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WHOSE EQUINOX?

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> At Knowth ... the orientation ... suggests that there could have been two ceremonies at different times, the vernal equinox on 20 or 21 March and the autumnal equinox on 22 or 23 September. At these times, the sun rises and sets directly in the east and west, while day and night have equal lengths.[1]

While archaeoastronomers are generally aware of the problems of ethnocentrism, a number of concepts are so deeply rooted within the twentieth-century Western framework of thought that we hardly question whether analogous concepts actually existed in the context of other world-views, let alone whether they had an importance similar to their importance for us. A clear example of this is the equinox. Claims of equinoctial alignments are encountered frequently in the archaeoastronomical literature,[2] and recently have begun to appear in many mainstream archaeological publications, even those by British and Irish prehistorians, many of whom are inclined to treat other claims of archaeoastronomy with considerable scepticism.[3] In claiming such alignments as "equinoctial", these authors are making the tacit assumption that the concept of the equinox is meaningful, and important, within prehistoric world-view. This note will examine to what extent this assumption is likely to be justified.

Equinoctial sunrise and sunset are frequently included as self-evident horizon targets for consideration alongside the solstices and lunar standstills as part of a standard archaeoastronomical "recipe book" of potential horizon targets.[4] Where equinoctial alignments are claimed to have been laid out with some precision, one of three different methods is usually proposed:

(1) finding the spatial mid-point between the rising (or setting) position of the sun at the two solstices;
(2) finding the half-way point in time between the two solstices and aligning upon sunrise or sunset on that day; and
(3) finding the day on which sunrise and sunset occur in exactly opposite directions.

A fourth method, which is usually ruled out as impracticable, but should perhaps be mentioned here, is

(4) finding the day on which the length of time from sunrise to sunset is the same as that from sunset to sunrise.[5]

As approximations to the true equinox, these methods will produce varied results, depending upon a number of factors (see Figure 1). Method (1) will only yield

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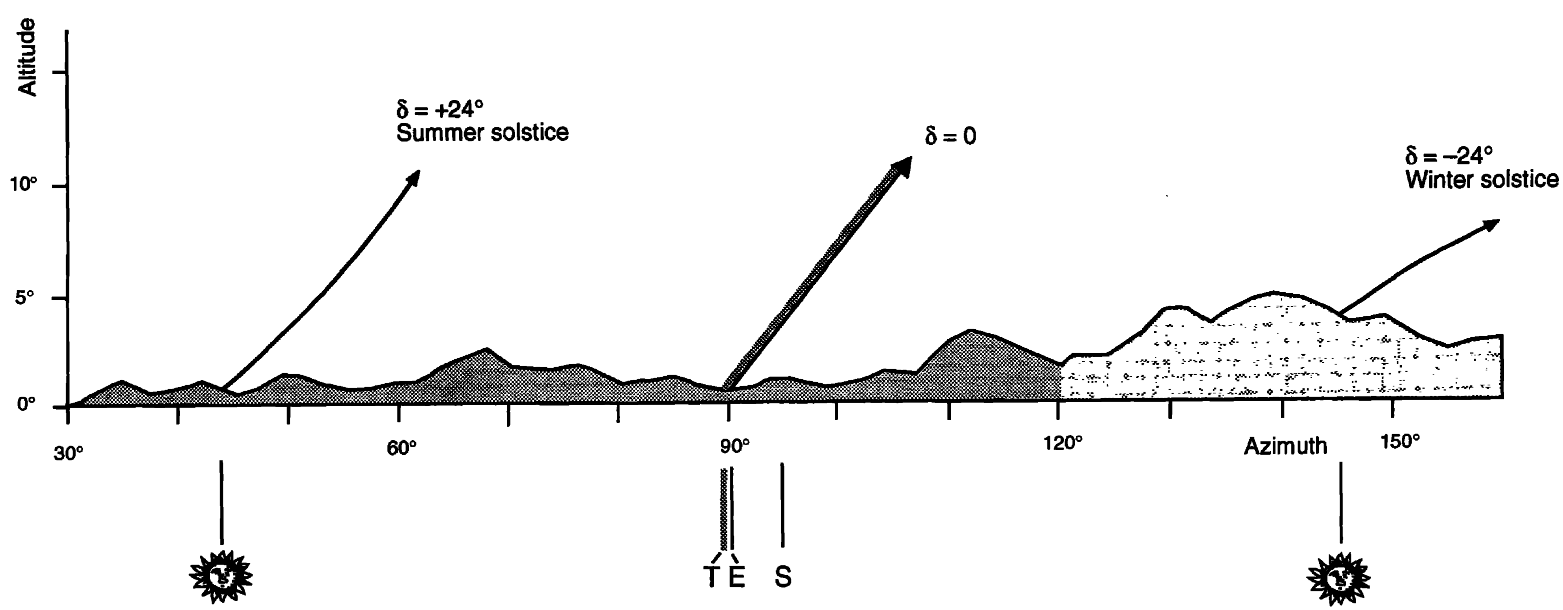

