

ART. V.—*Some recent Observations at the Keswick Stone Circle.* By W. D. ANDERSON.

Read at Carlisle, July 2nd, 1914.

THE various prehistoric structures which have been generically termed "Stone Circles" may be conveniently divided into three classes:—

- (1) Those which have been built for sepulture, such as the Circles at Eskdale and Muir Divock;
- (2) Those built for strategic purposes, such as the Circle at Carrock, Mosedale;
- (3) Those which seem to have been built primarily for astronomical and religious use.

The Circle on Castlerigg, near Keswick, seems to belong to this last class, and its old name, "The Druid Circle," may be a rational designation. Most authorities are agreed that these Circles date from pre-Celtic times, and many think that the Druids belonged properly to this period, but the Celtic-speaking peoples called their priests "Druids" and there is evidence to show that the Circle at Keswick was used for religious purposes in Celtic times.

This Circle should have a special interest for us now, since owing to the foresight and energy of Canon Rawnsley it has been saved from the toils of the speculative builder. The latter, it is true, could not have interfered with the Circle itself, which already, as an "Ancient Monument," had been placed under the care of the Board of Works, but he could have surrounded it with villas in such a way that some of its most interesting features would have been obscured.

The purchase of the whole field in which the Circle stands by the National Trust has removed all fear of such a disaster.

In vol. v. of these *Transactions* (1879-1880), Art. vii., will be found an excellent plan and minute description of the Circle by Mr. C. W. Dymond, together with memoranda on it made by various writers in the eighteenth and early nineteenth centuries.

In the *Proceedings* of the Durham Univ. Phil. Society, vol. iii. (1908-1909), Prof. J. Morrow gives a plan of the Circle based on an independent survey, and some astronomical notes connected with it.

I have recently myself made a fresh survey, the result of which is to be seen in the accompanying plan. The orientation of the stones was determined by observation of the trigonometrical stations on the surrounding hills, with reference to the Ordnance Survey Sheet, and by a special communication from the Department with reference to the bearing of Fiend's Fell. This seems to agree with the orientation shown in the plans of both Mr. Dymond and Prof. Morrow.

There are at present 38 stones in the outer circle and 10 in the quadrangular enclosure, making 48 in all.

Stukeley (1725), Gray (1769), Hutchinson (1775), Gough (1805), and an anonymous writer in 1809, all speak of the Circle containing 50 stones.* Of the two missing stones, one seems to have been between stones 36 and 37, where Dymond indicates the "bed of a removed stone." The other Hutchinson describes as a "single square stone laid at a distance of three paces from the Circle opposite the eastern inclosure."

There is, 200 feet to the S.W. of the centre of the Circle, an outlying stone which I am informed used to stand some inches above the surface of the ground. Professor Morrow observed it in 1907 and gives a rough indication of its site in his plan. Last year there was considerable difficulty in finding it, as its upper part had been broken off and it was completely covered by grass. It seems to

* Dymond, op. cit., p. 50 *et seq.*

be a stone of considerable importance, and had it not been observed and recorded by Morrow, would probably have been lost sight of forever.

Another stone, possibly also an outlier, lay in the E. fence of Castle Lonning, and had been used as a stile for entering the field. When a wooden stile was put up in this place last year, the stone was moved and on its under side, which had escaped the weather and wear of feet, a large number of transverse scratchings were revealed. This stone has been placed within the field in an erect posture so that its markings can be examined. It now stands about 2 feet nearer the Circle than it did. Its original distance from the Centre was 300 feet.

The Circle has been designed with a radius of 50 feet. There were apparently 40 stones in its circumference and 10 in the quadrangle.

Morrow's outlier is 200 feet from the centre, and the other stone 300 feet. These decimal quantities are worthy of note.

Many other Circles in the N. of England have been designed with this 50 feet radius. The Circle at Gunnerkeld, near Shap, consists of two concentric circles, the outer with a radius of 50 and the inner with one of 20 feet. It almost seems as if a foot of 12 inches had been the builders' standard of length, and should this prove to be so, perhaps it may throw some additional light upon the question of who these builders were.*

The arrangement of stones in the outer ring of the Keswick Circle is pear-shaped. This is due to stones 30 to 38 and 1 to 4 not following the curve of the almost perfect arc in which stones 5 to 29 lie.

