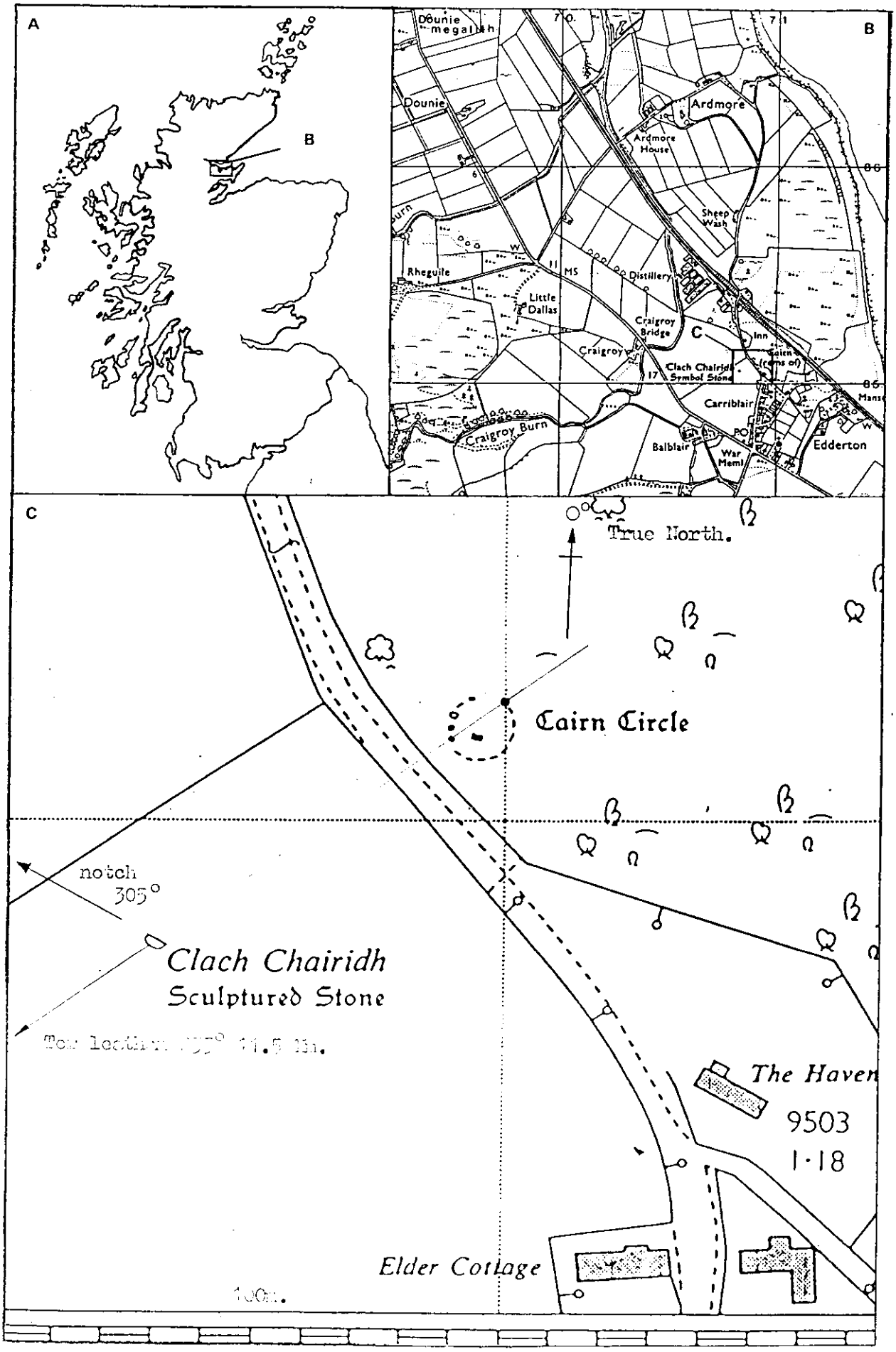
AN ASSESSMENT OF THE MEGALITHIC ALIGNMENTS AT EDDERTON ROSS-SHIRE

BY

DOUG SCOTT.

1984-85.


A
B
Dounie megalith
Dounie
Ardmore
Ardmore House
Sheep Wash
Rheguile
Distillery
Little Dallas
Craigroy Bridge
Craigroy
Inn
Clach Chairidh Symbol Stone
Carriblair
Craigroy Burn
Balblair
War Meml
Edderton
C
True North.
Cairn Circle
notch
305°
Clach Chairidh
Sculptured Stone
The Haven
9503
1·18
Elder Cottage

