

# **Orientation of prehistoric monuments in Britain: a reassessment**

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Images on the cover:

Front: Stone row at Down Tor, Dartmoor SX 5869; see e-FIG SR-13;

Back: Solar transit in later spring: composite figure; see e-FIGS AS-04b and c

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# Abstract

This analysis considers **cues** for axial alignment, and proposes a **unified basis** for interpretation amongst **major groups of monument** of Neolithic to earlier Bronze Age date from the British Isles:

chambered tombs, timber longhouses, augmented long barrows, cursus monuments, stone rows, stone circles, standing stones, henges, pit alignments, rock art sites, linear round barrow cemeteries, and a suggested class of hypermonuments.

**Additional area-studies** are presented for:

Stenness (Orkney), Sligo (Ireland), Stanton Drew megalithic complex (Somerset, SW'n England), Wye-Usk area (W'n England, E'n Wales), and Brittany.

Evidence for **solar symbolism** is discussed for the period in question, and existence of a widespread and active agrarian-solar cult is proposed.

**Climatic deterioration** over the Atlantic margins and its pressure on the agrarian economy is suggested as the cause for widespread proliferation and elaboration of strongly axial sites with potential solar links, such as stone rows, as also seen for certain solar-related motifs of rock-art.

The **seasonal-solar** model proposed here for axial alignment recognises the prime importance of the sun amongst agrarian communities, and introduces the idea that the axis of a monument was primarily set to intersect, and interact with, those specific sectors of the passing solar transit deemed to have particular economic or funerary significance, with optimisation of contact evident.

Two main **groups of axis** are identified: the broadly W'n, typically with funerary associations, and the broadly S'n, suggested here to be more closely identified with economic concerns.

This **new model** brings the monumental axis into a *dynamic and repetitive* physical relationship with the solar transit, allowing ready opportunity for on-going expression of those social, economic, and funerary rituals annually crucial for agrarian communities.

Linkage of funerary monuments into existing monumental axes is considered to have acted to unite ancestors into rituals promoting economic well being of the community, and consequently certain sites contain integrated W'ly and S'ly axes.

This change of emphasis marks a contrast with those interpretations that are restricted to more *static, intermittent* axial coincidence with risings and settings occurring at the horizon, although additional use of these liminal events could certainly supplement the model presented here.

Problems encountered in accounting for the type of equinoctial alignment prevalent amongst chambered tombs is explained by operation of compromise between competing factors, including constraints necessarily imposed by timing of the seasonal work-cycle.



## Section 01:

# Introduction

### 01a Preliminary notes for readers:

#### text

**References in the text** to other parts of the text are given as the relevant heading in the Table of Contents, and from there reference can be made to the actual page:

example: see Table of Contents: 02a/3b  
= symmetry within an axis ..corresponding page number given;

**Tables:** where these are very long and detailed they have been placed completely on digital media, with a reference and an outline of contents remaining within the text; certain other tables retained within the text have also been placed on disc as a copy more accessible for further use.

#### figures and photographs

All figures and photographs are on digital media:

**e-FIGURES** all maps, satellite imagery, diagrams, and graphs specially prepared for this volume are in separate folders, labelled for each of the major topics, with captions for each figure given in the list of figures at the end of the text for each section;

**photographs** most are included in a separate folder, similarly divided by topic, and provided with captions.



## 01b Table of contents

Some titles, as they appear in the text, have been abbreviated for easier inclusion in this TABLE; References in the text to other particular sections of the text are made via the TABLE OF CONTENTS below, and from here to the relevant page number listed; conventions for the reference are as follows:

example: 02c/4ai

explanation: 02 cues for alignment      main section  
              c astronomical issues      sub-sections  
              4 constellations  
              a Orion group  
              i brightness

main  
sections

page

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## 01c Preface

### Initial statement

A general review of the evidence and current state of analysis would strongly suggest the real need to **reappraise**, attempt to **rationalise**, and perhaps **integrate** the evidence for structural alignment clearly visible amongst certain types of prehistoric monument in Britain and Ireland. Such an **inclusive** approach would undertake to establish the presence of any **common theme**, rather than attempting to construct a detailed and more unified theory.

