow held as sacred as the legal marriage of to-day. Pains in the head cured by inserting the head in the cavity, cure of palsy in children. Children and adults travelled many miles to secure relief in this way.

At the Mên-an-tol the curative effects could only be obtained by crawling through the aperture, which is of considerable size.

As a rule, however, the aperture is much more restricted. The general size of the holed stone and the position of the aperture in it may be well gathered from the fact that almost all of them have been used for gateposts, and are now to be seen fulfilling that function. In some cases the old special use can be inferred, but in others this is more difficult, as the stones have been shifted or slewed round, or the ancient monument to which the sighting stone was directed has disappeared.

The astronomical origin of the Mên-an-tol, which obviously has never been disturbed, is quite obvious. Fig. 56 (from Lukis) shews that it was arranged along the May year alignment, the advent of May and August, February and November being indicated by the shadows cast by the stones through the aperture on to the opposite ones.

To the south-west the alignment for the February and November sunsets passes exactly over Chûn Castle.

The "Tolmen" near Gweek, Constantine, another famous holed stone 7 feet 9 inches high and with an aperture of 17 inches, is according to a magnetic bearing I took last Easter parallel to the Mên-an-tol, and doubtless was used for the same purpose.

CHAPTER XXVII

SOME OTHER CORNISH MONUMENTS

Boscawen-un, N. Lat. 50° 5′ 20″

My wife and I visited Boscawen-un on a pouring day, when it was impossible to make any observations. Mr. Horton Bolitho, who was with us, introduced us to the tenant of Boscawen-noon—Mr. Hannibal Rowe—who very kindly, in spite of the bad weather, took us to the circle and the stone cross to the N.E. of it.

Lukis thus described this monument:[1]—

"The enclosed ground on which this circle stands is uncultivated and heathy, and slopes gently to the south. Twenty years ago a hedge ran across it and bisected the circle.

"This monument is composed of nineteen standing stones, and is of an oval form, the longer diameter being 80 feet and the shorter 71 feet 6 inches. One of the stones is a block of quartz 4 feet high, and the rest, which are of granite, vary from 2 feet 9 inches to 4 feet 7 inches in height. On the west side there is a gap,

[1] *Prehistoric Stone Monuments of the British Isles: Cornwall.* W. C. Lukis. P. 1.

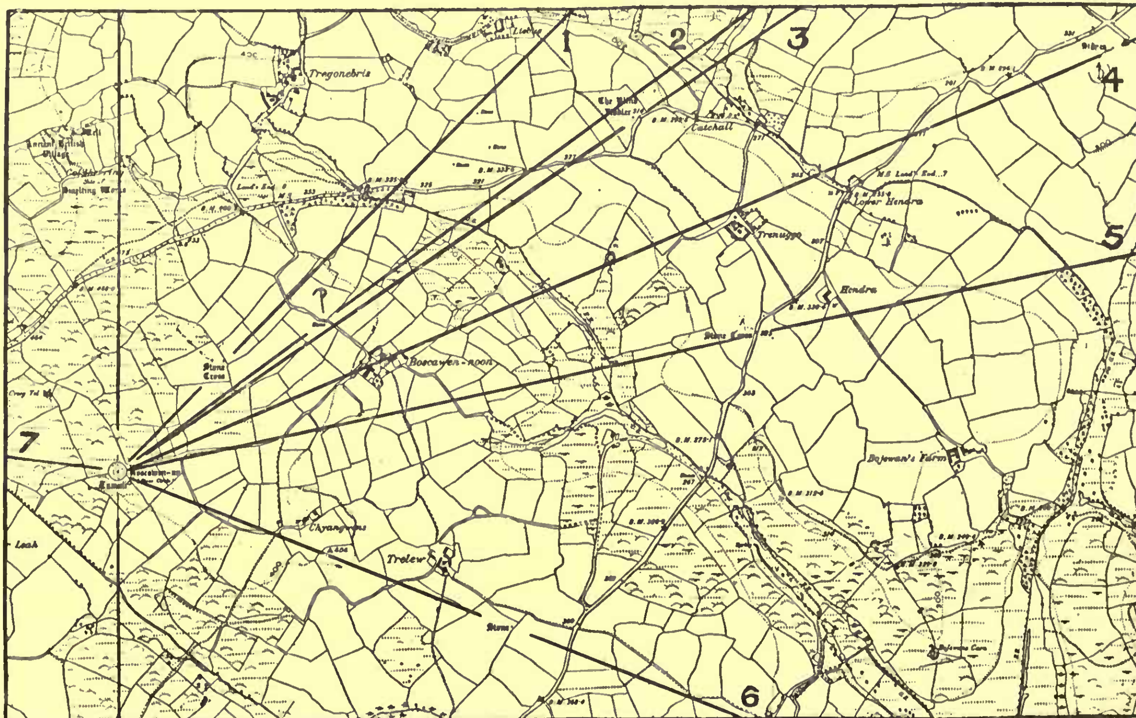


FIG. 59.—Photograph of the Ordnance Map.

whence it is probable that a stone has been removed. Within the area, 9 feet to the south-west from the centre, is a tall monolith, 8 feet out of the ground, which inclines to the north-east, and is 3 feet 3 inches out of the perpendicular.

"In 1594 Camden describes this monument as consisting of nineteen stones, 12 feet from each other, with one much larger than the rest in the centre. It must have been much in the same condition then as now. As he does not say that the monolith enclosed within it was inclined, it is possible that it was upright at that time.

"Dr. Stukeley's supposition was that it originally stood upright, and that 'somebody digging by it to find treasure disturbed it.'

"On the north-east side there are two fallen stones which Dr. Borlase, in 1749, imagined to have formed part of a Cromlech. It is more probable that they are the fragments of a second pillar which was placed to the north-east of the centre, and as far from it as the existing one is. There are instances, I believe, of two pillars occupying similar positions within a circle. One of the stones, that marked C in my plan, on the eastern side of the ring, was prostrate in the Doctor's time.

"At a short distance to the south-east and south-west there are cairns, which have been explored."

For this monument I have used the 6-inch map, as the circle lies nearly at the centre, and all the outstanding stones are within its limits. The heights of the sky-line were measured by Mr. H. Bolitho at a subsequent visit with a miner's dial; the resulting

U

declinations have been calculated by Mr. Rolston. A theodolite survey will doubtless revise some of them :—

Marks.	Az.	Hills.	Dec.	Star.	Date.
1. F. Stone cross . .	N. 43° 15′ E.	2° 7′	+29° 26′	Capella . .	2250
2. P. Fine menhir . .	N. 53 30 E.	1 15	22 58	Solstitial sun	—
3. B. Blind Fiddler .	N. 54 30 E.	1 15	22 24	,,	—
4. Two large menhirs	N. 66 50 E.	1 0	14 55	May sun . .	—
5. Stone cross. . . .	N. 78 0 E.	1 0 (?)	+ 8 8	Pleiades . . (May)	1480
6. Stone	S. 66 30 E.	1 0 (?)	−14 32	November sun	—
7. Stone	N. 83 30 W.	1 0 (?)	+ 4 36	Pleiades . (September)	2120

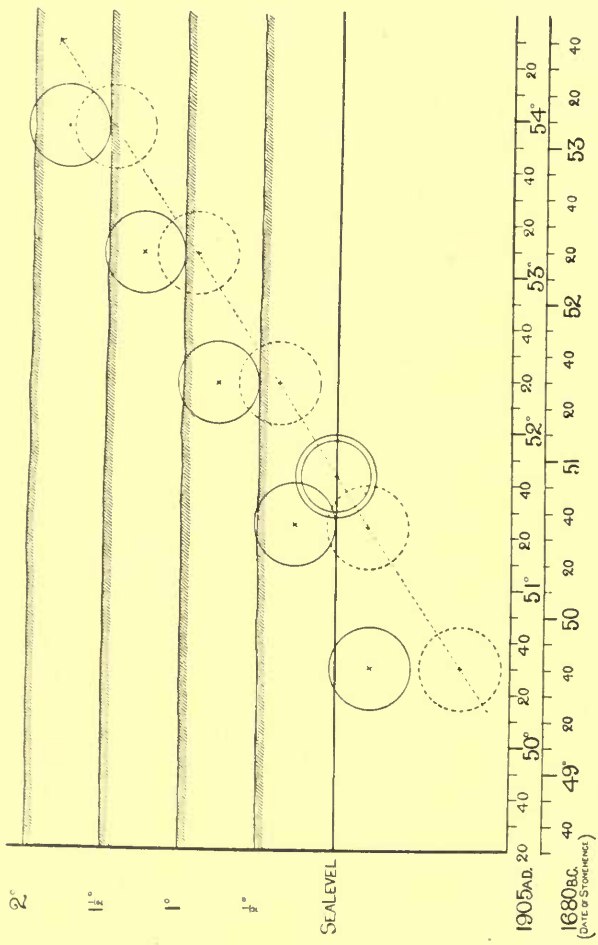


FIG. 60.—Showing azimuths in Lat. N. 50° for the summer solstice sunrise, with different heights of hills for 1905 A.D. and 1680 B.C.