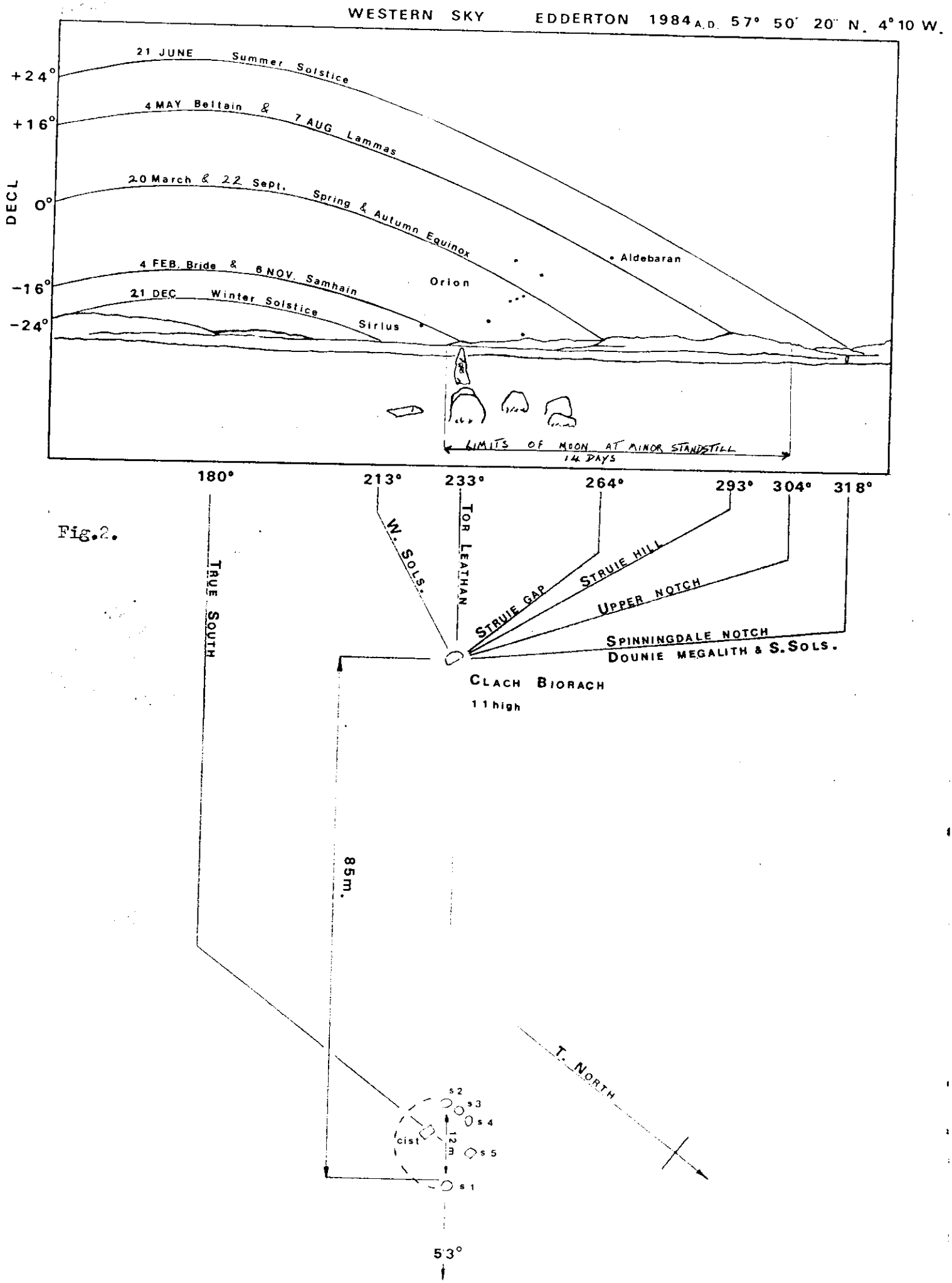

WESTERN SKY EDDERTON 1984 A.D. 57° 50' 20" N. 4° 10 W.
DECL
+24°
+16°
0°
-16°
-24°
21 JUNE Summer Solstice
4 MAY Beltain & 7 AUG Lammas
20 March & 22 Sept. Spring & Autumn Equinox
4 FEB. Bride & 6 NOV. Samhain
21 DEC Winter Solstice
Aldebaran
Orion
Sirius
LIMITS OF MOON AT MINOR STANDSTILL
14 DAYS
180°
213°
233°
264°
293°
304°
318°
TRUE SOUTH
W. SOLS.
TOR LEATHAN
STRUIE GAP
STRUIE HILL
UPPER NOTCH
SPINNINGDALE NOTCH
DOUNIE MEGALITH & S.SOLS.
CLACH BIORACH
11 high
85m.
T. NORTH
cist
s1
s2
s3
s4
s5
53°

Fig.2.

On the southern shore of the Dornoch Firth, near the village of Edderton, are the remains of a megalithic structure. It consists of a ruined circle of standing stones and one large megalith called the Clach Biorach. (pointed stone)

The Clach Biorach and circle are precisely located to make use of certain natural features on the surrounding horizon as foresights for the setting sun during the solar year and for the moon at the period called the minor standstill.* Each solar position, apart from those at the solstices, is used twice, one in the first half of the year and the other in the second half.

For the last year and a half, with the assistance of Mr. Terry Kelly, I have been gathering information as to the accuracy of the megalithic alignments at the above site. It was found that there were two main alignments.

These showed the position of the setting sun on three significant calendar dates, and two moonsets and a possible rising of the moon at the minor standstill. The first main alignment can be used in two directions (Fig.2.) Using two stones from the circle and the Clach Biorach to indicate the top of a hill called Tor Leathan 11.5 Kilometres away to the south west (233 degrees from True North), the hill top gives the position of the setting sun on two significant calendar dates, one in the first quarter of the year, the 4th of Feb., the other in the fourth quarter, the 6th of Nov. The same alignment in the opposite direction could show the rising moon at its most northerly position (maximum declination north)* at the minor standstill. Although there is no natural feature to serve as a foresight the moon would rise with an azimuth* of about 53 degrees from this point. The eastern slope of Tor Leathan also gives a position for the moonset at the maximum declination south at the minor standstill. (230 degrees, see Fig.2., limits of moon at minor standstill.) The alignment to the south west does not show the moonset position, the line being solar, but would require only a small movement in the circle of about two metres to the right to bring the Clach Biorach into an alignment with the moonset position on Tor Leathan at the minor standstill.

The north side of the Clach Biorach is flat and is decorated by two Pictish class 1. symbols. (see page) This side of the stone is angled away from the Tor Leathan alignment and indicates, to the north west, the lower of two notches on the northern slope of Struie hill. (305 degrees, see Fig.2. & Fig.4.) The megalith, which is tilted from the vertical 5 degrees in a north easterly direction, has been described in earlier accounts* to have been surrounded by a flat topped mound about 3 feet high and 12 paces in diameter. The purpose of the mound, of which no trace remains, is thought to have helped to stabilise the megalith's position. If the mound had any other function it is a present unknown. The erosion of the mound is most probably due to the effect of ploughing in the 128 years since the last discriptive account. Also the fact that sheep use the megalith as a rubbing stone has done much to affect its stability. If the megalith were placed back in a vertical position, it has been calculated that the north side would then indicate the upper of the two notches. This notch gives the position for the maximum declination north of the upper limb of the setting moon during the minor standstill. (304 degrees, Fig.4.)

