

The View from Within: a ‘time-space-action’ approach to Megalithism in Central Portugal

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The archaeological record of Northwest Iberia attests to a cluster of activity in the Neolithic period (Cruz 1995a). Megaliths dot the landscape from the northern Atlantic coast of Galicia to the platform of the *Mondego* river of central Portugal. The Central Massif, especially *Serra da Estrela* to the southeast of the *Mondego* platform, offers good pastures during the spring and summer seasons and has evidence of human presence since the fifth millennium BCE (Cruz 2001, 297). Shortly after this early Neolithic occupation, megalithic dolmens and tumuli began to be constructed and are especially concentrated around the most important rivers of the region.

Dolmens, or *antas* in the original Portuguese, are very simple monuments: they have a central polygonal chamber, made out of megalithic orthostats, typically seven, nine or eleven in this region of Iberia. The chamber might then have an entrance with or without



Fig. 10.1: Dolmen da Orca, with extant cover-stones and tumulus. Despite being one of the biggest dolmens of the region its entrance is nevertheless quite small (bottom-right). Notice the eucalyptus trees that surround it today.

a corridor, also megalithic in nature. Both the chamber and the corridor were roofed with cover-stones and the whole construction was surrounded by a tumulus: a mound, typically of earth, but covered with stone. At its prime, a typical dolmen would look like an artificial mound with a stone shell and a single opening (Fig. 10.1).

Passage graves, dolmens and other megaliths throughout the Atlantic façade of Europe are carefully positioned in relation to their landscape (Tilley 1994, Cummings 2009), but can also be oriented towards particular astronomical events (Ruggles 1999). The exploration of the skyscape complements that of the landscape and provides further insights into not just the ideologies and cosmologies of past societies, but also into their rituals and activities (see Introduction, this volume). This holistic approach to megalithism falls under what Darvill named a "time-space-action model" (Darvill 1999).

This chapter explores the location and orientation of the Neolithic dolmens of the *Mondego* platform using a methodology that borrows and integrates elements from landscape archaeology and archaeoastronomy. The view from within the dolmens highlights the importance of *Serra da Estrela*, the mountain range that contains the highest peak in continental Portugal, as well as the star Aldebaran that would rise in alignment with it. This leads to a discussion of the role of the brightest star of Taurus in the Neolithic cosmology, particularly its relationship with belief and ritual. This chapter both completes and complements a prior preliminary analysis carried out on a smaller sample of dolmens in the same region (Silva 2013).

The Neolithic of Central Portugal

Evidence for the occupation of central Portugal prior to the Neolithic is scarce but growing. To the northeast, in the *Côa* valley, famous for its Upper Palaeolithic open-air rock art sites, there is ample evidence for a continuous, though intermittent, Holocene occupation until the Early Neolithic (Monteiro-Rodrigues 2011; 2012). In *Oliveira do Bairro*, in the *Vouga* basin, and close to where the coastline would have been at the onset of the Holocene, microblade finds have been attributed to the Mesolithic, at about 6,500–5,500 BCE (Silva 2000). Based on these finds Cruz considers that the *Mondego* platform was not devoid of Mesolithic occupation but that these settlements would most likely now be submerged or destroyed by the rising water levels (Cruz 2001, 296).

The debate over the transition to the Neolithic has, as elsewhere in Atlantic Europe (Barker 2006, 325–381; Silva *et al.* 2013), revolved around two possible scenarios: that of colonization and that of acculturation. Zilhao (2001) proposes a 'Maritime Pioneer Colonisation' model according to which agricultural communities, formed by pioneer colonists, leap-frogged along the coast of the Mediterranean, eventually reaching the Portuguese coast. The north and interior of Portugal would have been populated quite late, as these Neolithic 'islands' developed, increased in size, and moved to occupy previously empty regions. Other scholars, however, highlight that communities on opposing sides of the transition shared similar landscape choices, settlement patterns, mobility and broad-spectrum subsistence strategies (Soares *et al.* 2003, 51). This suggests that Mesolithic communities adopted Neolithic traits and domesticates, becoming themselves Neolithic.

This discussion has so far been centred on the southwest coast, where the first Neolithic

communities appear. However, more recently, Monteiro-Rodrigues has looked at evidence from the Iberian northwest and the interior, particularly that stemming from the site of *Prazo*, in the *Côa* valley (Monteiro-Rodrigues 2011). This author suggests a much richer and complex process of Neolithization, involving ‘selective assimilation’ of Neolithic traits by different hunter-gatherer communities (Monteiro-Rodrigues 2011, 363–8). The Neolithic of interior regions of Portugal would thus spawn from earlier indigenous Mesolithic communities. This is not dissimilar to Tilley’s ‘structuration model’ proposed to explain the Neolithic transition in southern Scandinavia (Tilley 1996, 108–9). Such ‘continuity and transformation’ models are capable of explaining the diversity that is present in the archaeological record locally while, at the same time, giving agency back to the hunter-gatherers themselves and not some wider geographical, climatic and/or evolutionary process (Silva *et al.* 2013).

Discoveries of the past twenty years, especially of Neolithic settlements in the *Mondego* basin, have allowed a picture of local life during the fifth millennium BCE, the Early Neolithic, to emerge (Senna-Martinez *et al.* 2008a, 318–9; Valera 1998). Pottery fragments attributed to this period show characteristics belonging to the traditions of the Early Neolithic from *Estremadura*, to the southwest, and *Andalusia*, to the southeast. Based on this, Senna-Martinez and Ventura (2008b, 80) suggest the possibility of a dual origin. However, considering the scarce but increasing evidence for pre-Neolithic occupation of the region, continuity cannot be discounted and the pottery evidence might simply indicate the existence of exchange networks with meridional communities.