I gather from a report which Mr. H. Bolitho has been good enough to send me that modern hedges and farming operations have changed the conditions of the sight-lines, so that 1 and 3 are just invisible from the circle. This is by no means the only case in which the sighting stone has just been hidden over the brow of a hill and in which signals from an observer on the brow itself have been suggested, or a *via sacra* to the brow from the circle; there are many monoliths in this direction which certainly never belonged to the circle.

From the menhir P (No. 2) a fine view is obtained from N. to S. through E., so that the Blind Fiddler and the two large menhirs, and almost the circle, are visible. The curious shapes of 1 and 2 are noted, the east face vertical and the west boundary curved, like several sighting stones on Dartmoor.

The circle itself has several peculiarities. In the first place, as shown by Lukis, it is not circular, the diameters being about 85 and 65 feet; the minor axis runs through the pillar stone in the centre and the "fallen stones" of Dr. Borlase towards the "stone cross" (which is no cross but a fine menhir) in Az. N. 43° 15′ E. This would suggest that this was the original alignment in 2250 B.C., but against this is the fact that the two stones of the circle between which the "fallen stones" lie are more carefully squared than the rest. It is true, however, that this might have been done afterwards, and this seems probable, for they are closer together than the other circle stones.

The one quartz stone occupies an azimuth S. 66° W. It was obviously placed in a post of honour. As a matter of fact, from it the May sun was seen to rise over the centre of the circle.

As there are both at Tregaseal and Boscawen-un alignments suggesting the observation of the summer solstice sunrise, it is desirable here to refer to the azimuths as calculated. For this purpose Fig. 60 has been prepared, which shows these for lat. 50° both at the present day and at the date of the restoration at Stonehenge.

My readers should compare this with Fig. 36, which gives the solstice sunrise conditions of Stenness in Lat. N. 59°. Such a comparison will show how useless it is to pursue these inquiries without taking the latitude and the height of the sky-line into account.

"*Stripple Stones*" (lat. 50° 32′ 50″ N., long. 4° 37′ W.)

This is a very remarkable circle consisting of 5 erect and 11 prostrate stones situated on a circular level platform 175 feet in diameter on the boggy south slope of Hawk's Tor on the Hawkstor Downs in the parish of Blisland. The circle itself is about 148 feet in diameter, and the whole monument is, in Lukis's opinion, the most interesting and remarkable in the country. Surrounding the platform is a ditch 11 feet wide, and beyond that a penannular vallum about 10 feet in width. The peculiarity of the vallum is that it has three bastions situate on the north-east, north-west, and east sides. It is to the north-east bastion that I wish to refer.

Sighting from the huge monolith, which is now prostrate but originally marked the centre of the circle, along a line bisecting the arc of this bastion we find that the azimuth of the sight-line is N. 25° E.; the angular elevation of the horizon from the 1-inch Ordnance map appears to be about 0° 22′. From these values, proceeding as in the former cases, we find

Alignment.	Decl.	Star.	Date.
Centre of circle to centre of bastion .	35° 1′ N.	Capella	1250 B.C.

indicating that this alignment was formed for the same purpose as that which dominated the erection of the "Pipers."

"*Nine Maidens*" (lat. 50° 28′ 20″ N., long. 4° 54′ 35″ W.)

In this monument we find a very different type from those considered previously.

The Nine Maidens are simply 9 stones in a straight line 262 feet in length at the present day; possibly, as suggested by Lukis, it may have extended originally to the monolith known as "The Fiddler," situated some 800 yards away in a north-easterly direction. Measuring the azimuth of the alignment on Lukis's plan, and finding the horizon elevations from the 1-inch Ordnance map, we have the following:—

Az.	Hills.	Decl.	Star.	Date.
N. 28° E.	0° 0′	37° 47′ N.	Capella	1480 B.C.

It may be remarked that here we have a date for the use of Capella intermediate between those obtained for the "Pipers" and the "Stripple Stones" respectively.

CHAPTER XXVIII

THE CLOCK-STARS IN EGYPT AND BRITAIN.

I HAVE now finished my astronomical reconnaissance of the British monuments. I trust I have shown how important it is that my holiday task should be followed by a serious inquiry by other workers so that the approximate values with which I have had to content myself for want of time may be replaced by others to which the highest weight can be attached. This means at each circle reversed observations with a six-inch theodolite and determination of azimuths by means of observations of the sun if necessary.

I propose in the present chapter to bring together the general results already obtained in cases where the inquiry has been complete enough to warrant definite conclusions to be drawn.

The first result to be gathered from the observations, and one to which I attach the highest importance, is that the practice, so long employed in Egypt, of determining time at night by the revolution of a star round the pole, was almost universally followed in the British circles. This practice was to watch a first-magnitude star, which I named a "clock-star,"[1] of such a declination that it just dipped below the northern horizon so that it was visible for almost the whole of its path.

Doubtless this same method of determining the flow of time during the night watches was also employed in Babylonia,[2] but there, alas! the temples, or, in other words, the astronomical observatories, have disappeared, so that only the Egyptian practice remains for us to study.

Egypt.

Let us, before we proceed, consider some results which have been gathered from the study of the Egyptian observations.

One of the earliest temples in Egypt concerning which we have historical references to check the orientation results was built to carry on these night observations at Denderah, lat. N. 26° 10′. The star observed was α Ursae Majoris, decl. N. 58° 52′, passing 5° below the northern horizon; date (assuming horizon 1° high) about 4950 B.C., *i.e.*, in the times of the Shemsu Heru, before Mena, as is distinctly stated in the inscriptions.

After α Ursae Majoris had become circumpolar in the latitude of Denderah, γ Draconis, which had ceased to be circumpolar, and so fulfilled the conditions to which I have referred, replaced it. Its declination was 58° 52′ N. about 3100 B.C., and it, therefore, could have been watched rising in the axis prolonged of the old temple in the time of Pepi, who restored it then, no doubt on

[1] *Dawn of Astronomy*, 1894, p. 343.

[2] Jensen, *Kosmologie der Babylonier*, p. 147.

account of the advent of the new star, and is stated to have deposited a copy of the old plan in a cavity in the new walls.

Here, then, we have two dates given by orientation of a clock-star temple entirely agreeing with the most recent views of Egyptian chronology.

In Dr. Budge's *History of Egypt* (iii. 14) the story of the rebuilding of the temple at Annu by Usertsen (2433 B.C., Brugsch) is given from an ancient roll. Supposing this temple built parallel with the faces of the remaining obelisk, γ Draconis would rise in its axis prolonged 2500 B.C., proving that Usertsen did at Annu what Pepi previously did at Denderah, and that the same reason for restoration and even the same star were in question.[1]

When the clock-star ceased to be visible in the chief temple other subsidiary temples were subsequently built to watch it. Thus γ Draconis was watched at Thebes from 3500 B.C. to the times of the Ptolemys by temples oriented successively from that of Mut Az. N. 72° 30′ E. to 68° 30′, 63° 30′, and 62°.[2]

It is worth while to show that what we know now of the Egyptian methods of observation enables us to carry the matter further, while we gather at the same time that in consequence of the difference of latitude the method employed in Egypt could not be followed in Britain.

I showed in the *Dawn of Astronomy* that several ancient shrines consisted of two temples at right angles

[1] *Dawn of Astronomy*, p. 215.
[2] *Ibid.*, p. 214.

to each other (see Fig. 13), one axis pointing high N.E. to observe the clock-star—the worship of Set—the other low N.W. to observe either the sun by itself, or in association with some important star of the same declination as the sun.

The temples of Mut and Menu (or Min), and of Amen, with the associated temple M. of Lepsius, at Karnak, are the best extant examples of this principle of temple building.

There is evidence that both at Annu and Memphis the same principle was followed, but at Annu one obelisk alone remains, and at Memphis one temple; from these, however, Captain Lyons and myself have obtained sufficient data to enable the original directions of the temple-systems to be gathered.

At Denderah, if such a N.W. temple ever existed it has disappeared, but as the monument stands there are still two temples at right angles to each other, but the second one faces S.E. instead of N.W.

This premised, I will now give, in anticipation of another one dealing with the British monuments, a list of the most ancient star temples in Egypt, with their azimuths and the first-magnitude clock-stars which could have been observed in them at different dates. These dates have been approximately determined by the use of a precessional globe, an horizon of 1° elevation being assumed. As I have shown, the present views of Egyptian chronology and the inscriptions carry us back to α Ursae Majoris, at Denderah. But there is a suggestion at Luxor, and perhaps also at Abydos, that Vega was used before that star, though there are, so far as I know, no temple traces of Arcturus.