* In Egypt in the 4th Dynasty a cubit of 20.63 inches was the standard measure. The Greek *foot* of 12.45 inches originated in Babylon by the application of a sexary system to the decimal division of the Egyptian cubit (*Encyclop. Brit.*, 9th Ed., Art. "Measures and Weights"). But the *foot* of 12 inches seems to have been known in Egypt, for such a cubic foot of water weighs exactly 1,000 Egyptian ounces.

Stones 38 and 1 are obviously the pillars of a northern entrance and it seems possible that they originally formed a gateway to a short avenue, such as exists in the Circles of Swinside, Long Meg, Stanton Drew and others, and that the stones 30 to 38 and 1 to 4 may have been moved out of a true circle by a race which succeeded the original builders.

We should now consider what should be taken as a central point of the building in its present form. Both Dymond and Morrow have selected a point in the meridian line that bisects the northern entrance. Dymond obtains his centre by bisecting this line, but Morrow selects a point a little to the south of this, a point that is in line with the apex of stone 1, and a marked feature in the northern horizon formed by the gap or nick between Blencathra and Lonscale Fell. This alignment he considers of importance in dating the building of the Circle.

The centre that I have fixed upon is about 18 inches to the S.E. of Morrow's centre. It is a point at which eight diameters connecting opposite stones intersect, and for reasons that will be stated I believe this point played an important part in the astronomical observations that were made by the users of the Circle.

Of these eight diameters, all of which are shown in the Plan,* four were apparently used as sight-lines for determining certain dates by the position on the horizon of the rising sun. These diameters are the ones connecting stones 22 and 5, 25 and 6, 31 and 13, 33 and 14.

The Celts in the Isle of Man and Cumberland belonged to the Goidelic (Gaelic) branch, whereas in the rest of England they were mostly of the Brythonic or British group. It may be better, therefore, to use Gaelic nomenclature in considering the Circle from a Celtic standpoint.

* In the Plan the unshaded stones connected by continuous lines are those which indicate sunrise. The shaded stones connected by interrupted lines were probably used for star observations. Lines connecting the black stones would not intersect at the centre.

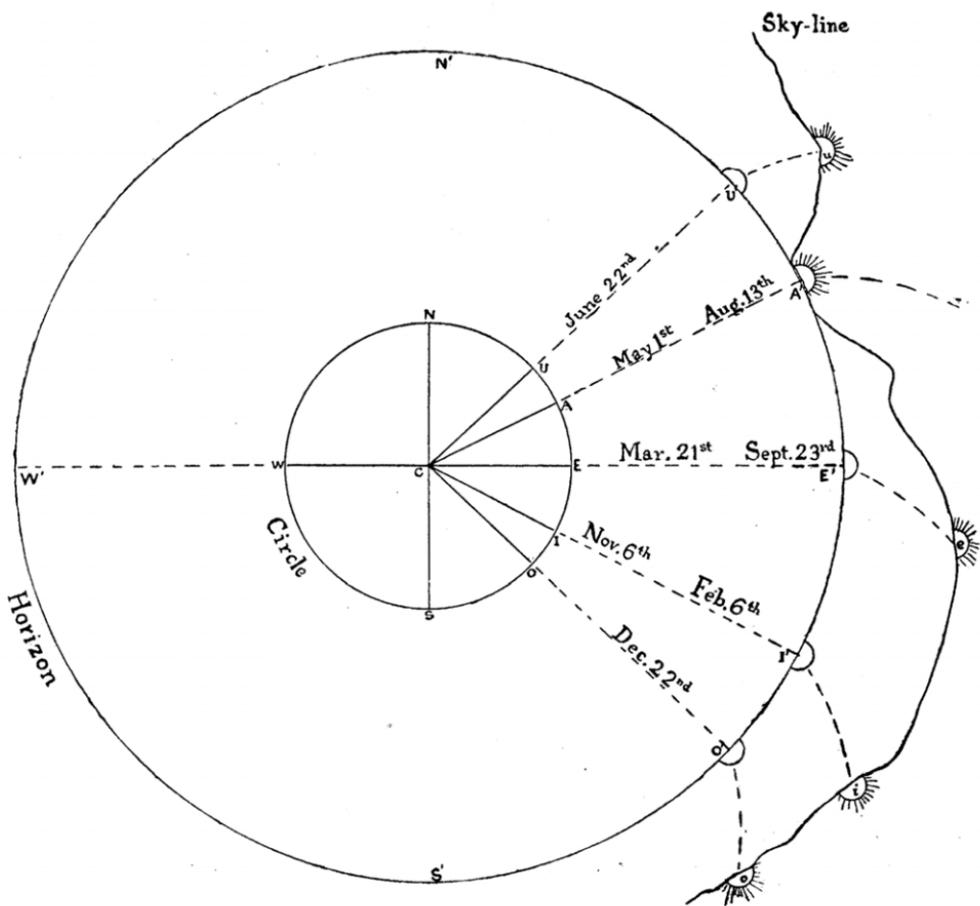


DIAGRAM ILLUSTRATING THE POSITION OF THE SUNRISE THROUGHOUT THE YEAR IN THE LATITUDE OF KESWICK. RADIANT SUNS SHOW THE POSITIONS OF SUNRISE AS MODIFIED BY THE HILLS ROUND THE KESWICK CIRCLE.

