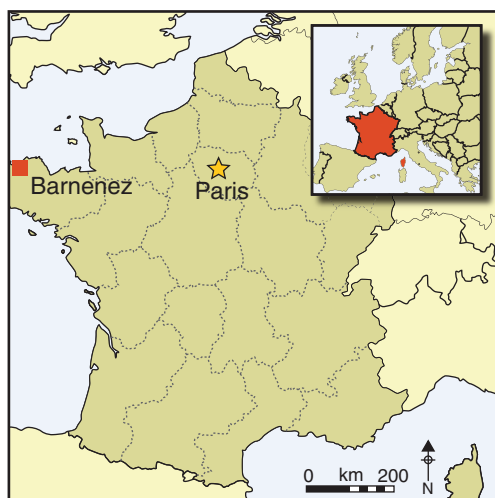


# Natural and artificial colours: the megalithic monuments of Brittany

Primitiva Bueno Ramírez<sup>1</sup>, Rodrigo de Balbín Behrmann<sup>1</sup>,  
Luc Laporte<sup>2</sup>, Philippe Gouézin<sup>2</sup>, Florian Cousseau<sup>2</sup>,  
Rosa Barroso Bermejo<sup>1</sup>, Antonio Hernanz Gismero<sup>3</sup>,  
Mercedes Iriarte Cela<sup>3</sup> & Laurent Quesnel<sup>2</sup>



*Megalithic art is a well-known feature of the Neolithic chambered tombs of Atlantic Europe. The surviving evidence consists largely of carved motifs, and, until recently, painted megalithic art was thought to be restricted to western Iberia. Recent discoveries have expanded that distribution, assisted by new methods of detection, recording and analysis. The discovery of painted motifs at Barnenez in Brittany, reported here, marks a breakthrough and raises the possibility that many megalithic tombs in north-west Europe were once coloured as well as carved. Similarities in motifs and techniques also point to the likelihood of direct connections with Iberia.*

**Keywords:** Atlantic Europe, Neolithic, megalithic art, chambered tombs, pigments, Raman microscopy, microparticle analysis

For supplementary material accompanying this paper, visit <http://antiquity.ac.uk/projgall/buenoramirez343>

## The role of colour in megalithic monuments

Megalithic chambered tombs of the fifth to third millennia BC are among the most prominent prehistoric remains across a broad band of Western Europe from southern Spain to Scandinavia. In a number of regions, engraved motifs are found, either within the

<sup>1</sup> Departamento de Historia y Filosofía, Universidad de Alcalá, Calle Colegios 2, 28801 Alcalá de Henares (Madrid), Spain (Email: p.bueno@uah.es; rodrigo.balbin@uah.es; rosa.barroso@uah.es)

<sup>2</sup> UMR6566-CReAAH Université Rennes 1, Campus de Beaulieu, 35042 Rennes Cedex, France (Email: luc.laporte@univ-rennes1.fr; philgouez@orange.fr; florian.cousseau@gmail.com; laurent.quesnel@univ-rennes1.fr)

<sup>3</sup> Departamento de Ciencias y Técnicas Fisicoquímicas, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Paseo Senda de Rey 9, 28040 Madrid, Spain (Email: ahernanz@ccia.uned.es; miriarte@invi.uned.es)

tomb structures or on the kerbstones of the mounds or cairns that enclose them. Megalithic tombs with painted decoration, however, have long been thought to be confined to the Iberian Peninsula. For example, Elizabeth Shee Twohig described painting as a technique specifically reserved for the megalithic tombs in the Viseu area in northern Portugal (Shee Twohig 1981). A number of discoveries had been made in the early decades of the twentieth century (Vasconcellos 1907; Coelho 1931; Leisner 1934), but, more recently, many new examples have been identified through targeted scientific projects carried out by specialists in this field. The results have shown that painting was a widely used technique within the Iberian Peninsula. Most megalithic monuments with carved motifs have also been found to have painted motifs when appropriate methodologies are applied. The presence of red, black and white pigments confirms the ritual value of colour in these funerary contexts (Bueno Ramírez & de Balbín Behrmann 1992; Carrera Ramírez & Fábregas Valcarce 2002; Bueno Ramírez *et al.* 2007, 2008: 52; Carrera Ramírez 2011).

Colour and light are inseparable characteristics when it comes to the selection of stones for megalithic monuments (Scarre 2004; Darvill 2011). This is especially noticeable when the stones themselves are of a neutral colour, essentially grey-white. The impact of light is all the greater as it increases, intensifies and changes the colours. The orientation of the access also plays an important role, allowing sunlight to enter the chamber. Furthermore, the colour of the orthostats sometimes contrasts strongly with the floors of the chambers, where the latter are painted red (Cassen 2000: 455; Gavilán Ceballos & Vera-Rodríguez 2005).