### Basic problems

#### **-the current approach to analysis is over astronomical, and a product of modern scientific thinking**

Interpretation, usually presented within the field of archaeo-astronomy, is currently highly fragmented, and in many important aspects unconvincing. In further discussing the range of potential targets for alignment, the term *celestial* would be preferable to *astronomical*, avoiding any connotations of modern science suggested by the latter.

In the area of survey under consideration here, modern astronomical mind-set and technical standards are frequently applied to interpretation of the establishment and use of ancient axially structured monuments, often involving unwarranted assumptions. There are very many such cases, few of which survive closer scrutiny, fuller analysis of which would require a separate volume. However, the following selection will serve to provide particular examples over the period in question, with more detailed discussion of others undertaken in later sections of the text:

*..arbitrary linking between sites:* for instance, establishment of axial lines between local long barrows of unknown sequence, points on the Dorset Cursus, and solar-lunar setting-rising positions (Penny and Wood 1973; e-FIG CU-03; see Table of Contents: 03c/8a); such attempted linking has also been attempted for Irish passage tombs, equally flawed (Prendergast 2006; e-FIG AS\_sl-01; see Table of Contents 04b/3); the suggested relationship between the Heel Stone at Stonehenge, and undated near-terminal pit-like anomalies in the nearby Great Cursus is similar, but on a smaller scale (Gaffney 2012, fig. 5/ p. 153);

*..much of the work of Thom:* from the 1960's to 1990's, on a range of megalithic monuments, is also of this type, with added development of geometries, calendric systems, and units of ancient measurement (see Table of Contents section 09: Bibliography: Thom); in one of many such examples, lunar limiting positions are imposed on a set of monuments centred at Le Grand Menhir, near Carnac, Brittany (see Table of Contents 04d/4); moving from monuments to objects, this approach culminated in a highly imaginative interpretation of the gold lozenge from Bush barrow as a solar-lunar event calculator (Thom *et al.* 1988; Ruggles 1999, fig. 8.10/ p. 140);

*..elaboration of axial lines within sites:* imposition of a detailed mesh of projected inter-post alignments for the compound attached to the cursus at Godmanchester (Cambs; TL 2570), a system now fortunately trimmed, was force-matched with various celestial risings and settings (McAvoy 2000; e-FIG CU-10 and 11; see Table of Contents: 3c/9);

*..application of modern concepts:* clearly shown by the recent fanciful interpretation of a short pit alignment of Mesolithic date as a device for synchronising lunar and solar calendars (Gaffney *et al.* 2013; e-FIG PA-02; see Table of Contents 03i/3). Here, such works as Whitrow 1989 would have been well advised for prior reading.

There appears very little in the general structural data presented in this analysis clearly to support coherent and sophisticated astronomical or calendric reference to a complex repertoire of celestial targets. However, a far more realistic case can be made in support of a widespread basis for orientational behaviour arising from economically relevant agrarian-funerary ritual and propitiation, predominantly solar, and general in its essential reference.

Certainly, in addition to this more practically economic emphasis, a complex celestial cosmology, with distinct directional elements, for which there is abundant and widespread ethnographic, historical, and archaeological evidence on a global scale, could have formed an integral part of accompanying ritual, but one not reflected in any surviving structural axis.

**-a basis for interpretation more appropriate to simpler agrarian societies seems inherently more realistic**

A more considered approach to interpretation is certainly required, based on the type of seasonal-economic preoccupations, and related ritual, to be expected of small-scale agrarian communities, rather than on back-projections of modern science, and its methodology.

Propitiatory rituals related to economic prosperity, and to mitigation of unfavourable seasonal conditions, with funerary aspects involving mediation of ancestors, seem to present a more credible basis for explanation of alignment than do modern constructs of eclipse prediction, solar-lunar calendric co-ordination, or abstract observation of esoteric events, such as stellar rising-setting, or lunar standstills. For the sites in this survey, these latter events, regularly invoked in the literature, and occurring as they do at near 19-year intervals, almost generational, would seem to provide a sparse and inconveniently nocturnal basis for ritual at such monuments, a poor return for their often highly labour-intensive construction, obvious social importance, and longer-term maintenance. Recourse to a supplementary range of planetary, or stellar risings and settings to explain diverse choice of axis for monuments also seems borne more of desperation than rationale, with once-proposed stellar BC astro-datings regularly shown to be at variance with those eventually determined internally for the monument by physical means.

