ARCHAEO-ASTRONOMY

Supplement to

JOURNAL FOR THE HISTORY OF ASTRONOMY

NUMBER 23

Supplement to

VOLUME 29

SCIENCE HISTORY PUBLICATIONS LTD

1998

Publisher: SCIENCE HISTORY PUBLICATIONS LTD, 16 Rutherford Road, Cambridge, England, CB2 2HH (phone: 01223-565532; fax: 01223-565532; e-mail: shpltd@aol.com; web site http://members.aol.com/shpltd)

SUBSCRIPTIONS: *Archaeoastronomy*, the Supplement to *Journal for the History of Astronomy,* is published once each year. The 1998 Supplement (no. 23) costs £19.00 (US $38.00 in the Americas and Japan) for institutions, £11.00 (US $22.00 in the Americas and Japan) for individuals subscribing direct, including postage. Complete sets (nos. 1–23) cost £225.00 (US $450.00 in the Americas and Japan), £110 (US $220 in the Americas and Japan) for individuals subscribing direct, including postage. A subscription to Volume 29, 1998 of *Journal for the History of Astronomy* (ISSN: 0021-8286), including *Archaeoastronomy* Supplement 23, is £77.00 (US $154.00 in the Americas and Japan) for institutions, £35.00 (US $70.00 in the Americas and Japan) for individuals subscribing direct, including postage.

ISSN: 0021-8286

Printers: University Printing Services, University Press, Cambridge

Archaeoastronomy

Number 23 JOURNAL FOR THE HISTORY OF ASTRONOMY 1998
Supplement to Volume 29

CONTENTS

Models of Temporality in Archaeoastronomy and Rock Art Studies
WILLIAM BREEN MURRAY S1

Mediterranean Archaeoastronomy and Archaeotopography: Pre-Roman Tombs of Africa Proconsularis
JUAN A. BELMONTE, CÉSAR ESTEBAN and JOSÉ JUAN JIMÉNEZ GONZÁLEZ S7

Orientations of Graves in the Late Roman Necropolises of Ampurias
ALFONSO LÓPEZ BORGOÑOZ S25

First Fruits Celebrations among the Nguni Peoples of Southern Africa: An Ethnoastronomical Interpretation
KEITH SNEDEGAR S31

Studies in Iberian Archaeoastronomy: (5) Orientations of Megalithic Tombs of Northern and Western Iberia
MICHAEL HOSKIN and colleagues S39

Summary of a Relevant Article in *JHA* S88

Book Review S89
Skywatchers, Shamans & Kings: Astronomy and the Archaeology of Power, by E. C. Krupp (Stephen McCluskey)

Notes on Contributors S91

Index to *Archaeoastronomy*, no. 23 ..... S92

INSTRUCTIONS TO CONTRIBUTORS

Papers for inclusion in *Archaeoastronomy* should be typed on quarto or A4 paper, with both texts *and notes* double spaced and in the style used in the *Journal*; further instructions concerning the presentation and documentation of papers may be obtained from the Editor, Dr M. A. Hoskin, Churchill College, Cambridge, England, CB3 0DS (phone: +44 (0)1223-840284; fax: +44 (0)1223-565532; e-mail: MAH15@CUS.CAM.AC.UK). Contributions should be written in English (or American). Original artwork should not be sent until the paper has been accepted for publication.

Articles should also be submitted in electronic form; this results in an enormous saving of labour for all concerned, and largely eliminates the need for proofreading. It is most convenient when this is done on a PC disk, preferably using Wordperfect 5.1.

All communications on editorial matters and books for review, should be addressed to Dr Hoskin.

As usual, Archaeoastronomy for 1998 is paginated S1, S2, ... and separately indexed, so that it can be bound at the back of the normal volume of *Journal for the history of astronomy* by those who wish.

Archaeoastronomy, no. 23 (*JHA*, xxix (1998))

MODELS OF TEMPORALITY IN ARCHAEOASTRONOMY AND ROCK ART STUDIES

WILLIAM BREEN MURRAY, University of Monterrey

Both archaeology and astronomy are structured by the temporal frameworks within which they work, but the meaning of time in each field is very different. Their difference becomes critical when one tries to identify archaeological evidence that demonstrates prehistoric knowledge of the sky. Inter-disciplinary consensus is a necessary condition of scientific proof in archaeoastronomy, but if paradigmatic contradictions make this consensus impossible, collaboration of the kind contemplated in archaeoastronomical research is foreclosed. This dilemma and the possibilities of overcoming it are now open issues in archaeoastronomy[1] and the many attempts to explain prehistoric rock art in astronomical terms are a useful illustration of the problem's intricacies.

All discussions of rock art must begin by recognizing that the term itself is an evident misnomer whose continued use in archaeological discourse is questionable.[2] The label groups several kinds of cultural artifacts (variously identified as pictographs, petroglyphs, geoglyphs, inscriptions and rock sculpture, among others) into a single composite category, and imputes artistic or aesthetic motives to them without demonstrated proof. Both of these assumptions are false and misleading, and a redefinition of the object of study is urgently needed.

For the purposes of this discussion, rock art can be defined very broadly as any kind of intentional human marking of a natural rock surface.[3] This definition carries several implications. In cultural terms, it means that rock art is by nature polyfacetic; no single meaning or explanation will account for all examples. Its unity lies in the domain of physical objects and is bounded archaeologically by the interaction between the human hand and natural rock. No distinction is made between prehistoric and historic examples, and only accidental or unstructured rock markings (doodles) are excluded from the category. Human intentionality and the physical act of marking are its primary attributes.

The property of intentionality may explain in part why archaeologists identify rock art by such a curiously inappropriate label. For most archaeologists, rock art is somehow different from other kinds of prehistoric remains. In physical terms, it is not subject to depositional displacement — only removal to a new cultural context or destruction *in situ*; therefore, it is never an accidental byproduct of human cultural activities (like lithic scatter) or a random assortment of subsistence debris (like prehistoric hearths). Its distribution, frequency, context and meanings are not questions of statistical probability; they are determined exclusively by cultural intent, and can only be explained within an anthropological framework. Indeed, under

0142-7273/98/0023-0001/$2.50

the strictest positivistic terms, all interpretations of rock art are mere speculations because archaeologists can never return to the past and query its creators about their intentions.

These conditions make analysis more a matter of feel and taste, metaphorically identified by archaeologists as 'art' in order to distinguish it from other kinds of evidence more apt for legitimate scientific study, i.e. reducible to 'hard facts' and statistical probabilities. Since the focus of rock art studies necessarily includes the mind that guided the hand, as well as the hand itself, the questions it asks often appear to point to endless speculation, rather than solid proofs. Until recently, its interpretation has been systematically ignored by serious archaeology, and abandoned to the 'lunatic fringe'.

On the other hand, rock art is a major part of the prehistoric record in almost every part of the world where suitable rock surfaces are found, and its considerable antiquity is now well-demonstrated using established archaeological dating techniques.[4] As Kuhn points out,[5] scientific paradigms are overthrown by what they can not explain, and in that sense archaeology's imposed silence about rock art is striking. Rock art clearly is one of the great 'blind spots' of the modern archaeological research paradigm. Its reincorporation into the archaeological record requires more than an occasional line or two in site reports. It demands a re-examination of the disciplinary paradigm itself, and this may be another reason for the archaeologists' discomfort.

Archaeology's time framework is the paradigmatic feature that all archaeoastronomical interpretations of rock art must confront. Edmund Leach[6] notes the potential conflict when he distinguishes between repetitive and non-repetitive conceptions of time. The repetitive view of time derives from the observation and recognition of recurrent cycles of nature — months, seasons, and years — whose lengths may vary, but whose rhythms are constant. This perception of time as eternal repetition clashes, however, with the universal human experience of birth and death, a linear process which is irreversible and can never be repeated. This chronology is the basis of history. Leach goes on to point out that most attempts to reconcile these two perceptions of time depend on a religious or supernatural explanation, so from the very beginning we know that archaeoastronomy has ventured onto dangerous ground!

From its inception, scientific archaeology distinguished itself from prophetic religion by embracing a linear non-repetitive time framework that projects historical time backward into ever more remote periods. Despite considerable soul-searching and not a few abstentions, modern archaeology still remains basically committed to providing an account of human prehistory. Archaeological measures of time may be less precise than historical ones, but they are always human time measured in chronological years, be they radiocarbon years (B.P.), or years of Our Lord (B.C./A.D.).

Historical time also defines the way archaeologists perceive rock art. For the

archaeologist, the most important fact about rock art is that it is the product of an individual actor at a unique historic moment, and is by definition undateable. Moreover, physical remains alone are rarely sufficient to prove either contemporaneity or definite cultural association, so at any given site, rock art's relationship to other archaeological remains must be considered entirely coincidental unless proved otherwise. By insisting that each example be examined as an isolated (pre)historic act of creation by an individual actor, rock art can be cut loose from the archaeological record and permanently consigned to the limbo. Its meanings become idiosyncratic to an unknowable historic moment and any possibility of broader cultural comparison and generalization is systematically denied. If we really think that every example of rock art is like a signature on a manuscript, then its cultural content obviously does become as enigmatically inaccessible as the Mona Lisa's smile.

Yet even the most cursory examination of documented rock art shows how poorly this characterization fits the empirical evidence. Although it is an 'individual' creation, rock art rarely displays individuality or uniqueness; its most striking characteristic is that like modern billboards and traffic signs, the same motifs are repeated over and over again. Rather than being scattered randomly about the landscape, rock art is nearly always spatially clustered at specific locations, as if it derived from culturally structured activities rather than unique isolated events. Instead of being physically separated from other remains, rock art is more often very intimately associated with them. It hardly ever seems to have been made by a lone thief in the night, anxious not to be caught. More often it appears to be like many other kinds of culturally patterned communication systems studied by archaeologists, including displays of monumental sculpture, inscriptions, acoustics, and even pottery styles.

After all, rock art is not archaeologically unique. Rather, it shares the same interpretive problems that face all cultural explanations of mute prehistoric artifacts. In fact, if current technical advances in dating continue,[7] it seems likely that within the next decade rock art's reincorporation into the archaeological record will become unavoidable. In this eventual circumstance, it seems to me that archaeoastronomy becomes an attractive analytic model, in part precisely because it views the evidence within a different temporal framework.

Modern astronomy derives its time framework from astrophysics, which perceives time along with space as fundamental properties of physical reality.[8] The astronomer's time spans billions of years filled with numberless cycles of recurrent events of different durations. For the most part the astronomer's sky is an unchanging reality whose perception is a cultural universal of human cognition, and whose cycles are a constant natural framework of human life. Like the recurring motifs of rock art, nearly all celestial phenomena are recurring events, rather than unique historic moments, so from the astronomer's perspective, the probability of their representation in prehistoric artifacts is by definition far greater than random statistical chance.

Obviously, one can always question just how much attention prehistoric cultures

might have paid to the sky. Some archaeologists[9] might argue that it was of little importance, and explain current interest in archaeoastronomy as merely a projection of modern wonder onto prehistoric materials, a simple case of ethnocentrism. Critics are particularly put off when the use of the term 'astronomy' imputes scientific motives like those of the modern astronomer to prehistoric activities that were almost certainly not so motivated.[10] It is not just the technical limitations of naked-eye observation that set archaeoastronomy apart from the rest of astronomy, and a more neutral term like 'sky-watching' is probably needed (but has not been widely adopted) to avoid any prejudged implication of scientific intent.

Nevertheless, if one denies all knowledge of the sky to earlier cultures, a different ethnocentric trap looms up. Technological limitations are not equivalent to mental incapacity, and even the most dim-witted savages must be granted some awareness of day and night, the changing of the seasons, and the rise and fall of the moon. Historians of astronomy have already established that sky knowledge is both ancient and widespread,[11] and have embraced archaeoastronomy as a broader extension of their inquiry into its prehistoric phase. Sky knowledge may in fact be an extremely ancient and conservative part of human culture. The archaeoastronomers' problem is to determine what material forms such evidence might take, and prove in each case that its astronomical context is intentional, and not merely the result of chance associations or the inherent properties of nature.

If the possibility of some prehistoric cultural awareness of the sky is granted, rock art's great antiquity and global geographical distribution agree closely with the astronomers' expectations, making it an especially attractive candidate for archaeoastronomical analysis. For the archaeoastronomer, it is not really important what era or place the rock art comes from. The tests for astronomical order are everywhere the same, and more importantly, the intentionality of rock art solves one of the principal methodological problems posed by the *a posteriori* probabilistic tests of replication required for many other kinds of archaeoastronomical evidence.

As earlier reviews of archaeoastronomy have noted,[12] the probabilistic approach is necessary whenever cultural continuity is broken, and is more characteristic of European archaeoastronomical studies. Rock art is seldom mentioned in this connection, although some famous megalithic sites feature it prominently. In North America, on the other hand, ethnography and ethnohistory provide much more information about prehistoric knowledge of the sky, and probabilistic replicative tests are a weaker proof of astronomical intent, used only when the available sources are silent or contradictory. Old World and New World archaeoastronomy thus pursue divergent methodological paths which imply different kinds of evidence and different degrees of acceptability in mainstream archaeology.

A paradigmatic conflict within archaeology itself regarding temporality now seems obvious. In spite of its commitment to a historical approach, modern archaeology has become increasingly suspicious of ethnohistoric and ethnographic analogy. Archaeology produces both a scientifically documented record of artifacts, and a

more colourful narrative of prehistory which aims to reconstruct the human past from the surviving fragments. This story about prehistoric people necessarily incorporates ethnographic and ethnohistoric data, and may even contradict certain parts of the archaeological record itself.[13] Butzer shows[14] that even in well-documented contexts, the gap between the artifactual and historical events is too great to be bridged by mere hunches.

At the same time that New World archaeoastronomers avidly pursue ethnographic analogies as a way to overcome the limitations of probabilistic archaeological inference, many archaeologists[15] complain of the tyranny of the ethnographic record. For them, ethnographic analogy is a very imperfect and captious guide to prehistory, and they are willing to leave the narrative task entirely to novelists. In order to accept an archaeoastronomical explanation, archaeologists must make two great exceptions, namely that (1) cyclical time is recorded in the archaeological record, and that (2) ethnographic analogies can sometimes provide conclusive identification of it. Archaeoastronomers have not always been able to explain why archaeologists should make these exceptions, and the resulting dialogue has led more often to questions of relevance than of substance.

The problems of archaeoastronomy's identity obviously stem from the archaeological research paradigm itself. Part of the answer lies, I think, in a newly emerging perception of how the archaeological record accumulates and particularly the time resolution each kind of evidence permits.[16] For example, by focusing only on the initial act of creation, one easily forgets that rock art is temporally durable and may sometimes have been meant by its creators to last forever. If rock art does not just refer to unique historic events, it may have been culturally reused with or without physical renewal in relation to cyclical events over a longer period of time. "Periods of cultural relevance" is perhaps a more adequate measure of the temporal dimension of rock art than radiocarbon years, and such periods are often clearly marked by super-positioning of motifs, physical destruction of earlier glyphs, or their restructuring into a new cultural pattern. These patterns may never be fully understood, but they are accessible to logical modelling and cultural analysis, and some of their elements may be more easily identified than others.

Archaeoastronomical demonstrations can sometimes identify one element of this framework, but they require archaeologists to recognize a kind of temporality that is not historically defined. Archaeoastronomy is not after all an explanation; it merely focues on a facet of the archaeological evidence. This facet offers, rather than a precise chronological dating of specific events, a new access to mankind's evolving awareness of cyclical time. It may ultimately provide the first clear glimpse into the prehistoric mind behind the hand, but to reap this reward, archaeoastronomy must be prepared to embrace some concepts still considered revolutionary by many archaeologists.

Acknowledgements

The author wishes to thank the authorities of the University of Monterrey for their ongoing encouragement and support of his research activities, and the stimulating intellectual inputs of many colleagues, in particular Anthony Aveni, David Whitley, Ed Krupp, Solveig Turpin, Herb Eling and Clive Ruggles, whose critical insights motivated parts of this exposition. The paper is a slightly revised version of that presented in the special session on "Archaeoastronomy and Rock Art" at Oxford IV Symposium on Archaeoastronomy, Stara Zagora, Bulgaria, 23–27 August l993.

REFERENCES

1. Keith W. Kintigh, "I wasn't going to say anything, but since you asked: Archaeoastronomy and archaeology", *Archaeoastronomy & ethnoastronomy news*, no. 5 (1992); A. F. Aveni, "Nobody asked, but I couldn't resist: A response to Keith Kintigh on archaeoastronomy and archaeology", *ibid*., no. 6 (1992).
2. Osaga Odak, "A new name for a new discipline", *Rock art research*, viii (1991), 3–7 (with commentaries).
3. *Cf.* Clement Meighan, "Theory and practice in the study of rock art", in *Messages from the past*, ed. by C. Meighan (Institute of Archaeology, UCLA, Los Angeles, 1981), 3–20, and Whitney Davis, "The origins of image-making", *Current anthropology*, xxvii (1986), 193–215, for slightly different definitions.
4. *Cf.* Robert G. Bednarik, "Sobre la datación del arte rupestre", *Boletín*, Sociedad de Investigación del Arte Rupestre de Bolivia, no. 5 (1991), 31–33.
5. Thomas S. Kuhn, *The structure of scientific revolutions* (Chicago, 1962).
6. Edmund R. Leach, "Dos ensayos sobre la representación simbólica del tiempo", in *Replanteamiento de la antropología* (Barcelona, 1971), l92–211.
7. Bednarik, *op. cit.* (ref. 4).
8. Stephen W. Hawking, *A brief history of time* (London, 1988).
9. David Whitley, personal communication.
10. *Cf.* Alvar Ellegård, "Stone Age science in Britain?", *Current anthropology*, xxii (1981), 99–126, for the European dimension of this discussion.
11. E. C. Krupp, *Echoes of ancient skies* (New York, 1983); *idem*, *Beyond the blue horizon* (New York, 1991); Evan Hadingham, *Early man and the cosmos* (Norman, Oklahoma, 1984).
12. A. F. Aveni, "Whither archaeoastronomy?", in *World archaeoastronomy*, ed. by A. F. Aveni (Cambridge, 1989), 3–12.
13. *Cf.* Don Fowler, "Uses of the past: Archaeology in the service of the state", *American antiquity*, lii (1987), 229–48.
14. Karl W. Butzer, "A human ecosystem framework for archaeology", in *The ecosystem approach in anthropology*, ed. by E. Moran (Ann Arbor, 1990), 91–130, pp. 96ff.
15. H. M. Wobst, "The archaeo-ethnology of hunter-gatherers or the tyranny of the ethnographic record", *American antiquity*, xliii (1978), 303–9.
16. *Cf.* Nicola Stern, "The structure of the lower pleistocene archaeological record: A case study from the Koobi Fora Formation", *Current anthropology*, xxxiv (1993), 201–25.

Archaeoastronomy, no. 23 (*JHA*, xxix (1998))

MEDITERRANEAN ARCHAEOASTRONOMY AND ARCHAEOTOPOGRAPHY: PRE-ROMAN TOMBS OF AFRICA PROCONSULARIS

JUAN A. BELMONTE, Instituto de Astrofísica de Canarias,
and Museo de la Ciencia y el Cosmos, OAMC, Cabildo de Tenerife,
CÉSAR ESTEBAN, Instituto de Astrofísica de Canarias, and
JOSÉ JUAN JIMÉNEZ GONZÁLEZ,
Museo Arqueológico de Tenerife, OAMC, Cabildo de Tenerife

Introduction

The present decade has seen intensive investigations into the orientations of megalithic and para-megalithic monuments in the Iberian Peninsula,[1] the islands of the Western Mediterranean,[2] and even the Canary Islands.[3] The results have been both suggestive and statistically significant in demonstrating the importance of sacred topography and the possible presence of astral cults in the funerary practices of pre-Roman societies in this important region of the ancient world. However, despite its historical and cultural importance for the region[4] and the presence of formidable monuments,[5] the nearby Maghreb (Morocco, Algeria and Tunisia) has been neglected apart from limited recent work on Morocco[6] and the Algerian studies of Savary carried out some decades ago.[7]

Accordingly, the authors have embarked on a systematic archaeoastronomical study of appropriate archaeological sites in the region. This paper reports on the first prospecting campaign carried out in the spring of 1997 in northern Tunisia (the ancient Africa Proconsularis, see Figure 1). The measures were made with an accurate compass and a clinometer. There was no reason to expect any magnetic anomaly as a result of the geology of the region.

The authors had in view a number of aspects of cultural astronomy, but here we focus on the orientations of the burial monuments of the pre-Roman cultures of the area. These comprise the megalithic monuments ('dolmens'[8]) and rock-cut tombs ('*hawanat*', that is, 'tents', in the singular *hanut*) of the ancient Libyans or proto-Berbers, and the tombs of the Punics (African Phoenicians) who occupied the coastal regions from the ninth century B.C. onwards.[9] The orientation customs embodied in these monuments are of interest in their own right, but still more so when seen in relation to the corresponding customs in the Iberian Peninsula, the Balearic Islands, Sardinia, Corsica and Malta, and also in the geographically distant but culturally close Canary Islands.

0142-7273/98/0023-0007/$2.50

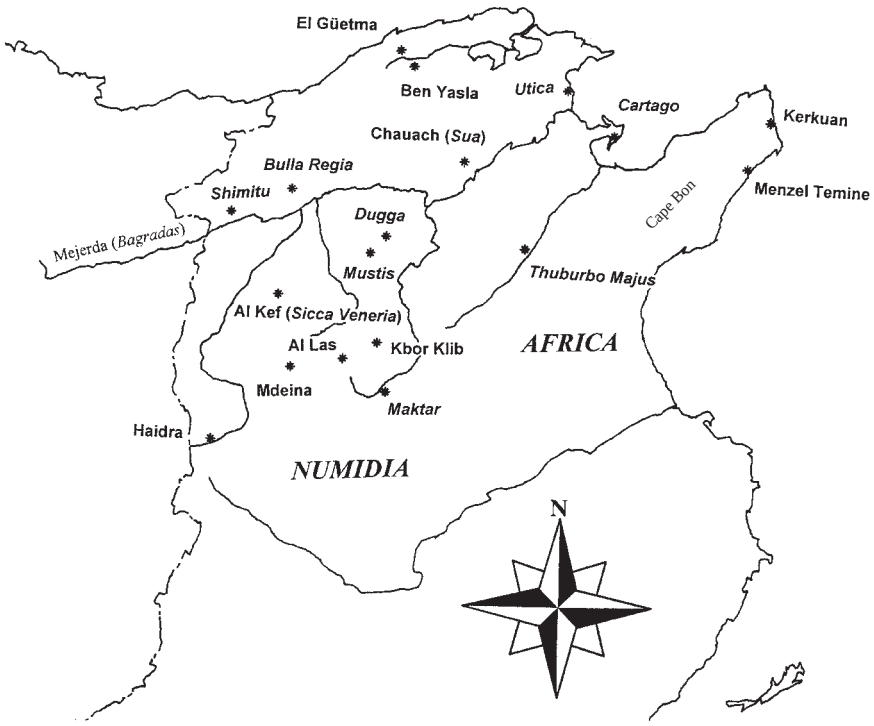


FIG. 1. Map of Northern Tunisia showing the places where the fieldwork was conducted.

The Dolmens

Ancient Numidia (the northwest of Tunisia and the northeast of Algeria) is well populated with megalithic monuments, and in particular dolmens, which were presumably erected by Libyan or proto-Berber populations during the first millennium B.C. Although dates around 1500 B.C. have been proposed for the oldest monuments, the most elaborate, such as the large porch dolmens from Al Las and Maktar, were built between the fifth and the first century B.C., being re-used well into the Roman period.

Various hypotheses have been proposed for their origin. Some favour an autochthonous development, either free of alien influence or under Punic inspiration, while others see them as the result of settlement by, or at least the cultural influence of, peoples from the Mediterranean islands (Sardinia, Malta, etc.) prior to the arrival of the Phoenicians in the eleventh century B.C. (the date of the legendary foundation of Utica). The question is still open.

There are well over a dozen megalithic necropolises in northern Tunisia, but we have concentrated on some of those with a significant number of dolmens in a good state of preservation, namely Al Las (or Elles, see Table 1), Dugga (Table 2), Maktar

TABLE 1. Orientations of 53 dolmens at Al Las (latitude 35° 57′), with numbering as on site.

No.	Az. °	Alt. °	Dec. °	Sector	State
30	115½	7½	−15½	L1	Bad
35	135½	3	−33	L1	Good
32	130½	2½	−30	L1	Good
54	158½	3	−46	L1	Very good
50	153	3	−43½	L1	Good
49	154½	3	−44½	L1	Good
48	158	3½	−45½	L1	Regular
47	165½	4	−48	L1	Very good
46	155	6½	−41½	L1	Regular
45	146	8	−35½	L1	Good
44	148	8	−36½	L1	Good
43	156	8½	−40	L1	Regular
42	140½	7	−35½	L1	Good
41	137½	6	−32	L1	Regular
38	141½	3½	−36½	L1	Regular
39	155	6	−42	L1	Good
31	135	4½	−31½	L1	Bad
40	134½	6	−31	L1	Good
36	142½	4½	−36½	L1	Regular
53	121½	2	−23½	L1	Good
51	87½	1	+3	L2	Bad
55	71½	1	+15½	L2	Bad
52	61½	1	+23½	L2	Good
56	66½	1	+19½	L2	Bad
57	56½	1	+27½	L2	Good
58	59½	1	+25	L2	Regular
59	52½	1	+30	L2	Very good
60	64	1	+21½	L2	Good
29	95	0½	−3½	V	Very good
23	87½	2	+3	V	Very good
*c*0 (24)	86½	2	+4	V	Good
*c*1 (25)	98½	2	−5½	V	Regular
*c*2 (26)	90	1½	+1	V	Bad
*c*3 (27)	89½	1½	+1½	V	Bad
*c*4 (28)	73½	1	+14	V	Good
*c*5 (22)	113	2	−17	V	Very good
*c*6 (21)	68½	1	+18	V	Very good
*c*7 (20)	57½	2	+27½	V	Good
*c*8 (19)	131	2	−30½	V	Very good
*c*9 (18)	129½	3	−29	V	Very good
15	189	3½	−49½	L3	Good
14	169½	3½	−49½	L3	Good
13	163½	2	−49	L3	Bad
10	179	4	−50	L3	Good
9	179½	4½	−49½	L3	Regular
8	175½	4	−50	L3	Regular
5	167	3½	−48½	L3	Regular
4	132½	3½	−30½	L3	Very bad
3	185½	4	−49½	L3	Good
2	178½	4	−50	L3	Good
1	154½	4	−43½	L3	Good
6	173½	4	−49½	L3	Regular
7	203½	3½	−45	L3	Bad

TABLE 2. Orientations of 16 dolmens at Dugga (latitude 36° 26′), with numbering as on site.

No.	Az. °	Alt. °	Dec. °	State
10	145	1	–42	Good
9	144	0½	–40½	Regular
4	143	1	–39½	Very good
13	135	1	–34	Good
7b	134½	1	–33½	Bad
8	142½	1	–39	Regular
12 (13R)	136	1	–34½	Good
(1)	149	1	–43	Good
(2)	152½	0½	–45½	Good
(3)	143	1	–39½	Good
(11)	143½	1	–39½	Good
(5)	139½	1	–37	Good
(5b)	138½	1	–36½	Good
6	155½	1	–46½	Regular
7	148½	1	–43	Good

TABLE 3. Orientations of 6 megalithic monuments at Maktar (latitude 35° 50′), numbering by the authors. Nos. 1 to 3, located some 2km southeast of the town alongside other tombs no longer measurable, are in much poorer condition, simpler in form, and probably much older than the impressive monuments denoted by G.

No.	Az. °	Alt. °	Dec. °	State	Typology
G1	193½	0½	–51½	Very good	4 chambers
G2A	195½	0½	–51	Very good	3 chambers
G2B	196½	0½	–50½	Very good	3 chambers, abuts G2A
G3A	69	0½	+17	Good	Double chamber
G3B	68½	0½	+17½	Good	3 chambers, abuts G3A to N
G3C	69½	0½	+17	Good	3 chambers, abuts G3A to S
1	135½	0½	–35	Good	Double chamber
2	149½	0	–44½	Good	Double chamber
3	169½	1½	–51½	Good	Single chamber

(Table 3), and Bulla Regia (Table 4). Figure 2 shows the topographic orientation diagrams of the four groups. Five other monuments were measured elsewhere (see Table 5). Figure 3 shows one example of the porch dolmens of Al Las. These monuments, and their counterparts in Maktar, are among the most impressive pre-Roman monuments in northwest Africa.

