

Orientation

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THE term "Orientation," as applied to a structure of any kind, means the direction in which its principal line is laid out on the ground. Originally, as the word implies, orientation signified "eastwardness," only, and had special reference to churches, because (in western Europe) practically all churches were built with the longer side laid out in an east-and-west direction. In some, the line is to True East, exactly; in others the axis lies at an angle of some degrees either to the northward or to the southward of True East. This divergence in either direction from the Orient is called "the angle of orientation." Nowadays, the term "Orientation" has lost its original "Eastward" distinctiveness, and has become a general expression merely indicating "direction," and may imply any point of the horizon, and not necessarily the eastward.

Originally the angle of orientation was measured from True East as a zero, but now it is reckoned from the Meridian, or North (true).¹

During many centuries maps and charts have been drawn with the North end uppermost, and with "East" relegated to a side position. Consequently we find it a little difficult to realise that, anciently, East was the principal direction. We may surmise that the change

¹ Technically speaking, an angle reckoned from the Meridian is named an AZIMUTH, and is stated in degrees, minutes, and seconds of arc from 0° to 360° round the circle in the direction taken by the hands of a clock. This, the modern method of reckoning, is considerably the clearer and simpler.

An angular measurement reckoned from True East, or West is named an AMPLITUDE, and is stated in degrees up to 90° to the northward or up to 90° to the southward of East or West. Thus, it requires to be set down as "E—N" or "E—S", as the case may be (and from West in like manner).

The term BEARING is often seen used in reference to a direction, but, strictly speaking, this is a nautical term, and refers properly to the Mariner's (magnetic) Compass. It is the angle from Magnetic North, or Magnetic South for 90° each way towards East or West (magnetic), and requires to be stated as "N—E," "N—W," "S—E," or "S—W" as the case may be. It should never be used in describing orientations, which infer a True, and not a Magnetic direction.

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came about gradually, perhaps partly for the sake of the navigator, when the use of the magnetic compass was discovered, whose needle made a principal point of "North," and partly the change may have seemed to be rational, when the fact of the rotation of the Earth on a North and South axis was established. But in early days, the point of reference seems to have been East, namely that important part of the horizon at which sunrise took place.

When we go back into human history, we may find a practical reason for the importance of sunrises, and a special regard for the East, or Orientation.

In neolithic times, mankind was gradually giving up his "Ancient Hunter" form of nomadic existence, and was beginning to look to agriculture to provide him with some food.

"Farming," if we may so term these beginnings, necessitated the living, year in, year out, on the same spot, if only in order that the sower might be also the reaper. When thus established, the obvious inter-connexion of the annual movements of the Sun with the times of seed-time and harvest must soon have been remarked. Owing to this observation, the desire must next have arisen to establish a Calendar which should indicate what the connexion was between the Sun and Agriculture. Under primitive conditions this could be effected only by noting the daily change or movement of the point of sunrise along the eastern horizon together with the corresponding annual progress of the crops. (The observation could, of course, have been made as easily by noting the movement of sunsets, in the West; but it is more likely that the daily *return* of the Sun, and not its daily departure, is what would appeal to primitive people).

We may now consider the manner in which this first "Orientation Calendar" may have been made. To do so, let us imagine ourselves as seeing things with the eyes of these first "astronomers." Let us suppose that we are placed in the midst of some great fertile plain, such as that of Mesopotamia, with an eastern horizon line of distant mountains, whose peaks are silhouetted against the morning sky, and that from some fixed point within this plain, we are regarding, morning by morning, the sunrise. On the first morning the Sun is seen to rise (let us say) immediately behind peak A of the horizon line. A few mornings later, it rises behind peak B, a little to the left, as we regard it, of peak A. A few days later still, it is seen to rise still more to the left, behind peak C, and so on, until, after many days, a peak on the horizon is reached, farthest to the left, where, for a few days, the sunrise peak

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is the same (or nearly) on each successive sunrise—it is the time of the Midsummer Solstice, of great heat, and of long days of sunshine. Then would be seen to begin a retrograde movement of the position of sunrise, namely to the right day by day, past peaks C, B, and A, in that order, and further on still to the right, until at the end of what we term “six months,” a sunrise point furthest to the right is reached, where again there is for a few days little or no change in direction of rising—it is the Winter Solstice, the time of coldness, and of short days. And so on, with regularity, a constant daily movement of sunrise point in both directions, with a slight pause at the end of each travel.