Temple.	N. Lat.	Az. N.E.	N. Decl.	Vega.	Arcturus.	α Ursae Majoris.	γ Draconis.
Annu	30° 10′	14° 0′	57° 25′	6250	5550	*5200	*2500
Memphis	29 50	12 45	58 20	6450	6000	5000	2850
Denderah . . .	26 10	18 30	58 52	6550	6200	*4950	*3100
Thebes (Mut) . .	25 40	17 30	59 46	6700	6700	4800	*3500
Tell-el-Amarna .	27 40	13 0	60 12	6800	6800	4750	3700
Nagada	26 10	12 0	61 16	7000	7400	4600	4000

There is a very great difference between determining the date of a temple erected to the rising or setting of a particular star, and of one erected to the rising or setting of the sun on a particular day of the year. In the latter case no date can be given unless we have reason to believe that both the sun *and* a star rose or set at the same point of the horizon at the same date; in other words, the sun and star had the same declination, and the rising or setting of both could be seen in the same temple.

I assumed, without historical data, that this view was acted on in Egypt, at the temple of Menu; Mr. Penrose found, with historical data, that it was actually acted on in Greece at the Parthenon. To show that we are at all justified in this view we must study the association of gods with temple worship, and look for temples in different azimuths erected at different times if the god is a star; and we can run the star home if the dates fall in with the star's precessional change. Thus there is reason for supposing that the god Ptah and the star Capella were associated. There is a temple of Ptah at Memphis, Az. N. 77° 15′ W., hills 50′, decl. N. 11°, star Capella, date 5200. In the rectangular system at Memphis, then, α Ursae Majoris was watched in one temple and Capella in the other at that date. There is also evidence that the god Menu was associated with the star Spica. In the temple system of Mut at Thebes, in 3200 B.C., γ Draconis was used as a clock-star in one temple, while the setting of Spica was watched in the other.

If a temple is erected to the sun with no specially named cult, it may be a sun-temple pure and simple, not connected with star worship because there was no star with the proper declination at the time.

In Greece temple-building was carried on at a much later time, so late that perhaps water clocks were available, so that we should not expect to find many clock-star temples in that country. As a matter of fact there is only one, of which the data, according to Mr. Penrose, are as follows :—

	N. Decl.	Star.	Date.
Thebes, The City of the Dragon	$+54° 28'$	γ Draconis	1160

It will be seen that the star used in Greece was the last clock-star traced in the Egyptian temples.

Britain.

I now come to Britain. So far as my inquiries have gone, these clock-star observations were introduced into these islands about 2300 B.C.

In my statement concerning them I will deal with the astronomical conditions for lat. 50° N., as it is in Cornwall that the evidence is most plentiful and conclusive.

In that latitude and at that time Arcturus, decl. N.

41°, was just circumpolar with a sea horizon, and therefore neither rose nor set. Capella, decl. N. 31°, when northing was 9° below the horizon, so that it rose and set in azimuths N. 37° E. and N. 37° W. respectively; it was therefore invisible for a long time and was an awkward clock-star in consequence.

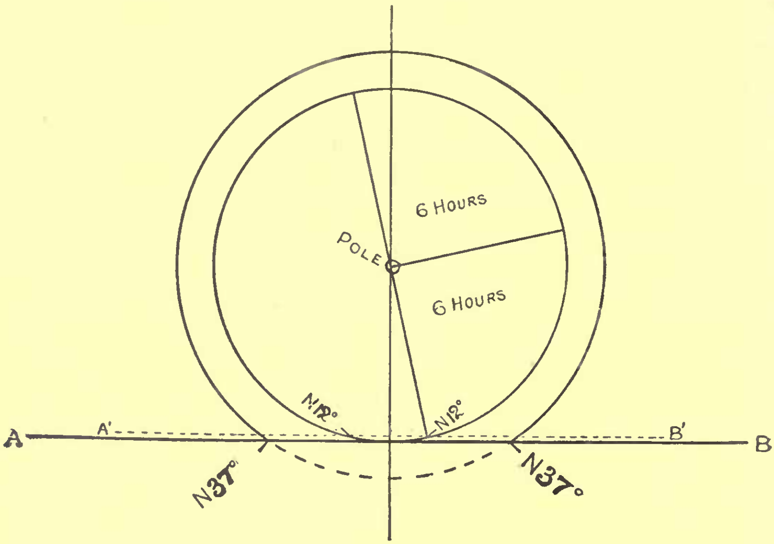


FIG. 61.—Arcturus and Capella as clock-stars in Britain.

AB = sea horizon.
A'B' = horizon 3° high.

Fig. 61 represents diagrammatically the conditions named, the circumpolar paths of Arcturus and Capella being shown by the smaller and larger circle respectively. *A B* represents the actual sea horizon and *A' B'* a locally raised horizon 3° high, whilst the dotted portion of the larger circle represents the non-visible part of Capella's apparent path.

What the British astronomer-priests did, therefore, in the majority of cases was to set up their temples in a locality where the N.E. horizon was high, so that Arcturus rose and set over it and was invisible for only a short time, as shown in the diagram by the raised horizon A' B'.

The two lists following contain the names of the monuments where I suggest Arcturus was used as a clock-star. In the first, the angular elevation of the sky-line as seen from the circle in each case has been actually measured, and the date of the alignment is, therefore, fairly trustworthy; but in the second list the elevations have been estimated from the differences of contour shown on the one-inch Ordnance map, and the dates must be accepted as open to future revision.

ARCTURUS AS A CLOCK-STAR.

I.

Monument.	Position.		Alignment.	Az.	Hills.	Decl. N.	Date B.C.
	Lat. N.	Long. W.					
Tregaseal . . .	50° 8′ 0″	5° 39′ 20″	Circ. to Carn Kenidjack	N. 12° 8′ E.	4° 0′	42° 33′	2330
The Hurlers . .	50 31 0	4 27 20	S. circ. over cent. circ.	N. 11 15 E.	3 24	41 38	2170
			Cent. circ. over N. circ.	N. 14 18 E.	3 24	41 9	2090
			N. circ. over N.E. barrow	N. 18 44 E.	3 24	40 6	1900
Merrivale . . .	50 33 15	4 2 30	Circ. to remains of cromlech	N. 15 0 E.	3 1	40 36	1990
			Direction of smaller avenue	N. 24 25 E.	5 0	39 55	1860
Fernworthy . .	50 38 30	3 54 10	Direction of Avenue	N. 13 0 E.	1 15	39 7	1720
				N. 14 20 E.	1 15	38 51	1670
Stanton Drew .	51 22 0	2 34 20	Cent. of Gt. Circ. to Quoit	N. 17 59 E.	2 33	38 38	1620
Fernworthy . .	50 38 30	3 54 10	Direction of Avenue	N. 15 45 E.	1 15	38 34	1610
Merry Maidens	50 3 40	5 35 25	Circ. to stone in the road	N. 11 45 E.	0 12	38 27	1590
Stanton Drew .	51 22 0	2 34 20	S.W. circ. to centre of Gt. Circ.	N. 19 51 E.	1 44	37 30	1420

II.

Monument.	Position.		Alignment.	Az.	Hills.	Decl. N.	Date B.C.
	Lat. N.	Long. W.					
Trowlesworthy	50° 27′ 30″	4° 0′ 20″	Direction of primary avenue	N. 7° 0′ E.	2° 52′	41° 24′	2130
			Direction of final avenue	N. 12 0 E.	2 52	41 6	2080
Longstone (Tregaseal)	50 8 10	5 38 20	Longstone to Chûn Cromlech	N. 9 0 E.	1 43	40 39	2000
Lee Moor . . .	50 26 30	3 59 40	Direction of avenue . .	N. 22 0 E.	2 28	38 17	1560

In some cases, for one reason or another, this arrangement was not carried out, and Capella, in spite of the objection I have stated, was used in the following circles :—

CAPELLA AS A CLOCK-STAR.

Monument.	Position.		Alignment	Az.	Hills.	Decl. N.	Date B.C.
	Lat. N.	Long. W.					
I.							
Boscawen-un .	50° 5′ 20″	5° 37′ 0″	Circ. to Stone Cross . .	N. 43° 15′ E.	2° 7′	29° 26′	2250
Merry Maidens	50 3 40	5 35 25	Circ. over the "Pipers"	N. 38 26 E.	0 20	29 58	2160
II.							
The Nine Maidens	50 28 20	4 54 30	Direction of Nine Maidens row	N. 28 0 E.	0 0	33 47	1480
Stripple Stones	50 32 51	4 37 35	Centre to N.E. bastion	N. 26 0 E.	0 22	34 38	1320

At the Merry Maidens, however, with nearly a sea horizon, when Arcturus ceased to be circumpolar and rose in Azimuth N. 11° 45′ E., it replaced Capella, and was used as a clock-star after 1600 B.C.

In this system of night observation we have the germ of the use in later times of an instrument called the "night-dial," specimens of which, dating from the fourteenth century, can be seen in our museums. The introduction of graduated circles permitted the employment of circumpolar stars, and the "guards" of the Little Bear or the "pointers" of the Great Bear were thus used.