The second alignment is from the Clach Biorach to the former position of another megalith 2,000 metres to the north west near the farm of Dounie.(318 degrees Fig.2 & Fig.4.) The Dounie megalith is now lying some 50 metres from its former position and was removed about 1970. There is now no way of knowing if it was aligned to any point of significance on the horizon. The former position, which can be seen clearly from Edderton, was plotted by use of Ordnance Survey maps and aerial photographs. The photographs, taken in 1959, show the megalith before it was removed. Using the photographs, and taking the angles from the field corners, it was later possible during a field survey to place the megalith to within a radius of 2 metres.

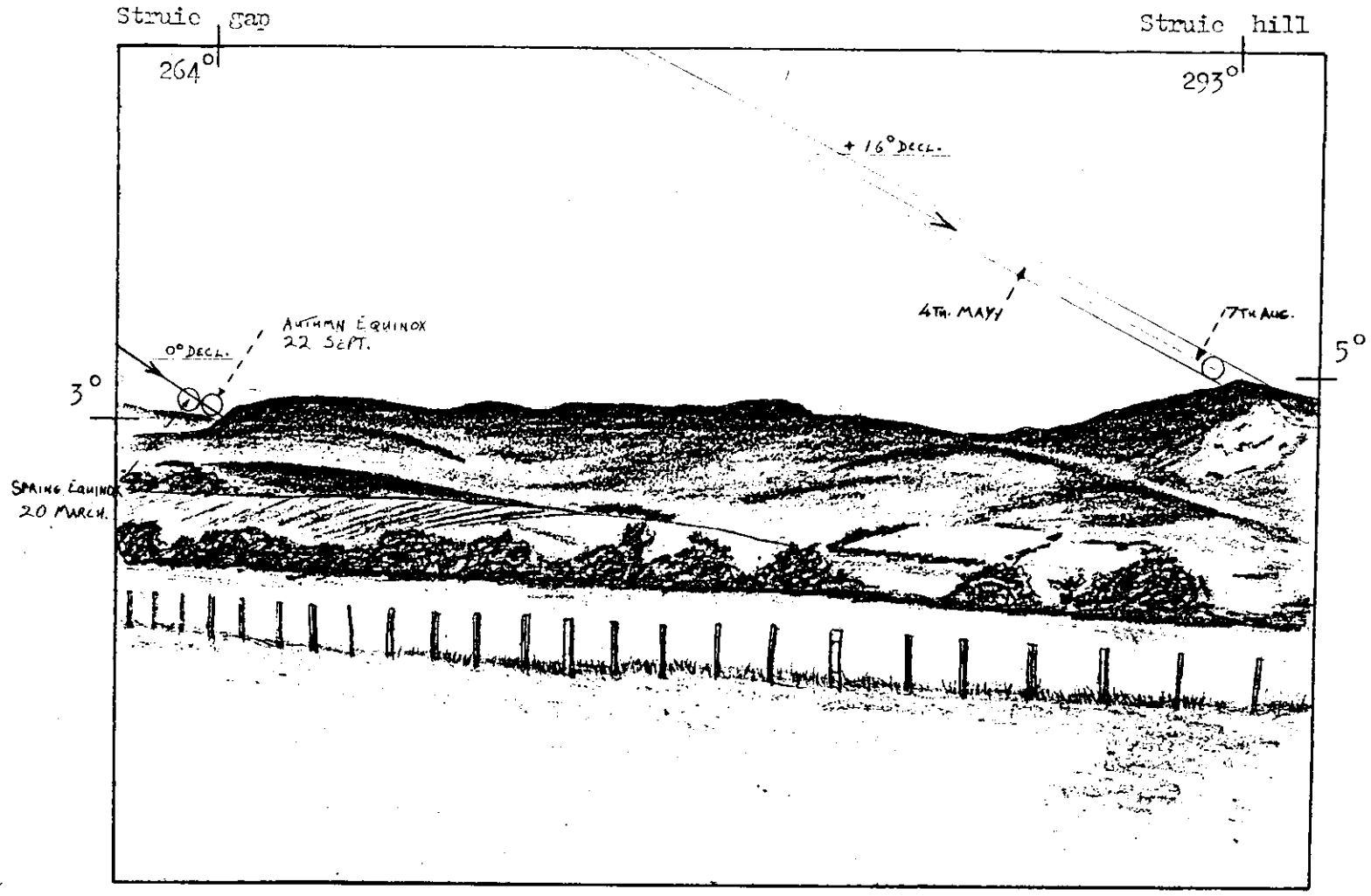


Fig. 3. Showing the position of the Struie gap (264°) and Struie hill (293°). These positions show the sunset at both equinoxes in the Struie gap, and on the 4th of May & 7th of Aug 1984.

This position was then marked and observed by theodolite from the position of the Clach Biorach and it was then noted that a notch above the village of Spinningdale was being indicated. The notch gives the third solar setting, which is the position for the max. decl. north of the sun at the summer solstice about the year 2,000 B.C. (midsummers day 21st. of June 1984). Fig. 4.

Between the extremes of the two alignments, an angle of 85 degrees, it was decided to look for other significant solar settings. It was found that a notch made by the pass of Struie gave a set for the sun at the spring and autumn equinoxe. (264 degrees)
These dates in 1984 are the 20th. of March and the 22nd. of Sept. This position has the function of dividing the two halves of the year into four quarters, each quarter being about 91 days long. The top of Struie hill (293 degrees) was also found to give two dates, the 4th. of May. and the 7 Aug. The last two positions have no stones to indicate them from the Clach Biorach but the fact that these positions mark the sunset on significant calendar dates would seem to be more than coincidental.