The evidence indicates that small communities sustained themselves primarily by small game hunting and the gathering of acorns and other winter fruits. Agriculture would have played only a minor role in the subsistence of these communities, if at all (Senna-Martinez *et al.* 2008a, 327). On the other hand, the raising of ovicaprids, introduced to the region by the first Neolithic settlers, suggests that winters were spent on low grounds and the spring and summer seasons on the high pastures of *Serra da Estrela* (Senna-Martinez *et al.* 1997, 663–4; Cruz 2001, 313). Palynological and antracological evidence from *Serra da Estrela* indicates that starting around 5,000 BCE there was “... general forest lightening, but with a few and scattered clearings” (Knaap *et al.* 1991). This has been interpreted as evidence of human impact on forest cover (Araújo *et al.* 2012), which is supported by its chronological coincidence with the onset of the Early Neolithic of the Mondego platform (Senna-Martinez *et al.* 2008a, 323). More recent and wider studies, however, suggest that both “human activity and climatic change may have collaborated to produce an unprecedented degradation of the landscape” (Martínez-Cortizas *et al.* 2009, 84). Nevertheless, incontrovertible evidence of human presence, in the form of Neolithic material culture, has been found at an elevation of 1430m (Cardoso *et al.* 2002).

The Monumentalization of the Landscape

Radiocarbon dates indicate that the first megaliths were built roughly a thousand years after the first Neolithic communities showed up in the region (Cruz 1995a). Senna-Martinez and Ventura (2008a, 333) suggest a division between Middle and Late Neolithic monuments. The first phase would be characterized by tumuli with a small megalithic polygonal chamber and a short corridor or none at all. Megaliths of the second phase would have been built during the Late Neolithic. These are generally bigger and possess developed corridors with heights that are different from those of the chambers and include more complex and differentiated

scenic spaces. Cruz, however, notes that it is difficult to establish a chronology for the small monuments and that, given the vast geographical regions considered, it is possible that megaliths of both sizes were being constructed and used contemporaneously by different communities (2001, 302). The general trend towards more and more complex monuments is nevertheless in line with arguments put forward for surrounding megalithic groups in Iberia (Cruz 2001, 302). On the other hand, "there is no evidence for the construction of dolmens" after 3,700 BCE, even though there is evidence for the continued use of some throughout the Late Neolithic and beyond (Cruz 1995a, 104).

Throughout the vast region and time period under consideration the depositional assemblages associated with these monuments are quite limited. Microliths, blades, polished stone axes and beads are universally present, whereas ceramic is notable for its absence, even though it shows up in other contexts (Cruz 2001, 305). Arrowheads are also found in the younger and more complex monuments of about 4,000 BCE onwards, once again in line with the introduction of this artefact into the Iberian northwest. The Late Neolithic is thus not so much characterized by new architectural styles but by the presence of new depositional artefacts, suggesting an increase in complexity of the funerary rites (Senna-Martinez 1994). New elements include novel pottery styles, projectile points, blade sickles and flint daggers, which are also found in known settlements that have been radiocarbon dated to the same period (Senna-Martinez 1994, 18).

Judging by the small quantity and variety of depositions and other artefactual finds, as well as the evidence for "condemnation structures" that permanently closed-off access to the dolmens, it seems that these monuments (both of the simple and complex types) had a relatively short lifespan (Cruz 2001, 290–1, 315–6). There is evidence for rituals involving fire in these 'condemnation' procedures, as well as care in the deposition of the stones that closed off the entrance, so that they would blend in with the surrounding tumulus, effectively camouflaging the dolmen's entrance.

These monuments can be seen as "true anchors in the landscape for populations that, on the other hand, have a high seasonal mobility" (Senna-Martinez *et al.* 2008b, 82). In this way Senna-Martinez and colleagues fit the monuments into their economic model: the megalithic cluster, by marking the winter territory, would legitimize its occupation. Settlements in the *Mondego* basin appear in close proximity to the dolmens and suggest an autumn and winter occupation, as evidenced by the presence of central hearths and earth ovens where acorns were roasted (Senna-Martinez and Ventura 2008a).

Megalithic Archaeoastronomy of the region

The seasonal model found further support from the archaeoastronomical analysis of the orientation of the entrance of the dolmens conducted by Hoskin, as part of his larger Mediterranean survey (Hoskin 2001, Senna-Martinez *et al.* 1997). Hoskin split the dolmens of Central Portugal into two groups, one roughly comprising those that were located in the northern river basins of the *Vouga*, *Paiva*, *Torto* and *Côa* rivers, the other those of the *Mondego* basin. In order to measure their orientation, Hoskin defined a line "from the centre of the backstone [the stone opposite the chamber entrance] to the centre of the entrance or passage" (2001, 12), of which he then measured the azimuth by using a compass.

Hoskin was unable to find a distinct pattern that applied to all dolmens: they all seemed to have different orientations, although within a given azimuthal range. The measured

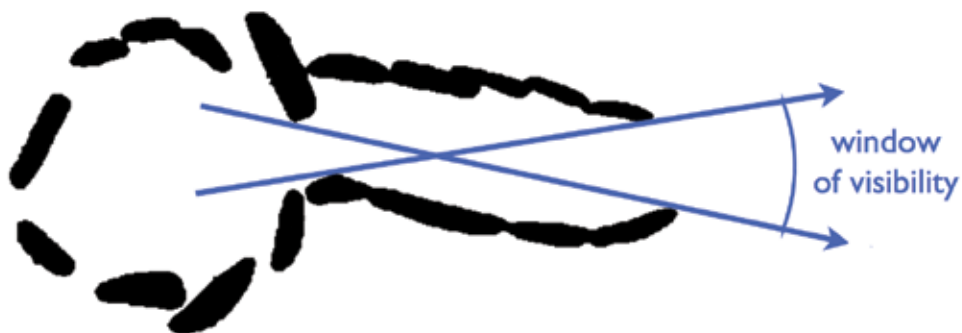


Fig. 10.2: Simplified plan view of a typical dolmen with corridor (orthostats in black), with the visibility window orientations measured (blue lines).

orientations were then interpreted as solar alignments to either sunrise or sun-climb (that is, to the sun shortly after sunrise) at the beginning of their construction. This would account for the variability in orientation but also for their confinement to a given range (as the sunrise position varies between a given minimum and maximum at the Solstices). For the *Mondego* dolmens, which exhibit a preference for south-easterly orientations and thus for autumn/winter sunrises, this seemed to fit the seasonal model of the archaeologists. Dolmens in other basins, however, exhibit a preference for slightly north-of-east directions, which can only fit an early spring/late summer sun (Silva 2010). In both groups, outlier orientations that cannot be explained by Hoskin's generalized solar interpretation abound which prompted the present author to conduct a more comprehensive survey of the region.