The Celtic year was divided into two seasons only, winter and summer. Winter lasted from the beginning of November till the beginning of May, and summer the other half of the year. These seasons were divided from each other by the Bealtuinn festival at the beginning of May, and the Samhuinn festival at the beginning of November. The latter marked the beginning of the Celtic year and was the more important festival. Lugnasd was in August, and Feill-Bride, or Bridget's feast, at the beginning of February.

Bealtuinn was in honour of the Earth-god, Beal. Lugnasd in honour of the Sun-god, Lugh. Possibly Samhuinn was dedicated to a god of fertility, "Samh."

At the risk of explaining what is already well-known, let me call attention to the accompanying diagram in which N., E., S., W. represent the cardinal points of a circle whose centre is C, situated on a large plain and surrounded by an even horizon, N' E' S' W'.

If the east and west diameter, E. W., be produced both ways to the horizon at E' and W', these points will be the positions of the sun's rising and setting, as seen from the centre of the circle at the Spring and Autumn equinox.

After the vernal equinox, March 21st, the sun rises more and more to the north till the Summer solstice is reached on June 22nd. A line C U' whose inclination to W. E. is dependent on the latitude of the place will, if produced in a north-easterly direction, cut the horizon at the point U' where the "Midsummer" sun rises.

After this the sun will rise each day more to the E., till on September 23rd it regains the equinoctial line W. E. Then it will rise more and more to the S. till the Winter solstice, December 22nd, is reached. At this date the sunrise will be indicated by the line C O' whose inclination to W. E. is equal to that of the line C U'.

From this point sunrise moves back again till it reaches the equinoctial line on March 21st.

All this is on the supposition that the horizon is even, but if the horizon, or more properly the *sky-line*, is hilly, the normal position of sunrise is altered. Imagine every point in the undulating line *u e i o* to be vertically above the horizon ; that line may be taken to represent such a hilly sky-line.

As the sun's path is oblique, (dotted lines, U *u*, E *e*, etc.), the hills will have the effect of bringing each sunrise more to the South. This is the case at the Keswick Circle.

Our year has been arranged with reference to the vernal equinox, but apparently this was not the case in the days when Stone Circles were used for the regulation of the kalendar. There is no equinoctial alignment at the Keswick Circle, nor as far as I can gather has one been found in connection with any of the ancient stone monuments of Britain. The reason for this may be that the Druids (let us boldly call them so) had no convenient method of determining this alignment, whereas the fixing of the solstitial sight-lines would present little difficulty. It seems highly probable that it was on these lines that the Celtic kalendar was based.

The Summer solstitial line at the Keswick Circle is well marked. It connects stones 22 and 5 : the latter is pointed and the former notched at the top, so that they could have been used like the fore and back sight of a rifle. Stones 33 and 14 indicate the Winter solstice. As 33 has fallen the sight line is not so well defined. The first alignment is slightly to the North and the second slightly to the south of the solstitial sunrises of to-day. This is an important point and will be referred to later.

As already stated, the two principal Gaelic feasts were Samhuinn and Bealtuinn. Next in importance were Lugnasd and Feill-Bride.

We could hardly learn either from history or tradition the *exact* days of the year on which these feasts were held, but the fact that in the Gaelic of to-day Bealtuinn is

May-day, Lugnasd Lammas, August 1st, Samhuinn All Saints' Day, November 1st, and Feill-Bride Candlemas, February 2nd, not only indicates the approximate dates, but suggests that the early missionaries adopted and christianised the old pagan feasts in the case of the three last, but were unable to slide Bealtuinn either back or forward to the moveable feasts of Easter or Whitsunday, so that till quite recently May-day retained many of its pagan rites, with its May-pole or Asherah, its " Beltane " fires and mock sacrifices.*

Probably the dates of these feasts varied within small limits in different localities and in different periods. In the Appendix to Lockyer's book on Stonehenge,† a summary is given of the dates on which the May and November sun was apparently observed, as shown by the alignments connected with a series of British monuments. The May sun alignments indicate dates ranging from April 25th to May 9th, and the November sun alignments from November 1st to November 12th. The mean of these dates being May 1st and November 6th. Sunrises on these mean dates are indicated by the alignments of the Keswick Circle.