The Al Las necropolis has four groups of monuments each located in a different area: Linch 1 (hereafter L1) to the northwest of the present village; Linch 2 (L2), opposite to L1 on the other side of a ravine; Linch 3 (L3), to the southeast of the village, and Valley (V), in the flat, cultivated area just south of the town. The Valley area includes the largest, best constructed and most elaborated porch monuments (see Figure 3) and they are presumably the most recent buildings. In these monuments, where porch and entrance are both present, the entrance is always perpendicular to the porch, being sometimes on one side of it and sometimes on the other

TABLE 4. Orientations of 6 dolmens and 2 rows at Bulla Regia (latitude 36° 34′), with numbering as on site and azimuths measured with a precision of about 5°.

No.	Az. °	Alt. °	Dec. °
2	316½	4	+38½
4	260½	1½	–6½
10	297½	4½	+24½
11	250½	1	–15
14	273½	2½	+4½
15	46½	4½	+36½
R1	239½	2½	–22½
R2	230½	3½	–28

TABLE 5. Orientations of 5 other megalithic monuments.

Place	Latitude	Az. °	Alt. °	Dec. °	State
Shimitu	36° 30′	96½	2	–4	Good
Mdeina I	35° 52′	153½	4	–43	Bad
Mdeina II	35° 52′	63½	8	+26	Very bad
Chauach I	36° 38′	147	0	–42	Bad
Chauach II	36° 38′	129	0½	–30	Regular

(in Maktar, the porch and entrance are on the same side). The rest of the necropolis is formed by squared box stone monuments, mostly without any entrance, and what seems to be a flattened area (an altar?) for rituals (the remains of offerings have been found on them), with two large corner stones (the precursor of later porches), on one side of the structure. After anxious consideration we concluded that the porch or altar was the most important cultural aspect of the monument, and consequently we have taken its orientation to be the significant one.

It is interesting that the four areas display different customs of orientation. This suggests that there might be a topographic reason for the customs, such as the lie of the land. However, in Figure 4 we present the declination histogram of the four sections and this apparently indicates that an astronomical motivation could be found for at least three of them: L2, centred on the midsummer sunrise; V, well within the range of sunrise; and, in particular, L3. Here, of the 13 dolmens (one of which is of Valley type while three are in poor condition) no fewer than 10 may be thought of as facing a celestial 'target' with declination between –48° and –50°. We are well aware that stellar targets are problematic, but we note that α Cen, the second brightest star in the sky, had a declination within this interval between 500 and 200 B.C.[10]

As shown in Figure 5, the dolmens of Bulla Regia are of a very different construction from that of any other megalithic monuments in the region. They consist basically of a crude stone circle, covered by a very large capstone. Surprisingly, in these structures the only apparent entrance to the chamber faces west. However, we are uncertain whether this was a true opening or is simply a gap in some of the rings of stone. Consequently, these orientations must be viewed with caution, and in our analysis we shall consider these buildings separately from the structures at Al Las, Maktar and Dugga.

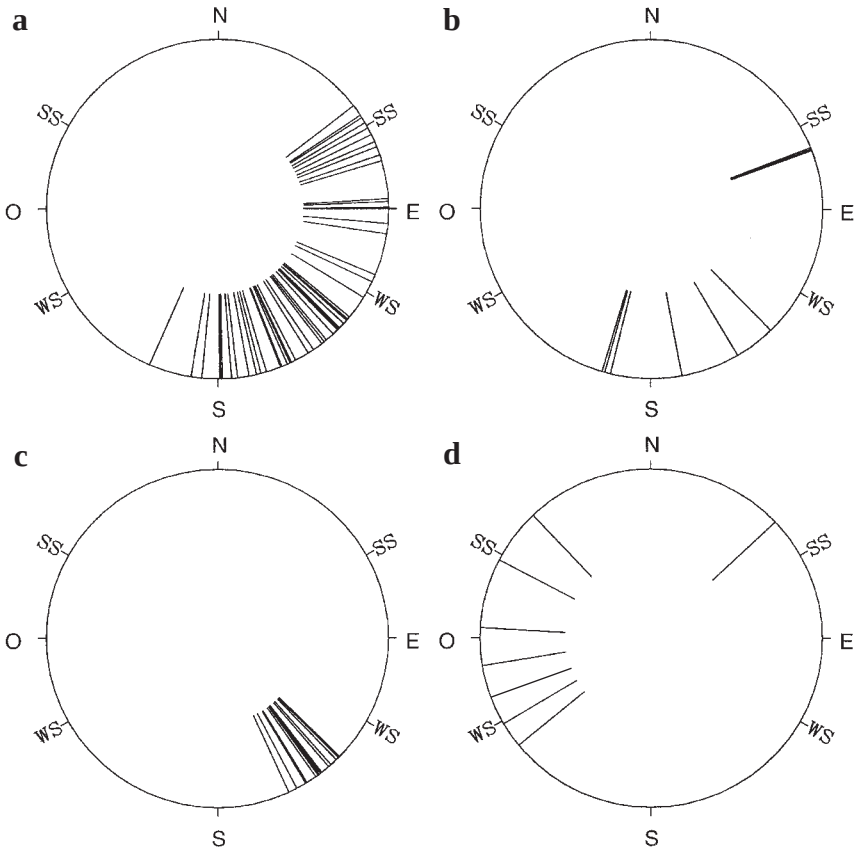
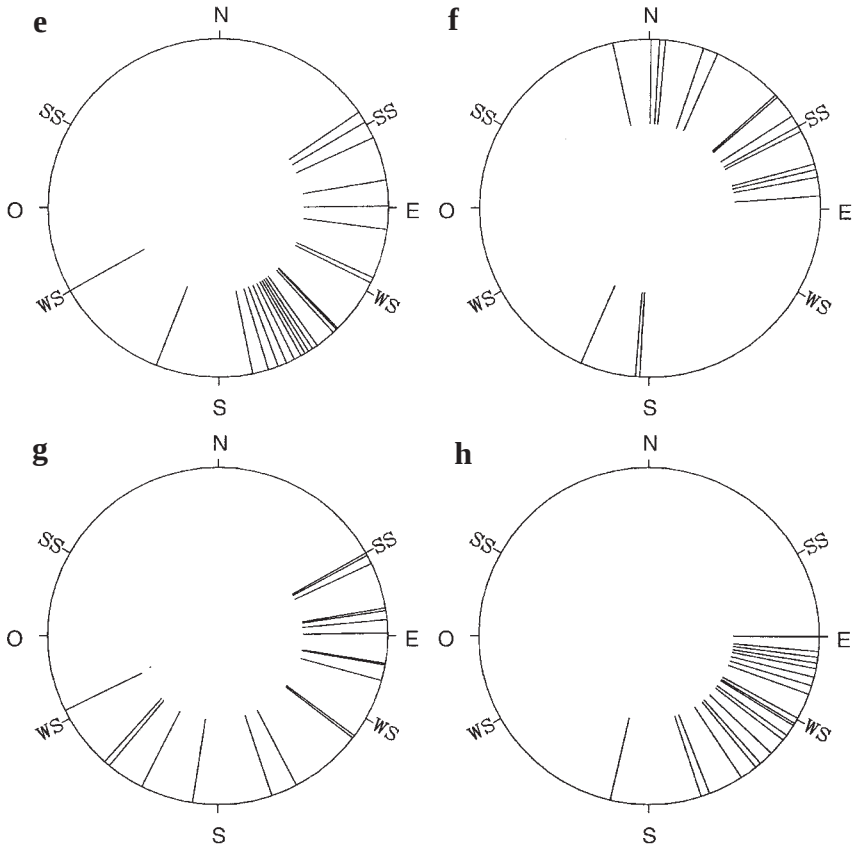


FIG. 2 (*above and opposite*). Orientation diagrams of Libyan (Numidian) burial monuments in Northern Tunisia: (a) Al Las dolmens, (b) Maktar dolmens, (c) Dugga dolmens, (d) Bulla Regia dolmens, (e) Ben Yasla *hawanat*, (f) El Güetma *hawanat*, (g) Chauach *hawanat*, (h) Chauach cairns.

The Hawanat

Scholars agree that the builders of the dolmens were also the people responsible for excavating the *hawanat* out of the rock, and that they selected one or other alternative (and sometimes both) according to the landscape and the geography of the area.[11] Of the dozen *hanut* groups known in Tunisia, we obtained data on three: Ben Yasla (see Table 6) and El Güetma (Table 7) in the Mogods Mountains, and Chauach (Table 8), the ancient Sua, far to the south (see Figures 1 and 6). Figure 2 contains the orientation diagrams of the three groups of *hawanat*. In addition, in Chauach, we measured the orientations of 26 unexcavated V-shaped 'cairns'. The data for these cairns are given in Table 9 and their orientations shown in Figure 2.[12]

The *hawanat* are cut out of the vertical cliffs of rocky outcrops, and so one might



expect the orientations to be random. However, we found a preference for the half of the sky that looks southeast (that is, from northeast to southwest), except in the case of El Güetma, which is surprising. In particular, at Ben Yasla nearly 60% of the orientations are between 135° and 170° in azimuth.

We saw above that the L1 sector was the only one at the necropolis at Al Las for whose orientations no evident astronomical motivation could be suggested. However, although less evidently so, the dolmens of Dugga (see Figure 7) some 80km to the northeast, and this group of *hawanat* of Ben Yasla, 150km to the north, seem to have the same orientation pattern. In view of the great distances between the sites it is difficult to explain these similarities except by reference to the sky. This suggests that some astronomical motivation underlay an orientation custom that was an aspect of the culture of the region in the first millennium B.C., and that the same people built the dolmens and the *hawanat*. More than this, however, it is difficult to say at present.

FIG. 3. Dolmen #29 of Al Las, showing the triple east-facing porch, typical of these monuments, where ritual offerings have been found. In this case the entrance is to the right, facing north. (Photo: M. Sanz de Lara.)

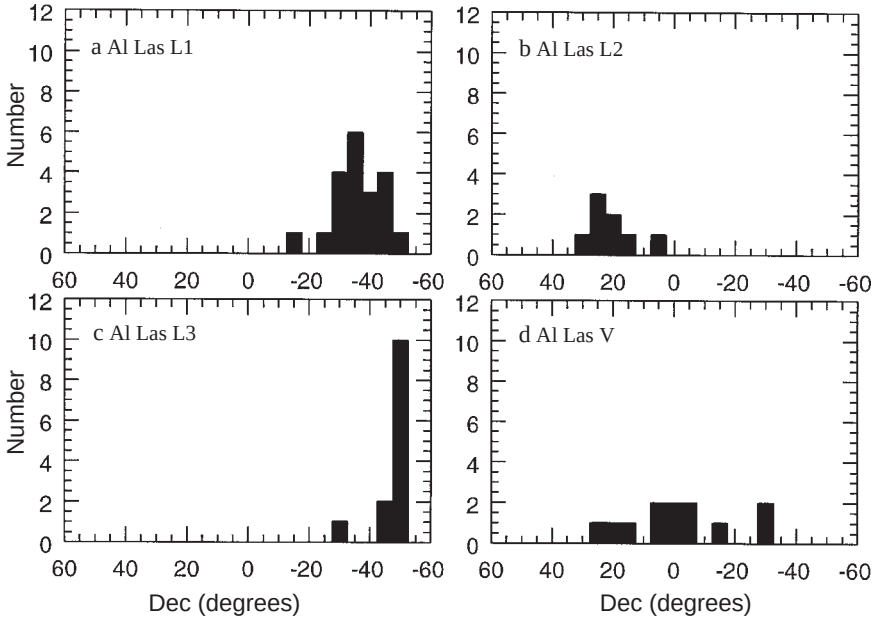


FIG. 4. Declination histograms for four different areas of the Al Las necropolis. Notice the big concentration of Area L3 around declination –49°, suggesting a probable celestial 'target'.

TABLE 6. Orientations of 24 *hawanat* at Ben Yasla (latitude 37° 3′), numbering as on site.

No.	Az. °	Alt. °	Dec. °
31	59½	2	+25
30	55½	2	+28
29	137½	2½	−34
22	168½	3	−48½
21	144½	3	−38
33	97½	2	−5
32	146½	2	−41
34	114½	2	−18
35	137½	1½	−35
36	240½	2	−22
37	149½	2½	−41½
38	153½	3½	−42½
39	159½	3½	−45½
40	151	3	−42
41	163	2½	−47½
15	156½	3	−44½
16	148	2½	−40½
14	135½	2	−33
13	136	2	−33½
(12)	89½	0	+½
(11)	201½	4	−44½
4	80½	2	+9
(2)	65½	2	+20½
(1)	116½	2	−19½

FIG. 5. 'Dolmen' of Bulla Regia. Notice the circular structures covered by a big capstone, which makes the definition of an orientation very difficult. (Photo: J. A. Belmonte.)

TABLE 7. Orientations of 18 *hawanat* at El Güetma (latitude 37° 7′), numbering as on site.

No.	Az. °	Alt. °	Dec. °
B1	85½	1½	+4½
B2	62½	1½	+22½
B3	74½	1	+13
B4	56½	1	+27
B5	48½	1½	+33
B6	47½	1½	+33½
B7	3½	5	+57½
C12	76½	1½	+11½
C1	79	1½	+09½
(C2)	18½	2½	+51½
(C3)	347½	5	+56
C6	5½	5	+57½
C7	½	4	+56½
C5	23½	2½	+49½
C8	184½	2	–50½
C9	203½	1½	–46
(C11)	183	2	–51
A1	60½	1½	+24

4. *Punic Necropolises*

The Phoenician colonization of the Tunisian coast took place in the early centuries of the first millennium B.C., and numerous colonies grew up along the coast, such as Utica, Kerkuan and, the most important of all, Carthage. These had residential areas, sacred enclosures and, of course, necropolises.[13]

FIG. 6. Cliff of Chauach, showing a group of east-facing *hawanat* cut out of the rock.

TABLE 8. Orientations of 23 *hawanat* at Chauach (latitude 36° 38′), numbering by the authors.

No.	Az.	Alt.	Dec.
	°	°	°
G1–1	81½	0	+7
G1–2	61½	0	+22½
G1–3	89	0	+1
G1–4	152½	0	−45½
G1–5	126½	0	−28½
G1–6	100	0	−8
G2–7	105½	0	−12½
G2–8	99½	0	−7½
G2–9	64½	0	+20
G2–10	60½	0	+23
G2–23	127½	0	−29½
G2–11	84½	0	+4½
G2–12	80½	0	+7½
G3–13	243½	0	−21
G3–14	221½	0	−37
G3–15	219½	0	−38½
G3–16	221½	0	−37
G3–17	161½	0½	−49
G3–18	188½	0½	−52
G3–19	206½	0½	−45½
G3–20	188½	0½	−52
G3–21	224½	8½	−28½
G3–22	227½	10	−25½

TABLE 9. Orientations of 26 stone cairns at Chauach (latitude 36° 38′), numbering by the authors.

No.	Az.	Dec.	No.	Az.	Dec.
	°	°		°	°
1	139	−37	14	141	−39
2	147	−42	15	121	−24
3	104	−11	16	101	−9
4	134	−34	17	97	−6
5	90	+0	18	95	−4
6	128	−30	19	122	−25
7	122	−25	20	104	−11
8	193	−51	21	110	−16
9	119	−23	22	162	−50
10	107	−14	23	159	−49
11	104	−11	24	104	−11
12	104	−11	25	99	−7
13	126	−28	26	139	−37

We measured a total of 87 tombs in three necropolises: Utica (see Table 10), Byrsa, in Carthage (Table 11), and Menzel Temine (Table 12). Their orientation diagrams are shown in Figure 8. The three necropolises exemplify different forms of burial and, perhaps, belong to different periods. That of Utica contains individual stone tombs of typical Phoenician construction, and is possibly the earliest.[14] That of Byrsa (sixth to fifth century) has tombs of this type but also large family tombs with a large cover-stone in the form of an inverted *V*.[15] Finally, the well preserved necropolis at Menzel Temine has one of the best examples of tombs excavated in the rock (hypogea) in the Punic area.[16] Most of the tombs had lengthy access stairs

TABLE 10. Orientations of 22 Punic tombs at Utica (latitude 37° 4′), numbering by the authors. The original horizon was probably sea level (0°).

No.	Az. °	Dec. °	No.	Az. °	Dec. °
1	110	–16	12	99	–7
2	107½	–13½	13	94½	–3½
3	106½	–13	14	89½	+0½
4	113	–18	15	108	–14½
5	93	–2½	16	92	–1½
6	96	–5	17	93	–2½
7	98	–6½	18	99	–7
8	107	–13½	19	93	–2½
9	103	–10½	20	89	+1
10	114	–19	21	95½	–4½
11	98	–6½	22	105½	–12½

and a chamber in the form of a cube, and they have been assigned to the third century B.C. or perhaps later. The plans we were using also included the Dermech necropolis in Carthage,[17] but today the necropolis is completely covered by the Baths of Antoninus Archaeological Park.

It seems that the Punics had orientation patterns that differed slightly from the customs of their Libyan contemporaries (compare Figures 2 and 8). In Utica, all the tombs faced the range of sunrise between the equinoxes and the winter solstice, while the Byrsa tombs mostly faced southwest. Much more suggestive is the impressive case of the hypogeum group at Menzel Temine. This is best illustrated by

FIG. 7. Dolmen #6 of Dugga, a good example of its class of structure. (Photo: M. Sanz de Lara.)

TABLE 11. Orientations of 8 Punic tombs at Byrsa (latitude 36° 50′), numbering by the authors.

No.	Az.	Alt.	Dec.
	°	°	°
1	206½	0	–46
2	210	0	–44
3	207½	½	–45
4	209	0	–44½
5	199	0	–49
6	206½	½	–45½
8	202½	½	–47½

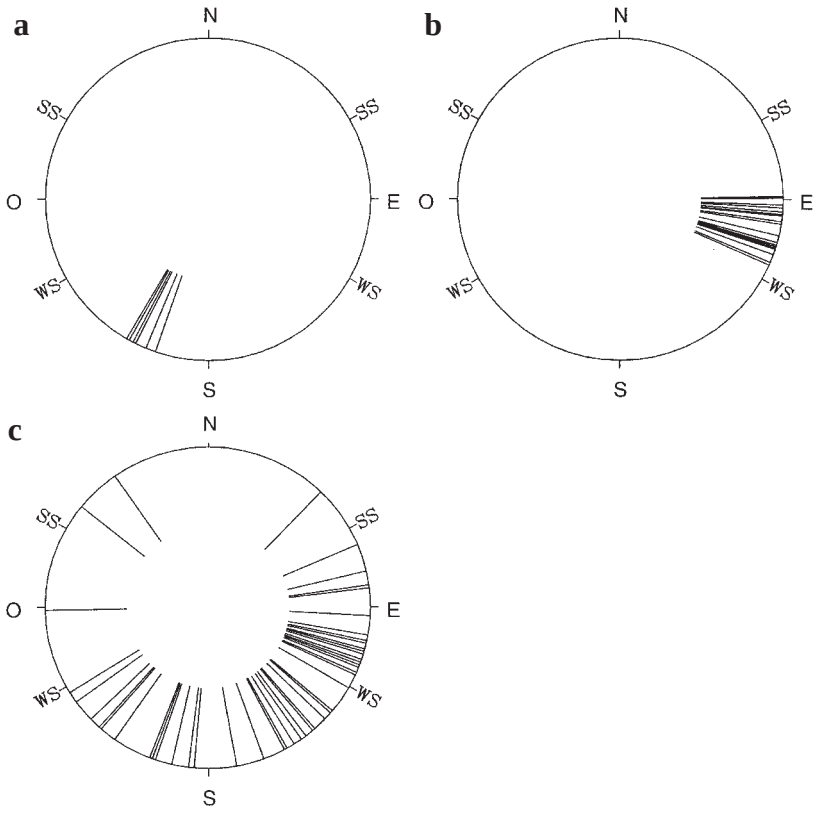


FIG. 8. Orientation diagrams of Punic burial monuments in Northern Tunisia: (a) Byrsa stone tombs, (b) Utica stone tombs, (c) Menzel Temine hypogea.

Figure 9, where the declination histogram of the Libyan dolmens can be compared with two histograms of Menzel Temine. The first of the two shows the histogram if the orientation is that of the actual tomb itself; this histogram displays three peaks with no evident astronomical association. However, the second histogram takes into account the slope of the stair, and is therefore related to the declinations of the celestial bodies whose light would have shone down on the entrance of the tomb at

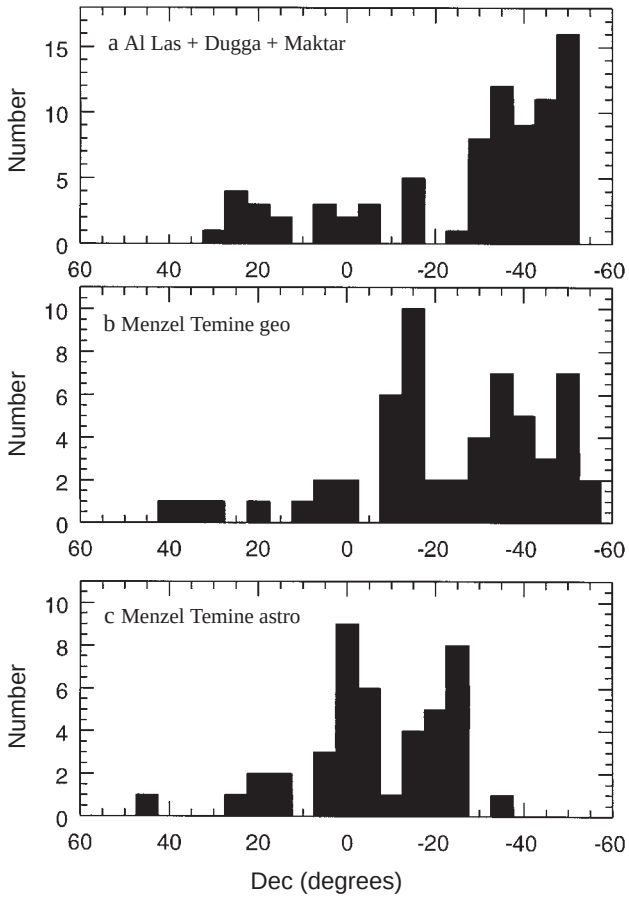


FIG. 9. Declination histograms from the Punic hypogea necropolis at Menzel Temine in comparison with Libyan dolmens. The terms *astro* and *geo* indicate different solutions according to whether the stair slope is taken into account or not (see text for further explanation).

TABLE 12. Orientations of 57 hypogea at Menzel Temine (latitude 36° 47′), numbering as on site.

No.	Az. geographical °	Dec. geographical °	Inclination °	Dec. astronomical °
1	325	+41	19	+54½
2	309	+30	17½	+41½
3	238	–25	9	–19
4	222	–36½	15	–25
5	221	–37	16	–24½
6	193	–51½	12	–40
7	200	–49	4	–45
8	199	–49	10½	–39½

TABLE 12 *(continued).*

No.	Az. geographical °	Dec. geographical °	Inclination °	Dec. astronomical °
9	215	–41	4½	–37
10	226	–34	5½	–29½
11	199	–49	7½	–42
12	201	–48½	20½	–29½
13	185	–53	9	–44
14	148	–43	20	–25½
16	151	–44½	20½	–26½
17	139	–37	18	–23
18	130	–31	20½	–16
19	131	–31½	17½	–18½
20	221	–37	29	–14
21	145	–41	21½	–23
22	83	+5½	21	+17½
23	269	–1	27	+15
24	234	–28	21	–13
25	140	–38	20½	–21½
26	131	–31½	18½	–18
27	120	–23½	24	–7
30	115	–20	26	–2
31	107	–13½	20½	–0½
32	103	–10½	26	+2½
33	114	–19	23½	–3½
34	102	–9½	27½	+7½
35	109	–15	27½	+2½
36	105	–12	21	+1
37	110	–16	26	+1
38	77	+10½	26½	+25½
39	110	–16	27½	+2
40	105	–12	21½	+1½
41	134	–34	20½	–18½
42	143	–40	19½	–24
43	187	–52½	19½	–33½
44	170	–52	25½	–27
45	100	–8	9	–2½
46	44	+35	12½	+44
47	100	–8	22½	+5½
48	143	–40	19½	–24
49	152	–45	14	–33
50	160	–49	25½	–25
51	67	+18	0	+18
52	82	+6½	11½	+13
53	106	–13	0	–13
54	109	–15	18½	–3½
55	111	–16½	18	–5
56	112	–17½	22½	–3
58	112	–17½	11	–10
59	93	–2½	0	–2½
71	145	–41	24	–21
84	112	–17½	21½	–3½

some time of year. Now the histogram has a double peak with maxima centred on declinations 0° (the equinoxes) and −25° (the winter solstice), and this we feel can hardly be a coincidence.

Conclusions

The dolmen groups, with the exception of Bulla Regia, cover very coherent ranges of azimuths between $52\frac{1}{2}°$ (corresponding to declination 30°, close to the major lunar standstill in the north) and $203\frac{1}{2}°$. Surprisingly, this arc is similar to that of the Catalan galleries in the Iberian peninsula,[18] and to that of the *tombe di giganti* of northern Sardinia.[19] A particular concentration is to be found in the east–south quadrant (see Figure 2), as happens also with the dolmens of Beni Messous near the Algerian coast[20] and with the Sardinian dolmens that preceded the *tombe di giganti*.[21] This range is quite different from those of the communal tombs of the Balearic Islands known as *navetas*,[22] but is similar to those of some dolmenic necropolises in the far-away Levant.[23] The Tunisian custom suggests a connection to the north, across the Mediterranean, and this may support the hypothesis of an alien influence.

Further evidence for this is to be found in the *hawanat* orientations. As we have noted, these suggest a probable association of the dolmen builders with the *hawanat* excavators. One wonders if similar links will be found in Sardinia between the *domus de Janas*, which resemble the *hawanat*, and the megalithic tombs of the island.

Our data apparently suggest a dichotomy between the orientations of the Numidian monuments and those of the Punic. However, maps of the Dermech necropolis in Carthage (sixth to fifth century) seem to show an azimuth preference between 120° and 160°.[24] This being so, it is still an open question as to whether there could have been influence between the Numidians and the Punics. The presence of older Punic necropolises (Utica, Byrsa) with different orientation patterns (see Figure 8) only serves to complicate the picture further.

We took the opportunity to measure some of the temples and royal mausoleums of the Roman period,[25] from the second century B.C. onwards. The latter are of particular interest and, together with impressive Algerian monuments such as the Medracen near Batna, deserve future study.[26] The temples also form a significant group and the results of our investigations of them will be presented elsewhere. Also for the future study are astronomical elements in the ancient chroniclers[27] and the local inscriptions,[28] and the structures and rock art of western Maghreb.

Acknowledgements

This work has been partially financed by the OAMC of the Tenerife Council, and by the Instituto de Astrofísica de Canarias under the project “Arqueoastronomía”.