Fieldwork for the on-going project started in the spring of 2010 and focused, in its first phase, on the region between the *Douro* and *Mondego* rivers (Silva 2010). The goal was not only to expand on the number of sites surveyed by Hoskin, by including newly excavated sites, but also to extend the employed methodology.

Not only was a general orientation measured, similar to that defined by Hoskin, but also a measure of what I have named the "window of visibility" – see Silva (2010; 2013) for in-depth discussions of the employed methodology. The latter is defined as the maximum extent of the horizon which, given the dolmen's corridor and entrance geometry, can be seen from the chamber (Fig. 10.2). Contrary to, say, the ancient Egyptian pyramids, the dolmens very rarely display straight lines, even in the corridors, due to the use of very rough orthostats. As a result of this, one can define as many straight lines as methodologies to measure them. Measuring one of these lines to as much precision as one can does not counter the fact that one cannot be sure whether one is measuring the "right" line or whether such a line was meaningful to the dolmen builders. The latter might have intended the orientation of the chambers to simply point out, indicate or direct one's gaze towards a broad area of the horizon, where an "obvious" topographical feature would mark the important astronomical event.

This visibility window methodology was only applied to dolmens with a corridor, as only these considerably constrain visibility. In one case, the archaeological plan was used to carefully abstract these measurements, as the site did not provide enough conditions to do the required field measurements. For the simpler dolmens, only a very rough entrance

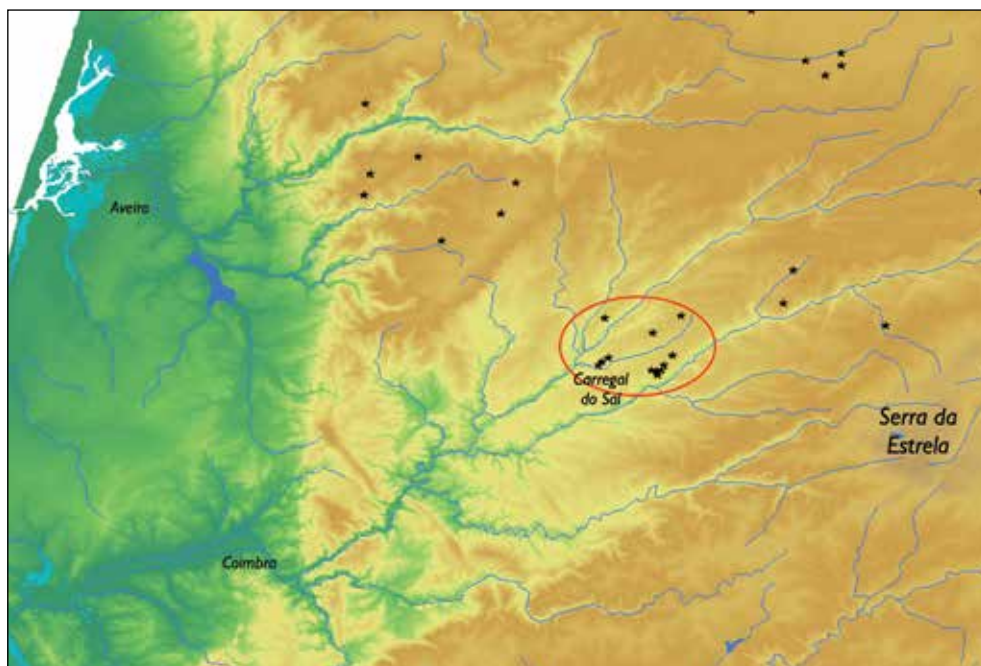


Fig. 10.3: Map of the Mondego platform with key locations named. The black stars represent the location of dolmens surveyed as part of this on-going project. The cluster that is being analysed in this chapter is highlighted by the red circle.

orientation was measured, as a considerably broader range of the horizon would be visible from within these. This measurement is not used in this work, although see Silva (2010; 2013), and should be seen as merely indicative, since it is still not clear how access to these dolmens was maintained. Some archaeologists suggest that, at least in a few such cases in North Portugal, access was via a ramp in the surrounding mound (Cruz, personal communication), which would constrain the view from the dolmen's chamber in a way that is impossible to reconstruct.

The methodology developed in the course of this project provides a more phenomenological approach to archaeoastronomy, allowing the portion of the horizon that is visible from within the chamber to speak for itself. When employed, patterns not observable in the milieu of possible statistical analyses were brought to the fore, particularly when looking at archaeologically significant scales. This microscopic approach was initiated by looking at one of the best-preserved megalithic clusters of the region.

The *Carregal do Sal* cluster

The district of *Carregal do Sal* is located on the northern bank of the *Mondego* valley, a mere kilometre and a half from the riverbed (Fig. 10.3). The archaeological record starts with the Early Neolithic settlement of *Carriceiras*, discovered in 1991 (Senna-Martinez *et*

Table 10.1: Window of visibility measurement of surveyed dolmens in the Mondego platform.

Ref	Name	Window Max Az	Window Min Az	Notes
23	Orca das Pramelas	130.00°	78.00°	
24	Orca de St Tisco	141.50°	93.00°	
25	Orca do Outeiro do Rato	124.25°	74.25°	
26	Orca do Santo	112.00°	85.00°	
27	Dolmen da Orca	117.50°	98.50°	
28	Orca 1 do Ameal	-	-	Simple dolmen, without corridor
29	Orca 2 do Ameal	-	-	Simple dolmen, without corridor
30	Orca da Palheira	-	-	Window impossible to measure
36	Orquinha da Vibora	-	-	Tumulus, possibly Bronze Age
42	Orca 2 de Oliveira do Conde	125.21°	80.42°	Measured from archaeological plan
51	Anta da Arquinha da Moura	111.00°	91.00°	
52	Orca de Travanca	-	-	Simple dolmen, destroyed
53	Orca de Valongo	-	-	Simple dolmen, destroyed

al. 1994). Since then, several others have been identified in the area: among them three open-air settlements and four rock-shelter settlements (Senna-Martinez *et al.* 2008a, 319). In addition, material recovered at the tumulus of *Orca 2 do Ameal* originated from an earlier settlement in the same location (Ventura 1998). The same was later confirmed for *Orca 2 de Oliveira do Conde* (Ventura 2000) and *Orca do Folhadal* (Senna-Martinez *et al.* 1999).