The only solar position that did not show any natural foresight or indicator was for the winter solstice. This position (213 degrees) lies on a featureless horizon 640 metres to the south west of the Clach Biorach. The area, when searched showed only a rough track by the edge of the hill where an indicator would have been. As the horizon could not be expected to provide features for all the suns settings, it would have been simple for the builders to have erected a cairn or megalith which could have suffered the same fate as other cairns and megaliths that have been removed by people at a later date who were ignorant of their function.

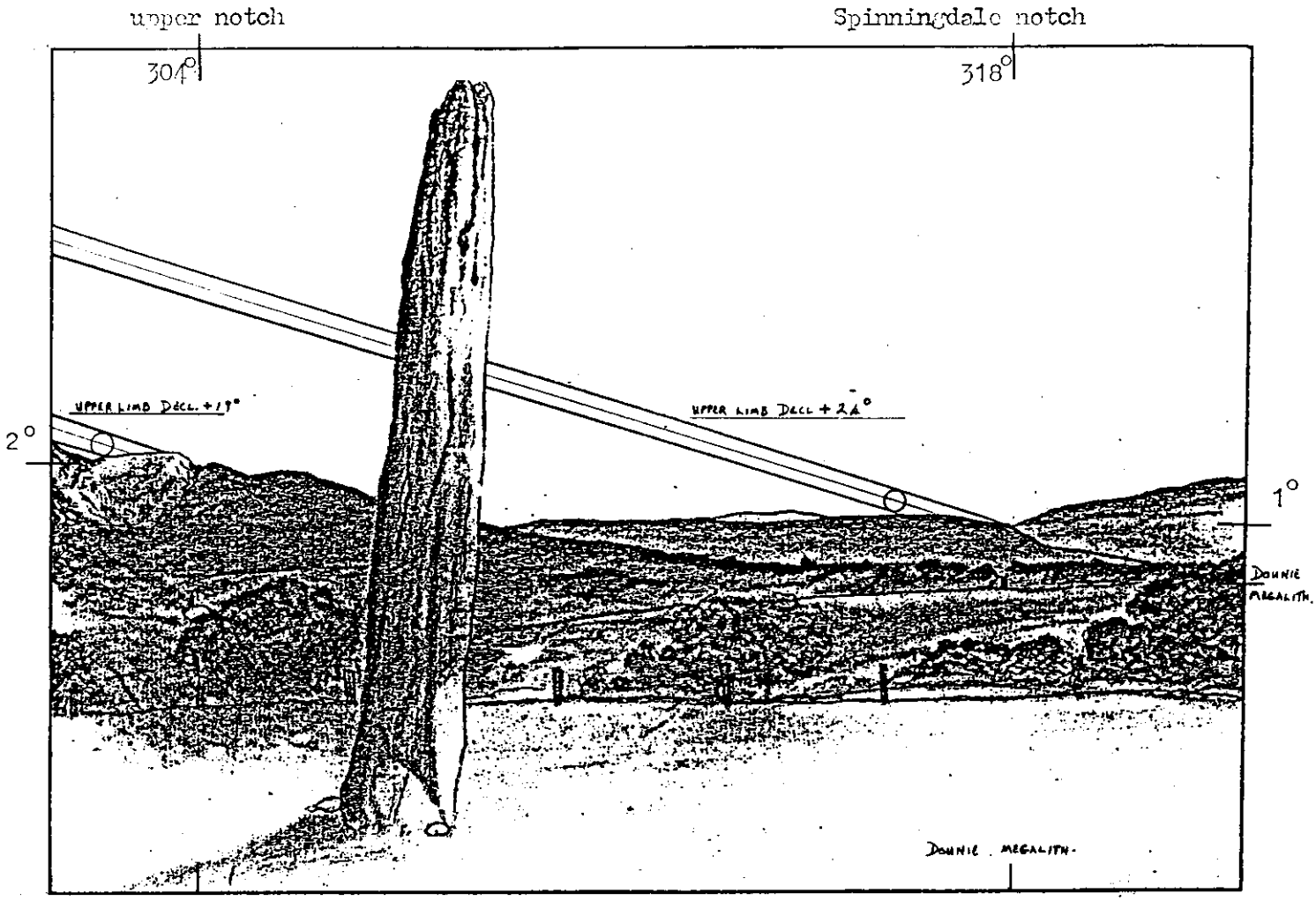


Fig. 4. Position from the Clach Biorach showing the set of the sun at the summer solstice in the Spinningdale notch about the year 2,000 B.C., also the set of the moon at the max.decl.north at the minor standstill in the upper notch.

Of the circle of five small stones, whose centre stands 79 metres from the Clach Biorach, four are still upright, one having fallen in towards the centre of the circle. Surrounding the stones is the remains of a wide ditch which is most evident to the north end of the circle. The remaining five stones form the shape of a semi-circle open to the south east. At the open end of the circle are two stones which we will call S.1. (Stone 1.) to the north east and S.2. to the south west. These two stones form an alignment with the Clach Biorach to indicate the hill Tor Leathan. It was this alignment that first drew attention that something significant was being indicated. Moving in a clockwise direction from S.2., call each stone in turn S.3., S.4. and S.5., the last having fallen. The inside diameter between S.1. and S.2. is 12 metres. From the centre of the circle a position on the horizon is 180 degrees from true north, this position is where Edderton hill's western slope meets with the hill Cnoc an t-Sabhail. In order to avoid confusion, as both hills on the Ordnance Survey map of the area are given the same name, Edderton hill is the closest to the site.

Near the centre, in the destroyed eastern half of the circle, are the remains of a burial cist which is orientated on the long side to the east and west. (Fig. 2) It was in the year 1866 that the Rev. J.M. Joass of Golspie excavated the site and later published his findings. When the cist was opened it was found to contain fragments of a highly decorated urn, pieces of burnt bone, worm teeth and bits of charcoal. At present there is no way to know the true shape or size of the circle as its other half was destroyed some time before the 1866 excavation. The Rev. Joass stated that there were originally ten stones in the circle but does not say if his statement is based on the information from the excavation. Of the missing stones of the circle, no trace on the surface remains.