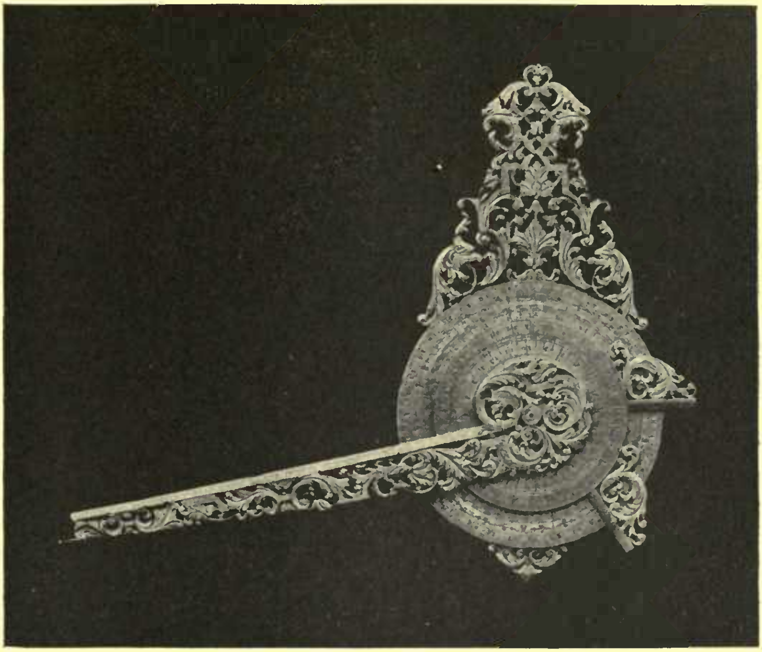


FIG. 62.—A "night-dial."

There was a disc with a central aperture through which the pole star could be observed; the disc could be adjusted for every night in the year; an arm was then moved round so that the direction of the pointers (or the guards) with regard to the vertical could be measured; on a second concentric circle the time of night could be read off.

CHAPTER XXIX

A SHORT HISTORY OF SUN TEMPLES

The Original Cult

I HAVE given detailed evidence showing that the first circle builders in Britain worshipped the May-year sun, whether they brought it with them or not. This year was used in Babylon, Egypt, and afterwards in Greece. In the two former countries May was the harvest month, and thus became the chief month in the year. The dates were apt to vary with the local harvest time.

The earliest extant temple aligned to the sun at this festival seems to have been that of Ptah at Memphis, 5200 B.C. I have already referred to this temple in relation to the clock-star observations carried on in it.

This approximate date of the building of the temple is obtained by the evidence afforded (1) by the associated clock-star (see p. 298), and (2) by the fact that the god Ptah represented the star Capella, since there is a Ptah temple at Thebes aligned on Capella at a later time, when by the precessional movement it had been carried outside the solar limit. There was also a similar temple at Annu (Heliopolis, lat. N. 30° 10′), but it has disappeared. The light of the sun fell along the axis when the sun had the declination N. 11°, the Gregorian dates being April 18 and August 24.

Another May-year temple was that of Menu at Thebes,

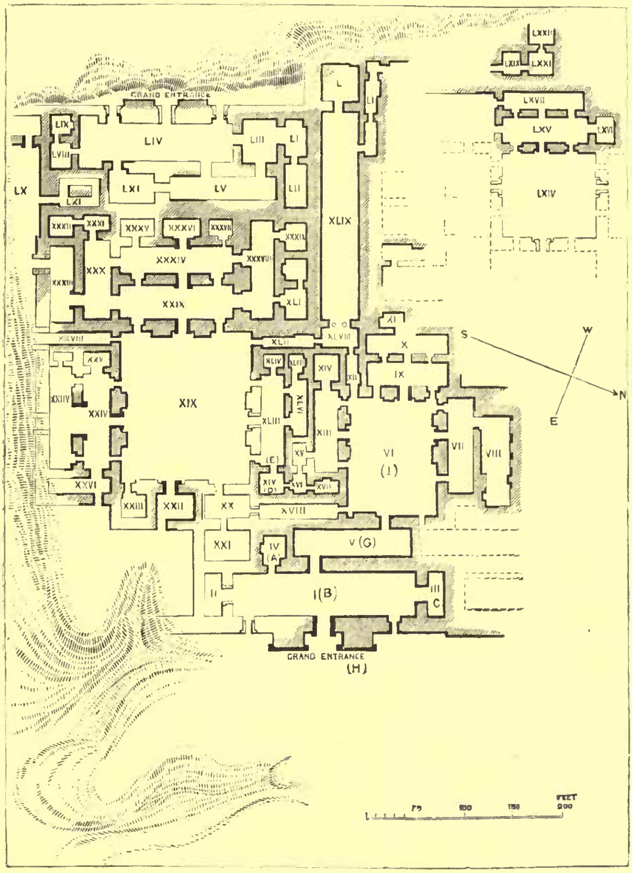
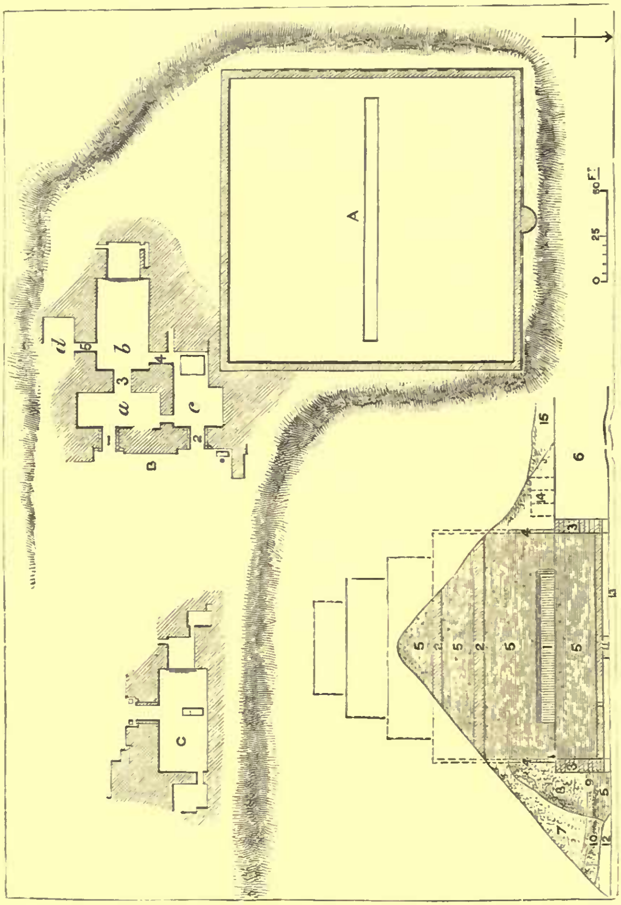


FIG. 63.—Layard's plan of the Palace of Sennacherib discovered in the mound of Kouyunjik. The temple axis, XXXVI., XXXIV., XXIX., XIX. (XXII. is on a lower level), faces the rising of the May sun.

Az. N. 72° 30′ W. (lat. N. 25°; sun's declination N. 15°; Gregorian date, May 1).

As we have seen (p. 299), Spica had this declination in 3200 B.C., and the coincidence may have been the reason for the erection, or, more probably, the restoration, of the temple,[1] especially as γ Draconis came into play as a new clock-star at the same date.



The orientation.

FIG. 64.—Layard's plan of the Mound at Nimrood showing its equinoctial orientation.

The researches of Mr. Penrose in Greece have provided us with temples oriented to the May-year sun. I shall return to them afterwards, as they are later in time than the British monuments.

[1] See *Dawn of Astronomy*, p. 318.

The explorations of Sir H. Layard at Nineveh, lat. 36° N., have shown that the temple in Sennacherib's