In the Middle Neolithic the region became home to several megalithic structures, of both the simple and the complex varieties. Table 10.1 lists all surveyed monuments in the region. Most are located in the *Fiais/Azenha* cluster, but others are found throughout the territorial municipality. A visibility window for *Orca da Palheira* was impossible to measure as a rural house was built around the dolmen using some of its orthostats. In addition, the extant corridor seems to have been slightly rotated in the process (Ventura, personal communication). Although technically not in the *Carregal do Sal* municipality, the monument *Anta da Arquinha da Moura* is included in this analysis for its similarities in proximity, landscape and skyline. It also illustrates the potential that the findings are extendable to the wider lower Mondego platform. Similarly, the tumulus of *Orquinha da Vibora* most likely never concealed a megalithic dolmen and might date to the Bronze Age (Vilaça *et al.* 1999), but its location, landscape and horizon are in every way similar to the dolmens in this cluster, which might indicate a continuity of practices in this region.

The region continued to be occupied throughout the fourth millennium, as evidenced by the settlements of *Ameal-VI*, *Murganho 2* and *Quinta Nova* (Senna-Martinez *et al.* 2008a, 340–2). These settlements are in everything similar to Early Neolithic ones, albeit structurally more complex. Radiocarbon dates, however, locate them firmly in the Late Neolithic/Calcolithic (Senna-Martinez *et al.* 2008a, 333).

When it comes to choice of landscape, it seems that there was a thread of continuity throughout the Neolithic. Settlements are found in open locations, with slight slopes and good visibility towards the east (Senna-Martinez *et al.* 2008a, 323). Much the same can be said of the megalithic structures. In fact the thread of continuity is very clear in the cases of the dolmens, mentioned above, that were built on top of Early Neolithic settlements, as well as of the Late Neolithic settlements that are preferentially located in the vicinity of megaliths.

Dolmenic Landscapes

The aspect I'm most interested in is what phenomenologically one would call *the view* or, in other words, the extent of landscape visible from a given site, as well as the horizon formed by the most distant topographic features (Cummings 2001; 2009). Unfortunately in the *Carregal do Sal* area, and more broadly in the *Mondego* platform, dolmens are found deep in wooded areas. The forests are, actually, quite recent. In fact, it was when these eucalyptus trees were being planted that most sites were identified for the first time (Ventura 1993).

Vegetation cover during the Neolithic would have been very different. Studies done on northwest Iberia have pointed to a "deforested landscape heavily affected by humans, with high abundance of shrubs and ferns", especially on the interior (Martínez-Cortizas *et al.* 2009, 84; Kaal *et al.* 2011; Araújo *et al.* 2012). Further to this, there is evidence that prior to the construction of a dolmen, the sites were cleared of any vegetation, probably by using fire (Ventura 1998, 124). Since in most cases the area surrounding the dolmen has not been fully excavated, the full extent of such clearance procedures is unknown. However, due to the existence of forecourts immediately outside the entrance, it could have been far-reaching.

Unfortunately, today's eucalyptus trees prevent one from enjoying *the view* from most dolmens in the region under study. To work around this, one can use Digital Elevation Models to virtually reconstruct the surrounding landscape in the absence of any vegetation. A Digital Elevation Model is a computer model composed of a raster of cells where each has the value of the mean elevation across the area defined by that cell (Connolly and Lake 2006, 27). There are several DEM models around, using elevation data acquired and treated differently. One such case is the SRTM or Shuttle Radar Topography Mission, which comprises elevations determined every 300 feet, outside of the US, obtained via radar interferometry by the Space Shuttle program during February 2000 (US Geological Survey 2010).

With this data a GIS software package can be used to create a virtual reconstruction of the horizon profile at any location. HeyWhatsThat is a free, online utility that uses SRTM data to do this (Kosowsky 2013). Figure 10.4 shows a 360-degree panorama of *the view* around *Anta da Arquinha da Moura*, as reconstructed using HeyWhatsThat. The different colours represent different distances of the topographical features (green is closest, then blue, dark magenta and finally purple). The vertical scale has been exaggerated 8 times to facilitate the identification of topographic features and the small inverted triangles, in red, mark visible named peaks. The cardinal directions are also marked.

The view from *Anta da Arquinha da Moura* is extensive, with mountain ranges in the distance creating a rugged horizon. The most prominent of these is the *Serra da Estrela* mountain range, towards the east/south-east. Most dolmens in the region under study are located in landscapes that yield similar views and horizons. The only exceptions seem to be *Orca da Palheira* and *Orca 2 de Oliveira do Conde*, both complex monuments with corridor that are four hundred metres distant from each other, which have a local horizon obscuring the view, as previously reported by Silva (2013, 107). When the site elevation given by the Digital Elevation Model is corrected, based on more accurate GPS readings and direct comparison to topographic charts, the reconstructed horizon displays a single feature towards the east: *Serra da Estrela*. This peculiarity occurs for both sites and will be returned to in the next section.

The importance of *Serra da Estrela* for the local Neolithic communities has been mentioned above and it is very interesting that this very same mountain range is featured



Fig. 10.4: The view from Anta da Arquinha da Moura, reconstructed using a Digital Elevation Model. Horizon images are copyright 2013 Michael Kosowsky. Used with permission.