The Ordnance Survey give, on their maps, the name Clach Chairidh (stone of the burial mound) to the megalith. The reason that the name Clach Biorach was chosen was that it is the oldest name recorded and describes the shape of the megalith. They also describe the circle as a cairn circle. Whether the structure was set up as a burial cairn with the stones acting as kerb stones holding the mound in position with a built in alignment indicating Tor Leathan, or that the circle was used as a burial site after its main function had fallen into disuse may be clarified by archaeologists in a new excavation using modern methods.

Whatever the total function of the circle and megalith there is enough evidence from other parts of the country, such as the solar and lunar sites at Kintraw, Ballochroy and Temple wood in south west Scotland, to show that these people knew what to look for in sighting their structures. Presuming that there was a special group of people with enough experience in other areas with already established alignments and knowing from these sites when the next summer solstice would occur, on finding a possible site, could have travelled to the site counting the number of days from the last summer solstice. If it is accepted that this could have been the situation how would they have set up this apparantly simple structure ? First, they could have selected a natural feature on the horizon such as the Spirmingdale notch, and with the knowledge of the coming solstice, position themselves so that the sun sets fully in the notch on midsummers day. They would then establish, perhaps with the aid of wooden stakes, an alignment that would indicate the notch. Next they could have looked for some natural feature to mark the position 183 days later for the winter solstice. They could have established a winter solstice sight line using Tor Leathan by moving to the north west towards Dounie, but by doing so they would have lost any other significant solar settings for the rest of the year. By using Tor Leathan for the next calendar date 45 days after the winter solstice, this would give the two extremes needed to mark the year with the required accuracy for a solar calendar. Where the two main alignments cross would give them a rough position to place the circle.

To understand the skill they had in choosing the position for the site of the structure, three other setting points lie along this horizon, two for the sun and one for the moon. By moving down the Tor Leathan alignment to where the Clach Biorach would be placed it would be possible to observe the sun setting at the two equinoxes in the Struie gap, one equinox in the spring half of the year, the other in the autumn half. Fig.3. The Struie gap is a mean position showing the set of the sun at both equinoxes within a 24 hour period. This is because the true equinox can occur at any time in 24 hours, not always at sunset. As it would be difficult to tell the exact time of the equinox, a day halfway between the summer solstice and the winter solstice would have been chosen, this would require a movement on the ground in the area of the Clach Biorach to get a sunset in the notch on the day chosen. The two equinoxes split the two halves of the year into four quarters, each quarter being about 91 days long.
(ie 4 X 91 = 364 days + 1 day = 365 days 1 year) The position of the megalith also shows the set of the sun at the top of Struie hill (293 degrees Fig 3) on the 4th of May and the 7th of Aug. 1984. This hilltop shares with Tor Leathan as being a cross quarter of the year position, splitting the second and third quarters of the year into 8ths, each 8th being about 45 days long. For a detailed view of the year from the Clach Biorach see Fig. 5.

The position of the structure would also give advance warning of as much as ten days before and after the summer solstice. As the setting sun approaches the solstice it appears to move slowly along the horizon each day until the max. north position is reached, the movement then reverses itself, the sun setting steadly to the south, until the winter solstice position is reached. The cycle would then repeat itself.