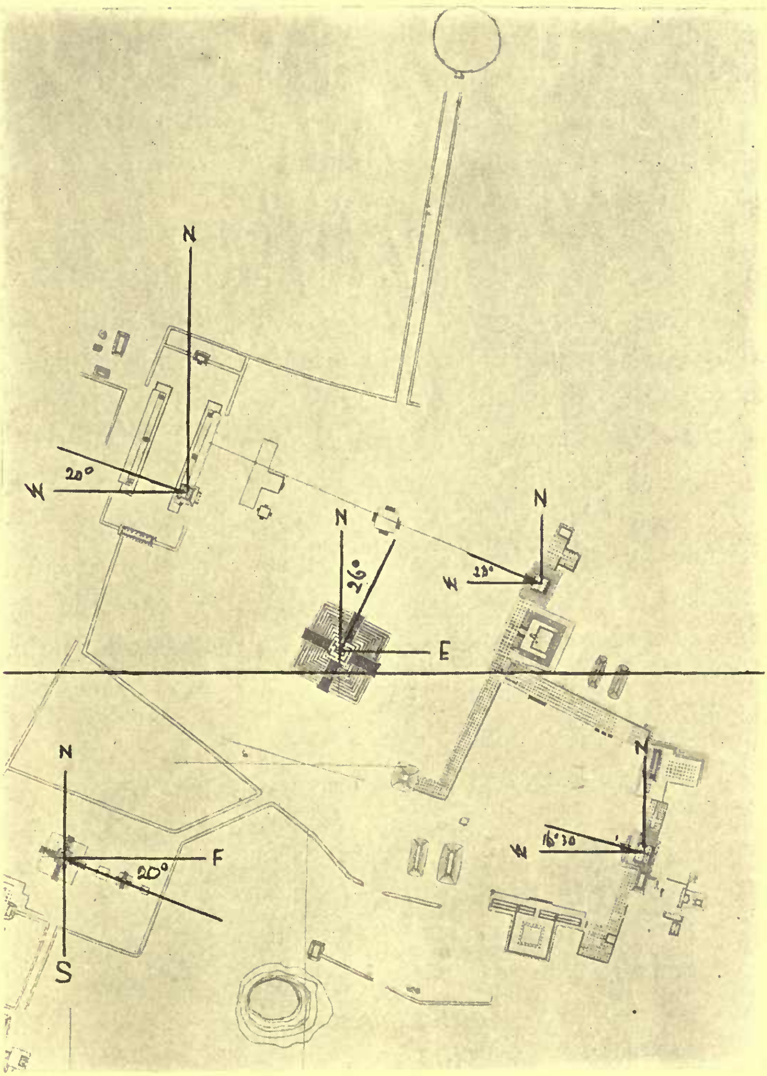


Fig. 65.—The Temples at Chichen Itza.

palace, which may have been a restoration of a much older temple, was also oriented to the May sun.

X 2

It is a pity that our present-day archæologists do not more strictly follow the fine example set by Sir Henry Layard in his explorations of Kouyunjik. When he had unearthed Sennacherib's palace (700 B.C.) he was careful to give the astronomical and magnetic bearings of the buildings and of the temple which seemed to form the core of them. The bearing is Az. N. 68° 30′ E., giving the sun's declination as N. 16°.

I am enabled by the kindness of Mr. John Murray to give copies of the plans which Sir H. Layard prepared of the excavations both at Kouyunjik and Nimrood, showing the careful orientation which enables us to claim Sennacherib's temple as one consecrated to the May year, while at Nimrood (Babylon) the equinoctial worship was in vogue as at the pyramids.

In association with these plans of Layard's, I give another by Mr. Maudslay of the as carefully oriented temples at Chichen Itza (N. lat. 20°) explored by him. In these temples, of unknown date and origin, the azimuths of two show that the May year was worshipped.[1]

[1] The temple conditions are approximately as follows :—

PALENQUE.

Azimuths.	Decl.		
N. 21° 30′ E.	60° 15′		Stellar temples. Clock-stars.
N. 18 0 E.	62 36		
S. 27 0 W.	56 17		
S. 66 0 E.	23 0	Solstice	Solar temples.
S. 73 0 E.	16 0	May	

CHICHEN ITZA.

Azimuths.	Decl.		
N. 26° 0′ E.	59° 0′	Stellar temple.	Clock-star.
S. 70 0 E.	19 0	(?)	
N. 70 0 W.	19 0	(?)	
N. 67 0 W.	22 0	Solstitial	Solar temples.
N. 72 30	16 0	May	

The May-Year Monuments in Britain.

In the first glimpses of the May year in Egypt we have dates from 5000 B.C. It does not follow that it did not reach Great Britain before about 2000 B.C. because monuments made their appearance about that time. It is clear, also, that with the possibilities of coastwise traffic as we have found it, it might as easily have reached Ireland by then; 2000 B.C., therefore, is a probable date for the May worship to have reached Britain arguing on general principles; we now come to a detailed summary of the facts showing that it really reached Britain earlier.

Alignments in British monuments designed to mark the place of the sun's rising or setting on the quarter-days of the May year have been found as follows:—

Monument.	Position.		May and Aug.		Feb. and Nov.	
	Lat. N.	Long. W.	Rising.	Setting.	Rising.	Setting.
Merry Maidens . . .	50° 3′ 40″	5° 35′ 25″	*	*		*
Boscawen-un	50 5 20	5 37 0	*		*	
Tregaseal	50 7 50	5 39 20	*			
Longstone (Tregaseal)	50 8 10	5 38 20	*			
Down Tor	50 30 10	3 59 30	*			
Merrivale	50 33 15	4 2 30	*			
The Hurlers	50 31 0	4 27 20			*	
Stonehenge	51 10 40	1 49 30	*	*		
Stanton Drew. . . .	51 22 0	2 34 30	* circle along avenue			? avenue to circle
Stenness	59 0 10	3 13 40	*	*	*	*

I have already shown that it was the practice in ancient times for the astronomer-priests not only to watch the clock-stars during the night, but also other stars which rose or set about an hour before sunrise, to give warning of its approach on the days of the principal festivals.

Each clock-star, if it rose and set very near the north point, might be depended on to herald the sunrise on *one* of the critical days of the year, but for the others other stars would require to be observed. This practice was fully employed in Britain.

May Warnings.—The following table gives the stars I have so far noted which were used as warners for the May festival.

Monument.	Star.	Date or dates B.C.
Stonehenge	Pleiades (R)	1950
Merry Maidens	Pleiades (R) Antares (S)	1930 1310
The Hurlers	Antares (S) Pleiades (R)	1720 1610
Merrivale	Pleiades (R) ,,	1610 1420
Boscawen-un	Pleiades (R)	1480
Tregaseal	Pleiades (R)	1270
Stenness	Pleiades (R)	1230
Longstone (Tregaseal)	Pleiades (R)	1030

(R) = rising. (S) = setting.

It is convenient here to give a list of the May warning stars found by Mr. Penrose in Greece, as it shows that the same stars were observed for the same purpose.

		Decl.	Day.	Year.
				B.C.
Archaic temple of Minerva . . .	Pleiades (R)	+ 7° 50′	April 20	2020
Hiero of Epidaurus, Asclepieion.	,, (R)	+ 9 15	,, 28	1275
Hecatompedon	,, (R)	+ 9 58	,, 26	1150
Older Erechtheum	Antares (S)	− 14 31	,, 29	1070
Temple of Bacchus	Pleiades (R)	+ 10 35	,, 29	1030
Corinth	Antares (S)	− 16 0	May 6	770
Aegina	,, (S)	− 16 45	,, 7	630

The warning stars at Athens were the Pleiades for temples facing the east, and Antares for temples using the western horizon.

August warnings.—Sunrise at the August festival was heralded by the rising of Arcturus, which, as we have seen, was also used as a clock-star. The alignments and dates given in the Arcturus table therefore hold good for August. At the Hurlers, where the hill over which Arcturus was observed fell away abruptly, we find Sirius supplanting Arcturus as the warning star for August in 1690 B.C.

November warnings.—So far I have discovered no evidence that any star was employed to herald the November sun. There may be two reasons for this. In the first place the November festival "Halloween" took place at sun*set* and the sun itself could be watched, no heralding star being necessary.

Secondly, the atmospheric conditions which prevail in Britain during November would not be conducive to the making of stellar observations *at the horizon*, and only risings or settings were observed with regard to the quarter-days.

February Warnings.—In the same way that Arcturus served the double purpose of clock-star and herald for the August sun, so did Capella serve to warn the February sun in addition to its use at night. The alignments and dates given in the Capella table will therefore hold good for its employment at the February quarter-day.

The Solstitial Year Monuments.

In Egypt generally, the solstitial worship followed that of the May and equinoctial years. The religion of Thothmes III. and the Rameses was in greatest vogue 2200-1500 B.C.

We find little trace of it in Greece proper, though Mr. Penrose has traced it in Calabria and Pompeii, and in some of the islands.

The solstitial cult was born in Egypt; it is a child of the Nile-rise. I have shown in my *Dawn of Astronomy* that the long series of temples connected with the solstice may have commenced about 3000 B.C.; but for long it was a secondary cult; it was parochial until the twelfth dynasty, say 2300 B.C. Egypt's solstitial "golden age" may be given as 1700 B.C., and her influence abroad was very great, so that much travel, "coastwise" and other, may be anticipated. It is for some centuries after the first date that the introduction of the solstitial worship into Britain may be anticipated. It, for instance, is quite probable that the pioneers of this worship should have reached Stonehenge in 2000 B.C.

The solstitial alignments found by Mr. Penrose in Greece are as follows :—

Temples.		Decl.	Day.	Year.
				B.C.
	JUNE.			
Athens, Dionysus (Upper Temple)	Antares (setting)	−11° 2′	June 20	1700
Pompeii (Isis)	β-Geminorum	−16 44	,, 19	750
	DECEMBER.			
Metapontum	β-Geminorum (setting)	+29° 38′	Dec. 21	610
Locri	,,	+29 40	,, 21	610

We find plentiful evidence that the worship of the solstitial sun such as was carried on in Egypt at Karnak and at other places [1] was introduced into Britain some time after the May-year worship was provided for in the monuments.