By contrast, seasonal variation of the sun and its effects, economically important, and easily observed, would have had directly relevant consequences for agrarian communities, its cycle offering ready and regular opportunities for repetition and elaboration of ritual contact. The sun would therefore have provided a major, obvious, but not necessarily exclusive, candidate as a target for axial alignment, other astro-seasonal rhythms, and terrestrial factors, perhaps providing supplementary cues, or context.

Under this view, the monument and its axis could then assimilate communities of the living, and the dead in the case of a funerary site, the seasonal economy, and the all-important connecting solar cycle.

**-a broader context for monumental orientation needs to be established**

Grouped axial data from a range of different types of monument are essential to provide a background for interpretation of axial alignment, both in space, and through time. This approach would form a basis for discussion of longer-term, or more distant axial relationships, as for instance between long barrows and longhouses, or of possible axial persistence, as from long barrows to linear cemeteries of round barrows, both topics developed later in this analysis.

**-arguments based on context-free appraisal of grouped monuments should outweigh those from context-rich single sites**

Detailed studies and interpretation of axial alignment are often confined to particular sites, rather than addressing the broader assemblage of monuments in order to extract robust descriptors for general behaviour. Such restricted analysis can leave many of the remaining monuments in the group unexplained, or sidelined as exceptions. Any coherent model for axial orientation within a defined group must not only explain the peak trend but also, *most importantly*, the spread of values outside this: *the best working hypothesis is, after all, the one that excludes least data.*

**-interpretation should be fitted to data, rather than data to preconception**

Interpretation must be data-led rather than concept-driven, in the latter case when sites are repeatedly matched against an existing model, without much consideration of alternatives. A good example of this practice would be standard use of the solar-lunar standstill diagram (e-FIG AS-01) as a required backdrop for analysis, with all of the assumptions it contains, for instance the primacy of horizon-based events, and of limiting positions. Repeated attempts to invoke the various, highly infrequent positions of lunar standstill as fundamental cues for alignment, when all else seems to have failed, are discussed later in the analysis (see Table of Contents: 03d/4b and 5; 04d/4).

**-when celestial cues are considered, those at the horizon should not be assumed as primary, but others at elevation also discussed**

The near universal assumption in the literature that setting, or rising events at the horizon are key to explaining monumental alignment is unwarranted, and serves unduly to restrict the range of available options for

interpretation. This horizon-based over-emphasis seems to arise simply because the plane of most sites, and hence the ready line of sight, accords more closely with the local horizon than with higher elevations, and also because rising-setting presents a more spectacular transition between visible and invisible, light and darkness, known and unknown. Liminal events are also embedded in the antiquarian tradition, and this persists.

**-the prime importance of the direction in which a monument appears to be facing should not be assumed**

This factor is particularly relevant to discussion of chambered tombs, where the front end usually appears larger, and more structurally developed than the rear, as for instance well seen in many long barrows. A strong case could be made (see Table of Contents: 03a/11b) for greater importance of the opposite direction in the axis, that *pointing* towards the rear, being the direction of approach towards, and potential entry of, interior axial structures, and of enhanced viewing of the monument against its background. Long barrows frequently face general E and point W'ward: under this viewpoint, rather than describing their *orientation*, perhaps use of the term *occidentation* would be more relevant.

**-a more culturally-appropriate level of precision for measurement, and of latitude for interpretation of axial data is required**

Structural orientations need to be determined, and compared against possible environmental cues, with a degree of precision judged not by modern criteria for scientific measurement, but by those likely to have been deemed practically sufficient and ritually appropriate by prehistoric communities.