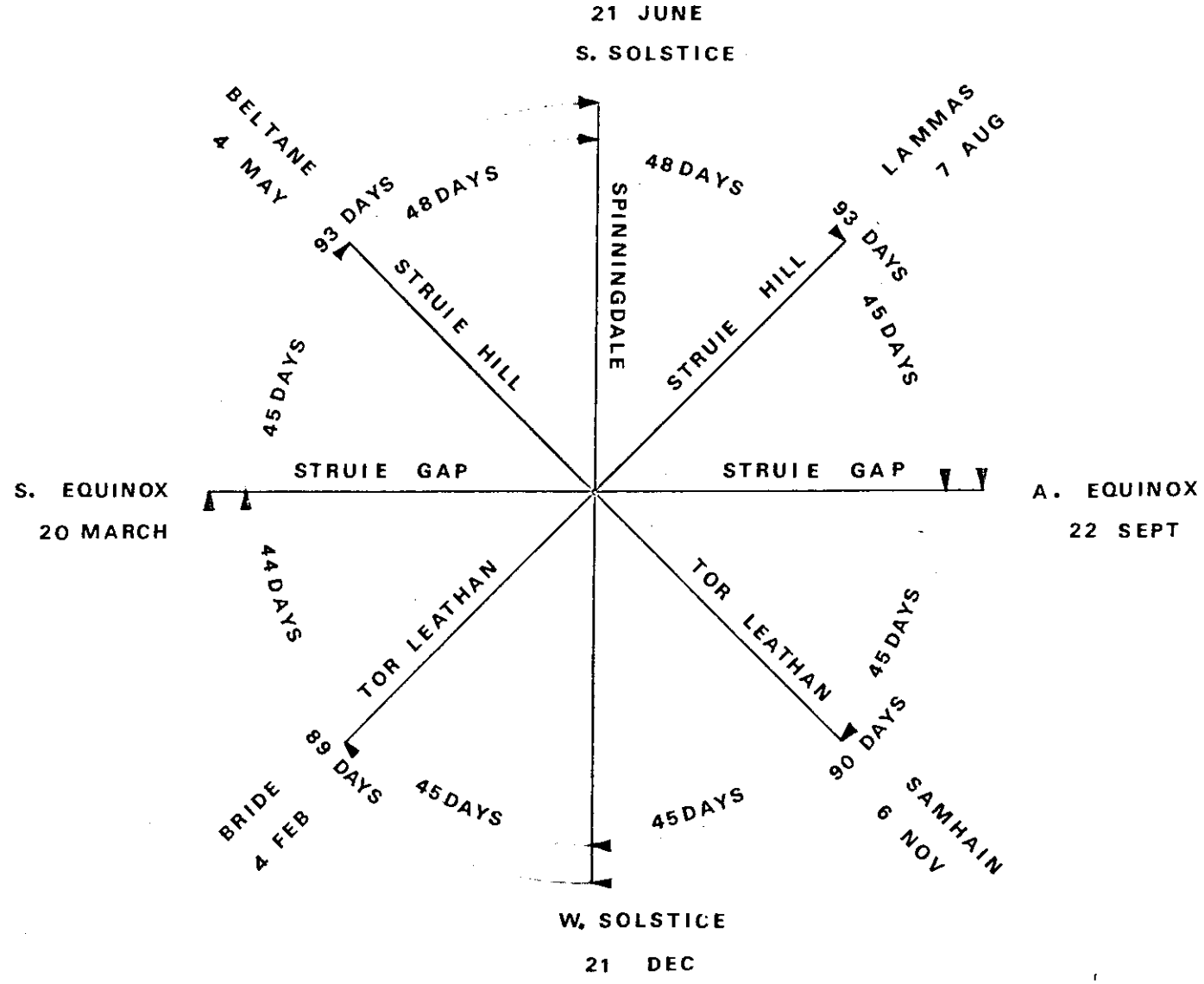


Fig.5. The apparent path of the sun & festivals at the divisions of the years 1984-85.

The slow movement of the sun would give them time to fix the day of the solstice with a high degree of accuracy. What is thought could have happened is, if two observers stood in the position of the circle ten days before the solstice was reached and watched the leading edge of the sun setting in the notch and on the next day one of the observers moved away from the circle's position down the Tor Leathan alignment until once again he or she saw the leading edge of the sun's disc setting in the notch, the observer would then mark that position. This would continue for the next nine days until the max. was reached. The following day at sunset, in order to keep the sun in view, the observer would have to move to the position marked the day before the max. was reached. By using this method they would know that the furthest position marked away from the circle would represent for the sun on the horizon the max. north position, (max. decl. north.) this being the summer solstice.
They would then have erected an indicator to show the position of the Spinningdale notch from the Clach Biorach, which they did at Dounie 2,200 metres away (518 degrees) The Dounie megalith is thought to have been placed at this distance because the level of the land immediately to the north west of the Clach Biorach drops more than ten metres and only rises to a similar level at Dounie. Between the two megaliths the low lying land is fed by two burns that empty into the Dornoch Firth. In megalithic times the low land may have been covered in scrub forest and been subjected to flooding in its lower regions by the sea at the high tides. This distance may also be significant as they could have placed the megalith further away. From the former position of the Dounie megalith it is possible to see the eastern edge and top of Tor Leathan forming the last hill on the horizon to the south. (see page 10 for details.)

The position for the moon would depend at what time in the 18.61 years lunar cycle when work first began at the site, 18.61 years being the time between the minor standstills. In this period they could have fixed with more accuracy the yearly solar positions. With the exception of the winter solstice, the horizon had conformed to their requirements in choosing the position for the structure. Because of the period of time between standstills it could have been difficult to predict the position of the moonset at the maximum declination at the minor standstill. As the standstill approached, the same observational technique as used for the sun at the summer solstice was applied to the moon, the circle giving several days warning before the maximum occurred. When this happened they would have marked its position on the horizon. As there is the problem of predicting this position and the chance that the horizon would produce a notch in the right position,(304 degrees) it is possible that the notch may be artificial. In order to assess if the megalithic people were capable of cutting such a notch, a piece of rock from the notch has been identified as old red sandstone. The notch measures roughly ten metres across at the top by about six metres deep. It is only after the final observations and adjustments were made that the Clach Biorach would have been erected and aligned to the notch.

At Edderton it has been shown there are ruins of a structure that can still show, with accuracy, the limits of the movement of the sun and moon. Each solar position matches to within a few days the times of the major festivals celebrated by the Celtic peoples of Europe. The remnants of these festivals can still be seen being celebrated in some parts of the country today. As shown in Fig.2., each position on either side of zero degrees declination (Struie gap) compare with each other to within a few minutes of arc. Because of this the dates mentioned may reflect the original times of the festivals. The reason that the dates differ from the ones used today is,with the problems that later cultures had in keeping an accurate calendar system, the dates drifted to conform to the social and religious needs of the time.

Although the people of the megalithic colture measured the movement of the sun and moon it is unlikely they would have done this with the same concepts and definitions our culture would use. In Celtic folklore there is the recurring theme of birth and death, light and darkness. These are equal to the summer and winter halves of the year. The light half begins in early May with the festival of Beltain (Sun's fire) which heralds the start of summer . The dark part begins at the start of November with the festival of Samhain. (Savain) This festival is known to be the most important event in the Celtic calendar, marking the beginning and end of their year. Nowadays it is celebrated on two dates, these being October 31 All Hallow's Eve (Halloween) and November 5 (Guy Fakes) the latter being a political event tagged on to a festival that had perhaps been celebrated for thousands of years. The November bonfires are possibly the only fire festival of antiquity that people still enjoy today. On either side of these two festivals are the other two important dates in the Celtic calendar, these are Lughnasadh (Lammas) in August and Imbolc at the beginning of February. Fig. 5.

With the passing of Samhain and the start of winter, this is the time of the caileach (kyle-yach, old woman), the hag, whose reign is the three dead months of winter, until the time of rebirth at the beginning of February. This festival is called Imbolc and is attributed to Bride the virgin who brings light and fertility back to the Earth after the white death of winter. Bride is the first stage in the Celtic goddess trinity of the female whose progress through the year in the form of the sun, matures with the summer at the Lammas harvests as the mother the giver of life and with the passing of the year becomes the hag of winter.
Of the other festivals of lesser importance to the Celts were those at the equinoxes and both the solstices. The next major festival brings the year full circle back to Beltain. These festivals mark the four most important events in the Celtic calendar and show a similar calendar system to that of the megalithic culture of the early bronze age. A carefull study of the myths and legends may reveal more information as to the beliefs of the megalithic people.