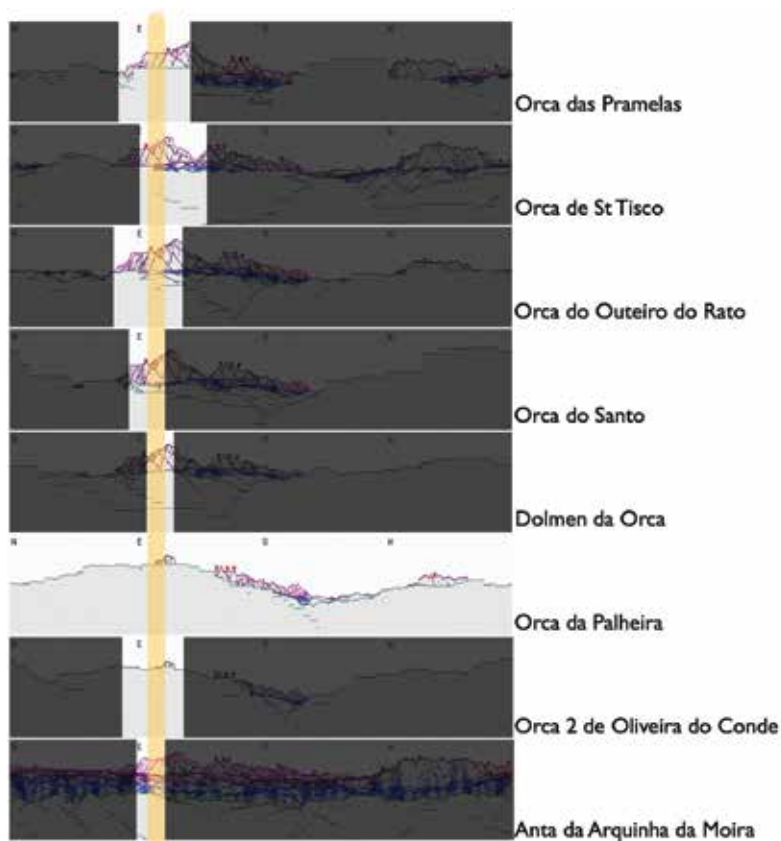


Fig. 10.5: The view from all surveyed corridor dolmens, reconstructed using a Digital Elevation Model. What cannot be seen from within the dolmen's chamber has been greyed out, thus highlighting the window of visibility. The vertical orange ribbon marks the region of the horizon that is visible from within all dolmens. Horizon images are copyright 2013 Michael Kosowsky. Used with permission.

so conspicuously in the landscapes of these communities. The significance of topographic features for Mesolithic and Neolithic folk has been highlighted by Tilley (1994). He argued that, in the Mesolithic 'known, named and significant places [were] linked by paths of movement to which populations repeatedly returned during their seasonal activity rounds' (1994, 202). In the Neolithic this dynamic would have changed, as the megaliths became

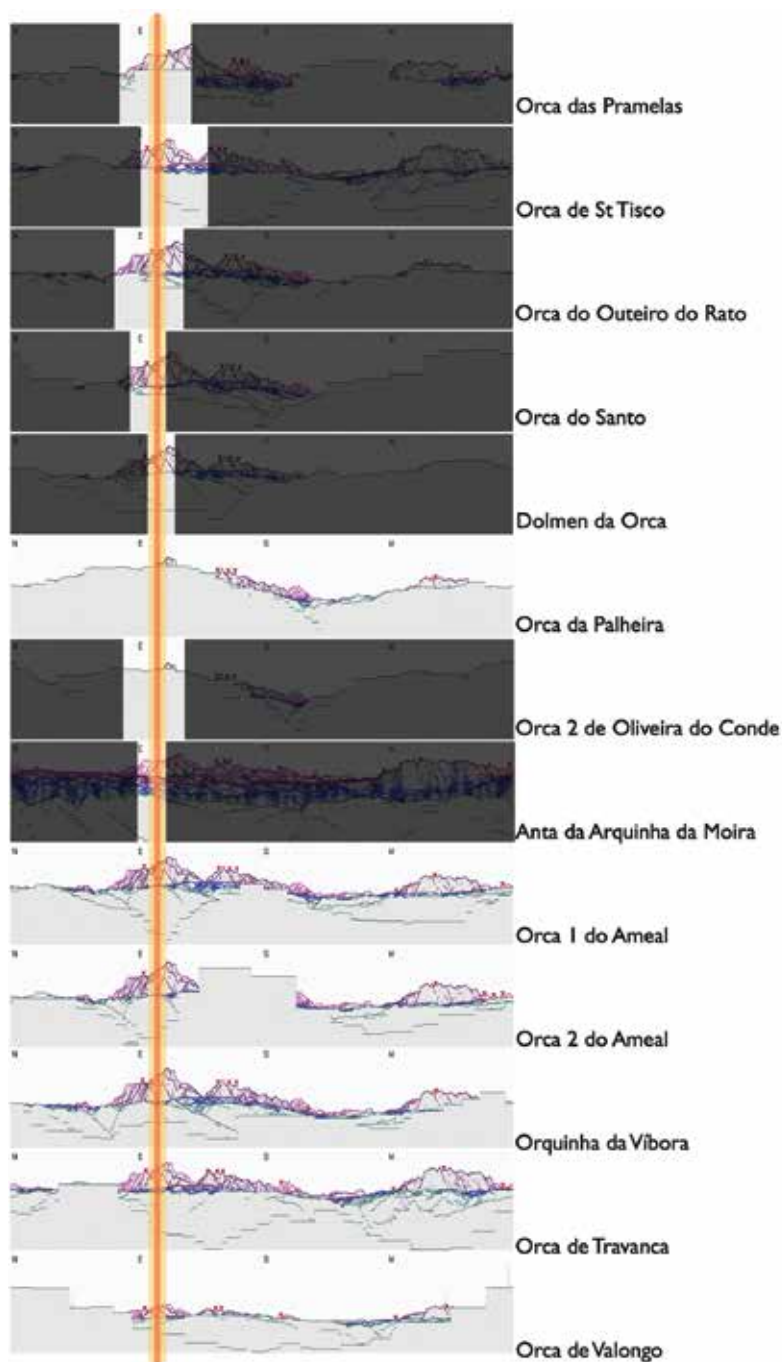


Fig. 10.6: The view from all surveyed dolmens in the Mondego platform. The vertical red ribbon marks the location from where the star Aldebaran would have risen from 4,300-3,700 BCE, directly above Serra da Estrela. The vertical orange ribbon is the same as in figure 10.5.

the anchors of the seasonal movements. Important landscape points ‘became *captured in the orientation* of morphological features of the monuments and *their placement in the landscape*’ (1994, 202–3, my emphasis).