A line from the outlier, through the centre of the Circle and continued to the horizon, ends in Fiend's Fell, in the Pennine Range,‡ where the sun is seen to rise on May 1st and where the Bealtuinn fires were possibly lit on the eve of the feast.

A line from stone 31 to stone 13 points to sunrise on the Helvellyn Range, on November 6th, when Samhuinn was probably celebrated, the same sight-line indicating sunrise on February 6th, Feill-Bride or Bridget's Feast.

Samhuinn was the beginning of the Celtic year, and

* Within living memory " victims," chosen by lot, had to jump through the Bealtuinn bonfires in the Highlands of Scotland.

† Sir Norman Lockyer, *Stonehenge and Other British Monuments*, p. 481.

‡ Now obscured by the plantation at Goosewell farm.

Bride or Bridget was the tutelary goddess of the Cumberland Celts, the Brigantes. This sight-line is formed, as might be expected, by two distinctive stones. The diameter connecting stones 25 and 6 indicates sunrise on August 14th and it is possible that this was the date on which Lugunasd was held. It must be remembered that unless the local atmospheric conditions in olden time were very different from what they are now, and this we cannot assume, sunrise on any given date could only occasionally be observed, so that the festal dates must have been normally reckoned by counting days from the previous feast, and the sun observations, when they could be made, only used to check these dates.

Possibly symmetry in spacing the greater festivals may have been sought. This may have suggested holding Lugunasd on August 14th instead of the 13th, when the sun rises in the May alignment. By this arrangement an equal number of days, 84, would lie between the February and May festivals and the August and November ones, thus :—

Nov. 6th to Dec. 22nd 46 days
" to Feb. 6th 46 "
Feb. 6th to May 1st 84 "
" to June 22nd 52 "
June 22nd to Aug. 14th 53 "
" to Nov. 6th 84 "
		<hr/>
		365 days
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Some such intercalation of a day would have been necessary to complete the year of 365 days, and the Keswick Circle seems to suggest that this was done at the feast of Lugunasd.

There must have been a further periodical intercalation as in our Leap-year, but there seems nothing to indicate when this was done.

It is probable that the Celtic kalendar, being under the control of frequent sun-observations, escaped the great errors that occurred in the kalendars of pagan Rome and Christian Europe.

In the following Tables the sight-lines of the Keswick Circle and the calculations based on them are summarised.

The observations were made with a small theodolite whose horizontal circle read to $7\frac{1}{2}'$, and the vertical arc to $2\frac{1}{2}'$.

The other data upon which the calculations were based are as follows :—

- (1) Latitude of Circle, $54^{\circ} 36' 3''$ (taken as $54^{\circ} 36'$).
- (2) Height of Circle above mean sea level, 720 feet.
- (3) Azimuth of Trigonometrical station on Fiend's Fell, from Circle N. $63^{\circ} 22' 54''$ E. (taken as $63^{\circ} 23'$).
- (4) Altitude of apparent sun, at sunrise, corrected thus :
 - i. Refraction deducted, ———mean value for alt.
 - ii. Semi-diameter deducted.
 - iii. $9''$ added for parallax between alts. 0° and 6° .
 - iv. $2'$ added to alt. of sky-line to represent appreciable amount of sun's upper limb.

Although some of these fundamental data have been computed to seconds of arc, the calculations founded on them have been worked out only to minutes and half-minutes. From the nature of the observations and alignments anything more precise would have been obviously useless.

For a general understanding of the Tables the following terms may be explained :—

Altitude of the sky-line means its angular distance above the level of the observer.

Azimuth of a point on the sky-line is its angular distance from a vertical plane running N. and S. of the observer. In other words, its true bearing.

Declination of the sun is its angular distance from the celestial equator, north or south. This declination is

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continually changing, and is to be found in the *Nautical Almanack* for every day of the year.*

The declination of any point of the skyline can be calculated when the latitude of the place and the altitude and azimuth of the point are known. Having determined the declination of such a point on the eastern horizon, by referring to the Almanack, we can find on what day or days in the year the sun has this declination, and we shall then know that it will rise at this point on these days.

TABLE I.