FIG. 1. Possible "mid-way" concepts yielding dates approximating to the modern concept of the equinox, for a hypothetical eastern horizon within Britain or Ireland. The spatial mid-point between sunrise at the two solstices (indicated by sun symbols) is at *S*, while sunrise halfway in time between the solstices may be anywhere within the shaded area *T*. Sunrise on the day when the sun rises and sets in opposite directions will generally be different again, depending on the altitude of the western horizon. Sunrise at the equinox, corresponding to a declination of 0°, is *E*. Diagram reprinted from Clive Ruggles, "Astronomy and Stonehenge", *Proceedings of the British Academy*, xcii (1997), 203–29, Fig. 2.

declination 0° if the horizon is completely level and flat; otherwise the spatial mid-point could be several degrees away from the true equinoctial sunrise or sunset position. Method (2) will produce declination values generally somewhat above 0° because the earth does not travel around the sun at a constant rate.[6] The date determined by method (3) is dependent upon the horizon altitudes in the east and west at the place of observation. The results of method (4) are affected by the height of the horizon and the effects of refraction.

In addition, the procedures to determine these dates are not generally straightforward. Method (1) involves dividing the azimuthal interval between the solstitial directions into two equal halves. Even given a well marked, fixed observing position and a distant horizon with fixed landmarks, it is not clear how this could be achieved without a calibrated device to measure angles. Method (2) would involve counting the number of days between the solstices and halving the difference, which presupposes a level of numeracy sufficient to count, record, recall, and manipulate (halve) numbers up to at least 183,[7] and that the solstices themselves have already been determined accurately to the day, which cannot be achieved by direct observation.[8] Method (3) is arguably the simplest, perhaps being achievable by sighting in both directions between a pair of markers. Method (4) would require devices capable of measuring periods of time, both by night and by day, to a precision of a minute or two, as well as ways to record and compare the results.

But to concentrate on issues of how well the dates determined by these methods approximate to the true equinoxes, and the practical difficulties of measuring them, is to ignore the more fundamental question of why prehistoric people might have been motivated to determine them in the first place.

Certainly the concept of the equinox has a precise meaning within the framework of Greek geometrical astronomy that underlies the Western scientific tradition. For us, the two equinoxes are defined in terms of the tilt of the earth with respect to the plane of the earth's orbit around the sun. Alternatively, they can be understood in terms of the places where, and the times when, the apparent path of the sun against the fixed stars, the ecliptic, crosses the celestial equator at declination 0°. But from the perspective of a totally different world-view devoid of these underlying geometrical concepts, finding an explanation of "our" equinox would be far from simple, and possibly it could make no sense at all.

It is far from self-evident, then, that any fundamental concept similar to our equinox had any meaning, let alone any importance, to people in prehistory. Neither does it follow that just because people attempted to align monuments upon sunrise or sunset at the spatial or temporal mid-points between the solstices, or on the day when sunrise and sunset occurred in opposite directions, these necessarily represented attempts to determine and indicate the "true" (i.e. "our") equinox.[9] If such observations and measurements were indeed being made, then we should search for other explanations.

The trouble is that it is difficult to imagine any possible motivation that could have led people with a world-view quite unlike the Western one to ascribe significance to any of the dates identified by methods (1) to (3). In the case of (3) it is possible to suggest that the day when the sun rises and sets in a straight line might have been considered important because this axis represented a fundamental conceptual division of the world into two parts, just as the world is conceptually quartered by two axes in many indigenous world-views.[10] And in the case of (2) — the method by far the most extensively proposed and discussed in the literature — the example of the Celtic calendar is often raised in support, with its eight-fold division of the year, although it now seems possible that the universality of this calendar, and the precision with which calendrical festivals were defined in the ceremonial year, may have been considerably exaggerated.[11] But there is little further support for speculations as to why importance should have been attached to a mid-point between the solstices, spatial or temporal.

The need for caution is reinforced when we consider that the very idea of mid-points is itself redolent of Western-style conceptions of space and time as abstractions: as featureless linear axes, the division of which into a number of equal parts seems "natural" because it can be simply conceived in terms of the basic concepts of abstract mathematics and geometry with which we are all familiar. The anthropological evidence from modern indigenous groups suggests a very different picture, in which conceptions of space and time are likely to be highly context-rich and context-dependent. People try to make sense of the passage of time by classifying and categorizing events in relation to their personal or shared experience rather than viewing time as an abstract entity.[12] Likewise, context-rich concepts of "place"[13] tend to give rise to "sacred geographies" in which landscapes are charged with meaning.[14] The significance of particular places and events will almost certainly be related to their role in reaffirming the perceived natural (cosmic) order. The sunrise or sunset positions that are significant in a horizon calendar might for example correspond to the dates of seasonal ceremonies related to subsistence activities, or to the positions of prominent and sacred landscape features such as distant mountains. They are unlikely indeed to relate to abstract divisions of space and time.