REFERENCES

1. On Andalucía, see M. Hoskin, E. Allan and R. Gralewski, "Studies in Iberian archaeoastronomy: (3) Customs and motives in Andalucía", *Archaeoastronomy*, no. 20 (1995), S41–48; on Extremadura, see J. A. Belmonte and J. R. Belmonte, "Astronomía, cultura y religión en la prehistoria de la Península Ibérica: Los dólmenes de Valencia de Alcántara", *Tribuna de astronomía*, nos 116–17 (1995), 18–25 and 72–77, and the article by Hoskin and colleagues in the present issue of *Archaeoastronomy*; on Catalunya see the same article by Hoskin and colleagues, together with M. Hoskin and T. Palomo i Pérez, "Studies in Iberian archaeoastronomy: (4) The orientations of megalithic tombs of eastern Catalunya", *Journal for the history of astronomy*, xxix (1998), 63–79.
2. For the Balearic Islands, see M. Hoskin and J. J. Morales Nuñez, "The orientations of the burial monuments of Menorca", *Archaeoastronomy*, no. 16 (1991), S15–42; for Sardinia, see in particular M. Zedda, M. Hoskin, R. Gralewski and G. Manca, "Orientations of 230 *tombe di giganti*", *Archaeoastronomy*, no. 21 (1996), S33–54; for the temples of Malta, see G. Foderà Serio, M. Hoskin and F. Ventura, "The orientations of the temples of Malta", *Journal for the history of astronomy*, xviii (1992), 107–19; and for the tiny Maltese dolmens, see E. Pásztor and C. Roslund, "Orientations of Maltese dolmens", *Journal of European archaeology*, v (1997), 183–9.
3. J. A. Belmonte, C. Esteban, R. Schlueter Caballero, M. A. Perera Betancort, R. Génova and M. Cruz, "Astral gods, tombs and sacred mountains: The case of Mediterranean Africa", in *Actas del IV Congreso de la SEAC "Astronomía en la cultura"*, ed. by C. Jaschek and F. Atrio Barandela (Salamanca, 1997), 247–53.
4. For a general introduction to the region see G. Camps, *Les Berberes: Mémoire et identité* (3rd edn, Paris, 1992). For a recent review of the ancient politics, see M. Coltelloni-Trannoy, *Le royaume de Mauritanie sous Juba II et Ptolomée* (Paris, 1997).
5. G. Camps, *Aux origenes de la Berberie: Monuments et rites funéraires protohistoriques* (Paris, 1961), the authoritative work on the subject. For an up-to-date revision, see *idem*, *Les nécropoles mégalitiques de l'Afrique du Nord*, in P. Trousset (ed.), *Monuments funéraires et institutions autochtones du Afrique du Nord antique et médiévale* (VI^{e} Colloque International sur l'Histoire et l'Archéologie de l'Afrique du Nord, Paris, 1995), 17–31. The same work contains essays on the different kinds of tombs.
6. See for example V. Castellani, "Necropoli di tumuli ed archeoastronomia", in *Archeologie e astronomia: Esperienze e prospettive future* (Accademia Nazionale dei Lincei, Rome, 1995), 83–98.
7. For the "idebni" of the Ahaggar, see J. P. Savary, *Monuments en pierres seches de Fadnoun* (Mémoires du Centre pour la Recherche Archéologique et Historique de l'Est de la Algerie, vi; Algiers, 1967), 46. See also *idem*, "L'architecture et l'orientation des dolmens de Beni Messous", *Lybica*, xvii (1969), 271–330; these dolmens are similar to those of Tunisia.
8. G. Camps (ed.), *Encyclopédie Berbere* (Aix en Provence, 1996), xvi, *s.v.* "Dolmen".
9. For an excellent account of the Punic presence in the north of Africa, see S. Lancel, *Cartago* (Barcelona, 1994).
10. On the other hand, Acrux, the most southern star of the Southern Cross, was within this interval between about 650 and 400 B.C. We ought however to admit that if instead we take the perpendicular direction (that is, to the east — the gate of Dolmen 1 faces in this direction) then the group has an average declination close to zero and it may be that we are dealing with a simple custom of eastern orientation.
11. Most of the *hawanat* are concentrated near the coast whereas most of the dolmens are to be found in the interior (see Figure 1). However, near Enfida, in eastern Tunisia, there was twenty years ago a large coastal dolmenic necropolis, today in very bad condition. For the tombs excavated in the cliffs, see M. Longerstay, "Les Haounanet", in Trousset (ed.), *op. cit.* (ref. 5), 33–53.
12. These cairns, which are probably funerary, are found on a flat area on top of the cliff, near two

badly ruined dolmens. They may be very old, but they may also be Islamic. Their orientations, to the east–south quadrant, sheds little light.

13. M. Fantar, "Nécropoles puniques de Tunisie", in Trousset (ed.), *op. cit.* (ref. 5), 55–72.
14. The oldest parts of the necropolis have been assigned to the seventh century B.C. However, the most elaborated tombs could be of the fifth century. See F. Chelbi, *Utique* (Tunis, 1996).
15. Lancel, *op. cit.* (ref. 9).
16. M. Fantar, "Découvertes à la nécropole punique de Sidi Salem à Menzel Temine", *Histoire et archeologie: Les dossiers*, lxix (1983), 36–42.
17. H. Benichou-Safar, "Carte des nécropoles puniques de Carthage", *Karthago: Revue d'archéologie Africaine*, xxvii (1976), 5–35.
18. See Hoskin and Palomo i Pérez, *op. cit.* (ref. 1), and Section A of the article by Hoskin and colleagues in the present issue of *Archaeoastronomy*.
19. See Zedda *et al*., *op. cit.* (ref. 2).
20. See Savary, *op. cit.* (ref. 7, 1969). These dolmens face in azimuth between 85° and 150°.
21. M. Hoskin and M. Zedda, "Orientations of Sardinian dolmens", *Archaeoastronomy*, no. 22 (1997), S1–16.
22. See Hoskin and Morales Nuñez, *op. cit.* (ref. 2).
23. J. A. Belmonte, "Mediterranean archaeoastronomy and archaeotopography: Two examples of dolmenic necropolises in the Jordan Valley", *Archaeoastronomy*, no. 28 (1997), S36–43.
24. We were able to measure the correct azimuth of the Dermech Basilica and to correct the maps of the necropolis for actual (topographical) azimuths. See Benichou-Safar, *op. cit.* (ref. 17), Figure 2.
25. For some preliminary results on the temples see J. J. Jiménez, C. Esteban and J. A. Belmonte, "Arqueoastronomía en el Africa Proconsular", *Revista de arqueología*, no. 203 (1998), 46–53.
26. F. Rakob, "Numidische Königsarchitektur in Nordafrika", in H. G. Hom and C. B. Rüger (eds), *Die Numider: Reiter und Könige nördlich der Sahara* (Cologne, 1979), 119–80.
27. See also Herodotus, *Histories*, Book IV.
28. See J. B. Chabot, *Recueil des inscriptions Lybiques* (3 vols, Paris, 1941). A recent review on scholarship between different Libyc-Berber writing groups and its consequences can be found in J. A. Belmonte, R. Springer Bunk and M. A. Perera Betancourt, "Statistical comparative analysis of the Libyc-Berber script of the Canary Islands and the northwest of Africa", *Tabona*, xi (1998), in press.

Archaeoastronomy, no. 23 (*JHA*, xxix (1998))

ORIENTATIONS OF GRAVES IN THE LATE ROMAN NECROPOLISES OF AMPURIAS

ALFONSO LÓPEZ BORGOÑOZ

Ampurias (Emporium) is the site of an early Greek colony, located on the coast of modern Catalunya some 40km northeast of Girona. It was founded about 580 B.C. by sailors from Phocaea. The first settlement took place on a little islet known today as Palaiápolis (Old City), but later colonists established themselves on the mainland in a city now known as Neápolis (New City). After a period of commercial development during which the hinterland was occupied, Ampurias was used by the Romans as a military base during the Punic wars (*c.* 218 B.C.) because of its strategic importance. After their arrival and the construction of a small encampment, the Romans settled in the city, and then, near the end of the second century B.C., founded a newer and larger city on a nearby hill, the so-called Ciudad Romana. At the same time they modified the funerary practices observed in Ampurias, introducing incineration as the only rite and establishing cemeteries in new areas. After the Flavian period (1st century A.D.) the city experienced a decline, leading to the final abandonment of both Neápolis and the Ciudad Romana late in the third century A.D. The remaining inhabitants established themselves in the area of Sant Martí d'Empúries (over the earlier Palaiápolis, now united with the mainland) and used the area of Neápolis as a necropolis where inhumation was practised.

The study of the various necropolises associated with Ampurias has always held great interest for archaeologists. Recently, various scholars have been investigating the late Roman necropolises,[1] with a view to increasing our understanding of the period during which the necropolises were in use and of the customs governing interment.[2] To do this they have had to avail themselves of the work of past excavators, in particular the results achieved by Emilio Gandía during the first third of the present century[3] and the study published by M. Almagro in 1955.[4]

A serious problem that these past excavations pose to the investigator arises from the fact that, because of the circumstances prevailing at the time of the excavations, much of the information uncovered was not exploited in the manner that would be possible today. Unfortunately, the exact measurement of the orientations of the graves is one of these lacunae, and in most cases the information is irretrievably lost.

In spite of this, we believe that a revision of the work of Almagro from the perspective of archaeotopography[5] can yield data that allow us to validate hypotheses concerning these funerary customs, and how these customs varied with space and time within the region of Ampurias (see Figure 1).[6]

0142-7273/98/0023-0025/$2.50

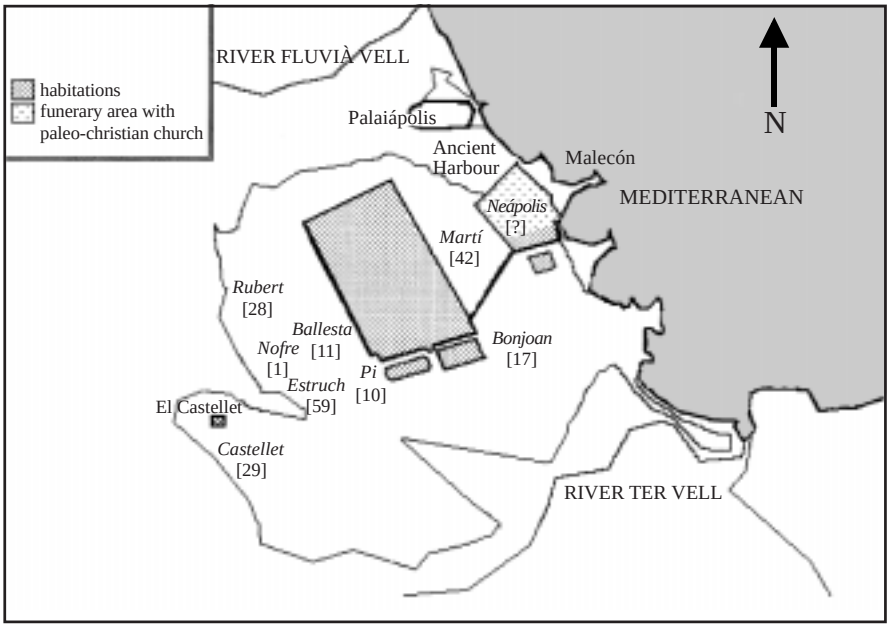


FIG. 1. The locations of the late Roman necropolises of Ampurias, with the numbers of graves in each.

Archaeotopography in Ampurias

It is unfortunately the case that measurements of the orientations of the Ampurian graves, of every epoch right from the first (and probably Greek) inhumations in the sixth century B.C., were made only roughly. Thus, we do not know how they determined north, and whether it was magnetic or geographic. Nor do we know whether in each necropolis north was determined on site, or afterwards, from the plan. In particular, we think that in their records the excavators themselves made a first estimate by eye of the cardinal points, and that afterwards, on the plan, the orientation was given to each necropolis that appeared in the maps of the area. This is why one can detect certain minor discrepancies between the two types of data.

Sometimes major differences are to be found between the position of the bodies in the maps and that indicated in the accompanying text, as for example with the Martí necropolis and in some of the graves in that of Estruch. Furthermore, on the skeletons in Estruch, Almagro remarks that "the bodies are oriented with the head to the mathematical southwest, or the apparent west",[7] and it is by no means clear what he is trying to say. No doubt all this was usual at that time (and, unfortunately, even today, as is shown by the publications being put out on this type of cemetery[8]) — the result of a certain contempt for this type of information and for what it might yield, compounded by the fact that the excavators had no compass and made their estimates of orientation by eye.

Orientations in the Late Roman Necropolises of Ampurias

Almagro[9] tells us that in the late Roman necropolises of Ampurias, the heads of the bodies were generally towards the west.[10] However, in the case of the Martí necropolis, where we are fortunate enough to have a plan in which the graves and skeletons are well represented (unlike most other necropolises, such as El Castellet, where the graves either are represented very schematically or have orientations that are difficult to measure), it seems it would be more correct to say that all the graves were aligned roughly 300°/120°.[11]

In the light of these difficulties, the use of Almagro's data and maps is admittedly questionable, but we believe that the broad conclusions we derive in what follows are nevertheless valid.

As can be seen in Table 1 and Figure 2, there is a strong concentration of orientations in the north–east quadrant. There is a clear predominance towards east, with rather more than 40% of all the graves and more than half of those whose orientations we know. This concentration in the overall representation is due to its abundance in the necropolises of Castellet, Bonjoan and Martí. In all the necropolises there are graves with this orientation, and it is the preferred one for graves in the early Roman Empire period.[12]

The second most common orientation is in the direction southwest/northeast, with nearly 21% of the total (and more than a quarter of those known). That this occurs in just one necropolis may reflect particular funerary customs in this sector of the necropolises (and so of a specific period in time), or a family or group with practices reflecting their particular beliefs, or the physical layout of the site that favoured certain orientations.

If we examine the matter further, we shall see that in the limited range of an octant between southwest/northeast and west/east, we find 77%, or more than three-

TABLE 1. Numbers of graves of known (and unknown) orientation in the necropolises of Ampurias, with percentages of the total of those known.

Azimuth	0°	45°	90°	135°	180°	225°	270°	315°	Total known orientations	Unknown orientations
Cemetery										
Ballesta	3 (1.9%)	0 (0.0%)	1 (0.6%)	0 (0.0%)	2 (1.2%)	0 (0.0%)	2 (1.2%)	0 (0.0%)	8 (5.0%)	3
Rubert	9 (5.6%)	0 (0.0%)	1 (0.6%)	1 (0.6%)	6 (3.7%)	0 (0.0%)	2 (1.2%)	1 (0.6%)	20 (12.4%)	8
Pi	3 (1.9%)	0 (0.0%)	2 (1.2%)	0 (0.0%)	4 (2.5%)	0 (0.0%)	1 (0.6%)	1 (0.6%)	10 (6.2%)	0
Subtotal	15 (9.3%)	0 (0.0%)	4 (2.5%)	1 (0.6%)	12 (7.5%)	0 (0.0%)	5 93.1%)	1 (0.6%)	38 (23.6%)	11
Nofre	0 (0.0%)	0 (0.0%)	1 (0.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	0
Bonjoan	0 (0.0%)	0 (0.0%)	12 (7.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	12 (7.5%)	5
Castellet	0 (0.0%)	0 (0.0%)	27 (16.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	1 (0.6%)	29 (18.0%)	0
Estruch	1 (0.6%)	41½*(25.8%)	1½* (0.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	44 (27.3%)	15
Martí	0 (0.0%)	0 (0.0%)	37 (23.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	37 (23.0%)	5
Subtotal	1 (0.6%)	41½*(25.8%)	78½*(48.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	1 (0.6%)	123 (76.4%)	25
TOTAL	16 (9.9%)	41½*(25.8%)	82½*(51.2%)	1 (0.6%)	12 (7.5%)	0 (0.0%)	6 (3.7%)	2 (1.2%)	161 (100%)	36

*Adjusted to accommodate 1 grave said to face ENE.

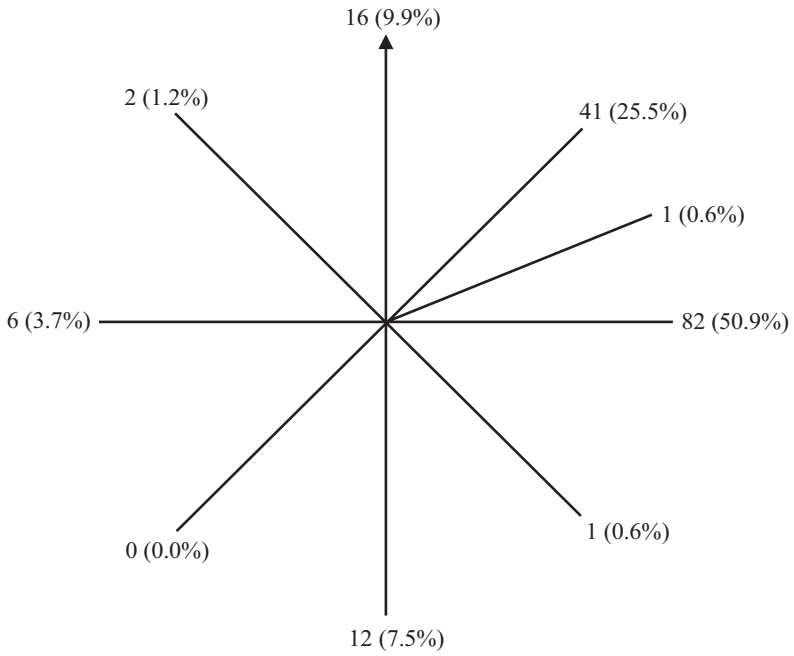


FIG. 2. Numbers of graves of known orientation in the necropolises of Ampurias.

quarters, of the graves whose orientations we know.

If we now simply count the number of graves with known orientations in the necropolises Bonjoan, Castellet, Estruch (plus the grave of Nofre) and Martí, a total of 123, we find that only 3 graves lie outside the range between southwest/northeast and west/east. The remaining orientations are often to be found in the remaining necropolises, such as Ballesta, Rubert and Pi, which form a separate group and which could be part of a funeral area of Ampurias belonging to the Early Empire and the beginning of the Late Empire. In these three necropolises, of the 38 graves whose orientations we know,[13] we see that only 4 faced west/east while 15 faced south/north and 12 north/south, and only 5 faced east/west. It is certainly the case that in these necropolises there is a high dispersion of orientations.

As Almagro noticed,[14] it is possible that here we are dealing with two communities with different burial customs, a division that is also reflected in the spatial distribution of the graves, which is less ordered in the necropolises closer to the Roman city. That is, the orientations, the topography and the dating reveal two different sets of graves[15] in Ampurias in Late Antiquity:

(i) graves, for the most part early (although with some overlap in time), which were located near the walls, in the midst of the ancient necropolises where incineration had been practised; and

(ii) graves supplied by various late suburban *villae* (and certainly later than or contemporary with the abandonment of the city in the late third century A.D.), located in particular areas and following the late custom of orientation towards the east.

REFERENCES

1. The late Roman necropolises, where inhumation was always practised, are dated in Ampurias between the third and the fifth/sixth centuries A.D. They are in two areas. One consists of necropolises where these inhumations shared space with incinerations and inhumations of the Early Empire and which seem to have terminated with the end of the city itself, late in the fourth century (Ballesta, Rubert, Pi and Bonjoan), the other of areas of new funerary practices (Castellet, Nofre, and Estruch, together with Martí, where there was a return to use of an earlier Greek funerary space, and Neápolis, near a cult building). Broadly speaking, the first group (except for Bonjoan) seems linked with the period when the city itself flourished, while the second is certainly associated with the late, suburban Roman villas, and with people living away from the ancient Palaiápolis (today St Martí d'Empúries). In addition, there are other burial sites associated with Visigoth Christian temples.
2. There is no doubt that the excavations carried out in the area in recent years by a number of teams, for various reasons and notably because of road construction, have made significant contributions to the increase of our understanding of funerary customs in the Ampurias region in Late Antiquity.
3. See J. Mª. Nolla and J. Sagrera, *Les necròpolis tardanes de la Neàpolis* (Vic, 1996).
4. M. Almagro, *Las necrópolis de Ampurias II: Las necrópolis romanas e indígenas* (Monografías Ampuritanas, Barcelona, 1955), further examined by A. Lopez Borgoñoz, "Ampurias: Consideraciones sobre las necrópolis bajoimperiales", in *Actas del XIV Congreso Internacional de Arqueología Clásica* (Tarragona, 1994), ii, 423–4. Other publications by Almagro include "Nuevas tumbas halladas en las necrópolis de Ampurias", in *Ampurias*, no. 24 (1962), 225–34, and M. Amalgro and P. Palol, "Los restos arqueológicos paleocristianos y altomedievales de Ampurias", *Revista de Girona*, no. 20 (1962).
5. Michael Hoskin, "Arqueoastronomía", *Universo*, no. 3 (July 1995), 52–57, and "One specialist among many", *Archaeoastronomy and ethnoastronomy newsletter*, no. 21 (September 1996), 1; J. A. Belmonte, "Arqueoastronomía, ¿un término adecuado?", *Universo*, no. 23 (March 1997), 30–34.
6. Some of this work is developed further in a broad study that re-examines the orientations of late Roman graves and their relation to sunrise: A. Lopez Borgoñoz, "Orientaciones de tumbas y sol naciente: Astronomía cultural en la antigüedad tardía", *Actas del XXIII Congreso Nacional de Arqueología, Cartagena 1997* (Zaragoza, in press).
7. "Los cadáveres están orientados con la cabeza hacia el SO matemático, o sea, el O visual", Almagro, *Las necrópolis*, 305.
8. An exception is P. Rahtz ("Late Roman cemeteries and beyond", in R. Reece (ed.), *Burial in the Roman world* (CBA Research Report no. 22, London, 1977), 53–64), whose archaeotopographic results can be relied upon.
9. Almagro, *Las necrópolis*, 321.
10. This is quite different from Greek burials, in which the heads were usually to the west, according to Almagro.
11. The number of degrees is not specified, the indication of orientation is subjective and only approximate.
12. Lopez Borgoñez, *op. cit.* (ref. 6).
13. A total of 49 graves have been published, of which 11 have no specified orientation.
14. Almagro, *Las necrópolis*, 307.

15. Of the plans that have come down to us of the graves found in Neápolis, the burials either clearly show an orientation with the head roughly to the west, or the grave is clearly aligned west–east (although we do not know in which of the two possible directions the body itself was laid out). The work of Nolla and Sagrera on these graves (*op. cit*., 250–1) shows that of the 493 listed graves, 467 (94.7%) were oriented with the head to the west and the feet to the east, while 18 (3.7%) of the rest had no given orientations and the remaining 8 (1.6%) had other orientations. The authors state that this custom prevailed throughout the Ampurian region at this period.

[*Continued from page S92*]

ORIOL MERCADAL I FERNÀNDEZ is an archaeologist and Gestor del Patrimonio at Puigcerdà in western Catalunya. He is Director of Museu Cerdà at Puigcerdà.

WILLIAM BREEN MURRAY teaches in the Faculty of Humanities and Social Sciences in the University of Monterrey. He has published widely on rock art and artefacts from Mexico and the United States, especially in relation to calendrical questions.

ANTÓN A. RODRÍGUEZ CASAL is professor of Prehistory at the University of Santiago de Compostela. He is the author of *O megalitismo: A primeira arquitectura monumental de Galicia* (1990), and editor of *O neolítico atlántico e as orixes do megalitismo* (1997), and is currently preparing a monograph on the megalithic monuments of the Iberian Peninsula.

KEITH SNEDEGAR earned a doctorate in Modern History from the University of Oxford, and in 1994 held a postdoctoral fellowship at the University of Cape Town. His research interests include history of medieval astronomy as well as southern African ethnoastronomy. He now teaches history of science and technology at Utah Valley State College.

NUNO MIGUEL SOARES took his master's degree in archaeology, and has since been engaged in numerous studies and investigations in the area of prehistory. He has made a special study of megalitism in the region of the basin of the Rio Lima.

LUIX MARI ZALDUA is an archaeologist working in the Urnieta Council Heritage Department.

Archaeoastronomy, no. 23 (*JHA*, xxix (1998))

FIRST FRUITS CELEBRATIONS AMONG THE NGUNI PEOPLES OF SOUTHERN AFRICA: AN ETHNOASTRONOMICAL INTERPRETATION

KEITH SNEDEGAR, Utah Valley State College

This paper has to do with two sorts of first fruit. One is the first fruits celebrations of the Nguni peoples of southeastern Africa. I am principally concerned here with the astronomical elements, both practical and symbolic, that these festivals utilize. The African clans who gave themselves such names as Tsonga, meaning "people of the sunrise", or Zulu, "the people of heaven", had clearly taken notice of the sky. In studying Nguni traditions I wanted to collect material on their star names and celestial terminology, calendrics, mythology; and to explore the prospects for astronomical dating of oral histories. I anticipated that the Nguni would have incorporated their astronomical understanding in their ritual practices. As the most dramatic events in their ritual year focus on the chief's tasting of the first fruit of the harvest, these ceremonies make a natural object for investigation. Secondly, this paper itself is the immediate product of my studies in Southern Africa in 1993; given at the Oxford IV conference in Stara Zagora, Bulgaria, in August of that year, it represents the first fruit of my research.

As I shall be discussing such peoples as the Bhaca, Ndebele, Swazi and Zulu, let me begin with a thumbnail introduction of them. All belong to a group of southern Bantu-speaking peoples called the Nguni, who before the sixteenth century had migrated from east-central Africa to their present homelands in what today constitutes Mozambique, South Africa, Swaziland and Zimbabwe. The Nguni retained a clan structure that kept them socially and politically disunited until the early nineteenth century, when larger states began to accrete around powerful warlords. The most successful of these new leaders was Shaka of the then inconsequential Zulu clan. During his reign, from 1818 to 1828, the Zulu established their hegemony over their neighbours, forming a political unit as large as most Western European countries, an empire defended by tens of thousands of rigorously drilled warriors owing their allegiance to the Zulu king. The Bhaca, Ngcobo and dozens of other clans submitted to Zulu domination. The Swazi were likewise attempting to build a kingdom for themselves about this time. No match for the Zulu, they had the good sense to come to a diplomatic understanding acknowledging Zulu suzerainty. Clans not paying tribute to the Zulu had the choice of destruction or exile. The Ndebele were among those choosing exile, moving north into the Transvaal and then across the Limpopo River in the 1830s. The refugee Ngoni clan did not stop for another thousand kilometres, not settling down until they had reached the shores of Lake Malawi.

Before European colonialism arrived in full force toward the end of the nineteenth

0142-7273/98/0023-0031/$2.50

century the practice of *eshwama* — the celebration of the first fruit of the year's harvest — was universal among the Nguni. The Zulu called their *eshwama* the *umkosi*. To this day the Swazi hold their annual festival, the *incwala*; the Ndebele called it the *inxwala*; it was *ingcubhe* among the Bhaca. The *eshwama* had originally been an agricultural rite conducted privately in each kraal or homestead. A parallel can be drawn between the various Nguni *eshwamas* and the first fruit offerings of the ancient Hebrews (*cf.* Leviticus 23: 9–14; this of course is not to say that any direct historical connection existed between these cultures). During the period of African state formation the *eshwama* increasingly became a rite of clan identification and symbolic revitalization, focusing on the chief's secular powers and supernatural potency. Under the Zulu and Swazi particularly it became a national military festival. The celebrations had many facets of cultural meaning. They were conducted in part to ensure the success of the incipient harvest, to cleanse the king or chief of any evil magical influences, and to strengthen warriors so they might be brave and victorious in battle. Chiefs would use the occasion to promulgate new laws; sometimes they would allow regiments of a certain age-set to marry (normally, troops in active service remained bachelors). These were important affairs in the life of an African chieftaincy.

Our knowledge of the Nguni *eshwama* tradition is quite imperfect. Though we have early European commentators to thank for much information, indigenous first-person accounts are rare; in the past century the tradition has also been significantly eroded to the point of being nearly extinct. The last full observance of the Zulu *umkosi* took place in January 1879, a few weeks before the British invasion and conquest. Similarly, the suppression of the Ndebele in 1896 put an end to that people's *inxwala* tradition. Where first fruits celebrations were less clearly linked to political independence, as among the Bhaca, Christian missionary activity undermined indigenous practices in a more gradual way. The Bhaca performed their last complete *ingcubhe* in 1926. Thereafter Christianized Bhaca held more sway than those who kept to traditional beliefs, and after 1930 the traditionalists practically abandoned their efforts to continue. David Hammond-Tooke watched a pathetic attempt at a revival in 1949.[1] As the chief did not join the celebrants, the gathering was fruitless both symbolically and literally. European conventions of time-reckoning have also influenced Nguni peoples continuing to hold *eshwamas*. In recent years Ngcobo first fruits celebrations have invariably run from Wednesdays to Saturdays, with the culminating rituals on the final day so as to be on a weekend.[2] Modernization had been a contentious issue for the Swazi in 1921, at the inaugural *incwala* under paramount chief — later king — Sobhuza II. Some Swazi who had been educated by Europeans wanted to set the date according to printed calendars, while the governors of royal villages, who seem to have prevailed on this occasion, argued that tradition dictated indigenous methods of selecting the appropriate day.[3] Nowadays the *incwala* occurs in the National Sports Stadium and the date is set according to the Gregorian calendar.