Although some of the alignments already discovered are in all probability solstitial, the variation of the sun's solstitial declination is so slow and takes place between such narrow limits that a most careful determination of the actual azimuths and of the angular heights of the various horizons must be made before any definite conclusion as to dates can be arrived at. The necessity for this care is illustrated in the paper on Stonehenge [2] communicated to the Royal Society by Mr. Penrose and myself in 1891, where, after taking the greatest precautions, the resulting date was in doubt to the amount of 200 years in either direction.

[1] *Dawn of Astronomy*, p. 78.

[2] *Proc. Roy. Soc.*, vol. 69.

So far Stonehenge is the only temple at which these observations have been made, so that for the other alignments contained in the following list no dates can yet be given.

Monument.	Alignment.	Az.	Decl. (provisional).	Season.	Date B.C.
Stonehenge .	Direction of avenue . .	N. 49° 34′ 18″E.	23° 54′ 30″N.	Summer (R)	1680
Boscawen-un	Circ. to fine menhir . .	N. 53 30 0 E.	22 58 13	Summer (R)	
	,, Blind Fiddler .	N. 54 30 0 E.	22 24 12	,,	
Tregaseal . .	Circ. to row of holed stones	N. 53 20 25 E.	22 53 26	Summer (R)	
	Circ. to two barrows 900′ distant	N. 50 0 0 E.	24 7 0	,,	
Longstone (Tregaseal)	Mên-an-tol to Longstone	S. 50 30 0 W.	24 33 0 S.	Winter (S)	
The Hurlers .	N. circ. to S.E. stone .	S. 50 50 0 E.	24 17 20 S.	Winter (S)	
Stanton Drew	Gt. Circle to N.E. circle	N. 51 0 0 E.	23 48 46 N.	Summer (R)	
Stenness . .	Circle to Hindera Fiold	N. 39 30 0 E.	24 3 15 N.	Summer (R)	
	Barnstone to Maeshowe	N. 41 16 0 E.	—	,,	
	Circ. to Ward Hill tumulus	S. 41 0 0 E.	—	Winter (R)	
	Circ. to Onston tumulus	S. 36 30 0 W.	—	,, (S)	
	,, tumuli	N. 37 0 0 W.	—	Summer (S)	

(R) = rising. (S) = setting.

I cited an alignment at the Hurlers which marked the rising point of Betelgeuse. This star warned the summer solstice sunrise at about the Hurlers' date. So far, however, I have not yet found any suggestion of its use elsewhere.

At Shovel Down and Challacombe on Dartmoor there are avenues pointing a few degrees west of north. The sight-lines along these avenues would mark the setting-point of Arcturus at the time that that star (setting) warned the rising of the sun at the summer solstice; but this use cannot be considered as established, as Arcturus would scarcely set before its light was drowned in that of the rising sun. The absence of darkness in high summer in these latitudes and the bad weather in the winter may both be responsible for so few alignments for the solstices.

The Equinoctial Year Monuments.

The equinoctial pyramid and Babylonian cult in vogue in Egypt in the early dynasties (4000 B.C.), with the warning stars Aldebaran (March) and Vega (September), was represented in Greece at a much later period. The facts for Greece, according to Mr. Penrose, are as follows:—

		Decl.	Day.	Year.
				B.C.
	MARCH.			
Nike Apteros	Spica (setting)	+6° 10′	Mar. 17	1130
Juno Lacinia (near Croton)	α-Arietis	+7 27	,, 28	1000
Paestum (Neptune)	Spica (setting)	+3 5	,, 22	535
Gergenti (Hercules)	,,	+2 30	,, 30	470
	SEPTEMBER.			
Rhamnus (Themis)	Spica (rising)	+6° 0′	Sept. 17	1092
Tegea (Minerva)	,, ,,	+5 51	,, 18	1075
Syracuse (? Minerva)	,,	+4 30	,, 20	815
Athens (dedication unknown)	,,	+4 17	,, 23	780
Rhamnus (Nemesis)	,, ,,	+4 5	,, 22	747
Bassæ (Apollo)	,, ,,	+3 57	,, 22	728
Ephesus (Diana)	,, ,,	+3 57	,, 25	715
Syracuse (Diana)	,, ,,	+2 22	,, 26	450
Ephesus (Diana) (re-orientation)	,,	—	Oct. 6	355

In Britain equinoctial alignments are not wanting, but so few have been traced that I have reserved them for future inquiry.

CHAPTER XXX

THE LIFE OF THE ASTRONOMER-PRIESTS

THE facts contained in the preceding chapters have suggested, at all events, that whatever else went on some four thousand years ago in the British circles there was much astronomical observation and a great deal of preparation for it.

In a colony of the astronomer-priests who built and used the ancient temples we had of necessity:—

(1) Observatories, *i.e.*, circles in the first place; next something to mark the sight-lines to the clock-star for night work, to the rising or setting of the warning stars, and to the places of sunrise and sunset at the chief festivals. This something, we have learned, might be another circle, a standing stone, a dolmen, a cove, or a holed stone.

A study of the sight-lines shows us that these collimation marks, as we may call them, were of set purpose, generally placed some distance away from the circles, so far that they would require to be illuminated in some way for the night and dawn observations. When there was no wind, one or more hollows in a stone, whether a menhir or a quoit, might have held grease to feed a wick or a pine-wood torch. But in a wind some shelter would be necessary, and the light might have been used in a cromlech or allée couverte. Stones have been found with such cups, and débris of fires have been found in cromlechs.

It must not be forgotten that here there was no oil as in the Semitic countries whence, as we have seen, the immigrants came; and it was not a question of a light on the sight-line alone. If wood were used, it must have been kept dry for use, and whether wood or animal fat were employed the most practical and convenient way of lighting up would have been to keep a fire ever burning in some sheltered place.

(2) Dwellings, which would be cromlechs or many-chambered barrows, according to the number of astronomer-priests at the station. These dwellings would require to be protected against the invasions of the local fauna, very different from what it is now, and for this a small, and on that account easily blocked, entrance would be an essential.

These dwellings would naturally suggest themselves as the shelter place for the ever-burning fire or the supply of dry wood. Tradition points with no uncertain sound to the former existence of life and light in these "hollow hills." Mr. MacRitchie's book[1] contains a mine of most valuable and interesting information on this subject.

(3) A water supply for drinking and bathing, which might be a spring, river or lake, according to the locality.

Given a supply of food we have now provided for

[1] *The Testimony of Tradition.*

the shelter and protection of the astronomer and the man.

But the man who brought this new astronomical knowledge was, before he came, astrologer and magician as well, and, further, he was a priest; hence on account of his knowledge of the seasons, he could not only help the aboriginal tiller of the soil as he had never been helped before, by his knowledge; but he could appeal in the strongest way to his superstitious fears and feelings, by his function as the chief sacrificer and guardian of the sacrificial altars and fires. Hence it was that everything relating to the three different classes of things to which I have referred was regarded as very holy because they were closely associated with the astronomer-priests, on whom the early peoples depended for guidance in all things, not only of economic, but of religious, medical and superstitious value.

The perforated stones were regarded as sacred, so that passing through them was supposed to cure disease. Whether men and women, or children only, passed through the hole depended upon its size. But a hole large enough for a head to be inserted was good for head complaints.

The wells, rivers, and lakes used by the priests were, as holy places, also invested with curative properties, and offerings of garments (skins?), and pins to fasten them on, as well as bread and wine and cheese, were made at these places to the priests.

The fact that the tree on which the garment was hung was either a rowan or a thorn shows that these offerings commenced as early as the May-November worship.

The holed stones, besides being curative, were in long after years, when marriage had been instituted, used for the interchange of marriage vows by clasping hands through the opening.

The cups for the light would also be sacred objects; and many of them have been since used for holy water.

The cursus at Stonehenge and the avenues on Dartmoor may be regarded as evidences that sacred processions formed part of the ceremonial on the holy days, but sacrifices and sacred ceremonials were not alone in question; many authors have told us that feasts, games and races were not forgotten. This, so far as racing is concerned, is proved, I think, by the facts that the cursus at Stonehenge is 10,000 feet long and 350 feet broad, that it occupies a valley between two hills, thus permitting of the presence of thousands of spectators, and that our horses are still decked in gaudy trappings on May Day.

Nor is this all. It is hard to understand some of the folklore and tradition unless we recognise that at a time before marriage was instituted, at some of the sacred festivals the intercourse of the sexes was permitted if not encouraged. This view is strengthened by the researches of Westermarck[1] and Rhys.[2] Given such a practice, the origin of matriarchal customs and of the *couvade* is at once explained; and it is clear that the charges against the Druids of special cruelty and impurity must be withdrawn. Their sacrifices and customs were those common to all priesthoods in the ancient world.

[1] *History of Human Marriage*, Chapter II.
[2] *Celtic Folklore*, ii., 654.

I have shown that some circles used in the worship of the May year were in operation 2200 B.C., and that there was the introduction of a new cult about 1600 B.C., or shortly afterwards, in southern Britain, so definite that the changes in the chief orientation lines in the stone circles can be traced.