We may presume that the next step in “astronomy” would be to count the number of sunrises between the two ends of the sun’s path along the eastern horizon. Then, dividing that number by two, the sunrise peak of the middle day would be noted; the time when days and nights were of an equal length—the Equinoxes of Spring and Autumn, denoting (in some latitudes) the times for sowing and for reaping, respectively. Then, as agriculture became less simple, or because, with the spread of knowledge into other latitudes the operations of sowing and reaping required different, or additional dates in the growing Calendar, the halving of the numbers of sunrises on each side of the Equinoctial peak on the horizon would provide two more calendar dates for agricultural operations; one to the left, midway between Midsummer Solstice and Equinox, and one to the right, midway between Midwinter Solstice and Equinox. When this was effected, there would be a division of the whole year into eight sections of 45 or 46 days each, terminating in dates that we still recognize and name as the four “quarter days” and four “half-quarter days.” So far as the present discussion is concerned, the point about them is that they originated, in all probability, through observation of sunrise points along the eastern horizon, and were the original points of Orientation.

So much for the primitive calendar of the Sun. The Moon, in ancient times (at all events in the countries between the eastern Mediterranean and the Persian gulf) was certainly employed as a time-measurer, a fact perpetuated in England by our word “month.” The necessary observations of the Moon for this purpose could not have been by its risings (or settings) because, except on the day of full moon either the rising of the Moon, or its setting, or both, take place during daylight, and so are not visible. Orientation, consequently,

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cannot probably be connected with moonrises, except, perhaps, on certain full moon days.

When we consider the Stars, however, their connexion with Orientation, and with sunrises, is fairly clear. Stars rise at (practically) the same azimuth at each revolution of the Earth on its axis. (There is a slow change in azimuth, due to Precession ; but except to an observer provided with an instrument of precision, it would not be noticeable). For this reason, the rising point of any particular star would fix a point on the horizon for the primitive observer as definitely as the " mountain peak " that we have imagined. Thus the position of sunrise (or of sunset) on any date may be referred to the particular star that rises (or sets) at the same point as the Sun on that date. In this fact lies the origin of the Zodiac, which is the belt of stars within whose limits the Sun apparently rises and sets throughout a year. Stars rise about 4 minutes earlier at each revolution of the Earth, so that in one year the point of sunrise (or of sunset) passes through the whole 360° of the Zodiac. There is too much light on the horizon at the time of sunrise (or sunset) actually to see at that moment any particular star rising or setting, but the group of stars, or " constellation " which is seen immediately before dawn (or immediately after sunset) directly behind the Sun at its rising or setting is the " Sign of the Zodiac " of that time of year. Sunrise or sunset of any date may thus be referred to the rising or setting of one of the Zodiacal constellations, and, in particular, to any specially bright star within it (many of which have special names, anciently bestowed), as these would be the last stars visible in the sky before the sun rose, and the first to be visible in the evening twilight after it had set. In early astronomy, such stars were said to be rising or setting " heliacally." For these reasons, Orientation can be referred to a star-rise as much as to a sunrise.¹

By the time of the classical authors B.C., the agricultural divisions of the year were, in certain regions, well established (*e.g.* the connexion of the heliacal rising of the Pleiades with the date of the Spring sowing in northern Italy). As to the beginnings of this knowledge, we are not able to date, even approximately, when sunrise and star-rise observations began to be made ; but from reasoning connected with

¹ It may be remarked that there are, besides the Zodiacal stars, certain well-known bright stars that rise and set further north, along the horizon, than the Sun at the Summer Solstice, or that rise and set further south than the Sun at the Winter Solstice. These stars may possibly be connected with Orientation ; but there is as yet insufficient evidence of its occurrence.

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precession the Zodiac (the very nature of which implies the long-previous existence of such observations) must have been known in Mesopotamia as early as 5000 B.C. In western Europe man was then in the earliest stages of culture, and remained so until about 2000 B.C., but it is conceivable, and even probable, that during those millennia some knowledge of eastern agriculture slowly filtered westward into the savage world of Europe, and with it the knowledge of marking the seasons by sun and star-rises. We ought not therefore to feel surprise at finding traces of that knowledge in prehistoric remains in these Islands. This excursion into ancient astronomy has been necessary not only to realize the origins of Orientation, but also to point out the principal dates of the primitive calendar,—the “quarter-days” and “half-quarter days.” We have now to apply this knowledge to prehistoric archæology.