One can use the measured visibility windows to check whether *Serra da Estrela* is not only prominent in the megalithic landscape but also, in Tilley’s words, ‘captured in the orientation’ of the dolmens. Figure 10.5 shows the reconstructed panoramas for all dolmens with corridor, with the window of visibility overlaid: the extent of the horizon that is not visible from within the chamber has been greyed out.

The telescopic corridors of the *Mondego* platform dolmens are all oriented towards *Serra da Estrela*, further highlighting its role in the cosmology of these communities, and even suggesting a link between the function of the dolmens and the mountain range. In fact this is readily extendable to the simpler dolmens that have no corridor but which, nevertheless are roughly oriented towards the mountain range (Fig. 10.6).

Besides having potential ritual and funerary functions, the dolmens of the *Mondego* valley also marked the winter territories of their builders (Cruz 2001, 311; Senna-Martinez *et al.* 2008b, 82), whereas *Serra da Estrela*, in the horizon, marked their summer pastures (Senna-Martinez *et al.* 2008a, 332). Consequently, it seems that both man-made and natural landscape markers were anchoring the seasonal movement of these Neolithic communities. Thus the orientation of the *Carregal do Sal* dolmens, makes sense from a landscape perspective.

Megalithic Skyscapes

The prominence of *Serra da Estrela* in the megalithic landscapes under study has just been discussed. However, this particular mountain range is visible from a wide range of locations in north-central Portugal, in some cases being a much more prominent horizon feature than when seen from *Carregal do Sal*. Yet, this region yields a higher density of megalithic sites than, for instance, the Upper *Mondego* region, where there are fewer megaliths and where they tend to appear in isolation. This could be a matter of archaeological sampling and survival rates, in other words that the region under study has been more thoroughly surveyed and thus more Neolithic structures have been found. On the other hand, it is possible that this region was chosen by the Neolithic communities not simply because *Serra da Estrela* was visible from it but also for other reasons. One suggestion I’d like to entertain is that this mountain range acted as a foresight for an astronomical event of importance to these Neolithic communities.

The exploration of the horizons surrounding the *Carregal do Sal* dolmens allows one to consider the possibility of astronomical intentionality behind the orientation of these dolmens. The horizon is where the heavens meet the earth, where landscape meets the skyscape, and therefore, where landscape archaeology and archaeoastronomy overlap. Let us look at the extent of the horizon that is visible from within the chambers of all dolmens with corridor in *Carregal do Sal*. If one of the many directions in this range was of astronomical importance to the dolmen builders then one would expect this direction to be visible from within all dolmen chambers. This is to say that a pattern should emerge from the study of the horizon. Figure 10.5 highlights in orange the range of azimuths that are visible from the chambers of all corridor dolmens. The highlighted region does not include the peak of the mountain range (which is not visible from several dolmens) and is most constrained by the two most

impressive monuments: *Dolmen da Orca* and *Anta da Arquinha da Moura*. Curiously, in the cases of *Orca da Palheira* and *Orca 2 de Oliveira do Conde* this region matches the bit of the horizon where the local landscape meets the distant mountain range. This might explain why these two monuments were built in this location, as it would have been quite easy to target that region of the horizon.

The highlighted region corresponds to azimuth range 98–111°. There are no well-established and visually well-defined solar or lunar events around this part of the horizon. The solstitial sunrises, when the position of sunrise is seen to stand still for about a week in midsummer and midwinter, occur further north and south respectively, and of the traditional lunar targets only one of the equinoctial full moons occurs close to this azimuth range at about 90–100° depending on the altitude of the horizon (Silva and Pimenta 2012). Another possibility is for sun- or moon-rise on an arbitrary date. Since the moon's movement is very erratic and difficult to predict and pinpoint with accuracy, this seems to be less likely, but the sun could be seen to rise in the highlighted region around the 20th of February and the 23rd of October every year.

The pinpointing of the sun's position on the horizon on a seemingly arbitrary date is not without precedent. The Hopi horizon calendars are a good example of a developed application of the same principle and its usefulness for an agricultural community (McCluskey 1977). The Neolithic communities could likewise have used this observation as a temporal marker for the coming of spring. However, there was another astronomical event in this region of the sky that might have served as a better trigger for the seasonal movement to higher pastures: the heliacal rising of Aldebaran, the brightest star of Taurus, and one of the brightest stars in the night-sky.

At the time of dolmen construction, circa 4,300–3,700 BCE, Aldebaran would have risen exactly within the band of the horizon that is visible from within all corridor dolmens. Figure 10.6 shows this band, marked by the thin vertical red ribbon, not only for the corridor dolmens, but also for the simpler ones. Although the architecture of these did not feature a corridor that would focus attention on a narrow band of the horizon, Neolithic folk might still have observed the rising of Aldebaran from these simpler dolmens. We can now also look back at the peculiar landscapes of *Orca da Palheira* and *Orca 2 de Oliveira do Conde*, from where *Serra da Estrela* is barely visible, and notice that Aldebaran would have risen exactly where the distant mountain range meets the local horizon.

Even though stars, whenever visible, are always seen to rise in the same place on the horizon throughout the year, stars that lie this far from the celestial pole go through a period in which they are not seen in the night-sky. After this period of invisibility, their first appearance is at dawn, rising just before the sun: this is what is known as the heliacal rising (Schaefer 1987; Brady this volume). In the epoch under consideration, the heliacal rising of Aldebaran happened around 18–27th of April (Silva 2013). The precision of these dates needs to be taken with a pinch of salt, as visibility, climatic and other observational criteria might not permit the star to be seen so close to the horizon on a given day. Generally, however, one can say that Aldebaran first appeared in the eastern sky in late April/early May.

The seasonal model states that, in the spring and summer, the dolmen builders would take their ovicaprids to the high pastures of *Serra da Estrela* to take advantage of its grazing grounds. If these Neolithic communities were observing the heliacal rise of Aldebaran, as the dolmenic alignments suggest and is here proposed, they could have used it as a temporal



Fig. 10.7: The view towards the east from Orquinha da Víbora, at dawn at the end of April around 4,000 BCE, as reconstructed using a Digital Elevation Model and Stellarium. Aldebaran, the last star to rise before the sun, is seen to rise directly above the “mountain range of the star”.