Evidence concerning *eshwama* practices now directly available from Nguni

sources is quite limited. Some oral traditions have been preserved, though not systematically collected. One diligent scholar, James Stuart, has left us a record of hundreds of conversations he had with Zulu informants from the 1890s to the 1920s.[4] A few interviews contain nuggets of material pertinent to *eshwama*. In the 1930s and '40s, while many valuable informants were still alive, four gifted ethnographers, Eileen Krige,[5] Hilda Kuper,[6] Max Gluckman[7] and David Hammond-Tooke,[8] were conducting field work that would lead to publications on first fruits festivals.

What were the pre-colonial ceremonies like? Practices varied considerably from group to group, from chiefdom to kingdom, but there were essential commonalities. The following description is a composite of the best known traditions from the Zulu and Swazi. Both of these royal *eshwamas* comprised two parts, the little *incwala* or *umkosi* and the big *incwala*/*umkosi*, separated by roughly a fortnight. The king's household alone observed the little *incwala*/*umkosi*; nonetheless, up to 5,000 people could be involved. The Zulu little *umkosi* was also known as the *ukunyatela* or "stepping into the new year", and was held in the month called *Zibandhlela* — corresponding generally to December. At the very end of this lunar month, in fact on the night of the new moon, the king would go into seclusion in his sacred compound. Inside, the royal doctors administered special decoctions to enable the king "to bite the passing year". Early the next morning the king would emerge and proceed to an elevated plot of ground. He would dip his hands into a bowl of medicine — composed principally of a mush of the bitter *uselwa* gourd — and lick the decoction from his fingers. At the moment of sunrise the king spat the medicine in the Sun's direction, reputedly to bless the nation and to confound its enemies.[9] Stuart's informant Mtshayankomo stated that at a certain time younger soldiers would assemble to gather firewood to roast a sacrificial bull. The bull would roast in the fire for two days; on the third day it would be fed to young boys to make them strong. Then regiments of the army would gather at the king's kraal to ask for rain. The common folk would begin rehearsing songs and dances for the big *umkosi*.[10]

Paulina Dlamini, a handmaiden to the Zulu king Cetshwayo, gave the following account of a big *umkosi* in the 1870s.[11] At sunrise on the appointed day the king, emerging from his hut, was adorned in a suit of green reeds and holding a ceremonial spear. "He looked like a tree ... like a monster." As he had done at the little *umkosi*, Cetshwayo gazed angrily at the Sun, spitting *uselwa* gourd mush at it and thrusting his anointed spear in its direction as if to subdue it or draw power from it. The royal wives and entourage greeted him with joyous shouts. The king then left the royal enclosure to take the salute of the army. Passing before the monarch his regiments danced wildly and sang the *Ngoma*, a song that would be sung only on this day. (Death was said to be the penalty for singing it at any other time.) About midday a sacrificial bull was led to the warriors and, barefisted, they pummelled it to death. The animal's bones were burnt to ash, which was considered a potent strengthening medicine given to the king and army. The finale came when the king threw a number of gourds at the warriors, causing a mêlée to grab a piece of them.

This throwing of gourds initiated the new year; the people could then eat the first fruits of the season. Swazi ceremonies are much the same, except that the king wears an outstanding feather headdress and he smashes a gourd on his shield. The tradition of the bull has since been altered to quiet opponents of cruelty to animals.[12] Even from this brief outline it is clear that the ruler is the focus of the ceremonies. While the essential rituals pre-date the nineteenth-century monarchies, Swazi and Zulu kings easily appropriated *eshwama* iconography for the political aggrandizement and symbolic legitimatization of their regimes. The Zulu have a saying that a chief is not simply he who is greatest among his people, he is also the child of the sky.[13] Chiefs and kings were traditionally seen as intermediaries between the people and the ancestor spirits inhabiting the forces of nature. The astronomical elements of the *eshwama* tradition come into play here. Chiefly authority finds expression through celestial metaphors. Nguni peoples likened their chiefs to the Sun and Moon, celestial bodies governing time, hence the importance of holding the celebrations at the proper time. Southern African chiefs and kings, mediating supernatural forces, presided over first fruits celebrations, creating fundamental epochs in indigenous temporal systems.

"We find the Sun standing in the relation to the Moon and stars of a Zulu chief to his subordinates", wrote J. A. Farrer.[14] The Sun's nature, its celestial heat and light, worked as a metaphor for the chief's terrestrial authority. Just as the Sun outshines all other bodies, the king stands above all other men. Just as life on Earth depends on solar beneficence, so do the people grow and prosper under the guidance of their rightful king. "The king is the Sun, Great Male of the Heavens", the Swazi saying goes.[15] In the *izibongo* or panegyric of Dingane, the Zulu king is greeted: "Rise, O Sun, let the Zulus warm themselves [in you]."[16] More remarkably, praise singers hailed Shaka as the Sun "who eclipsed another with his rays".[17] The loyal masses who attended the little *umkosi* of 20 December 1824 may have witnessed just such an occurrence when, shortly after one o'clock in the afternoon, the sky began to darken. The centreline of an annular eclipse passed very nearly over Shaka's royal kraal; more than 90% of the Sun was obscured from where the celebrants stood. If we are to believe E. A. Ritter's account of that day — sadly unsupported by sources independent of him — the *umkosi* celebrants went mad with terror, believing that an evil spirit was devouring the Sun. Shaka kept his nerve long enough for the eclipse to wane. To bolster the effect he took more treatment from his doctors and he commanded the Sun to return, which of course it did. The Zulu nation had been saved by its glorious king; Shaka's prestige reached its highest level as a result.[18]

Not all eclipses added to royal authority. After the partial eclipse of 18 August 1849 one of king Mpande's regiments mutinied and fled to Swaziland. Mpande reputedly lamented: "See the Sun is broken, broken in the middle and so am I, I am broken and done."[19] The destiny of the king was considered to be linked with the Sun. In *eshwama* ceremonies the king spits at the Sun for the people's good fortune, as well as a share of solar potency.

The Moon also exerts itself on *eshwama* practices. Lunar phases represent the

sequence of life's passage: birth, growth, decay and death. As late as the mid-twentieth century Nguni parents ritually exposed their newborn to the waxing Moon before the infant received its name. Full moon was traditionally observed as a time to conduct business, when everything is at its greatest potential. No work, however, was to be done at new moon, the Moon's death.[20] Following death is rebirth, but not so much the resurrection of an individual as that of the life-force itself. Nguni peoples were not certain what happened when the old moon disappeared or died and a new moon subsequently appeared. Some thought it was the same moon miraculously revitalized. Others believed that a new moon came into being each month. Either way, a moon comes along every month. On earth the chief embodied this lunar mystery for his people. So long as he was properly doctored against evil, it was he who ensured the growth of crops within his domain, and it was he who consecrated the season's first fruit by the throwing of the gourds. He presided over the death of the old year and the birth of a new one. Lunar symbolism appeared in Zulu ceremonies in the form of the king's spear, whose blade Paulina Dlamini specifically described as crescent-shaped, resembling a young moon. The central feature of the Swazi little *incwala* is the monarch's seclusion during the new moon. Royal doctors medicate the king against this crisis; when the old year dies the king himself is weak. The Swazis say: "The king grows with the Moon."[21] Thus the king emerges from the royal enclosure only after a crescent moon is sighted. While the king remains hidden, the people outside join in a dance which begins in a crescent formation and becomes a full circle, prefiguring the waxing phases of the month. The king attains his full ritual potency at the big *incwala* which is naturally celebrated at full moon.

The temporal location of the *eshwama* is set within a lunar calendar. Swazi traditionalists in particular believed that if the ceremonies were mistimed, additional rites had to be performed to avoid national calamity. Whereas the Swazi and Zulu conducted their major rites in December or January, at least in the twentieth century the Bhaca celebrated in February or March, as the Ngcobo also have done in recent years. Hammond-Tooke imagined the Bhaca had good reason to celebrate their first fruits at a later time: farming in a highland region, their crops matured later in the season. But evidence also suggests that some groups had a ritual priority over others, who could hold their *eshwama* only after their political superiors had completed theirs. Information available on the Bhaca ceremonies from 1925 to 1930 reveals another quirk. They were performed at new moon, with the exception of the 1930 event which was at full moon.[22] The Swazi have always held their little *incwala* at new moon and the big *incwala* at full moon. Apparently the Ndebele, Ngcobo and others always held their rites at full moon.

In September 1900, James Stuart elicited material from a man named Ndukwana on how the Zulu fixed the date of the *umkosi*. Commoners, Ndukwana replied, knew very well that the celebrations were approaching when the mealies or sorghum began to mature; they also noted the movement of Zulu regiments at the time of the little *umkosi*; then they knew the great celebration was "one moon" away.

TABLE 1. Zulu and Swazi month-names.

	Zulu	Swazi
1.	Masingana	Bhimdiwane
2.	Nhlolanja	Indlovana
3.	Ndasa	Indlovulenkhulu
4.	Mbasa	Mbasa
5.	Nhlaba *or* Ngula-zibuya	Inkhwekhweti
6.	Nhlangula	Inhlaba
7.	Maquba *or* Ntlangulana	Kholwane
8.	Ncwaba	Ingci
9.	Mandulo	Inyoni
10.	Mfumfu	Imphala
11.	Lwezi	Lwetti
12.	Zibandhlela	Ingongoni
13.	Mpangazana *or* Ndid'amaDoda	—

The king commanded the people to gather at his royal kraal at a time of his choosing. Making the decision, Zulu kings consulted their *izinyanga*, or doctors, in order to establish to proper time. Ndukwana did not say how the *izinyanga* reckoned the time, probably because he was not one of them. In fact we have no unambiguous source on Nguni time reckoning. In ethnological literature the *nyanga* is often called a herbalist or doctor because most of his activities had to do with herbal preparations for magical or medical ends. However, the *nyanga* also had the responsibilities of a royal functionary, fortune teller, confidant, and counseller. It is highly likely that *izinyanga* had specialized knowledge of the traditional calendar; and they certainly kept a tally of the number of days before the ceremonies were to commence. Advance notice was essential. People from around the kingdom travelled considerable distances to the Zulu king's residence. Ndebele *izinyanga* reportedly kept tally sticks in connection with their *inxwala*. "The high priest made a cut on a stick each time there was a new moon", recounts Wallace Bozongwana,[23] "and when these came to thirteen he went to the king to inform him that the year had ended and that iNxwala (new year celebration) be made as soon as possible."

The question remains, which 'moon' was the right one for the *eshwama*? Nguni peoples used a lunar calendar rectified through the observation of natural signs: avian behaviour, flowering times, the onset of the rainy season, and the dawn rising of certain stars.[24] Zulu folk identified the nesting season of the Black Shouldered Kite with the month *Ncwaba* (August); the dawn rising of the Pleiades with the month *Nhlangula* (June); and the flowering of the River Willow with *Mfumfu* (October). About once every three years a lunation did not correspond with the natural signs associated with that time of year. The people would then argue over the proper month designation. The community debate simply had to play itself out until consensus was reached, a process over which not even a chief had great authority. Some Zulu clans knew the disputed period as *Ndid'amaDoda*, the month that puzzles men. The practice of consensual calendrics has been also documented in Ethiopia and was probably widespread in Sub-Saharan Africa.[25]

Both the Zulu and Swazi recognized the solstices. For the big *umkosi* or *incwala* to be properly celebrated the celebrations had to take place during the lunation

immediately following the summer solstice. This solsticial month would naturally have held additional potency in terms of the solar metaphor. The Zulu were obviously aware of the Sun's annual motion with respect to the horizon when they spoke of the Sun as "coming to rest" or "returning to its home" at this tree or that mountain at mid-summer. The Swazi elders who were so vehement about tradition in 1921 were anxious to observe the position of the rising Sun. According to Kuper[26] the headmen of royal villages, as they woke early to supervise those attending the cattle, watched the sunrise and noted the Sun's position against prominent features of the local horizon — like so many others in so many other cultures who watched the skies. Making their observations from their cattle kraals, they utilized no special instruments and built no special structures. An archaeoastronomical survey of these locations would be difficult as the kraals themselves are not permanent structures, but there is a concentration of royal kraals in the central valley of Swaziland. It is fittingly called *Ezulwini*, the Valley of Heaven.

At all events, the notion of a cattle-kraal observatory has a poetic justice. The Zulu author Mazisi Kunene writes in the introduction to his epic *The anthem of the decades* that the universe comprises the Earth and two worlds above it. The world immediately above the Earth contains the celestial bodies that determine time: the Sun, Moon, the Pleiades, Canopus, and the Morning Star. "Without the cosmic bodies of the Second World", Kunene explains, "there would be no time, no seasons, no growth".[27] Beyond them, and having no effect on terrestrial affairs, lies the Third World where the rest of the stars burn as distant jets of fire. In Kunene's conceptual order of things the Earth bears the same relation to the Second World as a man's house does to his kraal. What better place, then, for a Zulu or Swazi elder to be contemplating the celestial time-keepers than out where he is minding his herd?

REFERENCES

1. W. D. Hammond-Tooke, *Bhaca society: A people of the Transkeian uplands of South Africa* (Oxford, 1962).
2. "Ukweshwama: First fruits ceremony in the Ngcobo tribe", unpublished transcript of an interview with Chief Mlungisi Ngcobo, 1968, Killie Campbell Library, Durban.
3. Hilda Kuper, *Sobhuza II* (New York, 1979).
4. C. B. Webb and J. B. Wright, *The James Stuart archive of recorded oral evidence relating the history of the Zulu and neighbouring peoples* (4 vols, Pietermaritzburg, 1976–79).
5. Eileen Krige, *The social system of the Zulus* (London, 1936).
6. Hilda Kuper, *An African aristocracy: Rank among the Swazi* (Oxford, 1947), and *op. cit.* (ref. 3).
7. Max Gluckman, "Social aspects of first fruits ceremonies among the south-eastern Bantu", *Africa*, xi (1938), 25–41.
8. Hammond-Tooke, *op. cit.* (ref. 1).
9. Gluckman, *op. cit.* (ref. 7).
10. Webb and Wright, *op. cit.* (ref. 4), iv, 115.
11. H. Filter and S. Bourquin, *Paulina Dlamini: Servant of two kings* (Pietermaritzburg, 1986), 42.
12. Kuper, *opera cit.* (refs 3 and 6).
13. Axel-Ivar Berglund, *Zulu thought patterns andsymbolism* (Cape Town, 1989).

14. J. A. Farrer, *Zululand and the Zulus* (London, 1879), 144.
15. Kuper, *op. cit.* (ref. 6), 201.
16. D. K. Rycroft and A. B. Ngcobo, *The praises of Dingana: izibongo zikaDingana* (Durban and Pietermaritzburg, 1988), 85.
17. T. Cope, *Izibongo: Zulu praise poems* (Oxford, 1968), 90.
18. E. A. Ritter, *Shaka Zulu* (London, 1978), 290–3.
19. O. F. Raum, *The social functions of avoidances and taboos among the Zulu* (Berlin and New York, 1973), 130.
20. Krige, *op. cit.* (ref. 5); B. A. Marwick, *The Swazi: An ethnographical account of the natives of the Swaziland Protectorate* (Cambridge, 1940).
21. Kuper, *op. cit.* (ref. 3), 64.
22. Hammond-Tooke, *op. cit.* (ref. 1), 179–97.
23. Wallace Bozongwana, *Ndebele religion and customs* (Gweru, 1983).
24. Webb and Wright, *op. cit.* (ref. 4), iv, 363–4.
25. D. Turton and C. Ruggles, "Agreeing to disagree: The measurement of duration in a southwestern Ethiopian community", *Current anthropology*, xix (1978), 585–93.
26. Kuper, *op. cit.* (ref. 3), 64.
27. M. Kunene, *Anthem of the decades, a Zulu epic* (London, 1981), p. xxi.

Archaeoastronomy, no. 23 (*JHA*, xxix (1998))

STUDIES IN IBERIAN ARCHAEOASTRONOMY: (5) ORIENTATIONS OF MEGALITHIC TOMBS OF NORTHERN AND WESTERN IBERIA*

MICHAEL HOSKIN, Churchill College, Cambridge, and colleagues

The Iberian peninsula, which comprises Spain and Portugal, is broadly triangular in shape. Along its northern edge (see Figure 1) it is bordered by the Pyrenees mountains and the Bay of Biscay; along its western edge, by the Atlantic; and along its south-eastern, by the Mediterranean. Megalithic tombs of the Neolithic, Copper and Bronze Ages are rare in the central area of the peninsula, far from the sea and from the mountains that mark the frontier with France, but they are numerous in many of the peripheral regions.

The earlier Studies in this series were devoted to territories along the south-eastern (Mediterranean) side of the triangle. The first three[1] discussed nearly three hundred tombs in Málaga, Granada and Almería, provinces of the 'autonomous community' of Andalucía that lies in the far south. In the two autonomous communities along the Mediterranean coast immediately east of Andalucía, tombs are rare; but they become numerous again in eastern Catalunya, close to the Pyrenees and the French border, and these formed the subject of the fourth Study.[2]

This paper presents the results of extensive fieldwork, conducted throughout the 1990s, in most of the remaining regions of the peninsula where megalithic tombs are plentiful. Nearly everywhere the first author was fortunate to enjoy the collaboration of local archaeologists, who not only took him to many tombs that would have been difficult if not impossible to locate without their help, but who participated in the measurements and later provided for publication in this paper an outline account of the archaeology of their particular region. Iberian archaeologists have thereby taken a lead in recognizing and recording the information that has been preserved for us in the orientations selected by the original constructors of the tombs.

It was inappropriate to list all of these numerous collaborators as authors of the paper as a whole, with shared responsibility for the contents of every section. The paper is therefore a composite, with different authors for each section (the participation of the first author throughout being understood). The megalithic tombs of the peninsula are treated region by region, in an anticlockwise direction beginning with western Catalunya in the central Pyrenees (Section A). In Section D we reach Galicia in the north-west corner of the peninsula, and from there we turn south,

---

* To the memory of Yves Chevalier, whose early death in May 1998 after a long illness robbed archaeoastronomy of its leading authority on southern France.

0142-7273/98/0023-0039/$2.50

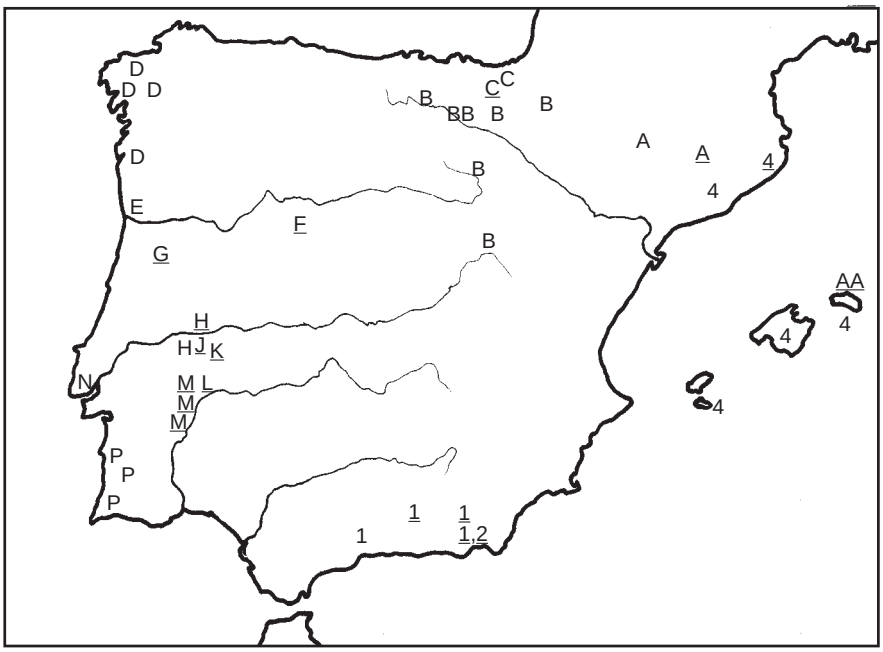


FIG. 1. Map of the Iberian peninsula showing the regions examined in this and the preceding Studies. The letters A, ..., P indicate the sections of the present Study, while the numbers 1, 2 and 4 refer to the preceding Studies (see refs 1 and 2). AA signifies articles on the tombs and sanctuaries of Menorca published in *Archaeoastronomy*, nos. 9, 14, 15 and 16. The sites with numerous tombs are indicated by underlining.

through Portugal and the neighbouring regions of Spain, ending in the far south of Portugal (Section P). Tholos (false cupola) tombs, which occur in limited regions of southern and southwestern Iberia, are reserved for a future Study, as are the megalithic tombs of the southwestern Spanish provinces of Seville, Huelva and Badajoz.

Fortunately the very limited areas of the peninsula where the nature of the rock could have affected compass readings were rarely involved in our investigations, a small zone immediately west of Lisbon (Section N) posing the main threat. We were therefore able to measure the orientations as usual, with an accurate 'off-shore' mariner's compass. Almost every tomb had an entrance lying along an axis of symmetry, and therefore an orientation, which we took to be in the direction from the interior to the exterior. In the tables below, the azimuth of this orientation has been corrected (to the nearest integer degree) for magnetic variation and for the small error in the construction of our compass. Altitudes were measured with a clinometer, and the declinations were calculated with a computer program written by Dr Clive Ruggles.

In order to keep the article within bounds, we here present the data along with

the minimum of context, reserving our interpretation of the orientations for a later Study. It has always been the primary purpose of our fieldwork to assemble data, which archaeologists and archaeoastronomers will then have at their disposal and may interpret as they see fit. For brevity, however, we allow ourselves the use of a convention that already suggests an interpretation. Among the tombs of the Andalusian provinces we encountered two particular customs of orientation. In both, the tombs faced the eastern half of the horizon (but well south of midsummer sunrise). In the more restricted custom, nearly all the tombs faced directions in which the sun rose at some time of the year; this custom we termed 'sunrise', or simply 'SR', though we hasten to note in particular that a tomb that could face sunrise could also face moonrise. In the other, more general custom, the tombs faced *either* in directions where the sun (or moon) rose at some time of year, *or* in directions where invariably the sun had risen and was either climbing in the sky or around culmination ('sunrise/sun-climbing', or 'SR/SC'). In this paper we shall find many examples of SR customs, and a few of SR/SC, and even one SC.

A: WESTERN CATALUNYA

ORIOL MERCADAL I FERNÀNDEZ and SARA ALIAGA I RODRIGO,
Museu Cerdà, Puigcerdà

The Pyrenees mountains that mark the border between France and Spain extend from the Mediterranean in the east to the Bay of Biscay in the west. On the Spanish side of the border, there are numerous megalithic tombs in the regions to either end of the mountain range. Those near the Mediterranean were discussed in the fourth of these Studies, while those in Navarra and the Basque Country, near the Bay of Biscay, are considered below in Sections B and C. In between these two regions (and therefore away from the coasts), megalithic tombs are found in numbers in Western Catalunya, especially near to Andorra and the French frontier.

In this area, the earliest stone tombs were small, rectangular 'Neolithic cists', containing a single burial, or occasionally two. These are dated to the late fourth and early third millennia. Communal tombs then appear in the form of 'Catalan galeries' (or 'sepulchres with wide corridors'), in which the chamber has a corridor that is of similar width; these are assigned to the middle of the third millennium (the 'Late Neolithic'). From the later third millennium we have 'megalithic cists', which are closed chambers with a tumulus, access to the chamber being obtained by raising the cover stone; 'semidolmens', in part man-made but also incorporating natural features; and 'paramegalithic crypts', adapted from natural caves and hollows.

Towards the close of the third millennium we encounter both the 'arca amb vestibul-pou', a sizeable communal tomb with rectangular chamber, tumulus, and access to the chamber from above via a shaft leading down to the front of the

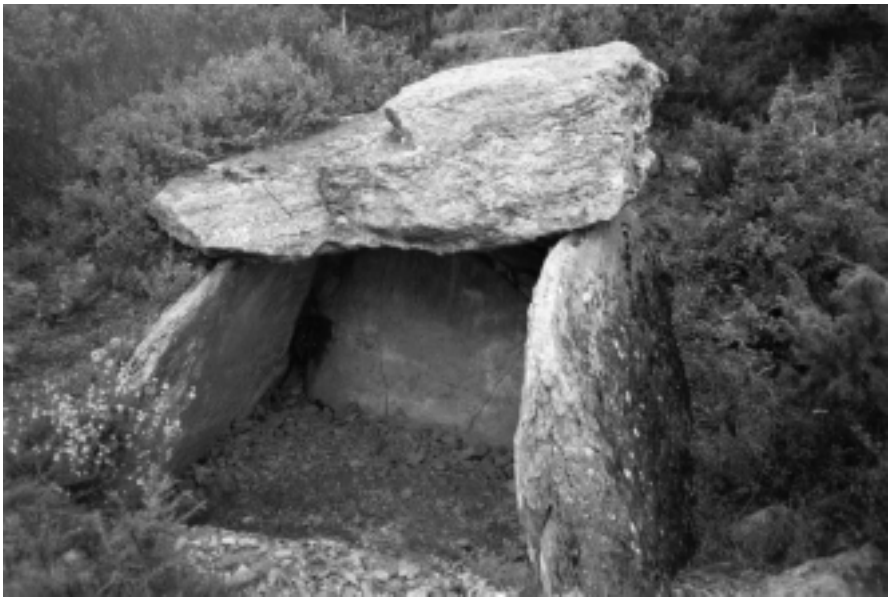


FIG. A1. Dolmen de Ca n'Orèn I, Prullans.

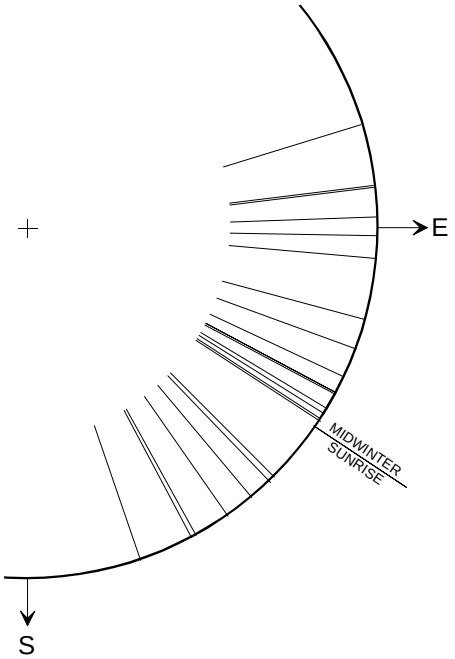


FIG. A2. Orientations of 22 simple dolmens of western Catalunya and Aragon.

TABLE A1. Orientations of 22 simple dolmens of Western Catalunya and Aragon.