During recent years the writer has made surveys of a considerable number of megalithic structures in these Islands, and of a few in France. The plans of many (but not of all) of these ruins, when plotted on paper, show undoubted indications of “precise” orientation. By the term “precise” is meant that these structures are laid out not only in general fashion to the Eastward or Westward arcs of the horizon, but that either,

- (1) Their axial lines are precisely directed to sunrises (or sunsets) of the quarter days, or half-quarter days of the Calendar, or,
- (2) From some well-defined position within the structure, or, in the case of a Barrow, from some spot upon it, a line of direction is made observable, by some means, to a distant object, natural or otherwise, which line is also precisely that of sunrise or sunset of a “Calendar” day.

Many observers have noted this fact of orientation in the monuments of antiquity ; it is no new discovery ; but as its existence is still largely doubted, every new detail respecting it is of value. Most, if not all, of the existing megalithic monuments are graves, or monuments of the dead. The only ones whose funerary character is doubtful are single Standing Stones, Stone Rows of 2, 3, 5, 7, etc., standing stones, and perhaps, some Stone Circles.

For what reason any of these structures should have been given “precise” orientation we do not know. Such, however, is the case.

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That there is an ancient connexion between Death and Orientation is certain, for the custom still exists in the Christian world—a custom without any definite explanation—of laying the dead in the ground with their feet “towards the East”; they are, in fact, “orientated.” The church around which the dead are buried is usually orientated also; but this is because churches (in western Europe, at least) have their origin, as a structure, in tombs. The first Christian missionaries in Rome were men of Jewish origin, and, instead of following the surrounding (heathen) custom of cremation of the dead, they buried, or rather, entombed the bodies of the first martyrs of the New Faith. This may partly have been in accordance with their own native custom of disposing of the dead, but no doubt had also in view the preservation of the body for Resurrection Day, then believed to be imminent. The tombs of these first martyrs were placed in the Catacombs, and there became the first altars of Christianity. A recollection of this is still maintained, for, even in the present day (in the Roman church), the relic of some dead saint is deposited in every consecrated altar-stone; so that, to that extent, a church may still be regarded as a “tomb.” Whether in the Catacombs the altar-tombs were placed in any “eastward” position or no, the fact is that when upper-air churches came to be built the custom arose and spread of placing the altar at the East end. The Christian faith does not, of itself, demand that the worshipper should face himself in any particular direction, and, in establishing such a custom, we may probably see a picturesque symbol of the resurrection of the body as represented in the daily resurrection of the Sun out of the nether darkness; in the direction of which spectacle the devout should be turned. Among Eastern peoples the belief in Resurrection is far older than the beginnings of Christianity (*e.g.* Ancient Egypt), and we may probably see in Christian orientation, as established by these Jewish missionaries, the revival, or the adaptation to the new religion, of some ancient Palestinian belief and custom.

To return now to megalithic monuments. It was stated above that while some certainly have “precise” orientation, others have not. Of these latter, it should be said that there are two other means besides the “precise” solar method by which orientation can be effected, neither of which has yet been fairly investigated.

- (1) By stellar orientation, with special reference to the stars outside Zodiacal limits, such as Capella, Arcturus, Sirius, etc.
- (2) By orientation in some non-astronomical direction.

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By method (2) is meant the laying out of the dead so as to face in some *terrestrial* direction, such as towards some sacred and adjoining site, or towards another country, such as, in the case of a warrior, that of his foes ; or, as in the case of an immigrant race, the land from which they had come,—the direction of the road home.

Instances exist of both of these “orientations”; and the latter is well known in the South Pacific Islands, where the dead are commonly taken to the westward parts of the island they inhabited, this being the direction from which the race originally reached it. All invasions of the British Islands were necessarily from some eastward direction ; and this may possibly account for the directions in which Long Barrows (to quote but one example of prehistoric grave) are laid out ; that is to say, nearly all of them directed to some easterly point, but some markedly northward of East or southward of East—and not on “precise” orientations.

Seeing that it still is customary to orientate the dead,—though no longer “precisely” followed,—there is nothing inherently improbable in the supposition that it was also customary with our ancestors of the Neolithic and Bronze ages.

Again, the fact that early man buried or entombed his dead, and in most cases supplied grave-furniture shows that there then existed belief in a life beyond the grave.