A different explanation seems likely, then, for supposed equinoctial alignments such as the passage orientations at Knowth and the orientation of the Stonehenge cursus. More likely, these represent instances of orientation that happen to fall close to due east or west amongst groups of monuments whose orientations when viewed as a set are susceptible to broader explanations. Where systematic studies of groups of monument orientations have been undertaken, as in the work of this author and others in Britain and Ireland[15] or Michael Hoskin in southern Europe,[16] evidence of orientations clustering around the true equinoxes, or indeed round any of the approximations that would be obtained by any of the methods described above, is quite non-existent.

In conclusion, easterly and westerly alignments have tended to be interpreted as "equinoctial" because of a highly questionable implicit assumption that our Western concept of the equinox is a universal one. In fact, re-examination of both the conceptual basis and the actual evidence casts considerable doubt on the idea that any monuments were deliberately aligned upon sunrise or sunset on dates that happen to approximate to the true equinoxes because, for example, they were conceived as half-way (in either space or time) between the solstices. If we are seriously to try to understand something of the cognitive principles that really did underlie some of the patterns of alignment found in the prehistoric material record, then we must start from theoretical perspectives that will suggest plausible models for conceptual structures in non-Western world-views. In the meantime, it would be probably be helpful if the word 'equinox' were simply eliminated from archaeoastronomers' vocabulary.

REFERENCES

1. George Eogan, *Knowth and the passage tombs of Ireland* (London, 1986), 178.
2. In the literature on British archaeoastronomy they have been extensive. Mesoamerican examples include Anthony F. Aveni, *Skywatchers of ancient Mexico* (Austin, 1980), 263, 280, 329–30 n.7. The index to *Archeoastronomia italiana* by Giuliano Romano (Padua, 1992) lists innumerable pages on which *equinozio* occurs.
3. Aubrey Burl (*The Stonehenge people* (London, 1987), 44) suggests that the Stonehenge cursus "may have been rather casually laid out to mark the equinoctial sunrises of March and September". According to R. J. Bradley and R. Chambers ("A new study of the cursus complex at Dorchester on Thames", *Oxford archaeological journal*, vii (1988), 271–89, p. 286), "The earlier section of the Dorset cursus points straight at the midwinter sunset, just as the Stonehenge cursus is directed at equinoctial sunrise". See also R. J. Bradley, *Altering the Earth: The origin of monuments in Britain and Continental Europe* (Edinburgh, 1993), 62; M. Parker-Pearson, *Bronze Age Britain* (London, 1993), 62; A. Gibson and others, "Excavations at the Sarn-y-bryn-caled cursus complex, Welshpool, Powys, and the timber circles of Great Britain and Ireland", *Proceedings of the Prehistoric Society*, lx (1994), 143–223, p. 207; A. C. Renfrew and P. G. Bahn, *Archaeology: Theory, methods and practice* (2nd edn, London, 1996), 382; T. C. Darvill, *Prehistoric Britain from the air* (Cambridge, 1996), 254. The historian R. Hutton (*The stations of the sun: The history of the ritual year in Britain* (Oxford, 1996), 4–5), in attempting to sum up the evidence on astronomy in the prehistoric British Isles, considers only solstitial and supposed equinoctial alignments.
4. *Cf.* A. F. Aveni, "The Thom paradigm in the Americas: The case of the cross-circle designs", in C. L. N. Ruggles (ed.), *Records in stone* (Cambridge, 1988), 442–72, pp. 442–5.
5. This is not, *pace* Eogan, the date when the length of night is equal to the length of day, because of the twilight periods before sunrise and after sunset. In any case, the point at which night can be deemed to have started is arbitrary and poorly defined. *Cf.* C. L. N. Ruggles, *Astronomy in prehistoric Britain and Ireland* (New Haven, 1998), Box Ast 8.
6. For details see *ibid.*, Box Ast 5.
7. Aubrey Burl ("'Without sharp north': Alexander Thom and the great stone circles of Cumbria", in Ruggles (ed.), *Records in stone* (ref. 4), 175–205, p. 201), for example, considers this improbable.
8. Even in early Roman times the date of the winter solstice was uncertain within three or four days (Hutton, *op. cit.* (ref. 3), 2).
9. For example, Fred Hoyle ("Speculations on Stonehenge", *Antiquity*, xl (1966), 262–76, pp. 271–2) states that "the only concept of the equinox susceptible to measurement in 1850 BC was the day on which the directions of sunrise and sunset were separated by π".

10. A. Lebeuf, private communication.
11. Ruggles, *op. cit.* (ref. 5), chap. 8. The idea of a strict temporal division of the year was fundamental to Thom's "megalithic calendar", but was only evidenced by statistical analyses of alignment data which have since been shown to have been highly selective (for a commentary see *ibid.*, chap. 2).
12. See, e.g., E. E. Evans-Pritchard, *The Nuer* (Oxford, 1940), 103–8; A. W. R. Whittle, *Problems in neolithic archaeology* (Cambridge, 1988), 203.
13. C. Tilley, *A phenomenology of landscape* (Oxford, 1994), 14–17.
14. Ruggles, *op. cit.* (ref. 5), Box Arch 7.
15. *Ibid.*, chap. 8.
16. See various papers by Hoskin and colleagues in the present and recent issues of this journal.