Az. °	Alt °	Lat. °	Dec. °	Tomb
Western Catalunya				
73	9	42.2	+18½	Dolmen de Pedracabana, Cabó
83	2½	42.4	+6½	D. de la Barraca del Camp d'en Josepó, Bellver de Cerdanya
83	2½	42.2	+6½	Tarter del Serrat del Malpàs, Cabó
88	0	42.4	+1	D. de Ca n'Orèn I, Prullans
91	0½	42.4	−0½	C. del Moro de les Agudes, Montferrer i Castellbò
95	1	42.4	−3½	Cabana del Moro de Coll de Pou, Montferrer i Castellbò
105	6	42.4	−7	C. del Moro de la Llosa, Les Valls de Valira
115	3	42.2	−16	C. del Moro de Coll de Jou, Montferrer i Castellbò
118	2	42.4	−19	C. del Moro de Turbiàs, Montferrer i Castellbò
118	10	42.5	−13	D. de la Borda, Eina (France)
121	3	42.2	−20½	C. del Moro de l'Oliva, Cabó
122	[1]	42.3	−22	La Casa Encantada de la Serra de Pinyana, Senterada*
123	3	42.3	−21½	D. de la Cabana de la Mosquera, Baix Pallars*
123	4	42.2	−21	C. del Moro de Colomera, Cabó
135	3	42.5	−29	D. de la Cova del Camp de la Marunya, Enveig (France)
136	5	42.3	−28	D. de la Cabaneta de Perauba, Baix Pallars
140	3	42.2	−32½	C. del Moro del Serrat de les Cobertrades, Cabó
145	10	42.4	−28½	C. del Moro de Bescaran, Les Valls de Valira
151	3	42.5	−37½	D. d'Èguet, Èguet (France)
152	13	42.4	−29	D. del Paborde, Alp
161	3	42.4	−41½	C. del Moro de Sarcèdol, Montferrer i Castellbò
Aragon				
110	6	42.6	−10½	Piedra del Vasar (Losa de la Campa), Tella

*Taken from J. P. O'Reilly, "On the orientation of certain dolmens recently discovered in Catalonia", *Proceedings of the Royal Irish Academy*, 3rd ser., iii (1893–96), 573–9. We found that O'Reilly's orientations of other tombs, which we also measured, were remarkably accurate. Dolmen de la Cabana de la Mosquera has been 'reconstructed' and now faces west of south; La Casa Encantada de la Serra de Pinyana we were unable to visit and we have assumed an altitude of 1° for the purposes of calculation.

monument where there was a removable door-stone; and the related 'simple dolmens' with which we are here concerned. As in eastern Catalunya, the simple dolmen was a communal tomb with a rectangular chamber having a monumental slab to each side (see Figure A1). The stone across the entrance was of reduced height, and immediately above it was a space or 'window' that allowed access to the chamber. These simple dolmens were constructed around the period 2200–2000 B.C., and continued in use for nearly a thousand years, during the early-middle Bronze Age.

For the most part the simple dolmens were well scattered, in terrain that is hilly and even mountainous. In the first week of September 1997 the authors, with invaluable assistance from Albert Villaró of La Seu d'Urgell and in company with Aylene Rogers, were able to measure 19 of these dolmens in Western Catalunya (three of them being in fact across the border into France) and one in Aragon. In addition, reliable orientations of two further Catalan dolmens were published long ago; one was not seen by us, while 'reconstruction' has altered the other beyond recognition. The results are listed in Table A1 and shown in Figure A2. Fifteen faced directions in which the sun rose at some time of year (SR), but seven faced

directions in which the sun had always risen and was climbing in the sky (SC). The orientations of the simple dolmens of western Catalunya, therefore, fall into the familiar 'SR/SC' pattern. This may be compared with the eight simple dolmens of eastern Catalunya discussed in the fourth Study which, with one anomalous exception, were 'SC'. The numbers of tombs involved in the two cases are not large, but the evidence suggests that the custom in the east of Catalunya was more restrictive than that in the west.

B: ALAVA, BURGOS, LA RIOJA, SORIA AND EASTERN NAVARRA

As we journey westwards from Catalunya, along the slopes of the Pyrenees, passage tombs are rare. They become numerous again only in the mountainous Basque province of Gipuzcoa which borders on the Bay of Biscay, and these tombs (together with those of the region of Navarra immediately adjacent) are the subject of Section C. There are however a number of sizeable passage tombs of considerable interest thinly scattered across a vast area to the east, south and west of Gipuzcoa. They include tombs with some of the longest corridors in Iberia, and a group all of which face between southeast and south. They were investigated by Hoskin in 1994 in company with Renate Gralewski on the basis of bibliographical information assembled by Elizabeth Allan; in 1996 in company with Jane Spencer and Consuelo Naranja; and in 1997 in company with Aylene Rogers.

FIG. B1. Chabola de la Hechicera, one of the sepulchres with corridor near Laguardia.

TABLE B1. Orientations of 7 megalithic tombs near Laguardia (latitude 42.6°).

Az. °	Alt. °	Dec. °	Tomb
≈140	$0\frac{1}{2}$	$-34\frac{1}{2}$	Alto de la Huesera, Laguardia
142	0	−36	El Encinal, Elvillar
143	0	$-36\frac{1}{2}$	Chabola de la Hechicera, Elvillar
147	1	$-37\frac{1}{2}$	Layaza, Laguardia
172	2	−45	San Martín, Laguardia
≈177	1	$-46\frac{1}{2}$	La Cascaja, Peciña
180	$0\frac{1}{2}$	$-47\frac{1}{2}$	El Sotillo, Laguardia

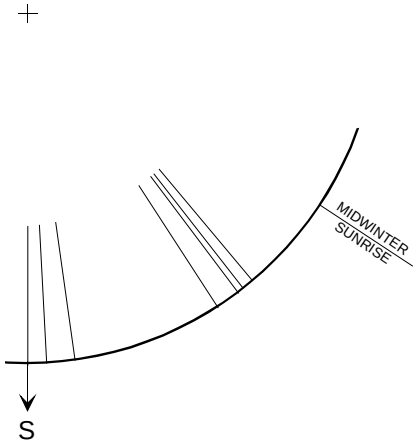


FIG. B2. Orientations of 7 megalithic tombs near Laguardia. This group of tombs is exceptional in that all face well south of midwinter sunrise.

The Tombs near Laguardia

A few kilometres north of the medieval hilltop town of Laguardia, in the Alava province of the Basque Country, the impressive mountains of the Cordillera de Cantabria run in an east–west direction. On the south side of the mountain range, where the steep slopes give way to a gentler incline, lies a line of seven widely-scattered tombs with polygonal chambers formed of orthostats. Six of these clearly have corridors (see Figure B1), and we agree with José Ignacio Vegas[B1] that the seventh, Alto de la Huesera, also has the vestiges of a corridor. The chambers of the tombs of the Laguardia group range in length from 5m to little more than 2m. Details of their orientations are given in Table B1 and shown in Figure B2. They are very unusual in being well south of midwinter sunrise: all the tombs faced the sun long *after* it had risen and was climbing in the sky. SR and SR/SC customs are common in Iberia, but a purely SC custom is very rare.

TABLE B2. Orientations of 6 megalithic tombs near Sedano (latitude 42.7°).

Az °	Alt °	Dec °	Tomb	Comment
101	$0\frac{1}{2}$	– 8	Ciella	
113	1	$-16\frac{1}{2}$	Porquera de Butrón	Corridor 7m long
121	2	–21	La Cabaña	
121	0	$-22\frac{1}{2}$	San Quirce	
126	1	–25	Huidobro	
126	0	–26	Las Arnillas	Corridor 14m long

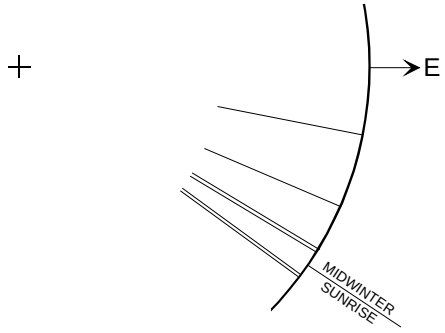


FIG. B3. Orientations of 6 megalithic tombs near Sedano.

Tombs near Sedano

In the region around the hamlet of Sedano, some 100km west of Laguardia and 40km north of Burgos, we located six scattered sepulchres with corridor, one of which has a corridor an extraordinary 14 metres in length. All are on high ground. Details of the orientations are given in Table B2 and shown in Figure B3, where it will be seen that all six tombs faced in azimuth between 101° and 126°, four of the orientations falling within a range of only 5°. Two tombs faced south of midwinter sunrise, but only marginally so, and so the group may be characterized as SR.

Isolated Tombs

(i) Ruyales del Paramo

This sepulchre is one of a pair near the hamlet of the same name, 22km north-north-east of Burgos. Its chamber is 5m in diameter, and the corridor is over 9m long. (Its companion, which lies some 200m away, is in ruinous condition and yielded no orientation.) Although sited on elevated ground outside the village, the tomb is in a hollow; indeed, such is the lie of the land that modern drainage channels posed problems of access. Not only is the tomb's location unusual, but the orientation of 214° is wholly exceptional, and makes it one of the extremely rare Iberian tombs (outside Catalunya) that unequivocally faced the western half of the horizon.

(ii) Cubillejo de Lara de Los Infantes

This sepulchre (Figure B4) also lies on lowish ground, near the hamlet of Quintanilla de las Viñas, 30km south-southeast of Burgos. The chamber is near-circular, and the corridor extends to 10m.

(iii) Atapuerca

We sought the tomb reported at Atapuerca some 15km to the east of Burgos, but of this only a ruined tumulus is now to be seen.

(iv) La Mina

Some 30km southwest of Vitoria is the little hamlet of Molinilla, and near the road to Salcedo lies the sepulchre of La Mina. Its structure has, we believe, been misunderstood. It does not face west; rather, it is a sepulchre with corridor that faces southeasterly, though it is unusual in having an additional structure on the south side of the corridor.

(v) Anda-Catadiano

On a plain in the valley of Cuartango 15km west of Vitoria are the remains of a cluster of four tombs, all now in poor condition. Two — Gurpide Sur and San

FIG. B4. Cubillejo de Lara, south-southeast of Burgos. Like many lowlying tombs in north-central Spain, it has a very long corridor, in this case no less than 10 metres in length.

FIG. B5. Sorginetxe, southeast of Vitoria. In this isolated tomb each successive side-stone leans against its predecessor, a form of construction common in Portugal.

Sebastian Sur — have surviving stones of a corridor or gallery.

(vi) Aitzkomendi and Sorginetxe

The massive tomb of Aitzkomendi, now prominent in a site alongside the main Vitoria–Pamplona road, was discovered more than a century and a half ago, and its corridor fell victim to the early excavators. Some classify it as a sepulchre with corridor, though each side is formed by a single massive orthostat. Some 6km to the southwest is the equally fine dolmen of Sorginetxe (Figure B5). There is no record of this dolmen having a corridor, and its side-stones are not true orthostats but lean against adjacent stones in the manner of so many Portugese tombs.

(vii) Portillo de Enériz and La Mina de Farangortea

Much further east, on elevated ground some 20km south-southwest of Pamplona, near Farangortea, are two galleried tombs of almost identical construction. In each the lower portion of the entrance stone to the chamber survives; the opening has an unusual 'porthole' shape reminiscent of that found in tholos tombs of faraway Andalucía.[B2] The galleries are short but made of substantial orthostats. Although the tombs are perhaps 1km apart, they have identical orientations of 168° (corresponding to a declination of –47°). There is no obvious terrestrial feature that may have been their 'target'.

(viii) Arrako

Close to the French border, near Isaba, high in the Roncal Valley in eastern Navarra, are two tombs. One, Arrako, is a galleried tomb; we found it to face well within the range of sunrise. The other, Sakulo, we did not locate, but its reported orientation is south-southeast, well south of the range of sunrise.

(ix) El Alto de La Tejera

This isolated sepulchre lies 120km southeast of Burgos, and 20km northeast of Soria. It is sited on the top of a hill outside the modern village of Castilfrío de La Sierra, and is in poor condition, with a ruined corridor some 7m in length.

(x) Portillo de Las Cortes

This sepulchre lies a further 100km to the south, near the hamlet of Aguilar de Anguita (in the Guadalajara province of Castilla-La Mancha, but included here for convenience). The chamber is 3m in width, and the corridor is again very long, measuring some 9½m. Three other 'sepulchres' in the area were reportedly excavated long ago. Enquiries suggested that no trace now remains of two of these, at Alcolea del Pina and Anguita. At Garbajosa however we were taken by proud locals to the "dolmen", which disappointingly proved to be formed of natural rocks of unusual shapes, beneath which tradition has it that there were prehistoric burials.

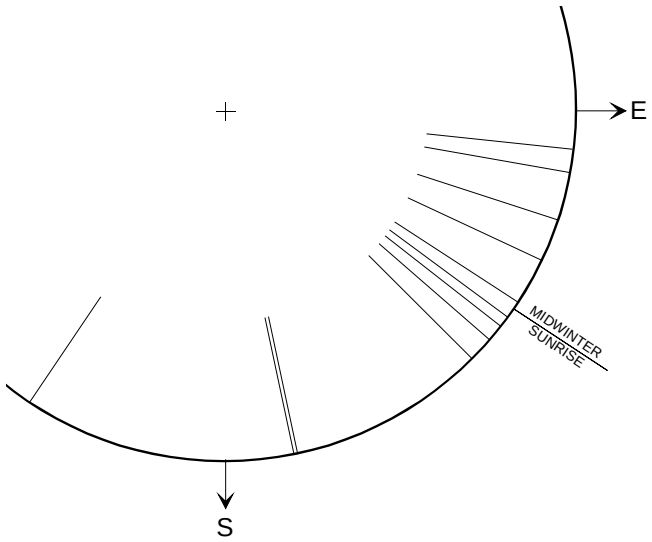


FIG. B6. Orientations of 12 isolated megalithic tombs in the region. The tomb with orientation 214°, Ruyales del Paramo, is one of only two tombs, out of some 400 discussed in this article, that clearly faced the western half of the horizon.

TABLE B3. Orientations of 12 isolated megalithic tombs in the region.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
≈94	6	42.9	+1	San Sebastian Sur, Catadiano	
100	3	42.9	−5½	Aitzkomendi, Eguílaz	
108	10	42.9	−6	Gurpide Sur, Catadiano	
115	1	41.4	−17½	Portillo de Las Cortes, Aguilar de Anguita	Corridor 9½m long
123	11	42.6	−15	Arrako, Roncal	
126	1	42.1	−25½	Cubillejo de Lara, Mambrilla de Lara	Corridor 10m long
128	1½	42.7	−26	La Mina, Molinilla	
131	8	42.8	−22½	Sorginetxe, Arrizala	
135	0½	41.9	−31½	El Alto de la Tejera, Carrascosa de la Sierra	Corridor 7m long
168	−0½	42.6	−47	Portillo de Enériz, Farangortea	
168	−0½	42.6	−47	La Mina de Farangortea, Farangortea	
214	6	42.5	−32½	Ruyales del Paramo	Corridor 9m long

These tombs, many of which have corridors of exceptional length, are scattered over a vast area, 250km from east to west and 200km from north to south. Nevertheless, with the notable exception of Ruyales del Paramo, they all face clearly within the east–south quadrant (Table B3 and Figure B6) and are either SR or SC.

C: GIPUZKOA AND THE NEIGHBOURING REGION OF NAVARRA

LUIX MARI ZALDUA, Urnieta Council Heritage Department

Numerous tombs and other prehistoric monuments are to be found in the mountainous Basque province of Guipuzkoa (and in the region of Navarra immediately adjoining it to the east). The majority are at elevations ranging from 500 to 1200 metres. They are found on mountain ridges dividing two watersheds, on gently sloping hillsides, and to the sides of paths leading from one pasture to another.

The tombs take many forms, and — unlike the impressive monuments studied in the last section — most are small and today in poor if not ruinous condition (though a small tomb may be the focus of a tumulus of impressive size, see Figure C1). The oldest are Neolithic sepulchres with polygonal chambers and corridors of orthostats. Then come galleried tombs, of monumental dimensions, in which the chamber of large orthostats is separated from the gallery by a stone slab; polygonal dolmens; elongated dolmens, smaller than the galleried tombs and having two or more orthostats of modest dimensions for each side and possibly a slab for closing off the entrance; and short dolmens, which may have only one stone for each side, and again may be closed or open. Unfortunately, the present condition of a tomb is often so poor that its type cannot be stated with confidence.

The region was visited by Hoskin in 1996 in company with Jane Spencer and Consuelo Naranja; and in 1997 by Zaldua and Hoskin in company with Aylene Rogers. The sites visited fell into four groups: the Sierra de Urquilla, the ridge of

FIG. C1. Txarrigorri, in the Sierra de Urquilla. Although small, the tomb is the focus of a tumulus that even today is of impressive dimensions.

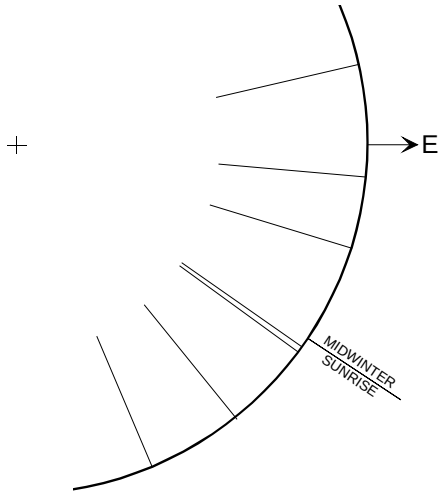


FIG. C2. Orientations of 7 tombs of Sierra de Aralar, where the custom seems to have led to orientations that typically were markedly further south than those found in the three other areas of Gipuzkoa.

TABLE C1. Orientations of 26 megalithic tombs in Gupuzkoa and neighbouring Navarra.

Az. °	Alt. °	Lat. °	Dec. °	Tomb
Sierra de Aralar				
≈77	13	43.0	+18	Uidui
95	$2\frac{1}{2}$	43.0	−2	Zearragoena
107	$1\frac{1}{2}$	43.0	$-11\frac{1}{2}$	Uelogoena Norte
125	5	43.0	−21	Arraztarangaña
126	2	43.0	−24	Uelogoena Sur
141	5	43.0	$-30\frac{1}{2}$	Jentillari
157	$0\frac{1}{2}$	43.0	$-42\frac{1}{2}$	Aranzadi
Sierra de Urquilla				
84	4	42.9	+7	Beotegi
85	0	42.9	$+3\frac{1}{2}$	Intxusburu
106	$0\frac{1}{2}$	42.9	$-11\frac{1}{2}$	Txarrigorri
109	4	42.9	−11	Muñaan
115	1	42.9	$-17\frac{1}{2}$	Igartza Mendebaidea (Trikiharria)
Uharte-Arrakil				
80	2	42.9	$+8\frac{1}{2}$	Aubia
82	5	42.9	+9	Pamplonagain
84	0	42.9	+4	Ipar Aubia
87	2	42.9	$+3\frac{1}{2}$	Ekialdeko Elurmenta
93	5	42.9	+1	Errengeneko Debata 3
97	7	42.9	$-0\frac{1}{2}$	Seakoin 1
101	1	42.9	$-7\frac{1}{2}$	Erbilerri
Hego Aubia, Hiruzolo Txikita and Mendebal Elurmenta are destroyed.				
Northeast Gipuzkoa				
78	$3\frac{1}{2}$	43.2	+11	Ponzontorriko
91	6	43.3	$+3\frac{1}{2}$	Igoingo Lepua 1
92	2	43.2	$-0\frac{1}{2}$	Arritxieta
97	2	43.2	−4	Sagastietako Lepua 1
100	2	43.2	−6	Sagastietako Lepua 2
102	3	43.2	−7	Akolako Lepua 1
103	$8\frac{1}{2}$	43.2	$-3\frac{1}{2}$	Akolako Lepua 2

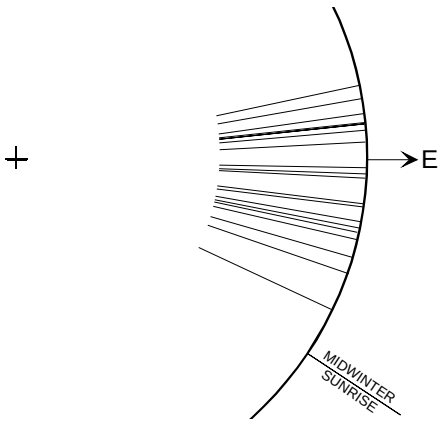


FIG. C3. Orientations of 19 tombs of Sierra de Urquilla, Uharte-Arrakil and northeast Gipuzkoa.

which forms the border between Gipuzkoa and Alava; the Sierra de Aralar; the region of Uharte-Arakil in neighbouring Navarra; and the northeast corner of Gipuzkoa, not far from San Sebastián. A total of 26 orientations resulted (Table C1), of which all but two are SR.

Two comments should be made. First, within the SR custom there are notable differences between the different areas. On the Sierra de Aralar the orientations of the seven tombs are scattered over a range of 70° (see Figure C2), and two of the seven are clearly SC while two more faced close to midwinter sunrise. By contrast, the nineteen other orientations lie within a range of only 37° (Figure C3) and most of the tombs faced sunrise in the spring and autumn; in particular, of the seven near Uharte-Arakil only one has a negative declination of significance. Local variations within an overall SR custom will occur in several of the following sections, and pose an interesting challenge to the interpreter.

Second, while the tombs whose orientations we have listed in this section are overwhelmingly SR, the published inventory of Gipuzkoa monuments[C1] suggests that we should hesitate before characterizing the custom of the region as such. It is true that the inventory assigns certain orientations that we found to be seriously in error. Nevertheless, the inventory does imply that a sizeable minority of tombs *not* measured by us are SC rather than SR, and if so then our sample cannot be wholly representative.

D: GALICIA

ANTÓN A. RODRÍGUEZ CASAL, University of Santiago de Compostela

Galicia is the autonomous community of Spain that occupies the northwest corner of Iberia, being bounded by Portugal to the south and by sea to the west and north. Its most celebrated city is Santiago de Compostela, whose cathedral houses the reputed tomb of the apostle St James. Galicia is rich in Neolithic and Bronze Age remains, belonging to cultures that are related to those of neighbouring Asturias and, more especially, northern Portugal. Tumuli, or *mámoas*, are extraordinarily abundant: the catalogue for the province of Lugo lists no fewer than 748, while the inventory for the province of Pontevedra contains an astonishing two thousand.[D1]

By contrast, those stone communal tombs, or *antas*, that are currently accessible to the investigator are thinly scattered. All are megalithic in the literal sense: tholos (false cupola) tombs are unknown, and the use of dry-stone walling is exceptional. They are varied in location, size and structure, and there is no agreed classification, but they fall into three main types:

(i) *Antas simples* ('simple dolmens'), with a small chamber, completely closed and usually with a single capstone. The chamber is typically polygonal or near-circular, and of less than 2m in diameter.

FIG. D1. The Dolmen of A Mina de Parxubeira (A Coruña), a typical *anta de corredor* of Galicia.

(ii) *Antas de corredor* ('passage tombs'), the most impressive monuments, and the ones with which we are concerned. Here the polygonal chamber (see Figure D1), which may be up to 4m or 5m in diameter, has an entrance, and therefore an orientation. A seven-stone chamber (backstone plus three stones to each side) is common. In some cases the entrance leads to a corridor which may have its own capstone(s), but in other cases the corridor may not be clearly differentiated from the chamber, the sidestones of the chamber simply converging at the entrance. Lengthy corridors are unknown, and overall the chamber and corridor may measure up to 7m. Radiocarbon studies suggest that construction of these tombs began soon after 4000 B.C., reached a peak around 3000 B.C., and continued until late in the third millennium.

(iii) *Arcas megalíticas* ('megalithic cists'), simple tombs with a single, carefully worked capstone and a rectangular chamber. These were a prelude to the cists for individual inhumation that become common in the early Bronze Age.

In July 1995 the authors measured 32 *antas de corredor*, and in November of that year a further 4. Accurate measurement was made difficult by the frequent absence of a corridor; and when present, the corridor is sometimes not aligned with the backstone. At Mámoa da Caída (Lugo), for example, the corridor is aligned some 20° to the south of the direction faced by the backstone, while at neighbouring Mámoa do Pecado (Lugo) the corridor is aligned well to the north of the backstone. As a result, the azimuths listed in Table D1 and shown in Figures D2 and D3 are subject to unusually large uncertainties, and in the case of two tombs, Cavada

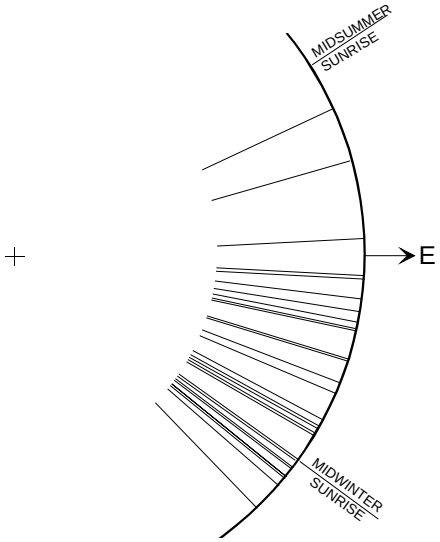


FIG. D2. Orientations of 27 *antas de corredor* of the Galician provinces of A Coruña, Lugo and Pontevedra. Where backstone and corridor have different orientations, the backstone is shown.

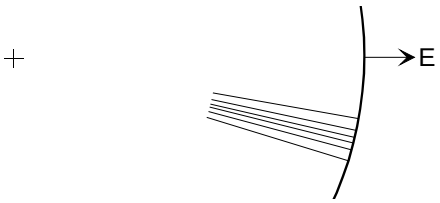


FIG. D3. Orientations of 6 *antas de corredor* near the Portuguese border with Galicia.

2 and Casolo do Foxo, we were unable to interpret the monument with reasonable certainty and so no orientations are listed for them.

Elsewhere the variety of location and structure, and the poor condition of some of the monuments, often made interpretation difficult. There was also a wide variation in size. Three of the tombs we visited, Pedra da Xesta 1 and Cavada 1 and 2, in the Península de Barbanza near the coast towards the south of Galicia, are tiny (in the case of Cavada 2 the area of the chamber was barely one square metre). Two others, Casota de Freán and A Fornela, were neighbouring monuments unusual in having rectangular chambers with only a single, massive stone at each side. The remainder were sizeable *antas de corredor* with more complex chambers.

It is clear from Table D1 that all the tombs are clearly SR/SC (as indeed are the two omitted tombs, Cavada 2 and Casolo do Foxo). In this respect the location of

TABLE D1. Orientations of 36 *antas de corredor* of Galicia.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
Province of A Coruña (NW Galicia)					
93	4	43.0	+0½	Arca da Piosa	
93	2½	42.7	−0½	Casota do Fusiño	
97	3	42.9	−3	Parxubeira	
99	3½	42.6	−4½	Axeitos	
101	5	43.0	−4½	Pedra Cuberta	
≈102	3	42.8	−7	Argalo	
102	−0½	42.7	−9½	Pedra da Xesta 1	
107	3½	43.1	−10	Casota de Freán	
113	−0½	43.0	−17½	Casa dos Mouros	
118	0	43.0	−20½	Forno dos Mouros	
119	1½	43.0	−20	Monte Carneo	
120	3½	42.7	−19	Arca de Barbanza	
127	3	43.2	−24	Dombate	
129	0½	43.1	−27½	A Fornela (Aprazadoiro)	
≈129	1	42.7	−27	Cavada 1	
typ		42.7	typ	Casota do Paramo	Corridor not *in situ*
unc		42.7		Cavada 2	Interpretation debatable
Province of Lugo (NE Galicia)					
74	1	42.7	+12	Campo de Valentín	
107	2½	42.7	−11	Santa Mariña 30	
119	1	43.0	−20½	Vieiro 1 = D. de A Moruxosa	
≈120	0	43.1	−22	Mámoa do Pecado	
127	3	42.7	−24	Santa Mariña 19	
127	1	43.1	−25½	Mámoa da Caída	Corridor faces 147°
134	3	42.7	−28½	Santa Mariña 11	Corridor faces 120°
137	1	43.1	−32	Dolmen de Bravos	
Province of Pontevedra (SW Galicia)					
65	0½	42.3	+18	Mámoa do Rei, M. Cabeiro	
≈87	5	42.4	+5½	Mámoa do Rei, Morrazo	
111	−0½	42.2	−16	Dolmen de Meixueiro	
127	2	42.3	−25	Chan de Arquiña	Much restored
Province of Ourense (SE Galicia)					
100	1½	41.9	−6½	Outeiro de Cavaladre 5	
102	−0½	42.1	−9½	Outeiro de Ferro-Penagachi 11 (Portugal)	
103	0	42.1	−10	Outeiro de Ferro-Penagachi 16 (Portugal)	
104	1½	41.9	−9½	Veiga de Maus de Salas	
105	2	41.9	−10	Outeiro de Cavaladre 1	
107	−0½	42.1	−13½	Outeiro de Ferro-Penagachi 9 (Portugal)	
unc		41.0		Casolo do Foxo	Interpretation debatable

typ: quantitative measure not possible, but typical of tombs of this group.
unc: uncertain orientation as interpretation debatable.

Note: here and below, where the orientations of the backstone and corridor differ significantly, the table and the relevant figure show that of the backstone.

the major tomb of Pedra Cuberta is particularly significant: the large stones of which it is constructed were dragged several hundred metres down the eastern slope of a valley, across, and half-way up the western slope, apparently in order that the tomb might look easterly (and towards an acceptably low horizon).