And if survival after death was believed in, the idea of resurrection almost logically follows. Orientation to a rising sun, or star, clearly typifies this idea ; while orientation to a setting body (which also occurs in prehistoric monuments) perhaps typifies the belief of some different, and gloomier-minded race, in a final descent to some under-world to the westward.

Here, then, is a field of investigation of which the results would provide at least one more contribution towards the unravelling of neolithic problems, and even, perhaps towards the allied problem of the early migrations of races. Even if the surveyor of a prehistoric structure should be of opinion that there is “nothing in” Orientation, still the direction in which the structure is laid out on the ground should be accurately reproduced in the resulting plan, if only in the interests of scientific completeness. Until this is done, the matter will never be settled as to whether, in fact, there is, or is not Orientation in these structures of antiquity ; and if there is, wherein it is expressed. It

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seems impossible that the instances of "precise" orientation already published should be the result of mere chance ; and, as hinted at above, if the fact of Orientation can be raised above all doubt, there is a great deal more in the subject than is contained in the mere discovery of it.

There is another problem latent in Orientation, namely the possibility, on astronomical grounds, of arriving at the date of erection of a monument. An article dealing with the subject, with special application to Stonehenge, appears in the present number of ANTIQUITY ("Stonehenge considered as an Astronomical Instrument," by A. P. Trotter). The writer of these notes finds himself in full agreement with the conclusions come to by Mr Trotter ; yet a few remarks on the subject, both on general lines, and particularly as regards Stonehenge, may be of interest.

Even if we accept (as many do not) that there is in any prehistoric structure an intentional orientation to a rising or setting body, it may confidently be said that it is not possible to ascertain the date of erection of any such monument through a *solar* orientation.

The chief general reason for this is that we do not know,—and probably never shall know—what *particular moment* of the phenomenon of sunrise was chosen by the builders for the laying out of the desired line on the ground that was to be the orientation of the building. Mr Trotter has referred to this in his paper. The importance of possessing this knowledge lies in the following facts:—Owing to a certain movement of the axis of the Earth, the effects of which are known as "Precession," the azimuth of sunrise is steadily and perpetually changing, and it is on the knowledge of the amount of this change that the theory of the dating of a monument is based. The change in azimuth is exceedingly small, and at the latitude of Stonehenge is rather less than half of one diameter of the sun, measured along the horizon, in 1,000 years.

Now, at the latitude of Stonehenge (for example) at the time of the Summer Solstice, between the moment when the "first flash" of the sun's upper rim is sighted, and the moment when the whole sun is seen standing (as it were) on the horizon, the sun changes its azimuth by about $1\frac{3}{4}$ diameters along the horizon. So that the date arrived at by accepting "first flash" as the proper moment for observation, differs by nearly 4000 years from that arrived at by considering "whole orb visible" as the moment. "First flash" is just as likely a moment as "whole orb." We do not *know* which to employ, and this it is which

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makes dating by azimuth of sunrise, whether at Stonehenge or anywhere else, impossible.

With regard to Stonehenge in particular, and the so-called " Axis " upon which the determination of date has been based, there are certain considerations that may be offered. The first of these is as follows :— The partial excavation made at the site during recent years has made it clear that there are at least three different structures included in " Stonehenge," built at widely differing dates. There is

- (a) The earth vallum and ditch, to the date of which possibly belong the un-trimmed sarsen blocks still remaining, namely the Heel Stone, the Slaughter Stone, and the two stones numbered 91 and 93, erected just inside the vallum, on opposite sides of its circumference.
- (b) The blue-stone Stone Circle and " Cove," when in their original positions, with the stones un-trimmed, as imported.
- (c) The blue-stone Stone Circle and " Cove," in their present position (partly trimmed). To this period possibly belongs the ring-fence of great sarsens that surrounds the blue-stone Stone Circle and Cove, and the trilithic sarsen Cove itself, trimmed, morticed, and tenoned.

The first named of these structures, the Earthwork ring, belongs, almost certainly, to a very early date in the neolithic period, while the great trimmed sarsens, with almost equal certainty, belong to quite a late date, possibly just before the opening of the Bronze Age. Two or three thousand years may separate these two parts of Stonehenge. To which of them does the date arrived at from the azimuth of the " Axis " belong ?