Azimuths given to minutes of arc, which are at times quoted in axial data from prehistoric sites, usually have little basis in structural reality, given the irregular nature of axial elements such as megaliths, or little either in likely prehistoric relevance, given the technical aids available at the time of construction. Questions of suitable angular resolution can be brought into personal focus by contemplating the average adult male fist as it subtends an angle of about 8° when held at arm's length, and matching this against features on the local horizon, or against setting and rising positions of sun and moon. Uncertainty over the nature of any cue, let alone which element within it might have been the one targeted for alignment, would seem to make undue observational precision further redundant. On these grounds the need for very close correspondence to occur before a measured axis would qualify as solstitial or equinoctial, for instance, seems inappropriate, and hence use of the terms *peri-solstitial* or *peri-equinoctial* would be preferable, and more realistically inclusive.

Boundaries for modern measurements of axis may therefore need to be spread well apart before application to prehistory. A case in point from this analysis is provided by results obtained after broadening the field of outward view at recumbent stone circles, from a single central value, to include working margins (see Table of Contents: 03e/7; e-FIG SC-11 and 12).

**-a major structural axis need not be related to continuing ritual**

The link between structural orientation and attendant ritual should not be assumed. It is certainly possible that any such alignment might indeed have played little or no part in recurrent ritual, being more token, dedicatory, and of short-term initial relevance, set at construction, and then becoming marginal to the main activity, with a passive rather than active function (see Table of Contents: 02a/2f and g). The actual ritual intention of an axis might also be seriously misconstrued. As an example, to an uninformed observer, the E'ward orientation of Christian churches and graves in Britain and Europe might suggest sun-worship, rather than its actual symbolic reference, and active involvement of this axis in continuing liturgy might also tend to be falsely over-emphasised.

**A more realistic model**

Applying the conditions outlined above, and pre-empting the conclusion of this analysis, a clear case can be made for the existence of a **strong solar component** in axial targeting, with the transit as its key element, a basis likely to have persisted amongst agrarian communities over a considerable time-span, with other additional cues highly probable, but not clearly evident.

Latitude-dependent effects are apparent in axial data from well-separated areas, again suggesting a possible link between axial direction and some large-scale phenomenon, such as the solar cycle.

The high degree of variability amongst axial data would indicate that **implementation of any rule** for targeting, celestial or otherwise, was generalised, rather than consistently and strictly applied, although central tendencies are apparent, suggesting a basic pattern of behaviour.

There seems to be a **broad separation of axial emphasis** between W-NW'ly 'pointing' monuments with clear funerary associations, such as long barrows and other chambered tombs, and other generally S'ly 'pointing' monuments, such as stone rows, which have less directly funerary content, and hence were possibly more concerned with economically-based propitiation, aligning their axes away from the funerary W, and towards the sunward S. However, these latter monuments often incorporate distinctly funerary sites into their axis, thus bringing the ancestors into the process of solar targeting, to produce a more inclusive model for economically-based propitiation.

The **seasonal pattern of economic activity** might well have contributed to the alignment finally achieved by a W'ly pointing funerary monument, acting to constrain its axis further, within limits defined by the annual work-cycle. Amongst chambered tombs, as well seen in the case of long barrows, the W'n transitional zone of the solar transit at lower elevation appears important, their predominantly W-NW'ly pointing axial directions explicable in terms of interaction between the need for such W'ly solar targeting and the seasonal availability of a sufficient work force for construction to begin (the seasonal-solar model: see the note at the end of this preface);

Besides an inherent funerary interest in the W, and constraints imposed by the work-cycle, another factor is involved in a **final compromise for orientation** of the axis: the need to optimise the frequency of its exposure to the passing transit, by choice of an appropriate direction, whilst maintaining the other two conditions (competing factors: see Table of Contents 03a/13c). Such optimisation could be achieved by moving the direction of pointing further towards, even beyond due W, and this in fact seems evident from the final positions of peaks observed in frequency distributions. Such analysis indicates general avoidance of solstices, and according to the triple compromise, the peri-equinoctial distribution about the W-NW'ly peak can be explained without involving the equinox, possibly more a modern construct, than one of direct ancient application.