Fig. 10.8: Very vivid extant red ochre paintings of Dolmen de Antelas (Oliveira do Bairro).

marker for this movement to high pastures. Aldebaran’s period of invisibility – from late February to late April – would provide the perfect amount of time to make preparations for whatever rituals were going to be enacted at the dolmens, as well as to prepare for the move to higher grounds.¹

The Role of Aldebaran in Neolithic Cosmology

The question now is what role would Aldebaran have played in the beliefs of these megalith builders. The possibility that the helical rising of Aldebaran could have been used as a temporal marker for the seasonal movement of the Neolithic communities of central Portugal has just been highlighted. Yet, the heliacal rising of a star can be observed without the need to build any tools or structures. As an example, tribes in the Amazon celebrate the heliacal rising of the Pleiades as the transition from the dry to the wet season without building any monuments aligned to this event (Lévi-Strauss 1969, Hugh-Jones 1988). Much like the Amazonians, however, this seasonal function of Aldebaran would certainly mean that it would have played a key role in the cosmology of the Neolithic folk of central Portugal. Social memory of the importance of this star might have survived down to present-day in toponymical folktales of *Serra da Estrela*, which translates as Star mountain range (Silva 2013). However, this does not mean that observing the heliacal rising of the brightest star of Taurus was the intention behind the alignment of the *Carregal do Sal* dolmens: the heliacal rising is, after all, only the first observed rising of the star.

Aldebaran could be seen to rise in alignment with *Serra da Estrela* on any given night from its heliacal rising in late April to its achronycal setting in mid September (when it stops to be seen to rise during the night) and, throughout this breadth of time the dolmenic alignments would have been visible. However, since the dolmen builders spent the warmer months in the high pastures of *Serra da Estrela* they could not always observe the star rise from the location of the dolmens. This leaves us with two possibilities that should be equally considered: either the alignment was observed just before the seasonal move, and thus at the moment of heliacal rising; or the alignment was not meant for the living.

The former hypothesis implies that the moment of heliacal rising was indeed of importance. The latter, on the other hand, suggests a connection between the dead in the tomb's chamber and the star, which could be either symbolic (and ever-present) and/or ritual (and thus timed). These possibilities are not mutually exclusive as the connection between the dead and Aldebaran might be established at the time of the heliacal rising through the enactment of funerary rites. In the following these possibilities will be explored separately, with recourse to ethnographic and historical analogy whenever possible.

Aldebaran for the Dead

Aldebaran could have been regarded as the heavenly abode of the dead ancestors, or their escort towards the afterlife. The dolmen's corridor and entrance could serve as a conduit for the dead soul to be transported to the horizon and henceforth to the sky with the assistance of Aldebaran. This could occur at any point during the warmer months, or it could be "triggered" by funerary rites timed by the heliacal rising of the star in late April. In many ways, this could be similar to ancient Egyptian beliefs in the afterlife, particularly during the Old Kingdom (Brady 2012; Faulkner 1966).

Another possibility is that Aldebaran was to take care of the dead buried in the chamber, while the living were away from them during the summer months. There could also be an element of territoriality in this, in that the personified star would, by doing this, keep an eye on their territory. But, perhaps more simply, the star was meant to serve as a beacon to the dead ancestors, marking the location of the living, who had gone to *Serra da Estrela* during

the warm months. In this way the ancestors could protect the living or ensure the natural fertility of the mountain range in the summer half of the year. On the other hand it might have simply been a case of ensuring that the seasonality that defined Neolithic existence in life was continued in the afterlife. The dead ancestors would use the stellar beacon to join their living relatives and descendants in the high pastures of the mountain range.

However intriguing these possibilities might be, particularly since they touch the otherwise intangible afterlife ideologies of long-gone communities, they are based on the assumption that the dolmens were tombs. This has been the default assumption of archaeologists both locally and elsewhere in Atlantic Europe. However, the evidence for this is scarce, particularly so in northwest Iberia.

In the Mondego platform human bones associated with Neolithic sites have only been found on one site: *Anta da Arquinha da Moura*, one of the dolmens considered in this study (Silva 1995). However, these are the result of inhumations during a later reuse of the dolmen (Bettencourt 2010; Cunha 1995). Although Calcolithic and Bronze Age folk reused many dolmens, a practice that was common in northwest Iberia, it is clear that they were unaware of its original purpose or design (Cruz 1995a, 104): they clearly identified the site, probably from the tumulus or any extant coverstones, but they didn't know where its entrance was supposed to be. Instead they dug the tumulus from seemingly random directions, eventually finding the corridor or chamber, removing some of its orthostats to get in, and then reused it for inhumations.

The lack of bone evidence in north Portugal is usually attributed to the effect of its acidic soils. Acid dissolves the mineral in the bones, which means that interred human bones do not survive for long in acidic soils (Silva 1995, 141–2). This could very well be the case, however, this should be treated less as a dogma and more as a working hypothesis that should be constantly tested. The restraining effect of long-held assumptions on the understanding of prehistoric archaeological remains is not without precedent (Monteiro-Rodrigues 2011; Silva *et al.* 2013).

Aldebaran for the Living

An alternative hypothesis is that the dolmens were built primarily as temples, and only secondarily served as tombs, if at all. Although these are Neolithic monuments, agriculture played a very minor role for these communities: it was one form of subsistence among a broad spectrum of strategies that mostly focused on hunting and gathering. One should thus shed one's "agricultural thinking" (Gamble *et al.* 2005) when trying to understand these communities (Silva *et al.* 2013). They were essentially hunter-gatherers and, using ethnographic analogy as a proxy, ceremonial feasts and initiation rites should have played a major role in their social lives (Hayden *et al.* 2011).