It is a moot point, whether the prevailing custom could be considered strictly SR.

The only tombs that may have faced significantly too far south for sunrise are: *A Fornela* (dec. $-27\frac{1}{2}°$), whose unusual three-stone chamber has already been mentioned; *Cavada 1* (dec. −27°), a tiny tomb also with a rectangular chamber; *Santa Mariña 11*, whose backstone faces south of midwinter sunrise (dec. $-28\frac{1}{2}°$) but whose corridor faces 14° further north (dec. $19\frac{1}{2}°$); and *Dolmen de Bravos* (−32°), which is indeed a hill-top tomb with a complete seven-stone chamber, though of reduced size. Dolmen de Bravos is therefore the only regular *anta de corredor* to face too far south for sunrise, which it does by some 12°. It seems preferable to regard this tomb as a minor anomaly, and to conclude that the Galician tombs may be considered SR. Interestingly, the six tombs we measured along the frontier with Portugal in the far south of Galicia, not only are SR but have orientations within the narrow range 100°–107°.

E: THE MINHO REGION OF NORTHWEST PORTUGAL

NUNO MIGUEL SOARES

The Minho occupies an area of nearly 5,000 square kilometres of northwest Portugal, being located in the ancient Iberic massif, which, with its deep valleys separated by mountains and areas of plateaux, was ideal location for early human settlement. Although thought of for a long time as a "peripheral" area in the archaeological investigation of pre-historic megalitism (the first scientific excavations date only from the middle of the 1980s), the Minho is now an area of recognised importance, as is Galicia to the north, with which it has many evident similarities. Although many of the monuments have now been studied — especially along the coast, around the estuary of the River Lima, and in the plateau of Castro Laboreiro — unfortunately in some cases the results have yet to be published.

The tradition of constructing megalithic monuments first appeared here around the beginning of the fourth millennium B.C. However, the information so far published concerning Mamoas 2 and 3 of the Alto da Portela do Pau (Castro Laboreiro) in fact indicates the second half of the fifth millennium as the possible construction date, while another source appears to place the abandonment of Mamoa 2 in the first half of the fourth millennium. It is possible that in the first half of the third millennium there appeared, side by side with the simple sepulchres under mounds, monuments with an entrance or with a well-differentiated but short corridor, and this was probably the case with monuments of the megalithic group of the Mezio (Mamoas 3 and 4); but it is in the second half of this millennium that we encounter dolmenic structures with corridor of undifferentiated type and significant dimensions (such as the Dolmens of Barrosa (Figure E1), Eireira and S. Romão do Neiva).

The movement towards the colonization of the coastal plains, in contrast to the previous custom of settling in the high lands of the interior, seems to have established

FIG. E1. The Dolmen of Barrosa. No entrance stones separate the corridor from the chamber.

TABLE E1. Orientations of 8 megalithic tombs of the Minho region of Portugal.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
80	1	41.9	+8	Mamoa 4 do Mezio, Arcos de Valdevez	
86	0	41.6	+2½	Mamoa 1 do Rapido, Esposende	Corridor faces 95°
91	5	41.8	+2½	Mamoa da Eireira, Afife, Viana do Castelo	*Allée couverte* in form
97	1½	41.6	−4½	Mamoa 1 de Castelo de Neiva, Viana do Castelo	Corridor faces 70°
102	3	41.9	−7	Mamoa 3 do Mezio, Arco do Valdevez	
105	1½	41.8	−10½	Anta da Barrosa, Vila Praia da Ãncora	
113	0	41.6	−17½	Anta da Portalagem, Esposende	
116	0½	41.5	−19	Mamoa 1 de Cima de Vila, Esposende	

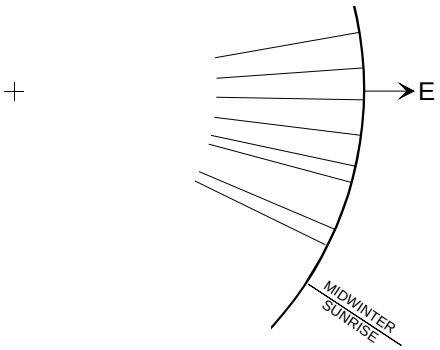


FIG. E2. Orientations of 8 megalithic tombs of the Minho region of Portugal.

the phenomenon of "anti-necropolis", in which the tombs were distributed around the landscape and used as markers for the territorial borders. It is possible that to this period also belong the mounds without dolmenic structures (such as Mamoa de Aspra (Caminha)) and monuments with small chambers and undifferentiated and relatively long corridors (Mamoa 1 do Rapido).

An important feature of the megalitism of the Minho is the appearance, in the great majority of the monuments studied, of decorations in the form of engravings and/or paintings. Alongside the predominant schematic representations, with undulations or serpentiform lines, we find occasional anthropomorphic forms, as for example in Mamoa da Eireira.

The orientations of eight tombs were measured in June 1997 by the authors in company with Silvia Gibbons (Table E1). In two cases, Mamoa I de Castelo de Neiva and Mamoa I do Rapido, the corridor diverges significantly from the direction faced by the backstone: in the former, the backstone faces 97° and the corridor 70°, while in the latter they face 86° and 95° respectively. Whatever we take to be the orientations of these tombs, and despite the scattered location of the eight monuments, all the orientations are clearly SR.

F: SALAMANCA

M. SOCORRO LÓPEZ PLAZA, University of Salamanca, and
JOÃO CARLOS DE SENNA-MARTINEZ, University of Lisbon

The Spanish province of Salamanca borders north-central Portugal. It lies on the western edge of the high plateau (*meseta*) that occupies the centre of Spain, and from the province the river Douro, and the river Tormes that joins the Douro, flow westwards into Portugal to enter the sea at Porto. Archaeologically, the region was related to La Beira and Alentejo in Portugal, and more especially to the Spanish provinces of Toledo, Cáceres and Guadalajara, which lie to the south and east.

The megalithic tombs of the province fall into three main types:

(i) Tombs with large chambers (Figure F1), formed of as many as a dozen or more orthostats and often 4 or even 5 metres in diameter, the orthostats being set vertically into the ground. In some cases at least the chambers were partly covered by slabs of stone, the roof being completed with wood and branches packed with mud and slate. Access to the chamber was by means of a corridor that was clearly distinguished from the chamber both in width and height, and chamber and corridor were covered by a tumulus that was typically from 20 to 30 metres in diameter. Some tumuli were reinforced by concentric circles of stones.

No radiocarbon dates are available for these tombs, but comparison with related tombs elsewhere suggests that they were constructed in the last centuries of the fourth millennium B.C. and continued in use until the middle of the second millennium.

FIG. F1. La Casa del Moro, Gejuelo del Barro, a dolmen of Type A. The long corridor, in the foreground, is clearly distinguished from the chamber beyond.

(ii) Poorly conserved tombs whose construction seems to have much in common with the form usual in La Beira and Alentejo, in which the backstone was the first to be placed in position, and each of the remaining stones of the chamber (in La Beira, usually nine including the backstone) leaned upon its predecessor. These are to be found in the west of the province. The corridor was often long and clearly distinguished from the chamber; and the stones forming the sides of the corridor also leaned successively upon each other. The objects found in these tombs locate them late in the fourth millennium.

(iii) Small tombs, without corridor and with oval or rectangular chamber two metres or rather more in maximum diameter, or with a corridor barely distinguishable from the chamber. Only a handful of these tombs are known; they have been little studied, and no finds are recorded, so that their dates are very uncertain. They may

TABLE F1. Orientations of 21 megalithic tombs of the province of Salamanca.

Az. °	Alt °	Lat. °	Dec. °	Type	Tomb
≈84	1	40.9	+5	A	La Casa del Moro, Traguntia
≈87	0	40.7	+2	B	Los Castillos 1, Hurtada, Villar de Argañán
≈93	2½	40.5	−1	A	El Torreón, Navamorales
≈104	3½	40.6	−8½	B	Las Piedras Hincadas, El Valle
≈105	2	40.6	−10	A	El Prado Nuevo, Salvatierra de Tormes
≈105	1	40.8	−11	A	La Torre, Vecinos
109	2	40.6	−13	A	El Teriñuelo, Aldeavieja de Tormes
109	0	40.9	−14½	?	Las Eras, Fuenteliante
110	0	41.0	−15½	A	La Casa del Moro, Gejuelo del Barro
111	1	41.0	−15½	A	Zafrón, Doñinos de Ledesma
112	0	41.0	−17	A	El Méson de Porqueriza, La Mata de Ledesma
112	0½	41.0	−16½	A	Sahelicejos, Villar de Peralonso
115	0	41.0	−19	A	El Torrejón, Villarmayor
116	2	40.6	−18½	A	El Prado de la Nava, Salvatierra de Tormes
≈117	0½	40.9	−20	B	La Navalito, Lumbrales
117	0½	41.0	−20	A	La Casa del Moro, Villasdardo
119	1½	40.6	−21	C	Rábida 1, Ciudad Rodrigo
121	1½	40.9	−22	A	La Torrecilla, S. Benito de La Valmuza
124	0½	40.0	−25½	A	El Castillejo 1, Martín de Yeltes
≈128	6½	40.6	−23	C	Cista, El Valle
133	7	40.6	−26	A	Rábida 2, Ciudad Rodrigo

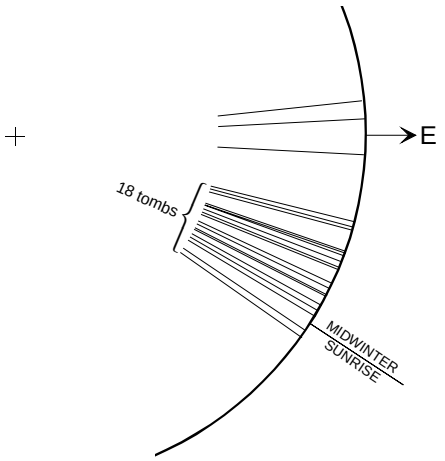


FIG. F2. The orientations of 21 Salamancan megalithic tombs (adjusted to accommodate the high elevations of the skylines faced by the last two tombs in Table F1).

be among the earliest megalithic monuments in Salamanca, but they may also be as late as the Bronze Age.

Some 80 tombs have been identified in the province, but the number whose orientations can be measured is only a small fraction of this. Many have disappeared,

or are in such a ruinous state that not even their type can be established. In company with Juan Antonio Belmonte, Elizabeth Allan and Renate Gralewski, we were able in campaigns in 1994 and 1995 to measure the orientations of 21 tombs, and these are listed in Table F1 and shown in Figure F2. Of the 21, 19 are SR and the remaining two faced too far south for sunrise by only negligible amounts, so that the custom can clearly be characterized as SR.[F1]

G: THE MONDEGO PLATFORM OF CENTRAL PORTUGAL

JOÃO CARLOS DE SENNA-MARTINEZ, University of Lisbon, and
M. SOCORRO LÓPEZ PLAZA, University of Salamanca

The Mondego basin of central Portugal has long been seen as a region of transition, an area where, both geographically and culturally, "Mediterranean Portugal gives way to Atlantic Portugal". At the south it is bordered by the Central Massif, where the good spring and summer pasture of Serra de Estrela has long been exploited by man, probably from the fifth millennium B.C. On the west and northwest the sierras of the Marginal Massif divide the basin of lower land from the Atlantic coast, with passes that follow the rivers Ceira, Mondego and Vouga, while on the north the upper basins of the Paiva and the Távora allow access to the basin of the Douro.

FIG. G1. Casa da Orca da Cunha Baixa, Mangualde.

The numerous megalithic tombs of the region can now be distributed between two cultural phases. The first is known as Carapito/Pramelas, and in this the tombs have polygonal chambers without corridor (or at most with a short, symbolic one), and the funeral offerings include geometric microliths, unretouched blades, polished stone axes, and hadzes and beads of stone. These tombs are dated between 4100 and 3700 B.C.

The second is known as Moinhos de Vento/Ameal, and the chambered tombs now follow an established pattern of construction, having nine orthostats (a largebackstone flnaked by two samller ones and three to each side, with each stone leaning on the preceeding one) and long corridors (with up to nine orthostats on each side, see Figure H1). The deposited artefacts are much more sophisticated, and include pottery, flint halberds, arrowheads, retouched blades, polished stone axes, hadzes and beads. The culture flourished in the second half of the fourth millennium and most of the third, and many of the tombs were reused during the Early/Middle Bronze Age (*c*. 2300–1300 B.C.).

The ground is for the most part of only moderate fertility, and this may explain the nature of the Neolithic habitations that have been identified in recent years (most of them in the neighbourhood of a tomb). These scattered dwellings are small and seem suitable for seasonal rather than permanent use. Indeed, their occupation in autumn and winter is suggested by the care with which fires for heating were located in the middle of the dwellings, and by the presence of oven-stores used to bake and preserve the acorns gathered from the oak trees that were abundant in the region.

It seems that there was some deterioration of the environment in the Sierra as the result of human action, from around the middle of the fourth millennium B.C., while at the same time grazing land was increasingly being opened up. This suggests that the custom of transhumance was being developed, whereby flocks (mostly of sheep and goats) were taken to high pastures in the spring and summer and returned to lower ground for the autumn and winter, which became a time for gathering and preparing acorns, etc., along with the production of pottery, the hunting of animals, the search for minerals, and so forth. This we think was the practice of those who built and utilized the dolmens.[G1]

Forty tombs of the region were measured (and three others visited) in September 1994 and June 1995 by the authors in company with Juan Antonio Belmonte, Margarita Sanz de Lara Barrios, Renate Gralewski and Elizabeth Allan. The results are listed in Table G1 and shown in Figures G2 and G3. As usual, all the tombs faced the eastern half of the horizon, but Pedralta is anomalous in facing north-east, well north of the range of sunrise. The custom, therefore, was SR, with Pedralta the only confirmed exception. It is interesting that of the 6 tombs measured in the Torto basin, the 4 secure measurements of azimuth ranged between 77° and 90°; whereas of the 21 measures taken in the Mondego basin, only 2 faced significantly north of east.

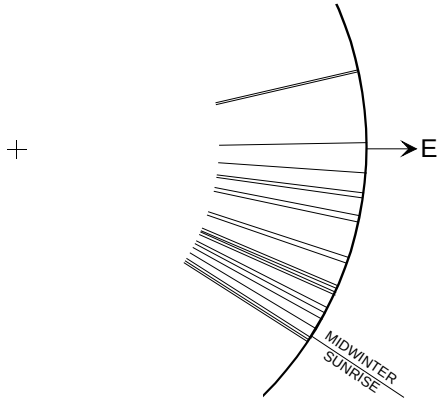


FIG. G2. Orientations of 21 megalithic tombs of the Mondego basin.

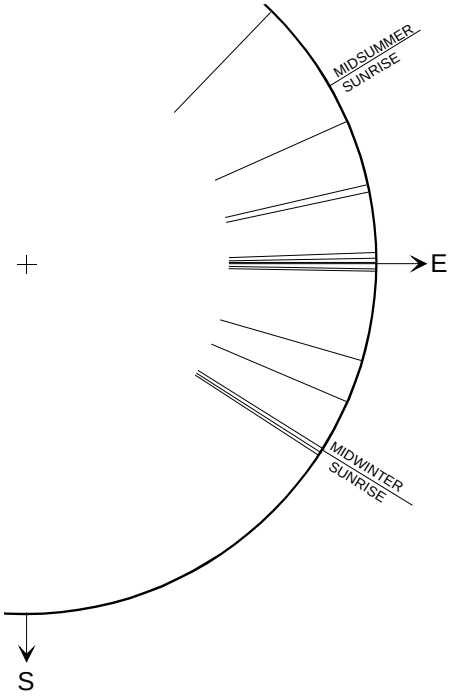


FIG. G3. Orientations of 15 tombs of the Vouga, Alto Paiva, Torto and Coa basins.

TABLE G1. Orientations of 40 megalithic tombs of the Mondego Platform.

Az. °	Alt °	Lat. °	Dec. °	Phase	Tomb
Mondego basin					
77	7	40.4	+14½	II	Lapa da Recainha, Oliveira do Hospital
≈77	1	40.2	+10½	II	Dolmen de S. Pedro Dias, Vila Nova de Poiares
89	0	40.5	+0½	II	Orca do Outeira do Rato, Lapa do Lobo
94	3	40.5	−1	?	Orca do Carvalhal de Louça, Paranhos, Seia
97	2	40.7	−4	II	Orca de Corgas de Matança, Fornos de Algodres
98	1½	40.5	−4½	II	Arquinha da Moura, Lageosa, Tondela
101	1½	40.5	−7½	II	Dolmen da Sobreda, Oliveira do Hospital
102	0	40.5	−9½	I	Orca de Pramelas, Canas de Senhorim, Nelas
108	4	40.8	−11	I	Dolmen 1 do Carapito, Aguiar da Beira
109	2½	40.4	−13	II	Orca de Fiais da Telha, Carregal do Sal
113	3	40.6	−15½	II	Casa da Orca da Cunha Baixa, Mangualde
≈113	2½	40.4	−16	I	Orca 2 do Ameal, Carregal do Sal
114	0	40.7	−18½	II	Mamaltar de Vale de Fachas, Viseu
114	5½	40.5	−14½	II	Orca de Rio Torto, Gouveia
≈117	3½	40.8	−18	I	Dolmen 2 do Carapito, Aguiar da Beira
118	1½	40.7	−20	II	Casa de Orca de Cortiço, Fornos de Algadres
119	2½	40.5	−20½	I/II	Orca de Santo Tisco, Carregal do Sal
121	2½	40.5	−21½	?	Orca de Vale Torto, Paranhos, Seia
≈124	1½	40.5	−24½	I/II	Anta de Mondegã, Lapa de Tourais
124	1½	40.4	−24½	II	Dolmen do Seixo da Beira, Oliveira do Hospital
≈126	2½	40.5	−24½	I	Dolmen 2 do Chaveiral, Pranhos, Seia
typ	0	40.5	typ	?	Penela 1, Lageosa, Tondela
typ	0	40.5	typ	?	Penela 2, Lageosa, Tondela
typ	?	40.5	typ	?	Mamoa do Areal, Tondela
Vouga basin					
44	−0½	40.8	+32	II	Pedralta, Cota, Viseu
66	1	40.7	+18½	I	Chão Redondo 1, Sever do Vouga
90	0	40.7	−0½	I	Dolmen de Antelas, Oliveira de Frades
≈91	9	40.7	+5	?	Anta dos Chascos, Ribeiradio, Oliveira de Frades
106	5	40.7	−9	II	Lapa do Repilau, Couto de Cima, Viseu
122	1½	40.7	−23½	?	Anta do Fojo 1, Couto de Cima, Viseu
129	4	40.6	−25½	?	Espirito Santo d'Arca 2, Caramulo
Alto Paiva basin (South Douro)					
78	3½	40.8	+11½	II	Orca dos Juncais, Vila Nova de Paiva
113	−0½	40.8	−18½	II	Orca do Tanque, Vila Nova de Paiva
Torto basin (South Douro)					
77	−0½	40.9	+9	II	Lameira de Cima 2, Antas, Penedono
88	3	41.0	+3½	II	Senhora do Monte 3, Penela da Beira, Penedono
89	−0½	40.9	0	II	Lameira de Cima 1, Antas, Penedono
90	4	41.0	+2½	?	Senhora do Monte 5, Penela da Beira, Penedono
≈128	4	41.0	−25	?	Senhora do Monte 1, Penela da Beira, Penedono
typ	4	41.0	typ	?	Senhora do Monte 2, Penela da Beira, Penedono
Coa basin					
91	6	40.6	+3	II?	Anta de Pera do Moço, Guarda

typ: quantitative measure not possible, but typical of tombs of this group.

Note: Espirito Santo d'Arca 1, Caramulo, in the Vouga basin, and Orca de Pendilhde, Vila Nova de Paiva, in the Alto Paiva basin, have both been reconstructed. Dolmen 1 do Chaveiral, Patanhos, Seia, in the Mondego basin, could not be measured because of vegetation. All three faced south of east.

H: THE SCHIST TOMBS OF THE PORTUGESE UPPER TEJO

FRANCISCO HENRIQUES, Associação de Estudos do Alto Tejo

The River Tejo, which later enters the sea at Lisbon, flows westerly while it marks the border between Spain and Portugal, with Spain to its south and Portugal to its north. But when the Tejo is joined by the River Sever, the border turns south and follows the Sever instead. The area of Spain within the angle of the Tejo and Sever is the subject of the next section; here we study the tombs of the region of Portugal on either side of the Tejo. In prehistoric times the rivers were highways rather than

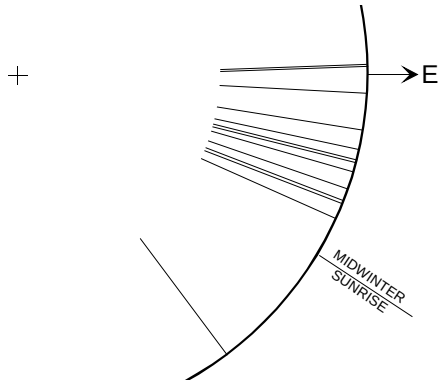


FIG. H1. Orientations of 13 schist tombs of the Rosmaninhal (Idanha-a-Nova) region of the Portugese Upper Tejo (northeast of the region studied in Section J).

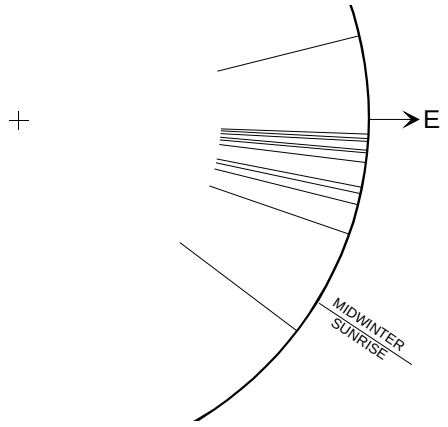


FIG. H2. Orientations of 12 schist tombs of the Vila Velha de Ródão and Nisa regions of the Portugese Upper Tejo (west and southwest of the region studied in Section J).

TABLE H1. Orientations of 26 schist tombs of the Portugese Upper Tejo.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
Area of Rosmaninhal					
88	0	39.8	+1	Amieiro 2	
88	0	39.8	+1	Couto da Espanhola 2	
93	0	39.8	−2½	Amieiro 3	
99	0	39.7	−7½	Samarrudo 1	
102	0	39.7	−9½	Mesas	
104	0	39.7	−11	Cubeiras 2	
104	0	39.7	−11	Zambujo 1	
106	0	39.7	−12½	Tapada da Ordem 1	
109	0	39.7	−15	Zambujo 3	
111	0	39.7	−16½	Zambujo 2	
111	0	39.8	−16½	Couto da Espanhola 6	
114	0	39.7	−18½	Tapada da Ordem 2	
143	0	39.7	−38½	Samarrudo 2	
typ	0	39.8	typ	Amieiro 8	
Area of Vila Velha de Ródão					
76	1½	39.7	+11½	Santo Amaro 2	
93	3	39.7	−0½	Santo Amaro 1	
93	2	39.8	−1	Casa da Moura	
95	7½	39.7	+1	Cabeço de Anta	
95	0½	39.7	−4	Vale das Cobras	
130	3½	39.8	−27	Silveirinha	
Area of Nisa					
92	1½	39.6	−1	Terra da Frágua	Corridor faces 82°
97	0	39.6	−6	Tapada do Muro	
101	1	39.6	−8	Terra da Azinheira	
102	0	39.6	−9½	Naves	
104	0	39.6	−11	Tapada do Sobreirão	
109	1½	39.6	−14	Oiro	

barriers, and not surprisingly we shall find that that the tombs of this and the next section are closely related, both in construction and orientation.

The Tejo itself dominates the area in terms of hydrography, most of its tributaries being torrential in wet periods and almost without water at other times. Geologically the region is characterized by an extensive covering of schist and greywacke, through which quarzite crystals obtrude. In terms of climate it is characterized by hot, dry summers, and by winters that are cold but also dry. Herding and agriculture were, and are, the most important economic activities.

The megalithic monuments are most common in areas within reach of the river, and are often to be found in twos. They are of schist, and the chambers have a variety of shape. Some three hundred were listed earlier this century. However, in some areas only a small fraction of those listed can be found today: the orthostats are rarely over a metre in height, the schist is fragile, and few of the tombs are easy to recognize. As a result, mechanical farming, and the widespread plantation of eucalyptus, has caused devastation on a tragic scale, sometimes intentional but often not.

The fragility of the schist orthostats prevented the use of capstones in most cases, and it seems that the tombs were covered with poles and branches. In some examples

this is confirmed by notches cut into the top edges of orthostats. Curiously, where human remains have been found, they have been of one, or at most two persons. This would seem to suggest that the entrances were for offerings rather than for the insertion of further bodies; but in size the chambers are on a par with communal tombs elsewhere, and we therefore treat them as such. In date the tombs are assigned to the Middle and Late Neolithic.

A total of 26 tombs were visited and measured by the authors in April 1998 in company with Aylene Rogers. Although they are scattered over an area of many tens of kilometres, their orientations (Table H1 and Figures H1 and H2) show a remarkable consistency, only three lying outside the narrow range 88°–114°, so that the tombs are clearly SR. Of the three, Silveirinha faces marginally south of midwinter sunrise, but Samarrudo 2 is the only clear exception.

J: THE SCHIST TOMBS OF WESTERN CACERES

M. SOCORRO LÓPEZ PLAZA, University of Salamanca

Schist tombs are to be found in a number of municipal regions of Caceres, but those studied here are located in the west of the province, in Santiago de Alcantara, Herrera de Alcantara, and Cedillo. The area is bounded to the north by the River Tejo, which constitutes the frontier with Portugal, across which are tombs studied in the previous section. The Tejo is the principal water highway of the area, and the left bank is intersected by a number of tributaries, among them the River Sever which similarly marks the frontier with Portugal, this time bordering Caceres to the south-west. The soil is poor and shallow, and traditionally the area is used for grazing. The monuments are mostly located near to running water and are typically at heights around 300m, especially in flattish, undulating or hilly countryside. They tend to be in groups of from two to five monuments, though at times as many as ten or so monuments may be found together.

All the tombs are constructed from schist, the material that forms the basic geology of the region where they are found. Unlike the massive granite tombs immediately to the south, which we shall meet in the next section, the orthostats of these tombs often extend above ground-level to no more than 1m. Three architectural types may be distinguished: (i) chambers of some 1.5 to 1.8m in diameter, with long and clearly differentiated corridors; (ii) simple open chambers of rectangular (or trapezoidal) shape and no clear distinction between chamber and corridor (much like the ‘galleries’ elsewhere); and (iii) rectangular closed tombs with chambers of less than two square metres (Figure J1). The tombs were located in prominent positions, and were covered with tumuli formed of earth with pieces of white quartz and slabs of schist; for tombs of type (ii) the tumuli were typically of 5 to 7m in diameter, but for tombs of type (i) with corridors the tumuli were oval and in the case of La

FIG. J1. Valle Pepino 1, an unusually well-preserved rectangular tomb formed of schist orthostats.

Laguna extended to 16.7m along the major axis and 11.5m along the minor.

The absence of radiocarbon dating makes it difficult to assign precise dates to the tombs, but on the basis of the finds Dr Primitiva Bueno Ramírez[J1] places them in the first half of the third millennium B.C., possibly as early as 3000 B.C., around the beginning of the Copper Age.

In June 1997 the authors, guided by Sra Eugenia Berrocal and in company with Silvia Gibbons, measured 11 of these tombs. Two of them, La Tierra Caida 1 and 2, are quite different from the rest. Instead of being on the highest ground available, they are down a steep slope, on a platform just above the River Sever. Although made of schist they are massive, and the construction of La Tierra Caída 1 (and no doubt that of La Tierra Caída 2, which is less well preserved) is similar to the seven-stone-chambered granite tombs a few kilometres upriver discussed in the next section. Further, they look towards high ground close by, to places where the sun rose in winter when it had declination $-21\frac{1}{2}°$. Of the remaining nine tombs, eight faced between 86° and 105° while the ninth, which had no clear symmetry, was estimated to face 112°: an SR custom that, unsurprisingly, is virtually identical with the range 88°–114° that we met in the Portugese tombs on the other side of the Tejo and Sever, discussed in the last section. Combining the results of the two sections and disregarding the La Tierra Caída tombs as being of totally different construction, we find that of the 35 small schist tombs, no fewer than 32 faced within the range 86°–114°, that is, within a sunrise range of less than 30°.