Such involvement of variable transit-frequency, in a process acting to increase axial exposure to passage of the sun, also seems evident amongst monuments with a distinct S'ly alignment, such as stone rows. Some of these sites have peak distributions of the axis around the peri-solstitial sectors of the transit at the SE, and SW (see Table of Contents: 02c/2e). Other rows, with even more S'ly peaks of axial alignment, lying within the permanent zone of the transit, also occur, and here exposure would be maximised to give daily repetition. If aligned close to the S'n zenith the row could also refer to the readily observed elevated vertical cycle of solar rising and sinking occurring at midday, providing a clear seasonal scale, easily visualised directly, or by shadow-casting, and very rarely taken into account as a possible cue.

The picture emerges of an active agrarian solar cult, with rituals expressed in part by orientation of key axes at many sites, and responding to environmental stress during the period in question by **structural elaboration and repetition of monuments**, as for instance seen amongst the many stone rows, and as proliferation of rupestrian rock art.

However, the model proposed here for alignment can not be described as a **theory**, in the closer sense of the term, because in the absence of clear tests for its refutation, based on strict analysis of data, it can not be readily disproved, a defining attribute for such a status (Popper 1963). For instance, the seasonal-solar model for alignment, as proposed in this analysis (see the note at the end of this preface), is certainly *capable* of explaining alignment of *any* axis, which must point towards *some* sector of the solar transit, transitional, permanent, or even where below the horizon in the null zone (see Table of Contents: 02c/2b ii; e-FIG AS-01), and in this negative sense it is automatically a unified approach.

How far this *working hypothesis* actually applies to what must have been a complex situation controlling selection of an appropriate axis is unknowable, given the number of possible variables, few of which can be determined objectively, or decisively eliminated, with discussion further complicated by the likely ancient perception of general rather than highly specific directions.



## Scope of the analysis

This analysis covers major types of monument: chambered tombs, a re-defined group of augmented barrows, cursus monuments, stone rows, stone circles, standing stones, rock art, henges, linear round barrow cemeteries, pit alignments, and certain barrows of the Iron Age and their burials. Drawn from these sites, a small group of hypermonuments, distinguished by their length, is discussed separately. Importantly, environmental factors are considered as a factor influencing orientation behaviour.

Other topics within this general format also include further discussion of:

..axial trends amongst linear round barrow cemeteries as possible evidence for persistence of earlier traditions;

..deliberate choice of axis to allow illumination of tomb interiors;

..the possible axial importance of shadow casting generated by the solar transit, as suggested at certain chambered tombs, and as a possible general attribute of standing stones.

## The main theme of the analysis: a brief restatement

The conclusions drawn from this analysis emerge from the **general group properties** of axial orientation amongst monuments, and hence are **data-led**, rather than concept-driven, or forced to comply with more modern abstractions, for instance astronomical. **Several trends** are apparent, each relating to a general model of agrarian ritual that is predominantly solar, with little or no convincing evidence for any involvement of the lunar cycle. The prime importance of the **solar transit** in axial orientation behaviour seems evident, although unknown factors would certainly have contributed.

Given the general solar model proposed, the importance of transit-frequency in the choice of axis is stressed, with a process of **optimisation of exposure** in operation through more S'ly placement of the axis towards the perisolstitial margins of, and to within, the permanent zone of the transit.

Alignment appears to be of **two main types: S'ly**, and of suggested economic emphasis, or **W'ly** and funerary, with cases of structural and axial linkage between the two. Alignment of this second major group of monuments, chambered long and round barrows, might have involved a cooperative combination of factors: an inherent interest in the setting zone of the solar transit for funerary-ritual reasons, coupled with a timing for practical onset of major construction as determined by seasonal and agrarian work-related factors, together with the need for optimisation of exposure to the transit.

The emphasis here is that the monument was not targeted to a specific short-term cue, but brought into a more **dynamic and persistent cycle**, using the passage of the sun, in its daily and seasonal motion, to connect the visible world of the living, and its needs, with the invisible world of the ancestors, and its possible solutions. Many of the monuments considered here incorporate all three basic elements: a clear structural axis, the physical remains of ancestors, and the passing solar transit, all combined to meet an ever-present need to propitiate seasonal powers, and ensure economic well being. Aligning the site on an appropriate axis would certainly ensure at least **passive** contact that was regular, in addition to providing periodic opportunities for more **active** enactment of rituals.