To the worship of the sun in May, August, November and February was added a solstitial worship in June and December.

The associated phenomena are that the May-November Balder and Beltaine cult made much of the rowan and maythorn. The June-December cult brought the worship of the mistletoe.

The flowering of the rowan and thorntree in May, and their berries in early November, made them the most appropriate and striking floral accompaniments of the May and November worships, and the same ideas would point to a similar use of the mistletoe in June and December.

The fact that the June-December cult succeeded and largely replaced the May-November one could hardly have been put in a cryptic and poetic statement more happily than it appears in folklore: Balder was killed by mistletoe.

This change of cult may be due to the intrusion of a new tribe, but I am inclined to attribute it to a new view taken by the priests themselves due to a greater knowledge, among it being the determination, in Egypt, of the true length of the year which could be observed by the recurrence of the solstices, and of the intervals between the festivals reckoned in days.

However this may have been, all the old practices and superstitions were retained, only the time of year at which they took place was changed. As the change of cult was slow, in any one locality the celebrations would be continued at *both* times of the year, and for long both sets of holidays were retained.

Since I have shewn that the solstitial worship came last, traces of this, as a rule, would be most obvious in places where it eventually prevailed over the cult of the May year. In such places the absence of traces of the May festival would be no valid argument against its former prevalence. In other places, like Scotland, where the solstitial cult was apparently introduced late and was never prevalent, we should expect strong traces of the May worship, and, as a matter of fact, it is very evident in the folk lore and customs of Scotland; even the old May year quarter days are still maintained.

Between the years 2300 B.C. and 1600 B.C., whether we are dealing with the same race of immigrants or not, we pass from unhewn to worked stones. The method of this working and its results have been admirably shown to us by Prof. Gowland's explorations at Stonehenge.

From the tables, given in Chap. XXVIII, it can be seen that, so far as the present evidence goes, there was a pretty definite time—about 2300 B.C.—of beginning the astronomical work at the chief monuments; Cornwall came first, Dartmoor was next.

Almost as marked as the simultaneous beginning are the dates of ending the observations, if we may judge of the time of ending by the fact that the precessional changes in the star places were no longer marked by the marking out of new sight lines.

The clock-star work was the first to go, about 1500 B.C. The May-warning stars followed pretty quickly.

We may say, then, that we have full evidence of astronomical activity of all kinds at the circles for a period of some 700 years.

What prevented its continuance on the old lines? It may have been that the invention of some other method of telling time by night had rendered the old methods of observation, and therefore the apparatus to carry them on, no longer necessary.

On the other hand, it may have been that some new race, less astronomically inclined, had swept over the land.

I am inclined to take the former view. It is quite certain that for the clock-stars other observations besides those on the horizon would soon have suggested themselves for determining the lapse of time during the night. The old, high, bleak, treeless moorlands might then in process of time have been gradually forsaken, and life may have gone on in valleys and even in sheltered woods, except on the chief festivals. When this was so astronomy and superstition would give way to politics and other new human interests, and the priests would become in a wider sense the leaders and the teachers of the more highly organised community.

It is clear that in later days as at the commencement they were still ahead in the knowledge of the time. "Hi terrae mundique magnitudinem et formam, motus coeli ac siderum, ac quod dii velunt sciere profitentur" is Pomponius Mela's statement concerning them.[1] From 1500 B.C. to Cæsar's time is a long interval, and yet

[1] *Pomp. Mela*, Lib. II. c. 2. I have already (p. 52) quoted Cæsar's testimony to the same effect.

the astronomical skill of the so-called Druids, who beyond all question were the descendants of our astronomical-priests, was then a matter of common repute. Cæsar's account of the Druids in Gaul (*Bello Gallico*, vi. c. 13, 14, 15) is extremely interesting because it indicates, I think, that the Druid culture had not passed through Gaul and had therefore been waterborne to Britain, whither the Gauls therefore went to study it.[1]

Simultaneously with the non-use of the ancient stones, we may imagine that the priests—of ever-increasing importance—no longer dwelt in their cromlechs, but, rather, occupied such buildings as those which remain at Chysoister, and from this date it is possible that burials may have taken place in some of the mounds then given up as dwelling places. As sacred places they were subsequently used for burials, as Westminster Abbey has been; but burials were not the object of their erection.[2] This new habit may have started the practice of cist burial by later people in barrows thrown up for that special purpose.

I cannot close this Chapter without expressing my admiration of the learning and acumen displayed by Dr. Borlase in his treatment of the subject of the Druids in his *History of Cornwall*, published in 1769; I find he has anticipated me in suggesting that the hollowed

[1] 'Disciplina in Britannia reperta, atque in Galliam translata esse existimatur."—*C. Bell. Gall.* lib. vi. c. 13. This "discipline" also included magic according to Pliny. "Britannia hodie eam (*i.e.* Magiam) attonite celebrat tantis ceremoniis, ut eam Persis dedisse videri possit" (lib. xxx. c. 1.)

[2] Bertrand and Reinach, *Les Celtes et les Gaulois dans les Vallées du Pô et du Danube*, p. 82. Tregellis, "Stone Circles in Cornwall." *Trans.* Penzance Natural History and Antiquarian Society, 1893–4.

stones were used for fires. It is clear, now that the monuments have been dated, that the astronomical knowledge referred to by Cæsar and Pomponius Mela was no new importation ; if, therefore, the present view of ethnologists that the Celtic intrusion took place about 1000 B.C. is correct, it is certain the Celts brought no higher intelligence with them than was possessed by those whom they found here ; nor is this to be expected if, as the inquiry has suggested, the latter were the representatives of the highest civilisation of the East with which possibly the former had never been brought into contact.

APPENDICES

I. Details of the Theodolite Observations at Stonehenge

The instrument chiefly employed was a six-inch transit theodolite by Cooke with verniers reading to 20″ in altitude and azimuth. Most of the observations were made at two points very near the axis, which may be designated by *a*, *b*. Station *a* was at a distance of 61 feet to the south-west of the centre of the temple, and *b* 364 feet to the north-east. The distance from the centre of Stonehenge to Salisbury Spire being 41,981 feet, the calculated corrections for parallax at the points of observation with reference to Salisbury Spire are :—

Station *a* + 4′ 12″.
„ *b* − 25 20.

(1) *Relative Azimuths.*—Theodolite at station *a*—

Salisbury Spire	0°	0′	0″
N. side of opening in N.E. trilithon of the external ring	237	27	40
Tree in middle of clump on Sidbury Hill	237	40	20
Highest point of Friar's Heel	239	47	25
S. side of opening in N.E. trilithon...	240	14	40
Middle „ „ „ ...	238	51	10

(2) *Absolute Azimuths.*—All the azimuths were referred to that of Salisbury Spire, the azimuth of which was determined by observations of the Sun and Polaris.

(*a*) *Observation of Sun, June* 23, 1901, 3.30—3.40 P.M.

Mean of observed altitudes of Sun		41°	26′	35″
Refraction .... $-1'\ 4''$	}	0	0	58
Parallax .... $+\ \ \ 6$				
True altitude of Sun's centre ...		41	25	37

Latitude = 51° 10′ 42″. Sun's declination = 23° 26′ 43″.
Using the formula

$$\cos^2 \tfrac{1}{2}A = \frac{\sin \frac{1}{2}(\Delta + c - z) \sin \frac{1}{2}(\Delta + z - c)}{\sin c \,.\, \sin z}$$

where A = azimuth from south, Δ = polar distance,
c = co-latitude, and z = zenith distance,

we get

Azimuth of Sun .... S.	75°	30′	30″	W.
Mean circle reading on Sun	84	38	35	
Azimuth of Salisbury Spire .... S.	9	8	5	E.

(*b*) *Observations of Polaris.*—June 23, 1901. Time of greatest easterly elongation, calculated by formula $\cos h = \tan \phi \cot \delta$, is G.M.T. 1.34 A.M.

Azimuth at greatest easterly elongation, calculated by the formula

$$\sin A = \cos \delta \sec \phi,$$

is 181° 57′ 0″ from south.

Observed maximum reading of circle	256°	33′	0″	
True azimuth of star	181	57	0	
Meridian (S.) reading of circle	74	36	0	
Circle reading on Salisbury Spire	65	28	0	
Azimuth of Salisbury Spire ...S.	9	8	0	E.

The mean of the two determinations gives for the azimuth of Salisbury Spire S. 9° 8′ 2″ E. This result agrees well with the value of the azimuth communicated by the Ordnance Survey Office, namely, 9° 4′ 8″ from the centre of the circle, which being corrected by $+ 4' 12''$ for the position of station a, is increased to $9° 8' 20''$.

Hence, from the point of observation a, $9° 8' 20''$ has been adopted as the azimuth of Salisbury Spire.

We thus get the following absolute values of the principal azimuths from the point a:

Highest point of Friar's Heel......		239°	47′	25″	
		−9	8	20	
		230	39	5	
	or N.	50	39	5	E.
Middle of opening in N.E. trilithon		238	51	10	
		−9	8	20	
		229	42	50	
	or N.	49	42	50	E.