TABLE J1. Orientations of 11 schist tombs of Western Caceres.

Az. °	Alt °	Lat. °	Dec. °	Tomb
86	0	39.6	$+2\frac{1}{2}$	Baldio Gitano 1, Santiago de Alcántara
92	$0\frac{1}{2}$	39.6	$-1\frac{1}{2}$	Cerro de la Caldera, Herrera de Alcántara
94	0	39.6	$-3\frac{1}{2}$	Joaninha, Cedillo
98	3	39.6	$-4\frac{1}{2}$	Valle Pepino 1, Santiago de Alcántara
≈98	$0\frac{1}{2}$	39.6	−6	Fuente de la Sevillana, Cedillo
98	0	39.6	$-6\frac{1}{2}$	Valle Pepino 2, Santiago de Alcántara
99	3	39.6	−5	Baldio Morchon, Santiago de Alcántara
105	$5\frac{1}{2}$	39.6	−8	Era de la Laguna 2, Santiago de Alcántara
≈112	$0\frac{1}{2}$	39.6	−17	Cuatro Lindones, Cedillo
128	9	39.6	$-21\frac{1}{2}$	La Tierra Caída 2, Cedillo
129	10	39.6	$-21\frac{1}{2}$	La Tierra Caída 1, Cedillo

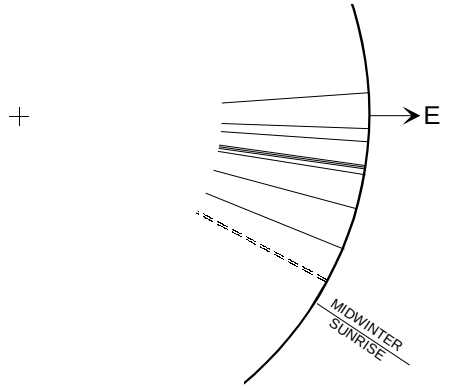


FIG. J2. Orientations of 11 schist tombs of western Caceres. Those of La Tierra Caída 1 and 2 are shown with broken lines, and have been adjusted to take into account the high elevation of the skyline they face.

K: GRANITE TOMBS NEAR VALENCIA DE ALCÁNTARA, CACERES

JUAN ANTONIO BELMONTE, Instituto de Astrofísica de Canarias

Immediately to the south of the regions described in the last two sections, the schist is replaced by granite that is ideal for the construction of massive tombs. The area that includes the Spanish town of Valencia de Alcántara and, across the Sever in Portugal, Marvão and Castelo de Vide contains an exceptional concentration of communal tombs, many of them well-preserved. Unlike the fragile and often inconspicuous schist monuments immediately to the north, these are mostly made of tall granite blocks, and dominate the landscape. Here we meet again the form of construction we have encountered in the Mondego Platform, whereby the backstone was set vertically into the ground while the two stones to each side leant against the

FIG. K1. Anta da Melriça, Castelo de Vide, also known as Fonte das Mulheres. The backstone is to the left. The large stone in the centre of the picture leans upon the backstone and in turn is leant upon by the stone to the right.

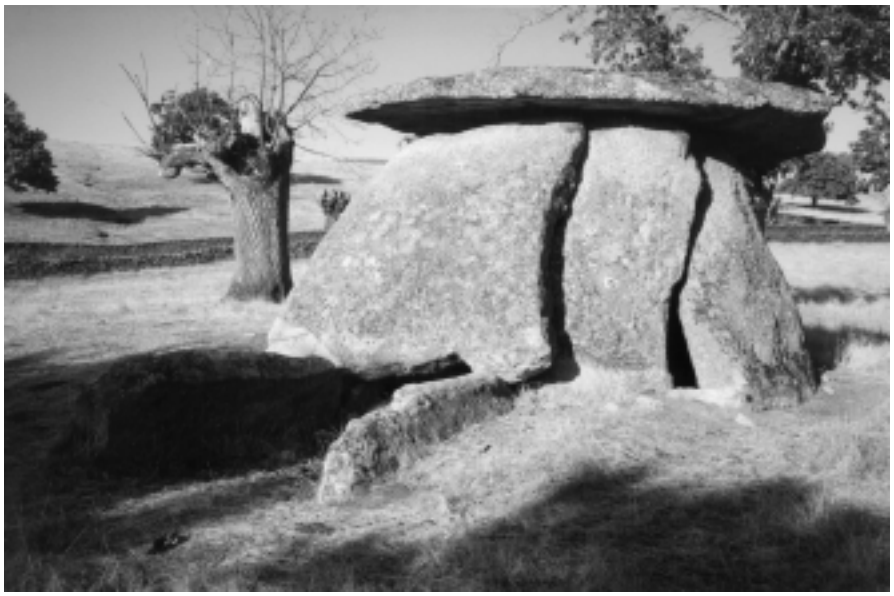


FIG. K2. Dolmen de la Marquesa, Valencia de Alcántara. Here, in addition to the usual seven stones of the chamber, an eighth stone (to the left) is astride the corridor.

TABLE K1. Orientations of 33 granite tombs near Valencia de Alcántara (Caceres).

Az. °	Alt °	Lat. °	Dec. °	Tomb
70	4	39.4	+18	Huerta de las Monjas, Valencia de Alcántara
76	0	39.4	+10½	Lanchas 1, Valencia de Alcántara
79	2½	39.5	+10	Pero d'Alba, Castelo de Vide
79	0	39.4	+8	Coureleiros 4, Castelo de Vide
81	0½	39.4	+7	Coureleiros 3, Castelo de Vide
81	6½	39.4	+11	Sobral, Castelo de Vide
81	3½	39.3	+9	Las Datas 1, Valencia de Alcántara
82	2	39.4	+7½	Tapada del Anta, Valencia de Alcántara
82	0	39.4	+6	Coureleiros 2, Castelo de Vide
83	0	39.3	+5	La Morera, Valencia de Alcántara
84	0	39.4	+4½	Coureleiros 1, Castelo de Vide
86	2½	39.5	+4½	Currais do Galhordas, Castelo de Vide
86	0	39.4	+2½	Zafra 2, Valencia de Alcántara
86	5	39.4	+6	Tapias 2, Valencia de Alcántara
88	0½	39.4	+1½	La Barca, Valencia de Alcántara
89	0½	39.4	+1	Huerta Nueva, Valencia de Alcántara
89	4	39.4	+3	La Miera, Valencia de Alcántara
92	3	39.4	0	Pombal, Castelo de Vide
93	4	39.4	0	Zafra 3, Valencia de Alcántara
95	5	39.4	−1	Zafra 4, Valencia de Alcántara
99	10½	39.5	0	Olheiros, Castelo de Vide
100	0½	39.3	−7½	Cajirón 1, Valencia de Alcántara
100	5	39.4	−4½	Lanchas 2, Valencia de Alcántara
101	6½	39.4	−4½	Zafra 1, Valencia de Alcántara
101	5½	39.3	−5	Cajirón 2, Valencia de Alcántara
102	0	39.3	−9½	La Marquesa, Valencia de Alcántara
104	1	39.4	−10½	São Gens, Nisa
105	3½	39.4	−9½	Fragoso, Valencia de Alcántara
106	5½	39.3	−9	Las Datas 2, Valencia de Alcántara
110	2	39.4	−14	Tapias 1, Valencia de Alcántara
111	2	39.5	−15	Conto do Zé Godinho, Castelo de Vide
114	0½	39.4	−18½	El Corchero, Valencia de Alcántara
121	2½	39.4	−22	Melriça, Castelo de Vide

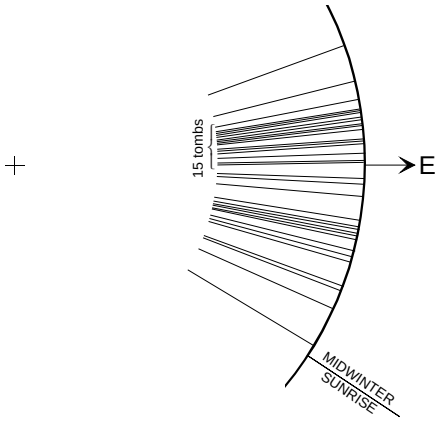


Fig. K3. Orientations of 33 granite tombs near Valencia de Alcántara.

backstone (Figures K1 and K2), and the next stones to each side leant against these, and so on, while opposite the backstone was an entrance leading to the corridor. Here however the chambers are formed of seven (rather than nine) stones, which are typically of some 3m in height. This very characteristic configuration of a seven-stone chamber now becomes standard as we move south, and we shall encounter these tombs in large numbers in the following sections. They are all SR tombs and display a quite extraordinary consistency of orientation, over distances of hundreds of kilometres. This phenomenon offers one of the strongest proofs in Western Europe that the motive underlying the orientation of orientation was astronomical, for it seems impossible to imagine any other way by which such consistency could have been obtained.

Yet within the SR custom we shall encounter regional differences that may be of great significance. South of the Portugese town of Elvas, whose tombs we study in the next section, the orientations are predominantly between due east and midwinter sunrise, corresponding to directions in which the sun rose in the six winter months of the year. By contrast, to the north of Elvas, and especially near Valencia (see Table K1 and Figure K3), the typical orientation is around east itself, corresponding to directions of sunrise in spring and autumn. Indeed, 17 of the 33 tombs listed face north of east. We shall of course examine this further in a later Study, when we discuss the possible motivations underlying the customs we have established.

The Valencia tombs have been extensively researched by Dr Primitiva Bueno Ramírez in her doctoral thesis,[K1] but those in Portugal are less well-known. The corridors vary in length, and according to Dr Bueno the construction of those with short corridor began around 4000 B.C. while those with long corridor first appeared around 3200 B.C. Not surprisingly, these impressive structures were reused into the early Bronze Age and possibly later. In some cases the entrance to the chamber was blocked by an eighth stone (see Figure K2); and the whole monument was covered by a tumulus of which few traces now remain.

The area was visited in September 1994 by the authors in company with José Ricardo Belmonte, Margarita Sanz de Lara Barrios and Elizabeth Allan, and in later years a number of additional tombs were measured (and others remeasured) by Hoskin, in 1997 in company with M. Socorro López Plaza and Silvia Gibbons, and in 1998 with Francisco Henriques and Aylene Rogers. Table K1 contains data on 21 tombs in Spain and 12 in Portugal (including one in Nisa, to the east of Castelo de Vide). All lie well within the range of sunrise, and, as already noted, just over half face north of east.

L: THE ELVAS REGION OF PORTUGAL

MIGUEL LAGO, Era-Arqueologia, and JOÃO ALBERGARIA

The Elvas region is to be found in the north-east of Alentejo, and borders Spanish Extremadura. An outstanding feature of the landscape is to be found in the vast aluvial plains of the River Guadiana, which here alters its direction of flow from west to south. In the open landscape the river becomes wider, and so becomes easier to cross. This is why, since remote times, the region has been a meeting place for people, products, and ideas.

The geology varies throughout Elvas. Shale is to be found in the south-southwest of the region, and the ground is increasingly irregular. Here the soil is poor and infertile, and particularly good for pasture and a non-intensive agricultural system. In the north the opposite is the case: there we find granite and limestone subsoils, and the land is rich and fertile and good for agriculture.

As a result of these differences in geology, prehistoric man found different raw materials to use in the construction of the megalithic tombs and cromlechs. Recent decades have seen a massive destruction of these monuments, and the number found today in the region is only about half those known and described in the middle of this century. The archaeological excavations of tombs all took place between the turn of the century and the 1950s, and the information we have is therefore very

FIG. L1. Anta da Coutada, Elvas.

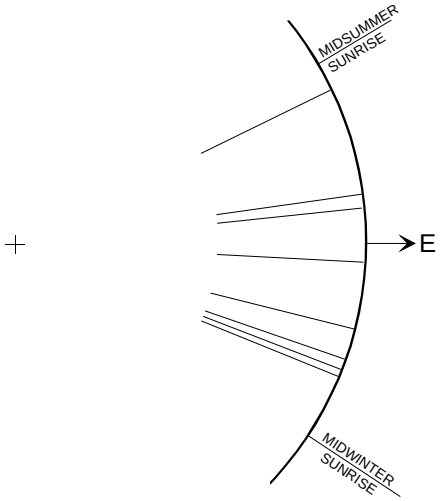


FIG. L2. Orientations of 8 'large' megalithic tombs situated north of Elvas.

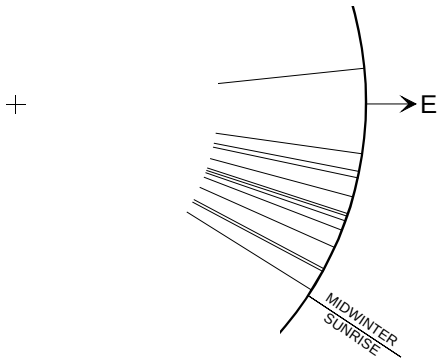


FIG. L3. Orientations of 13 'large' megalithic tombs situated south of Elvas.

basic, although we learn of rich collections of artefacts.

The funerary architecture is quite diverse. The tombs, which are sometimes found in close proximity, vary considerably in size. There are two main types: small tombs with subrectangular chamber and no corridor; and tombs of medium or large dimensions (Figure L1) with a chamber, a corridor and a tumulus, the latter sometimes reinforced by a ring of stones. We do not know whether the differences in type reflect differences in chronological sequence, but it seems possible that tombs of different types were being constructed simultaneously.

TABLE L1. Orientations of 25 megalithic tombs of the Elvas region.

Az. °	Alt °	Lat. °	Dec. °	Tomb
North of Elvas				
64	+1	39.0	+20½	Anta da Coutada
≈71	+4	39.0	≈+17	Anta da Cegonha*
≈82	–0½	39.0	≈+5½	Anta 1 do Torrão
84	+3	39.0	+6½	Anta do Olival do Monte Velho
93	+0½	39.0	–2½	Anta 3 do Torrão*
93	–0½	39.0	–3	Anta Monte dos Frades
101	+1	39.0	–8	Anta da Cabeça Gorda*
≈104	+2	39.0	≈–9½	Anta de Don Miguel
109	0	38.9	–15	Anta 1 de Pena Clara
111	0	38.9	–16½	Anta da Quinta das Longas
112	0	38.9	–17½	Anta do Monte dos Negros
South of Elvas				
≈84	0	38.8	≈+4½	Anta 1 das Defesinhas
98	+1	38.8	–6	Anta da Sardinha
101	0	38.8	–9	Anta do Monte Ruivo
102	–0½	38.9	–10	Anta 1 da Torre das Arcas
105	+1	38.8	–11½	Anta São Rafael 1
108	0	38.8	–14½	Anta 2 das Defesinhas
108	0	38.8	–14½	Anta do Sobral
109	+1	38.9	–14½	Anta 5 do Pombal
111	+1½	38.8	–15½	Anta Forte de Botas
114	0	38.8	–19	Anta São Rafael 2
118	+1	38.8	–21	Anta do Valmor
118	–0½	38.9	–22	Anta 2 da Torre das Arcas
≈122	0	38.8	≈–25	Anta das Avessadas
126	+0½	38.9	–27	Anta 4 do Pombal*

* 'Small' tomb.

It is possible to date the tombs only in very broad terms, as no radiocarbon dates are available. We therefore have to base our chronologies on the material culture, the architecture, and the identified funerary practices; these seem to indicate the period between the fifth and the third millennium B.C. as the most probable for their construction.

In June 1997 Lago and Hoskin visited the area and measured 25 tombs in company with Lucy Shaw Evangelista and Silvia Gibbons. The results are listed in Table L1, where it will be seen that all were SR (or almost so). The only true exception is Anta 4 de Pombal (declination –27°) which is of peculiar construction. Of the 25, 21 were of the second type, and of these, 8 were north of Elvas and 13 south. Interestingly, the 8 to the north of Elvas varied in orientation from 64° to 112° (Figure L2), the mean being 95°. By contrast, only one of the other 13 faced north of 98° (Figure L3), and the mean is 108°. Although the gap between the two regions is as little as 10km, the difference between the two means is considerable: the northerly tombs have orientations similar to those studied in the previous section, while the orientations of the southerly tombs have more in common with the tombs of the section that follows. Indeed, the latitude of the town of Elvas seems to divide tombs that typically faced easterly from tombs that typically faced sunrise in the winter months.

M: CENTRAL ALENTEJO REGION OF PORTUGAL

MANUEL CALADO

The extensive region of Portugal studied in this section lies to the south and west of Elvas, close to the Spanish frontier, and just below the latitude of Lisbon. It is an unusually flat area, extending from the River Guadiana that marks the frontier in the east, as far westwards as the city of Evora.[M1] The region is exceptionally rich in megalithic remains — cromlechs, menhirs, tombs and so forth — and because it is so flat there is seldom any terrestrial landmark, such as a mountain, from which the constructors of tombs could have taken a bearing. The astonishing consistency of orientation that we encounter in the numerous tombs could, we believe, have been achieved only if the constructors oriented them with reference to the sky.

The region does contain a number of tholos tombs, but these are rare and of later date. Of the megalithic structures, the majority fall into two groups:

(i) small funerary chambers, most of them elongated, and without any clear differentiation between chamber and corridor;

(ii) monumental tombs with chambers of seven stones (Figure M1), usually over 2m in height and sometimes of massive dimensions, and corridors whose orthostats are much smaller; as with the tombs in the last two sections, the backstone was put

FIG. M1. Anta 2 da Caeira, near Mora.

FIG. M2. The aptly named Anta Grande do Zambujeiro (Evora), surrounded by the remains of its huge tumulus, and protected by a dispiriting metal shelter.

in position and then each of the successive side-stones of the chamber was placed so as to lean against its predecessor.

The remains recovered from tombs of the first group are usually poor, while in tombs of the second group the votive offerings are often varied and plentiful.

A number of monuments do not fit easily into either of these groups, and we have treated them as a third group, although we do not intend to imply that they necessarily have a separate morphological identity.

In all the groups granite is the commonest building material, and particularly so with group (i). The chambers of monuments that are made of schist, not only in group (i) but also in group (ii), are smaller in both height and diameter than those made in granite, and this is doubtless due to the characteristics of the material. The largest of the seven-stone chambered tombs, with heights of 4 or even 5 metres (Figure M2), are invariably built of granite.

The chronology of the first two groups is a matter for discussion, but for various reasons the majority of investigators regard tombs of group (i) as earlier than those of group (ii). Tombs of our group (iii), which often display a mixture of the characteristics of the other groups, may well correspond to an intermediary phase, and represent a transition between the other two types.

The orientations of tombs of groups (i), (ii) and (iii) are listed in Tables M1, M2 and M3 respectively. Table M1 lists only eight tombs, but this does not necessarily imply that tombs of group (i) were originally constructed in limited numbers. Being

TABLE M1. Orientations of 8 'small' tombs of central Alentejo.

Az. °	Alt °	Lat. °	Dec. °	Tomb
73	1	38.8	+13½	Anta de Mijadouros, Estremoz
79	0½	39.3	+8½	Anta do Cabeço, Ponte de Sor
79	2	38.9	+9½	Anta 2 do Monte das Olveiras, Mora
97	1	38.6	−5	Anta dos Giões, Evora
99	0½	38.9	−7	Anta 2 do Remendo, Mora
113	0	38.9	−18	Anta 6 de Gonçala, Mora
120	1	38.9	−22½	Mamoa do Monte dos Condes, Mora
129	0	38.6	−30	Anta Cistoide de Vale de Moura, Evora

small, they have been especially vulnerable to destruction, and some members of the group may still survive unnoticed. However, they do seem to be absent from many of the contexts where dolmens of large size are to be found. It may well be that the tombs of group (i) are to be found in areas where agricultural occupation of the Alentejo first took place. When, in later times, greater economic prosperity permitted the major effort required for the construction of the massive tombs of group (ii), these tombs would be built not only alongside those of group (i), but also in other areas brought into cultivation around the end of the Neolithic, after construction of tombs of the first group had ceased.

Of the eight 'small' tombs, Anta Cistoide de Vale de Moura faces a few degrees south of the range of sunrise, but this tiny tomb is, as its name implies, little more than a cist. The others are all SR. So indeed (to within a couple of degrees) are all 95 seven-stone-chambered tombs listed in Table M2. A tomb near Reguengos may be more than 100km from one near Ponte de Sor, yet all 95 tombs face within the range 77°–122° (exactly one octant, see Figure M3), as do all ten tombs of uncertain type. Indeed, 25 of the 95 — more than a quarter of the total — face within a range of only 5°, from 102° to 106°. It is difficult to see how this consistency, over a vast area of flat countryside largely devoid of possible terrestrial 'targets', could have been attained without recourse to the sky.

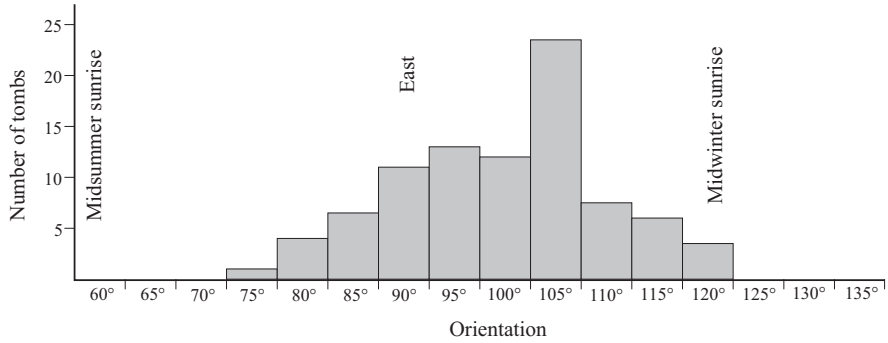


FIG. M3. Histogram of the orientations of 91 seven-stone-chambered tombs from the central Alentejo region.

TABLE M2. Orientations of 95 seven-stone-chambered tombs of central Alentejo.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
77	0½	38.9	+10	Anta 2 de Gonçala, Mora	
79	1	38.9	+9	Anta 1 do Remendo, Mora	
82	0	38.4	+6	Herdade do Duque, Reguengos	
82	0	38.9	+6	Anta 3 da Caeira, Mora	
82	0	38.6	+6	Anta do Patalim, Evora	
83	0½	38.9	+5½	Anta 1 da Cré, Mora	
83	0	38.9	+5	Anta 4 da Caeira, Mora	
84	1	38.6	+5	Anta das Paredes, Evora	
84	0	38.6	+4½	Anta do Silval, Evora	
85	0½	38.9	+4	Anta 2 da Cré, Mora	
85	0	38.6	+3½	Anta 1 de Bota, Evora	
86	1½	38.7	+4	Anta 1 de Claros Montes, Arraiolos	
88	–0½	38.9	+1	Anta 1 da Caeira, Mora	
88	1	38.6	+2	Anta 1 do Pinheiro do Campo, Evora	
89	0	38.9	+0½	Anta de San Diniz, Mora	
89	0½	38.6	+1	Anta 1 de Freixo de Cima, Evora	
89	4	38.9	+3	Anta 6 de Gonçala, Mora	
90	1½	38.9	+0½	Anta 2 de Figueirinha, Mora	
90	0½	38.9	+0½	Anta de Portela, Mora	
91	0	38.9	–1	Anta de Cabeção, Mora	
91	1½	38.8	0	Anta de Entreaguas, Estremoz	
91	0	38.4	–1	Anta 4 de Farisoa, Reguengos	
92	1	38.9	–1	Anta 1 de Torre das Aguias, Mora	
93	1	38.9	–2	Anta 3 de Cré, Mora	
93	1	38.6	–2	Herdade de Anta, Evora	
94	0½	38.6	–3	Anta 4 de Souza, Evora	
94	1½	38.9	–2½	Anta 2 de Torre das Aguias, Mora	
94	0½	38.9	–3	Anta 2 da Caeira, Mora	
94	0½	38.6	–3	Anta de Aguiar, Evora	
94	0	38.9	–3½	Anta 1 da Adua, Mora	
95	0	38.4	–4½	Anta 3 dos Cebolinhos, Reguengos	
95	0	38.6	–4½	Anta do Vale d'Anta, Redondo	
95	2	38.7	–3	Anta 2 de Claros Montes, Arraiolos	
95	0	38.9	–4½	Anta 1 de Gonçala, Mora	
≈95	0	38.6	–4½	Anta 2 de Bota, Evora	
96	–0½	38.6	–5½	Anta das Cabeças, Evora	
96	0½	38.6	–4½	Anta do Colmeeiro, Redondo	
98	–0½	38.4	–7	Anta 1 de Vale Carneiro, Reguengos	
98	0½	38.6	–6	Anta 1 do Paço, Redondo	
98	1	38.6	–6	Anta 3 de Souza, Evora	
99	–0½	38.6	–8	Anta de Zambujalinho, Evora	
100	1	38.6	–7½	Anta da Silveira, Redondo	
100	1	38.6	–7½	Anta 1 de Vale de Moura, Evora	
100	0½	38.9	–8	Anta 4 de Gonçala, Mora	
101	0½	38.6	–8½	Anta da Horta do Zambujeiro, Redondo	Now farm-house
101	0½	38.9	–8½	Anta Grande dos Antões, Mora	
101	0	38.6	–9	Anta 1 de Paço das Vinhas, Evora	
101	0	38.4	–9	Anta 2 dos Cebolinhos, Reguengos	
102	1	38.6	–9	Anta da Candeeira, Redondo	
102	4	38.7	–7	Anta do Pão Mole, Alandroal	
103	2½	38.4	–8½	Anta 2, Olival de Pega, Reguengos	Corridor faces 97°
103	1	38.6	–9½	Anta 2 da Azaruja, Evora	
103	0	38.6	–10½	Anta 1 da Azaruja, Evora	

103	2	38.8	–9	Anta das Casas do Canal, Estremoz	
103	0	38.4	–10½	Anta 3 dos Gorginos, Reguengos	
103	0	38.6	–10½	Anta 1 de Barrosinha, Evora	
103	–0½	38.4	–11	Anta 1 de Farisoa, Reguengos	Tholos in same tumulus
104	0	38.4	–11½	Anta 2 do Monte Novo, Reguengos	
104	0	38.4	–11½	Anta 5 de Farisoa, Reguengos	
104	0½	38.6	–11	Anta 2 de Freixo de Cima, Evora	
104	0½	38.6	–11	Anta Grande do Zambujeiro, Evora	
104	3	38.4	–9	Anta Grande, Olival de Pega, Reguengos	
104	0½	39.3	–11	Anta do Bernardo, Ponte de Sor	
105	1	38.6	–11½	Anta 1 de Sauza, Evora	
105	0	38.4	–12	Anta 2 de Farisoa, Reguengos	
105	1	38.9	–11	Anta do Monte das Oliveiras, Mora	
105	–0½	39.3	–12½	Anta da Matanga, Ponte de Sor	
106	1½	38.9	–11½	Anta de Briços, Mora	
106	0	38.4	–13	Anta 2 das Vidigueiras, Reguengos	
106	–0½	38.6	–13	Anta de Pau, Evora	
106	0½	38.7	–12½	Anta de Santa Luzia, Alandroal	
106	0	38.4	–13	Anta 1 dos Cebolinhos, Reguengos	
107	2½	38.7	–11½	Anta do Galvões, Alandroal	
107	0½	38.6	–13	Anta 2 de Sauza, Evora	
108	1	38.9	–13½	Anta 3 de Gonçala, Mora	
109	–0½	38.6	–15½	Anta de Azinheiras, Evora	
109	1	38.4	–14½	Anta 1 do Passo, Reguengos	
110	0	38.9	–16	Anta da Lapeira, Mora	
110	1	38.9	–15	Anta 5 de Gonçala, Mora	
≈110	0	38.6	–16	Anta 3 de Vale de Rodrigo, Evora	
112	0	38.6	–17½	Anta 2 de Vale de Moura, Evora	
≈112	0	38.6	–17½	Anta 2 de Vale de Rodrigo, Evora	
113	0	38.4	–18	Anta 1 dos Gorginos, Reguengos	
113	0½	38.6	–18	Anta do Hospital, Redondo	
113	0	38.4	–18	Anta 7 de Farisoa, Reguengos	
116	0½	38.6	–20	Anta des Vidigueiras, Redondo	
116	10	38.8	–13	Anta de Cortiçeira, Estremoz	
117	2	38.6	–19½	Anta das Casas Novas, Redondo	
118	0	38.4	–22	Anta 1 das Vidigueiras, Reguengos	
122	–0½	38.6	–25½	Anta 2 de Barrosinha, Evora	
≈122	0	38.6	–25	Anta 2 do Pinheiro do Campo, Evora	
typ	0½	38.6	typ	Anta do Paço 2, Redondo	
typ	0	38.4	typ	Anta de Vale Carneiro 5, Reguengos	
typ	0	38.4	typ	Anta do Monte Novo 4, Reguengos	
typ	0	38.4	typ	Anta do Monte Novo 1, Reguengos	

typ: quantitative measure not possible, but typical of tombs of this group.