The underlying **solar theme outlined here is basic** to any agricultural economy, from simple to complex, forms a recurrent background for ritual, and is supported by widespread ethnographic and historical detail: the sun moves through its journey from zenith to below the W'n horizon, through the realm of the underworld, to emerge again in the E, daily as the light-dark cycle, and seasonally as the waxing and waning of its transit. The true physical explanation for this, and its recurrent inevitability, is a modern concept: for the ancients the quantity and quality of the return would have needed to be ensured by propitiation, expressed within an inclusive *solar-agrarian-funerary* cult.

The permanent zone of the solar transit, the sector between winter solstice rise and set, defines the narrowest and lowest arc of exposure for the sun, hence resulting in the darkest, and coldest part of the year, the **critical point** of

hopeful return to seasonable summer conditions (e-FIG AS-04b). It forms a seasonal minimum, and for prehistoric agrarian communities would have provided an obvious target for propitiation, in order to promote favourable development of the coming year. Such ritual, anticipating an as yet unknown year, could be called *prospective* in emphasis, whilst that at the end of the completed year *retrospective*.

Variable and deteriorating **environmental conditions**, as seem evident during the later 3<sup>rd</sup> and earlier 2<sup>nd</sup> millennia BC in far NW'n Europe, an area anyway climatically unstable, could provide a possible explanation for the elaboration and repetitive construction seen amongst certain regional groups of monument, such as stone rows, and expressed at its most extreme in the development of hypermonuments.

Such a basic solar model need by no means be exclusive of **alternatives** and secondary factors. Complex celestial cosmologies, and detailed observational knowledge of the related events that formed each annual cycle, or those seen developing over longer periods of time, either held as abstract concepts, or applied for practical and ritual purposes, might have been a feature of the communities in question during this period, if not generally, then for some specialist group. However, there is nothing from analysis of axial alignment amongst the monuments to support this.

It should be noted that use of such axial monuments might well have functioned as planned long after foundation, reflecting continuation of the same essential agrarian-economic rituals common to all periods, and especially so at such larger, more robustly constructed and conspicuous sites as:

	<b>e-FIGS</b>
Dorset Cursus SU 0115	CU-03 to 06;
Rudston Cursus complex TA 0969	CU-12 to 13;
Stonehenge Greater Cursus SU 1243	CU-17;
major stone rows on Dartmoor SX 63 and 65	SR-07 and 09;
Stonehenge CU 1242	HE-30-32.

**The working hypotheses** outlined in this analysis are combined as follows:

<b>the seasonal-solar model</b>	<b>Table of Contents</b>	<b>e-FIG</b>
general	03a/13a; 02b/8; 02c/2i	CO-02
axial intersection with transit	02c/2d to f	AS-09
seasonal aspects	03a/16; 02b/7	LB-36 to 41
climatic influences	02b/4; 03a/19; 03d/8g 05/1a	LB-36 to 41
proliferation of monuments		
general	03d/8g	
stone rows	03d	SR-01 to 33; ND-01b;
stone circles	03e	SC-01 to 13; ND-01c;
rock art	03g	RA-01 to 21; ND-01d;
<i>letter-codes given for e-FIGS</i>	01d	

## Main theme: naming the model

The main elements of the seasonal-solar model, reflecting a combination of timing and solar target, can be summarised as follows:

<b>terms</b>	<b>suggested</b>	<b>axial</b>	<b>examples:</b>
<i>seasonal</i>	<b>ritual emphasis</b> -renewal  -continued prosperity  -mediation by ancestors	<b>targeting</b> WS  meridian  W-NW'ward	<b>key monuments</b> SW'n outliers at certain stone circles: see: e-FIG SC-10; stone rows: see e-FIG SR-05; cursus monuments: see e-FIG CU-19; long barrows; see e-FIGS LB-01 to 11;
<i>solar</i>	the transit is suggested as the primary target for axial ritual deemed central to the agrarian economy, providing an indirect means of continued contact with, and propitiation of, influential ancestors and deities beyond the W'n horizon.		

**Key:** WS winter solstice