Sight-line.	Stones.	Azimuth.	Sky-line feature.	Altitude.
No. (1)	22-5	N 50° 48' E	Scales Fell ..	3° 15'
(2)	Outlier to centre of Circle	63° 23'	Fiend's Fell ..	0° 37'
(3)	25-6	64°	Pennines ..	0° 37'
(4)	31-13	126° 38'	Great Dodd ..	5° 28'
(5)	33-14	142° 40'	Helvellyn Range	4° 16'

TABLE II.

Sight-lines as in Table I.	Alt. of sun rising at this point.	Declin. of sun.	Date.	Celtic Feast.
No. (1) ..	2° 48'	23° 54' N	Summer solstice	
(2) ..	- 0° 3' 30"	15° N	May 1st-2nd	Bealtuinn
(3) ..	- 0° 3' 30"	14° 40' N	Aug. 14th	Lugunasd
(4) ..	5° 5'	15° 48' S	Nov. 6th & Feb. 6th	Samhuinn
(5) ..	3° 50'	23° 54' S	Winter solstice	Feill-Bride

It will be noticed in Table II. that the declination of a sun's rising in the solstitial alignments is 23° 54', whereas

* The sun's declination is given at *noon*, and this must be corrected to that at the hour of sunrise by the use of "Hourly variation" column.

at the present time the declination at these dates is only $23^{\circ} 27'$.

The sun's declination at the solstices is the measure of the angle which the plane of the ecliptic makes with that of the equator, and this angle has been diminishing for many thousand years.

According to Stockwell's Tables,* this angle was $23^{\circ} 54'$ in the year 1650 B.C.,† but owing to the very slow rate of change in the angle, about $\frac{1}{2}''$ a year, and the necessary want of precision in the sight-lines coupled with the irregularity of the horizon, the value of this observation is not as great as it might seem to be at first sight; still, I think that one can reasonably infer that these sight-lines were used between 1000 and 2000 B.C. This includes the date 1400 B.C. suggested by Morrow.‡

The *exact* agreement of the declinations calculated from the two solstitial alignments is interesting, but must be looked upon as largely fortuitous.

The declination 15° shown in the sight-line (2) represents the sun's declination between May 1st and May 2nd at the present time. If a correction be made for the greater obliquity of the ecliptic about 1600 B.C., the date becomes May 1st, and applying the same correction to the November and February sun, we get as dates November 5th-6th and February 6th-7th.

It should be noted that the sight-line to the May sunrise on Fiend's Fell passes through "Long Meg and Her Daughters," suggesting some inter-relation between that Circle and the Keswick one.

As has been pointed out by Morrow, the median line

* See Lockyer, *op. cit.*, p. 130.

† 1650 B.C. is the date Lockyer obtained at Stonehenge, and he allowed 200 years more or less as the limits of error. The limits are wider here.

‡ Prof. Morrow found an alignment from his centre through the apex of stone 1 to the nick between Blencathra and Lonscale Fell. The declination of this nick is $37^{\circ} 19'$, and this was in 1400 B.C. the declination of *Arcturus*, which he believes was then used as a "warning star," whose rising heralded the dawn at certain times of the year.

of the quadrangle points to the summit of Great Mell Fell. This may or may not have been an astronomical alignment. Possibly the quadrangle was a sanctuary dedicated to some deity whose image or symbol was on that hill. On the other hand, if this were a sun alignment, it would point to the rising of an April sun (about April 6th), a month in which, as far as we know, there was no important Celtic feast. But this month was among the Saxons sacred to Eastre (German, *Ostara**), the goddess of Dawn and although the Norsemen are not known to have had an analogous goddess, Austra, still we find in the Edda a male deity, Austri, a spirit of light, who may have been worshipped like Eastre in April.†

If one may argue from the way the Hebrews adopted the Gilgals (Stone Circles) which were built by their predecessors in Palestine, one may suppose that, if our Circle was built in pre-Celtic times, it was subsequently used by Celts and possibly Norsemen in turn, and even by those erring Christians whom Jocelin tells us were found by St. Kentigern in these mountainous regions.‡

I submit these notes in the hope that some more competent observer than myself may confirm or correct my work and conclusions.

* Hence German *Ostermonat*, April.

† Jacob Grimm's *Teutonic Mythology*, trans. by Stallybrass, vol. i., p. 291.

‡ Pinkerton, *Lives of the Scottish Saints*, vol. ii., cap. xxiii., p. 47 "plurimos a fide alienos, alios in fide erroneos, ad Christianam convertit religionem."