TABLE M3. Orientations of 10 central Alentejo tombs of uncertain type.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
78	0	38.4	+9	Anta 1 de Poço de Gateira, Reguengos	
85	1	38.6	+4½	Anta 2 do Colmeeiro, Redondo	
91	1	38.6	–0½	Anta 2 da Godinha de Cima, Redondo	
102	2	38.4	–8½	Anta 2 de Poço de Gateira, Reguengos	
103	0	38.4	–10½	Anta 1 de Sta Margarida, Reguengos	
109	0	38.7	–15	Anta do Lucas 1, Alandroal	
113	0	38.6	–18	Anta 1 da Godinha de Cima, Redondo	
115	3	38.7	–17½	Anta do Cubo, Alandroal	
typ	0	39.3	typ	Anta do Alminho 2, Ponte de Sor	
typ	0	38.7	typ	Anta das Hortinhas, Alandroal	Road cut through tomb

N: THE REGION NORTH AND WEST OF LISBON

The region immediately to the north and west of Lisbon, bordered on the west by the sea and on the south by the River Tejo, is an archaeoastronomer's nightmare. It is logistically awkward, as several of the tombs are being engulfed by suburban sprawl. It contains limited areas of magnetic anomaly (though we did not detect any actual effect of this). And it has — today — very small numbers of tombs of many different types, not all of them conventional in structure. It was visited by the author in April 1998 together with Ana Catarina Sousa, Fernando Henriques and Aylene Rogers; the visits were kindly arranged, and accompanied, by Teresa Simões of the Museu de São Miguel de Odrinhas, who was unfortunately prevented by indisposition from writing this report.

Five of the tombs are authentic tholos, and these important monuments will be discussed in a later Study. Another, Praia das Maças, is also a tholos but it is an extension of an artificial cave tomb and located hard up against the cliff, and so the builders were constrained in their choice of orientation. Bela Vista, on high ground, has a large circular chamber made of massive blocks, but with no evidence of an attempt at a false cupola; it faces 80°, with altitude $-0\frac{1}{2}°$. One side of Pego Longo, which faces 347° (!), is an adaptation of a natural rock-face, to which an opposite side and a backstone have been added. At Carenque, on high ground, three hypogea have been cut into the rock (with orientations 38°, 153° and 174°).

FIG. N1. Anta da Estria (Belas), whose orientation of 213° makes it only the second, of some 400 tombs in this Study, to face the western half of the horizon. The chamber has the standard seven-stone construction of Alentejo, which makes its anomalous orientation all the more remarkable. Photograph by Fernando Pimenta.

TABLE N1. Orientations of 4 seven-stone-chambered tombs north or west of Lisbon.

Az. °	Alt °	Lat. °	Dec. °	Tomb
98	0	38.8	$-6\frac{1}{2}$	Anta do Monte Abraão, Belas
110	1	38.8	−15	Anta do Carrascal, Agualva
111	2	38.9	−15	Anta de Carcavelos, Loures
213	$1\frac{1}{2}$	38.8	−40	Anta da Estria, Belas

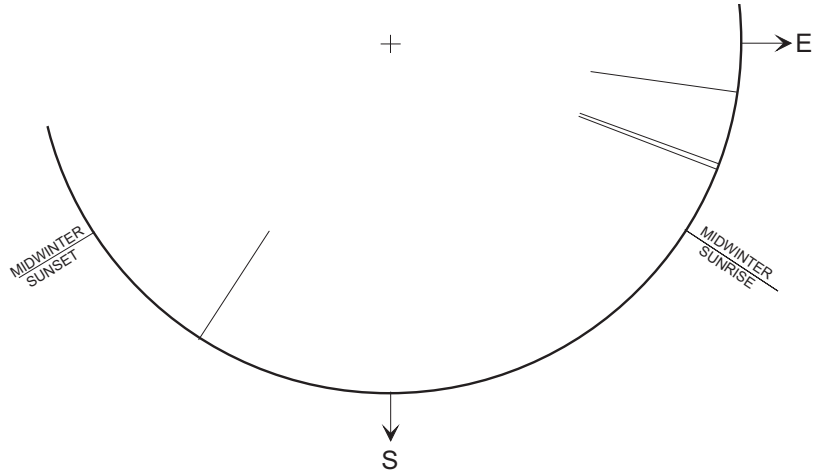


FIG. N2. Orientations of 4 seven-stone-chambered tombs north or west of Lisbon.

Five other tombs were measured. One, Anta da Estria (Belas), is on low ground and currently marooned amidst road works (Figure N1). Its very unusual orientation of 213° (alt. $1\frac{1}{2}$°) makes it only the second tomb in this Study that unequivocally faces the western half of the horizon (with dec. −40°), the other being Ruyales del Paramo, north-northeast of Burgos (Section B above). As the photograph shows, despite its anomalous orientation its chamber has the standard seven-stone construction, with successive side-stones each leaning against the preceding one.

Another tomb, Alto da Toufeina (Loures), was densely surrounded by bushes and could not be properly examined. It may have had a five- or a seven-stone chamber. What appeared to be the backstone faced 133° (altitude 4°), but this may well have been rotated to the south by pressure of another stone leaning against it, and there was also risk of a magnetic anomaly in the rock. We therefore omit it from Table N1, which lists just Anta da Estria and three other seven-stone chambered tombs. They mark the westward limit of the characteristic form of construction so widespread in the areas studied in the previous three sections, and with the notable exception of Anta da Estria their orientations (Figure N2) conform to the SR custom we have found in central Alentejo.

P: THE OURIQUE REGION OF SOUTHERN PORTUGAL

ARTUR MARTINS, Câmera Municipal de Aljustrel

The town of Ourique lies some 60km from the south coast of Portugal and is 50km from the Atlantic to the west. The region is known to have contained the remains of nearly fifty megalithic monuments, of various types and dates of construction. Nevertheless, today the locations of a great many of them are unknown, often because they were never published by their discoverers, or because the descriptions of their positions were insufficiently specific.

The area is mainly flat, except towards the south. There the irregular terrain is drained by the Alto Mira, while the northerly parts belong to the basin of the Alto Sado. It can be viewed as a region of the interior, being separated from the coast to the south and west by hills that form a kind of frontier; and indeed the chief routes from the west coast into the interior were the rivers Sado and Mira.

As already mentioned, we encounter monuments of various types: cists with rectangular chambers; dolmens of classic type, with chambers of seven stones and short corridors; monuments of pear or horse-shoe shape, with no clear distinction between chamber and corridor; and finally, tholos tombs. The materials recovered by excavation are fairly homogenous, but none of them can be considered characteristic of the region. At present it is difficult to establish a chronology, or even a

FIG. P1. Dolmen da Pedra Branca, Santiago do Cacém, a seven-stone-chambered tomb near to the Atlantic coast.

TABLE P1. Orientations of 9 megalithic tombs of southern Portugal.

Az. °	Alt °	Lat. °	Dec. °	Tomb	Comment
Ourique					
70	0	37.6	$+15\frac{1}{2}$	Anta 1 Fernâo Vaz	
73	0	37.6	$+12\frac{1}{2}$	Anta 2 Fernâo Vaz	
81	0	37.8	$+6\frac{1}{2}$	Laborela	
82	0	37.8	+6	Pedra d'Anta 1	Seven-stone chamber
≈107	$0\frac{1}{2}$	37.6	$-13\frac{1}{2}$	Brejo	
Santiago do Cacém					
100	2	38.1	−7	Dolmen da Palhota	
108	1	38.1	$-13\frac{1}{2}$	Dolmen da Pedra Branca	Seven-stone chamber
Vila do Bispo					
116	$-0\frac{1}{2}$	37.1	−21	Dolmen da Pedra Escorregadia	
Alcalár (Portimão)					
108	0	37.2	−14	Dolmen 1 de Alcalár	

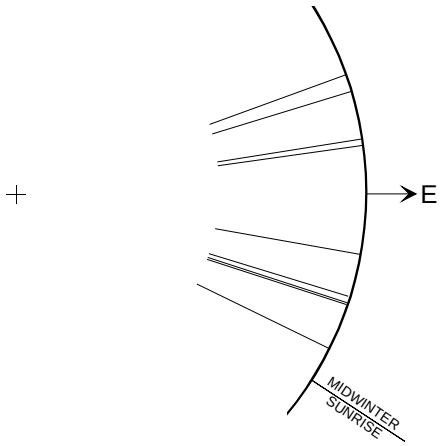


FIG. P2. Orientations of 9 megalithic tombs of southern Portugal.

sequence for the monuments, granted that we do not possess secure radiocarbon dates, and that the excavations carried out in the middle of the present century were insufficiently rigorous and followed procedures that resulted in the total destruction of the stratigraphic record. Nevertheless, despite our ignorance of their habitats and settlements, analysis of the materials excavated enables us to say with some confidence that the builders of these monuments must have belonged to a single community at any given moment.

The structure of the monuments suggests that occupation of the region began in the Middle Neolithic, and continued from that time without interruption. Some of the monuments themselves were reoccupied during the Bronze and Iron Ages, and many necropolises in the region from these later Ages were located close to existing monuments, which shows that the various groups that later occupied the territory

saw the sites of the megalithic sepulchres as sacred spaces.

The region was visited by Hoskin in September 1994 in company with Elizabeth Allan, and by the authors in March 1998 in company with Miguel Lago, Lucy Shaw Evangelista and Aylene Rogers. Five of the tombs measured are tholos and will be discussed in a later Study. We list in Table P1 five megalithic sepulchres for which measures were possible. Of the five, one is in very poor condition and our measure is only approximate; all are SR. It is however remarkable that the other four (which include one classic seven-stone chamber) all have orientations in the exceptionally northerly range, 70°–82°.

For convenience we also list four other megalithic sepulchres from southern Portugal: two dolmens close to the west coast near Santiago do Cacém, northwest of Ourique, one of which (Figure P1) also has a seven-stone chamber; and two near the south coast, one of which is associated with an important group of tholos tombs. These were measured by Hoskin in October 1996 with help made available through the kindness of Joaquina Soares of the Museu de Arquelogia e Etnografia do Distrito de Setúbal. All are SR, with orientations between 100° and 116°.

In the various tables in this study we have listed quantitative orientations for 384 authentic megalithic tombs. In the case of a further 12 such tombs, no quantitative measure was possible but it was clear that the tombs were 'typical' in facing roughly east or east-southeast. Another 11, listed in tables or discussed in the text, were of 'uncertain' orientation or questionable construction, while, finally, the unquestionably authentic Anta da Estria (Sintra) deserved special mention in the text of Section N for its unusual form and orientation.

Q: THE ARCHAEOTOPOGRAPHY OF THE MEGALITHIC TOMBS

As explained in the Introduction, the (archaeoastronomical) interpretation of these data on over four hundred tombs is reserved for a future Study. Some brief comments at the factual, 'archaeotopographical' level are however in order.

First, tombs that faced the western half of the horizon are excessively rare. There are in fact just two, Royales del Paramo, north of Burgos (214°), and Anta da Estria, west of Lisbon (213°). Even more rare are tombs that face easterly but north of midsummer sunrise. There is only one: Pedralta, near Viseu (44°). Therefore, of the 397 authentic tombs with quantitative or 'typical' orientations, no fewer than 394 are SR/SC; and of these, only three faced sunrise at the height of summer, with orientations north of 70°.

Second, SC tombs (facing south of midwinter sunrise by more than, say, 3°) are to be found in limited numbers across the north of the peninsula, and most notably at Laguardia (Table B1). In Portugal and neighbouring Salamanca and Caceres, however, they become very rare. Of the 288 SR/SC tombs listed for these regions, only 2 are clearly SC, with orientations corresponding to declinations –30° and –38½°.

We conclude, therefore, that almost all the megalithic tombs of northern and western Iberia are SR/SC; and that SC tombs are a minority in the north and almost unknown in the west.

Acknowledgements

The first author is profoundly grateful to the archaeologists and *aficionados* named in the text, and especially to those who contributed to this article. He is also indebted to Sr Fernando Pimenta for arranging several collaborations and his meticulous re-examination of Anta da Estria, and to Churchill College, Cambridge, and the Foreign Travel Fund of Cambridge University for financial support.

REFERENCES

1. Michael Hoskin, Elizabeth Allan and Renate Gralewski, "Studies in Iberian archaeoastronomy: (1) Orientations of the megalithic sepulchres of Almería, Granada and Málaga", *Archaeoastronomy*, no. 19 (1994), S55–82; "(2) Orientations of the tholos tombs of Almería", *Archaeoastronomy*, no. 20 (1995), S29–40; "(3) Customs and motives in Andalucía", *ibid*., S41–48.
2. Michael Hoskin and Toni Palomo i Pérez, "Studies in Iberian archaeoastronomy: (4) The orientations of megalithic tombs of eastern Catalunya", *Journal for the history of astronomy*, xxix (1998), 63–79.

B1. José Ignacio Vegas Aramburu, *Dolmenes en Alava: Guía para su visita* (2nd edn, Argitalpen Saila, 1983), 11.

B2. Hoskin *et al.*, "Studies ... (2)" (ref. 1), Figs 1, 2 and 3.

C1. *Gipuzkoa. Carta arqueologica, I: Megalitos* (Sociedad de Ciencias Aranzadi, San Sebastian, 1990), an inventory that is a model of its kind.

D1. For an introduction to megalitism in Galicia, see Antón A. Rodríguez Casal, "Neolitización e megalitismo en Galicia", in *idem* (ed.), *O neolítico atlántico e as orixes do megalitismo* (Santiago de Compostela, 1997), 447–62, and for further information, *idem*, *O megalitismo: A primeira arquitectura monumental de Galicia* (Santiago de Compostela, 1990), both in Gallego.

F1. A more detailed discussion, with bibliography, is contained in the authors' "Revisión de las orientaciones de los sepulcros megalíticos de Salamanca", *Actas del IV Congreso de la SEAC "Astronomía en la cultura"*, ed. by C. Jaschek and F. Atrio Baradela (Salamanca, 1997), 209–15.

G1. On this see João Carlos de Senna-Martinez, M. Socorro López Plaza and Michael A. Hoskin, "Territorio, ideología y cultura material en el megalitismo de la Plataforma del Mondego (centro de Portugal)", *O neolítico atlántico e as orixes do megalitismo*, ed. by A. Rodríguez Casal (ref. D1), 657–76.

J1. Primitiva Bueno Ramírez, "La Necrópolis de Santiago de Alcántara (Caceres): Una hipótesis de interpretación para los sepulcros de pequeño tamaño del megalitismo occidental", *Boletín del Seminario de Estudios de Arte y Arqueología*, lx (1994), 25–100.

K1. Primitiva Bueno Ramírez, *Los dolmenes de Valencia de Alcántara* (Excavaciones Arqueológicas en España; Madrid, 1988).

M1. On these, see *A guide to the megalithic monuments of the Evora region*, published in 1992 by the Câmera Municipal de Évora.

SUMMARY OF A RELEVANT ARTICLE IN *JHA*

"Studies in Iberian Archaeoastronomy: (4) The Orientations of Megalithic Tombs of Eastern Catalunya", by Michael Hoskin and Toni Palomo i Pérez (xxix/1, 63–79)

Megalithic tombs in the region of Spain close to the Mediterranean coast and the French frontier took three forms. The earliest tombs were 'sepulchres with corridor', 55 of whose orientations the authors list (Figure 1); next came 'Catalan galleries' (20 orientations, see Figure 2); and finally, 'simple dolmens' (8 orientations, see Figure 3). The orientations of the Catalan galleries have the familiar SR/SC format, but the sepulchres with corridor are unique in the Iberian peninsula in that as many faced the south–west quadrant as the east–south. This poses a problem for archaeologists who believe the latter evolved into the former.

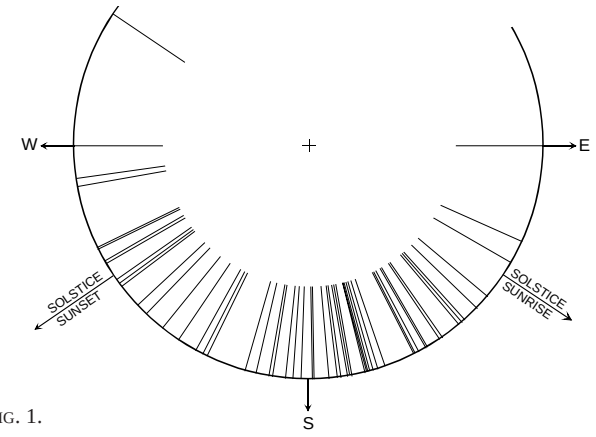


FIG. 1.

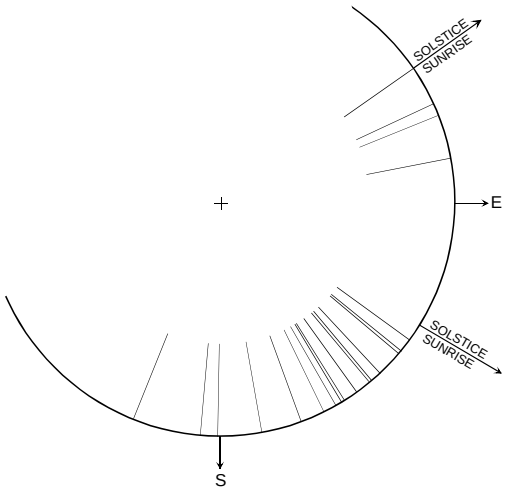


FIG. 2.

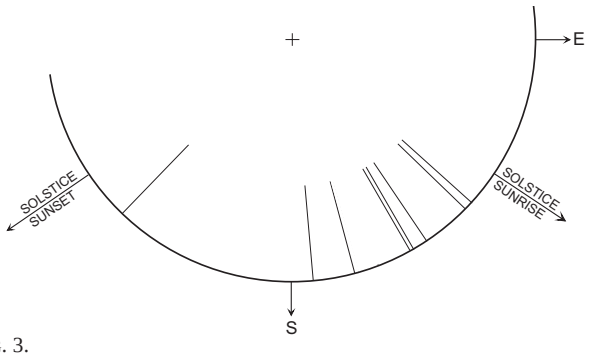


FIG. 3.

BOOK REVIEW

COSMOVISIONS AND POWER

Skywatchers, Shamans & Kings: Astronomy and the Archaeology of Power. E. C. Krupp (Wiley Popular Science, John Wiley & Sons, New York, 1997). Pp. xiv + 364. $27.95.

This book does not discuss ancient astronomical alignments or indigenous astronomical practices; Krupp has told us about these in his earlier books. This time the myths and rituals that he examines embody little astronomy, whether in the narrow sense of a predictive mathematical astronomy demanded by Neugebauer and Aaboe, or in the broader senses favoured in the archaeoastronomical community. Now Krupp has a bolder agenda only hinted at in his earlier works, to present what he sees as universal themes that characterize the relationships between visions of the cosmos and the manifold personal and institutional manifestations of power that these cosmovisions sustain.

Thus Krupp is not concerned here with how people use celestial myths and rituals to make their observations of the heavens intelligible; he wishes to tell us how they used the heavens as symbols to make their societies intelligible. Running through the book is Krupp's distinctive voice. In a masterful presentation he paints evocative pictures displaying the interplay of cosmic and political power in many different cultures.

Two crucial terms, 'shamanism' and 'power', lie at the core of his discussion. Yet both terms remain equivocal. Krupp himself recognizes the ambiguities of 'power'. Sometimes it is political power, sometimes spiritual, sometimes power flowing from knowledge of nature. The latter power is sometimes exercised as control over the entities that govern the natural world, sometimes by appeals to the cooperation of the gods. Were this review to catalogue fully the many different senses in which 'power' is used, it would fill many pages.

'Shamanism' has a similar ambiguity, sometimes referring narrowly to the ecstatic

spiritual experience of the shaman through which he gains spiritual power, sometimes to any experience of the sacred, and sometimes to the exploitation of religious ideas for political power. Although Krupp is careful to avoid the notion that shamans are cynical manipulators of an ignorant populace, his analytical framework tells us so little about shamanism as a religious experience that it comes close to being reduced to a mere way to obtain social, political, and economic power (p. 157).

By relating astronomy to the unifying theme of power, Krupp seeks to place these astronomies in a broader social framework, a framework that he finds repeating itself in many cultures. And yet the framework that treats power as the central factor in the study of the heavens is as much an outsider's analytical construct as is the almost universally rejected perception which would see all native skywatchers as the direct ancestors of modern astronomers. The manifold relationships between astronomy and power must also be discussed with caution.

Krupp seeks to define his theme of astronomy and power by presenting many diverse understandings of the cosmos. He draws examples from widely disparate cultures, seeking to demonstrate the universality of this theme. And here lies the problem. History and anthropology are grounded in the specifics of times and places, of individuals and cultures; I become suspicious when I read of the continual re-emergence of universal structures of thought (pp. 40, 174).

And yet, certain themes do re-emerge in the most widely separated places. Association of colours with directions that frame the cosmos and thereby define the cosmic order are noted in ancient China and contemporary Native America. It is not certain whether this is to be explained by the emergence of archaic structures of thought, by the diffusion of a fundamental cosmic framework to the New World at the time of the emigration of palaeo-Indians from Asia, or by a highly unlikely coincidence.

As is almost inevitable in such a wide-ranging study, there are occasional lapses in the author's grasp of his rich sources. Ironically, in discussing the role of the mother goddesses in ancient Anatolia, he asserts that the modern Turkish name for the region, Anadolu, means the "land of mothers", yet overlooks the original astronomical significance of the name. Perhaps the Turkish name later took on the maternal meaning, but in origin the name is clearly Greek and clearly astronomical. Like the Latin *oriens* and the English 'east', the Greek ἀνατολή refers to the rising of the Sun or another celestial body, and hence to the quarter of sunrise, the East.

I have mixed feelings after reading this book. The rich details that Krupp presents give the reader valuable insights into the manifold forms that knowledge of the heavens takes in various cultures. Yet I am not convinced of the book's overall interpretive structure. In the past decades we have seen many detailed examinations of the roles of astronomies in specific cultures; much investigation remains to be done in this area. Power, in many of its aspects, will most likely emerge from these studies as one important factor. It remains to be seen whether they will show it to play the dominant roles proposed in this important and wide-ranging survey.

West Virginia University STEPHEN MCCLUSKEY

NOTES ON CONTRIBUTORS

SARA ALIAGA I RODRIGO is an archaeologist and Gestor del Patrimonio at Puigcerdà in western Catalunya.

JOÃO ALBERGERIA is collaborating with Miguel Lago on a project concerning the megalithic monuments of the Elvas region.

JUAN ANTONIO BELMONTE is an astronomer and staff member of the Instituto de Astrofísica de Canarias, and is now the director of the Science and Cosmos Museum in Tenerife. He is currently researching various aspects of cultural astronomy throughout the Mediterranean. He is preparing, as Chairman, the Oxford VI and SEAC 99 Conference on Astronomy and Cultural Diversity, to be held in La Laguna in late June 1999.

ALFONSO LÓPEZ BORGOÑOZ is an archaeologist who studied history of science in the Autonomous University of Barcelona. An amateur astronomer, he is the present editor of *Universo*, a monthly popular Spanish review of space studies.

MANUEL CALADO is an archaeologist who researches as a member of the Archaeological Centre of the University of Lisbon.

CÉSAR ESTEBAN is a lecturer in astrophysics at La Laguna University. His main research work is on the interstellar medium. However, he is also interested in the ancient astronomy of North Africa and in the Iberian and Punic cultures. He is preparing, as a Scientific Secretary, the Oxford VI and SEAC 99 Conference on Astronomy and Cultural Diversity, to be held in La Laguna in late June 1999.

FRANCISCO HENRIQUES is an archaeologist and the author of several studies of the archaeology of the Portugese Upper Tejo.

MICHAEL HOSKIN has this year been conducting archaeoastronomical fieldwork in Tunisia, southwest Spain, and throughout Portugal. He is the editor of *The Cambridge Illustrated History of Astronomy* (1997), and of *The Cambridge Concise History of Astronomy*, which has just been published.

JOSÉ JUAN JIMÉNEZ GONZÁLEZ is an archaeologist and curator of the Archaeological Museum of Tenerife. He is working on various aspects (such as time-reckoning, population, social structure and organization) of the prehistory of the Berbers. Through his 1990 paper on aboriginal calendars, he helped pioneer the archaeoastronomy of the Canary Islands.

MIGUEL LAGO is a member of Era-Arqueologia, Lda., and is collaborating with João Albergeria on a project concerning the megalithic monuments of the Elvas region.

SOCORRO LÓPEZ PLAZA is professor of Prehistory in the University of Salamanca. Most of her research has focused on the Spanish northern plateau in the Copper

Age period and she has published widely on this subject.

JOÃO CARLOS DE SENNA-MARTINEZ is professor of Proto-Historic Archaeology in the University of Lisbon, and is currently working on Neolithic to Bronze Age sites in the Mondego Basin of central Portugal.

ARTUR MARTINS is archaeologist of the Câmara Municipal de Aljustrel, and researcher of the Unidade Arqueológica de Aljustrel. He is currently preparing a thesis on "Megalitism in the Ourique region".

STEPHEN MCCLUSKEY is professor of History at West Virginia University. He has investigated the astronomical traditions of the Americas and medieval Europe. His *Astronomies and cultures in early medieval Europe* was recently published by Cambridge University Press.

[*Continued on page S30*]

INDEX TO *ARCHAEOASTRONOMY*, NO. 23

Belmonte, Juan A., César Esteban and José Juan Jiménez González, Mediterranean Archaeoastronomy and Archaeotopography: Pre-Roman Tombs of Africa Proconsularis, S7

Esteban, César, Juan A. Belmonte and José Juan Jiménez González, Mediterranean Archaeoastronomy and Archaeotopography: Pre-Roman Tombs of Africa Proconsularis, S7

First Fruits Celebrations among the Nguni Peoples of Southern Africa, by Keith Snedegar, S31

Hoskin, Michael, and colleagues, Studies in Iberian Archaeoastronomy: (5) Orientations of Megalithic Tombs of Northern and Western Iberia, S39

Jiménez González, José Juan, Juan A. Belmonte and César Esteban, Mediterranean Archaeoastronomy and Archaeotopography: Pre-Roman Tombs of Africa Proconsularis, S7

Krupp, E. C., *Skywatchers, Shamans & Kings*, rev. by Stephen McCluskey, S89

López Borgoñoz, Alfonso, Orientations of Graves in the Late Roman Necropolises of Ampurias, S25

McCluskey, Stephen, rev. of *Skywatchers, Shamans & Kings*, by E. C. Krupp, S89

Mediterranean Archaeoastronomy and Archaeotopography: Pre-Roman Tombs of Africa Proconsularis, by Juan A. Belmonte, César Esteban and José Juan Jiménez González, S7

Models of Temporality in Archaeoastronomy and Rock Art Studies, by William Breen Murray, S1

Murray, William Breen, Models of Temporality in Archaeoastronomy and Rock Art Studies, S1

Notes on Contributors, S91

Orientations of Graves in the Late Roman Necropolises of Ampurias, by Alfonso López Borgoñoz, S25

Skywatchers, Shamans & Kings, by E. C. Krupp, rev. by Stephen McCluskey, S89

Snedegar, Keith, First Fruits Celebrations among the Nguni Peoples of Southern Africa, S31

Studies in Iberian Archaeoastronomy: (5) Orientations of Megalithic Tombs of Northern and Western Iberia, by Michael Hoskin and colleagues, S39

Summary of a Relevant Article in *JHA*, S88