The difference of $8\frac{1}{2}'$ between this and the assumed axis $49° 34' 18''$ is so slight that considering the indirect method which has necessarilly been employed in determining the axis of the temple from the position of the leaning stone, and the want of verticality, parallelism and straightness of the inner surfaces of the opening in the N.E. trilithon, we are justified in adopting the azimuth of the avenue as that of the temple.

Next, with regard to the determination of the azimuth of the avenue as indicated by the line of pegs to which reference is made on p. 65. The small angle between the nearest pegs A and B (which are supposed to be parallel to the axis of the avenue), observed from station a, was measured, and the corresponding calculated correction was applied to the ascertained true bearing of the more distant peg B.

Thus

True bearing of peg B = ...	238°	35′	0″	
Calculated correction to peg A = ...	0	12	8	
True bearing of line AB	238	47	8	
Bearing of Salisbury Spire	189	8	20	
True bearing of a line parallel to the axis of near part of avenue ......N.	49	38	48	E.

The mean of the three independent determinations by another observer was 49° 39′ 6″.

The calculated bearing of the more distant part of the axis of the avenue determined in the same manner by observations from station *b* is 49° 32′ 54″. The mean of the two, namely, 49° 35′ 51″, justifies the adoption of the value 49° 34′ 18″ as given by the Ordnance Survey for the straight line from Stonehenge to Sidbury Hill.

(3) *Observation of Sunrise.*—On the morning of June 25, 1901, sunrise was observed from station *a*, and a setting made as nearly as possible on the middle of the visible segment as soon as could be done after the Sun appeared.

The telescope was then set on the highest point of the Friar's Heel, and the latter was found to be 8′ 40″ south of the Sun.

Sun's declination at time of observation ...	23°	25′	5″
Elevation of horizon at point of sunrise ...	0	35	48
Assuming 2′ vertical of Sun to have been visible at observation, we have apparent altitude of Sun's upper limb	0	37	48
Refraction .... −27′ 27″ ; Parallax .... + 0 9	−0	27	18
True altitude of upper limb	0	10	30
Sun's semi-diameter	0	15	46
True altitude of Sun's centre	−0	5	16
From this it results that the true azimuth of the Sun at the time of observation =	N. 50°	30′	54″ E.
And since azimuth of Friar's Heel ...... =	50	39	5
2′ of sunrise should be N. of Friar's Heel	0	8	11
Observed difference of azimuth .... =	0	8	40
Observed—calculated .... =	0	0	29

The observation thus agrees with calculation, if we suppose about 2′ of the Sun's limb to have been above the horizon when it was made, and therefore substantially confirms the azimuth above given of the Friar's Heel and generally the data adopted.

II. Hints on Making, and Method of Reducing, the Field Observations.

It will probably be found useful if I give here a few hints as to the precautions which must be taken in making the field observations and an example of their reduction to an astronomical basis.

For the *azimuths* of the sight-lines the investigator of these monuments cannot do better than use the 25-inch, or 6-inch, maps published by the Ordnance Survey. Their accuracy is of a very high order and is not likely to be exceeded, even if approached, by any casual observer having to make his own special arrangements for correct time before he can begin his surveying work.

In some cases, however, it may be found that the Survey has not included every outstanding stone which may be found by an investigator on making a careful search; many of the stones are covered by gorse, &c., and are not, therefore, easily found.

In such cases the azimuth of some object that is marked on the map should be taken as a reference line and the difference of azimuth between that and the unmarked objects determined. By this means the azimuths of all the sight-lines may be obtained.

When using the 25-inch maps for determining azimuths it must be borne in mind that the side-lines are not, necessarily, due north and south. The Director-General of the Ordnance Survey, Southampton, will probably on application state the correction to be applied to the azimuths on this account, and this should be applied, of course, to each of the values obtained.

If for any reason it is found necessary or desirable to make observations of the azimuths independently of the Ordnance Survey, full instructions as to the method of procedure may be found in an inexpensive instruction book[1] issued by the Board of Education. The instructions given on p. 49, § 3, are most

[1] *Demonstrations and Practical Work in Astronomical Physics at the Royal College of Science, South Kensington.* Wyman and Sons, 1*s*.

generally applicable, and the form on p. 76 will be found very handy for recording and reducing the observations.

In making observations of the angular elevation of the horizon a good theodolite is essential. Both verniers should be read, the mean taken, and then the telescope should be reversed in its Ys, reset, and both readings taken again. One setting and reading are of little use.

The Ordnance Survey maps may also be employed *in a preliminary reconnaissance* to obtain approximate values of the horizon elevations. This may be done by measuring the distances and contour-lines shown on the one-inch maps. This method, however, is only very roughly approximate owing to the fact that sharp but very local elevations close to the monuments may not appear on these maps and yet be of sufficient magnitude to cause large errors in the results.

Where trees, houses, &c., top the horizon, they should, of course, be neglected and the elevation of the ground level, at that spot, taken. Should the top of the azimuth mark (stone, &c.) show above the actual horizon, its elevation should be recorded and not that of the horizon.

Having measured the angular elevation of the horizon along the sight-line, it is necessary to convert this into actual zenith distance and to apply the refraction correction before the computations of declination can be made.

The process of doing this and of calculating the declination will be gathered from the examples given below :—

Data.

Monument :—E. circle Tregeseal, lat. 50° 8′ N. *i.e.* colat = 39° 52′.
Alignment. Centre of circle to Longstone.
Az. (from 25″ Ordnance Map). N. 66° 38′ E.
Elevation of horizon (measured) 2° 10.′

Reference to the May-Sun curve, given on p. 263, indicates that this is probably an alignment to the sunrise on May morning. Therefore, in determining the zenith distance, the correction for the sun's semi-diameter (16′) must be taken into account, allowing that 2′ of the sun's disc was above the horizon when the observation was made.

Zenith Distance :—

Zenith distance of true horizon . . . . . = 90°
„ „ local „ = 90° − 2° 10′ = 87° 50′

Bessel's tables show that refraction, at altitude 2° 10′, raises sun 17′. If 2′ of sun's limb is above horizon, sun's centre is 14′ below.

∴ True zenith distance of sun's centre = 87° 50′ + 17′ + 14′ = 88° 21′.

Declination :—

Having obtained the zenith distance, and the azimuth, the latitude being known, the N.P.D. (North Polar Distance) of the sun may be found by the following equations :—

(1) $$\tan\theta = \tan z.\cos A,$$

where θ is the subsidiary angle which must be determined for the purpose of computation, z is the true zenith distance, and A is the distance from the *North* point.

(2) $$\cos\Delta = \frac{\cos z.\cos(c-\theta)^1}{\cos\theta},$$

where Δ is the N.P.D. of the celestial object, and c is the colatitude (90° − lat.) of the place of observation.

In the example taken this gives us—

(1) $$\tan\theta = \tan 88^\circ\ 21'.\cos 66^\circ\ 38'$$
$$\theta = 85^\circ\ 50'\ 45''$$

(2) $$\cos\Delta = \frac{\cos 88^\circ\ 21'.\cos(39^\circ\ 52' - 85^\circ\ 50'\ 45'')}{\cos 85^\circ\ 50'\ 45''}$$
$$\Delta = 73^\circ\ 57'\ 50''$$
Declination, δ, $= (90^\circ - \Delta) = 16^\circ\ 2'\ 10''$ N.

Reference to the Nautical Almanac shows that this is the sun's declination on May 5 and August 9. We may therefore conclude that the Long-stone was erected to mark the May sunrise, as seen from the Tregeseal Circle.

Had we been dealing with a star, instead of the sun, the only modification necessary in the process of calculating the declination would have been to omit the semi-diameter correction of 14′.

Having obtained a declination, we must refer to the curves given on pp. 115–6 in order to see if there is any star which fits it, and to find the date.

[1] $\cos(c-\theta) = \cos -(c-\theta)$.

Take, for example, the case of the apex of Carn Kenidjack, as seen from the Tregeseal circle—

$$\text{Az.} = \text{N. } 12^\circ\ 8'\ \text{E.}; \ \text{hill} = 4^\circ\ 0.'\ \text{lat.} = 50^\circ\ 8'.$$

This gives us a declination of 42° 33′ N., and a reference to the stellar-declination curves (p. 115–6) shows that Arcturus had that declination in 2330 B.C. From the table given on p. 117, we see that at that epoch Arcturus acted as warning-star for the August sun.

In cases where the elevation of the horizon is 30′, or in preliminary examinations, where it may be assumed as 30′, the refraction exactly counterbalances the hill, and therefore the true zenith distance at the moment of star-rise is 90°. Hence the N.P.D. of the star may be found from the following simple equation—

$$\cos \Delta = \cos A \cos \lambda \qquad (3)$$

where Δ and A have the same significance as before and λ is the *latitude* of the place of observation.

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T.

THE END

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