Reference to the Stonehenge " Axis " brings us to another consideration with regard to the calculation of date. Axis is defined as the line which divides a regular figure symmetrically, and thus, in the case of a Circle, it must pass through the centre. If the plan of Stonehenge published by the Ordnance survey in 1867 be examined critically, and also the plan published in the *Antiquaries Journal* of January 1926, accompanying Col. Hawley's Report on Stonehenge, it will be seen that the position of the centre of the circle of the great trimmed sarsens differs from that of the centre of the blue-stone Stone Circle by about 2 ft.

The scale of either plan is too small to admit of any high degree of accuracy in stating the amount of the discrepancy ; it is sufficient

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to show, however, that the " Axis " of the sarsen ring is not the same as the axis of the blue-stone ring, so that on this point also, the mathematical calculation of " dating " stands condemned.

The third observation to be offered is of an archæological nature. The writer has made, at different times, accurate large-scale plans of 27 Stone Circles in the British Isles. In not one case are the stones composing the ring placed in a true circle ; that is to say, it is not possible to draw a line joining all the stones which is mathematically circular. The best that can be done is to draw two concentric circles, forming a band, wide or narrow, within which the stones forming the ring may fall. This is the case with the blue-stone ring at Stonehenge. The eight stones remaining *in situ* do not stand on the arc of a circle, but lie between the limits of two concentric circles, 4 ft. apart. It is the common centre of these circles that is referred to above. Strictly speaking, the figure formed by the stones has no single central point, and consequently, no " axis."

A further point is this. Of the 27 Stone Circles above mentioned, seven still retain the means by which Orientation was introduced into the structure. The remaining 20 are either too greatly ruined to exhibit their orientation, or else they never possessed this feature. In each of the seven cases the alignment for orientation is made definite by means of getting certain stones of the " circle " in a line. There is no imaginary *unmarked* line such as the " axis " postulated for Stonehenge. Always there is an actual, megalithic " fore-sight " and " back-sight," and sometimes a " middle-sight " as well. The method is as simple as it is obvious. The alignment is made across the middle of the ring of stones, from one side of it to the other, along what, if they truly were *circles*, would be called a " diameter," and the stones to be employed for the purpose of the alignment are indicated, usually, by being considerably larger than the other stones of the ring, and (in one case) the " fore-sight," or stone nearest the sun in taking the observation, was engraved all over with " cup-markings." In two cases, an additional standing stone was placed at a short distance outside the actual Stone Circle, to form a third stone on the alignment, so that there could be no doubt as to the intention of the orientation.

Why, then, at Stonehenge should we expect to find a sunrise alignment *not* marked out by actual sighting stones? It may be remarked that there is, indeed, a possibility that a summer solstitial alignment was actually marked out at Stonehenge. If the Slaughter

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Stone ever stood upright, the line it makes with the Heel Stone is that of solstitial sunrise ; and if this supposition as to the Slaughter Stone is correct, excavation should reveal a stone-hole in the chalk on the side of the vallum on the opposite side of its circumference in the vicinity of stone-hole " X 28 ", where an un-trimmed sarsen once stood that would complete the alignment, passing over the middle of the blue-stone Stone Circle.

But even so, if ever the excavation of the site is completed, and this stone-site recovered, it would still be impossible, for the reason connected with " first flash " and " whole orb " discussed at the beginning of these notes, to calculate from the azimuth of this line a date for the blue-stone Stone Circle, or for any part of Stonehenge. If a definitely certain *stellar* orientation could be found, a date might be calculated from it, with a margin of accuracy of, say, 50 to 100 years. But this opens up astronomical questions that cannot here be discussed.

Complete excavation would inform us also, as to whether Stonehenge is, as many have supposed it to be, the sepulchre of some important person, either as an original burial at the time of the making of the earth vallum, or a later " intrusive " burial when the imported blue-stone Circle was set up. If so, the undoubted aspect of the Cove to the summer solstitial sunrise would make one more connexion between Orientation and the Dead. The subsequent great edifice of trimmed sarsen surrounding the site would then become more understandable. In similar fashion, after a similar lapse of about 1500 years, arose majestic St. Peter's at Rome over the once humbly interred bodies of St. Peter and St. Paul.

Perhaps the prehistoric Sir Christopher Wren who designed and set up the huge pillars with their lintels himself, also, lies within, proclaiming—in the literal sense—to a wondering posterity, " Circumspice."