The above paragraph refers to the Celts whose arrival in Britain is placed about 700B.C., nearly one thousand years after the decline of the megalithic culture. The decline is thought to be the effect of a change in the climatic conditions that have periodically affected the worlds weather pattern since the last ice age. The weather in Britain changed from a warm dry Mediteranean type of climate to one of cooler wet weather. Socially this would have led to a disruption in the daily activities that would affect all aspects of life in the culture, especially with the raising of crops on the higher ground where they lived in the deteriorating weather conditions. Depending on how rapidly the climatic change occurred, they would in time learn to adapt to the new conditions and perhaps continued with the observations when the weather allowed. The observers may have had other functions within the culture such as doctors, historians and religious priests. If the observations became the basis for a religious belief it may be possible that the concepts could have survived beyond the introduction of Christianity.

The problem of getting clear horizons for observations is one that still affects us in 1985. So far with the exception of Struie hill all solar positions have been observed with varying degrees of clarity. As the moon is at presant between stand-stills, it is only when the moon is setting close to a significant position whose value is known, that observations of the moon could be carried out. This was to try and match the moons declination for that day with the known positions on the horizon. Due to the problem of clear visibility only one good observation was made in 1984. At 1am on the 3rd of June, with perfect visibility, the lower limb of the 3 day old moon with a declination minus parallax of + 24 degrees 49 minutes set perfectly in the Spinningdale notch. The moon was a beautiful thin crescent and on the shadowed side the blue-green colour of reflected earthlight. Four days before on the 30 of May the moon had passed through the asending lunar node and had partially eclipsed the sun, the sun and moon being within the ecliptic limit of the node. This observation indicated that the moons node was more than half way between the minor and major standstills. This had the most impresionable effect, to see from the Clach Biorach that the megalithic structure was giving forewarning of the major standstill 4 years in the future showed that it was still fulfilling part of its function after 4,000 years.

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2 Kirksheaf Cottage,
Tain,
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3 . 5 . 85.

1.25.00

Azi. Alt. Decl. & Distance From Clach Biorach, Edderton, Ross-shire.

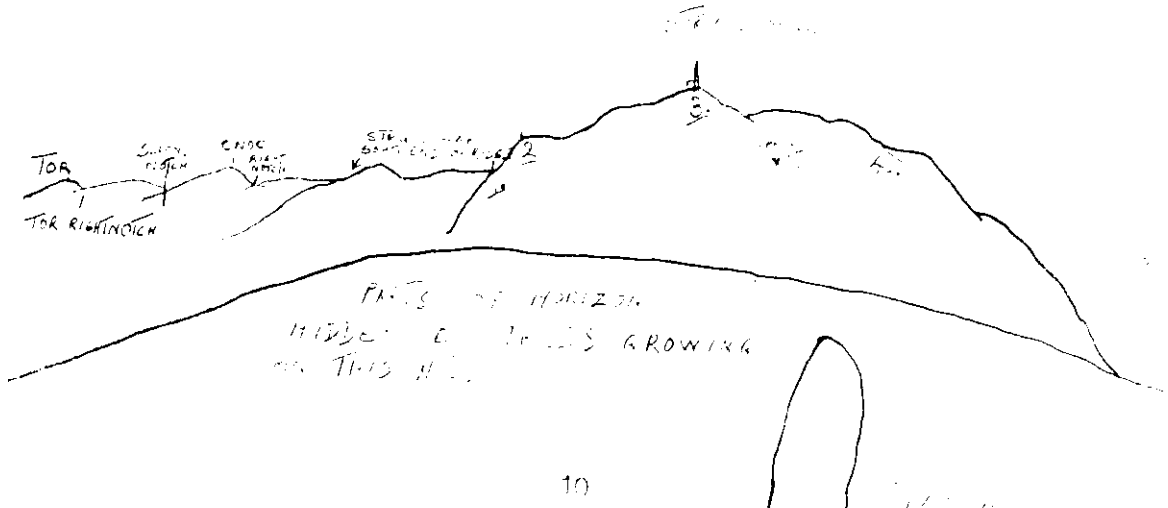
Lat. 57 50 1[illegible] N. Long. 4 10 31 W. Deci.Lat. 57.8371[illegible]21.

Position.	Azi.	Alt.	Decl.	Dist. in metres.
Midwinter set.	213.743	2.5	- 23.91	[illegible]640
Minor Standstill.	230.157	2.125	- 18.092	11,500
Tor Leathan.	233.006	3.0008	- 15.295	11,500
Cnoc M-bhaidh.	248.003	4.0001	- 8.039	7,500
Struie Gap.	264.0068	3.0028	- 0.[illegible]39	5,000
Orionis Delta.	265.2084	3.0033	- 0.003	
Aldebaran.	292.400	5.000	+ 16.015	
Struie hill.	293.0008	5.001	+ 16.320	3,404
Ravens craig.	303.0033	2.0058	+ 18.627	3,000
Upper notch.	304.0095	2.0043	+ 19.097	2,804 + E - I - Δ + S
Lower notch.	305.0075	2.0025	+ 19.559	2,804
Dounie megalith.	318	0		2,200
Spinningdale notch	318.0013	1.0015	+ 24.226	5,608

Azi. Alt. Decl. & Distance From Dounie megalith position.

Lat. 57 51 3 N. Long. 4 12 W. Dec. Lat. 57.85111.