The evidence for ceremonies at these sites is overwhelming, particularly in the forecourt immediately outside the dolmen's entrances. These forecourts seem to be a widespread feature of the dolmens of northwest Iberia, particularly of the more complex ones, and have been interpreted as "scenic spaces" (Senna-Martinez *et al.* 1999). These areas were clearly demarcated and, when excavated, provided a wealth of material culture (Carvalho 2005, 171–2). Their purpose is unclear but they have been interpreted as ritual in function.

Judging by the number of extant cases of megalithic art in the chamber's orthostats, of both the painted and the carved variety, it stands to reason that they might also have played

a role in whatever rituals were enacted there. Paintings of this nature, depicting hunting scenes but also more abstract or symbolic elements, are characteristic of hunter-gatherer rock art (Lewis-Williams and Pearce 2009). It has been suggested that these are associated with shamanism but also with initiation and puberty rituals or, more generally, with rites of passage (Lewis-Williams 1981; Power 2004; Solomon 1992).

Such rites '*accompany every change of place, state, social position and age*' (Turner 1967, 47) and, in general, share some characteristics that have been first identified by Van Gennep (Van Gennep 1960). They consist of three succeeding phases: 1) separation, when the initiate is separated from the community; 2) transition or liminality, which is the period of transformation; and 3) reintegration, during which the initiate is reincorporated into the community in a new role. Turner's work (1967) has emphasized the transformative aspects of liminality, when the initiate is separated from society. Further to this and based on an ethnographic survey of several groups, Hayden and Villeneuve highlighted the role of astronomy in initiation rites of hunter-gatherer secret societies, whose secret knowledge often "encompassed sophisticated solar, lunar and other celestial observations and knowledge" (2011, 348).

The dolmen's chamber could have acted as an initiation "womb": the young initiate would separate from the community, spend the night in the dolmen, maybe in a solitary vision quest that would culminate in Aldebaran rising just before sunrise. It is possible that the telescope-like feature of the corridor, by narrowing the band of the horizon visible from inside, would bar the dawn's twilight sufficiently for Aldebaran to be seen to heliacally rise days, if not a full week, ahead of any communal observation. Despite being purely conjectural, but phenomenologically testable, this would fit the view that hunter-gatherer "secret societies frequently appropriate parts of pre-existing ideologies but add new esoteric elements which normally form the 'secrets' known only to secret-society members." (Hayden *et al.* 2011, 346].

These factors do seem to suggest, and even highlight, the dolmen's possible use as an initiation structure. This is not necessarily to the exclusion of a funerary function: both could be associated in the ideology of the Neolithic communities. In fact, initiation is often conceived of as a new birth: a symbolic and social death-and-rebirth (Turner 1967, 48). Furthermore ritual, "especially certain forms which occur among secret societies, did not occur in isolation from behaviours such as feasting and dances" (Hayden *et al.* 2011, 351) which could be funerary in function (Hayden 2001, 37). What raising this hypothesis does is provide a new way to conceptualize and approach the phenomena of megalithism in northwest Iberia, one that has so far been overshadowed by the mortuary supposition.

Conclusion

Using a methodology that does not impose a straight line of orientation from the get-go, nor assumes precision in the alignment, but instead adds a pinch of phenomenology, the prehistoric monuments and landscapes of north-central Portugal were allowed to speak for themselves.

The view from within the chambers of all studied dolmens not only features *Serra da Estrela* in the horizon, but would also permit the rising of Aldebaran to be seen. Around

4,000 BCE, when the megaliths were built, the rising of Aldebaran could only be seen between late April and mid September. Because of their seasonal lifestyle, the Neolithic communities of the *Mondego* platform would spend the warmer half of the year in the high pastures of *Serra da Estrela* and not in the river valleys where the dolmens are located. They therefore could not observe the alignment between star, mountain range and megalithic corridors, unless this observation was done before they moved out of the platform. These communities could use Aldebaran's first rise in late April, after two months of invisibility, as a trigger for this seasonal movement.

However, everyone can observe the heliacal rising of a star without the need for any tools or structures. Aldebaran could have featured prominently in the cosmology of these Neolithic folk, but the purpose of the dolmenic alignments was not simply to observe its rising. This realization opens up new questions related to the use of these megalithic structures.

One possibility is that the alignment between star and mountain range was meant for the dead buried in the dolmen's chamber. This might link Aldebaran with a concept of afterlife, which is not without historical precedent. The star could be conceptualized as the land of the dead in the celestial skyscape, or as a conduit to such a land. On the other hand, it could serve as a beacon to ensure that the seasonality, between river valley and mountain range, that defined them in life continued in death. Funerary rites occurring at the heliacal rising of Aldebaran could trigger this link between the star and the dead, which continued for as long as the star was seen to rise in alignment with the dolmen's chamber. The hypotheses are many and varied, and constrained only by the limitations of ethnographic or historical analogy, and the imagination of the scholar.

The discussion has also allowed a new suggestion to be raised, namely that the dolmens were used as initiation structures and that the alignments played a role in these rites. This is certainly highlighted by other characteristics of the dolmens: the chamber's isolation, the lavish paintings found within in the style of shamanistic or initiatory rock art and the scant amount of depositions within. As part of the rite of passage, an initiate might be asked to spend one, or more, nights inside the dolmen's chamber in seclusion. This could be part of a vision quest, which would be boosted by the paintings inside the chamber. The vision quest might culminate in the observation of the heliacal rising of Aldebaran that, because of the telescopic nature of the dolmens' corridor, might have been visible days before any communal observation. This is not necessarily to the exclusion of previous hypotheses, as initiation and death could be conceptually linked in the Neolithic mind, and the dolmens might have served more than one purpose, as others have already proposed (eg Cruz 1995b).

The dolmens of the *Mondego* platform were therefore more than mere territorial markers or tombs, they were the very materialization of liminality: half-way between summer and winter, low ground and high ground, the river valley and the mountain range, night and day, nature and culture, society and the individual, maybe even the sacred and the profane, the living and the dead or the uninitiated and the initiated.

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Note

- 1 In a prior work, both Aldebaran and Betelgeuse, in the constellation of Orion, have been identified as possible candidates for this alignment. However, the late heliacal rising of Betelgeuse, a month after Aldebaran's, makes it a less likely candidate, as already pointed out (Silva 2013).

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