Position.	Azi.	Alt.	Decl.	Dist. in metres.
Tor Leathan	223.	3.183	- 19.971	11,500
" " right notch	223.583	3.083	- 19.838	?
" second notch	226.7	3.333	- 18.366	?
Cnoc M-bhaidh.	232.083	4.25	- 15.277	7,000
" right notch.	233.416	3.833	- 15.068	?
Struie hill 1.	255.416	7.5	- 1.236	1,500
" " 2.	258.5	9.333	+ 1.865	1,500
" " 3.	261.666	10.000	+ 4.072	1,800
" " 4.	263.583	9.666	+ 4.741	?



To try and explain simply as possible the apparent movment of the sun and moon we will use the idea of what is called the celestial sphere as shown in Fig.6. The Earth is placed at the centre of the sphere and rotates from the west to the east once every 24 hours. The Earth's north and south poles (the axis) indicates the north and south celestial poles. The Earth's equator is then projected on to the sphere to give the celestial equator. Just as the Earth's equator divides the planet into two halves, the celestial equator divides the sky in two halves. The north half is given the symbol +, the southern - .

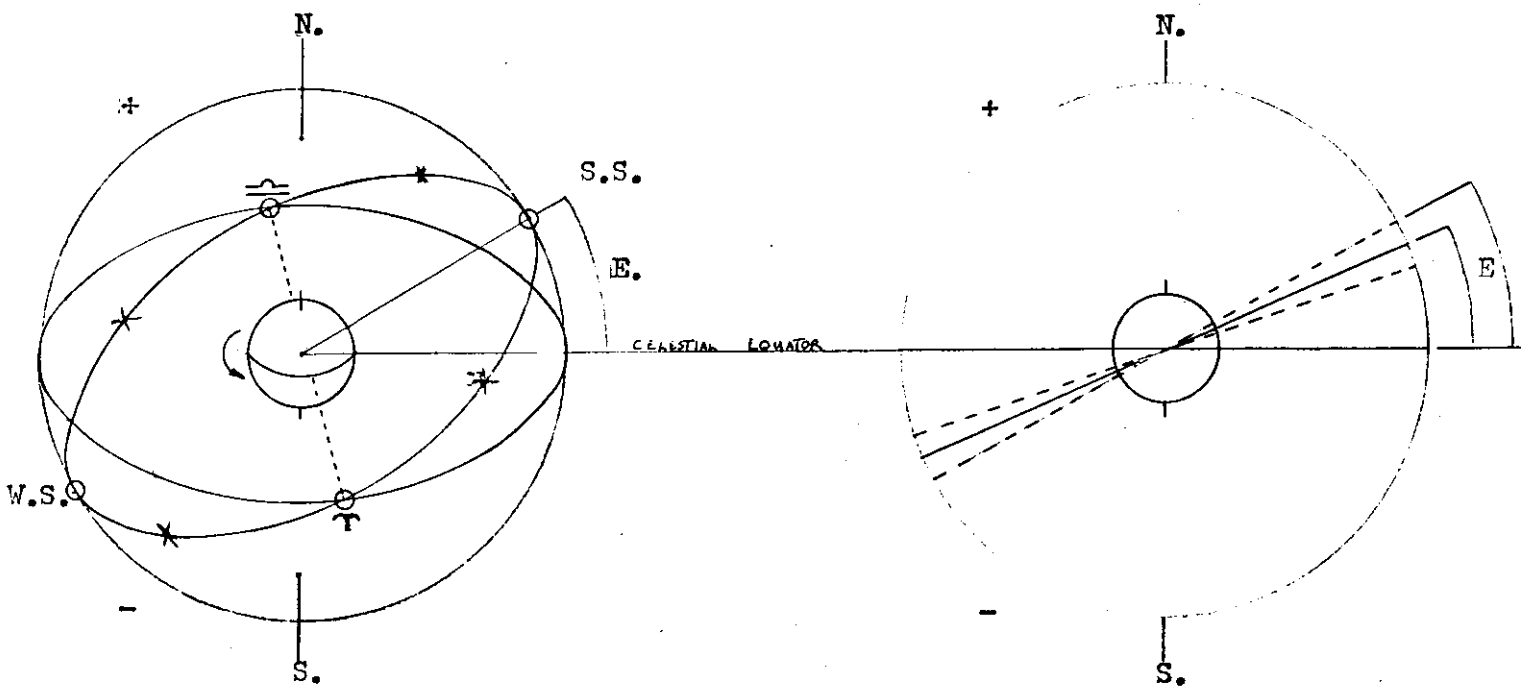


Fig.6. Showing the celestial sphere with the sun on the ecliptic at the four divisions of the year, the crosses show the cross quarter positions.

The ecliptic is the apparent path of the sun during the year, it passes through the twelve constellations of stars called the Zodiac, the ecliptic is inclined to the celestial equator at an angle of 23.5 degrees. 1985
This angle is given the letter E as a symbol.
About the 21 March each year the sun crosses the celestial equator, moving from the southern to the northern hemisphere. This is called the spring or Vernal equinox, the first point of Aries (♈). Six months later on 23 Sept, the sun again crosses the equator, moving from the northern to the southern hemisphere, this is called the Autumn equinox, the first point of Libra (♎).

On either side of these two dates about 21 June and 22 Dec. the sun reaches its most northern and southern positions, the summer and winter solstices (standstill) The decl. angle of the sun is then either + plus or - minus 23.5 degrees to the celestial equator.

The sun no longer sets in the Spinningdale notch from the Clach Diorruch. This is due to what is known as the procession of the equinoxes. Procession is caused by the effect of the gravetational pull of the sun and moon on the Earth's equatorial bulge, making the Earth's axis wobble like a gyroscope, the north and south poles describing a circle 47 degrees in diameter in the sky over a period of 25,800 years. This means that small changes in the Earth's axis affect the angle to the ecliptic, decreasing from about 24 degrees in megalithic times (2,000 B.C.) to 23.5 degrees in 1985. As the rate in the change of the Earth's axis is known it is possible to give a date for the erection of the megaliths to within a period of plus or minus 100 year, this date is about 2,000 years B.C.