Several strands of evidence confirm that geographically distant areas of Western Europe where megalithic monuments are found were linked by exchange (Herbault & Querré 2004; Sheridan 2005; Laporte 2009). The extent of relations between the Iberian Peninsula and Brittany is particularly noticeable. In both regions, the construction of megalithic monuments began at a relatively early date (by at least the mid fifth millennium, and probably earlier in Iberia). In both regions too, chambered tombs present motifs that are commonly grouped together under the heading of 'megalithic art'. Furthermore, there are parallels in the initial (fifth millennium BC) tradition of menhirs in both regions, and similarities in the motifs that are employed. However, until the recent discoveries presented here, no evidence for the use of applied colour had been detected within the chambered tombs of Brittany.

## **Technique and region: engraving *versus* painting**

The Iberian Peninsula has a number of rock art traditions of Neolithic age. One of the most important is schematic art, a tradition with Mediterranean affinities that has led to the peninsula as a whole being considered part of the Mediterranean zone. It is commonly assumed that the technique of painting and the themes that are depicted are part of a 'Neolithic package' (Hernández & Martí 2001), in which painting was the Mediterranean cultural norm and engravings the Atlantic equivalent. However, these regional boundaries only exist in historiography. Intensive surveys in western Extremadura and adjacent areas of Portugal with megalithic tombs have discovered evidence of painted motifs, which undermine this traditional division (Bueno Ramírez *et al.* 2009).

The absence of painted motifs in Atlantic megalithic art has also been attributed to the effect of climate (Devignes 1997). Thus, the cooler and wetter parts of the Atlantic façade have been considered inimical to the preservation of any painted motifs that might once have existed. This argument has repeatedly been made in studies of European prehistoric art but can no longer be supported. It should be noted, for example, that most of the painted dolmens in the Iberian Peninsula are located in the most humid areas of the north: Viseu, Galicia, Asturias and the Basque Country.

Outside Iberia, painted motifs are known in the south of France (Hameau *et al.* 2001), and traces have been identified in megalithic funerary contexts elsewhere in Western Europe (Breuil & Macalister 1921; Müller 1996; Bradley *et al.* 2000; Anati & Gomes 2013: 84) (Figure 1). By the middle of the twentieth century, the presence of black paint in the Late Neolithic rock-cut tombs of the Marne was acknowledged (Villes 1997). In the south of France, black pigments were found on the orthostats of the Courion dolmen (Guthertz *et al.* 1998). More intensive examination of chambered tombs in Aquitaine and southern France (Beyneix 2007: 523) has provided a broader evidence base (menhirs, engraved dolmens and remains of ochre), including painted stelae (Hasler 1998; Maillé 2010: 190; Benéteau-Douillard 2012: 166). Since the 1990s, evidence has also been found in the British Isles. Shee Twohig (1997) noted the important role of red pigments at the Skara Brae settlement: this has since been confirmed by work at the Ness of Brodgar (Card *et al.* 2007).

Despite these discoveries, the pigments themselves have never been analysed, and more detailed information is needed. The discoveries do, however, provide reasonable evidence for the role of painting in these areas. Brittany, on the other hand, has remained one of the areas with engravings but no traces of painted decoration. Using methods that have proved successful elsewhere, the situation can now be reassessed.

## Methods of detection, recording and analysis

The detection of painted decoration in megalithic monuments demands the use of specific methodologies. It is easy to find pigments that have been well preserved, but more difficult to establish reliable methods for identifying and recording less visible remains. Our reassessment of the evidence for painting in Brittany employed methods that had been successfully applied in Palaeolithic cave art, specifically digital photographic enhancement. Tracings are prepared from the digitally enhanced images: they are never made directly. These methods are based on experience obtained during 20 years of fieldwork on chambered tombs of the Iberian Peninsula. Individual megalithic blocks (orthostats) are divided into sections, and each section is photographed separately. If the surfaces have been engraved, or engraved and painted, the shadow and contrast effects become stronger and more dramatic under artificial illumination (Sanches 2006), so special lighting is used to enhance pigment visibility. Once paint and engravings have been detected, the strategy varies according to the specific circumstances. If there is the possibility of producing a 3D image, overlapping pictures are taken and embedded in the 3D program. To create the interpretative diagrams, photographs are adjusted in Adobe Photoshop using digital enhancement to select the best

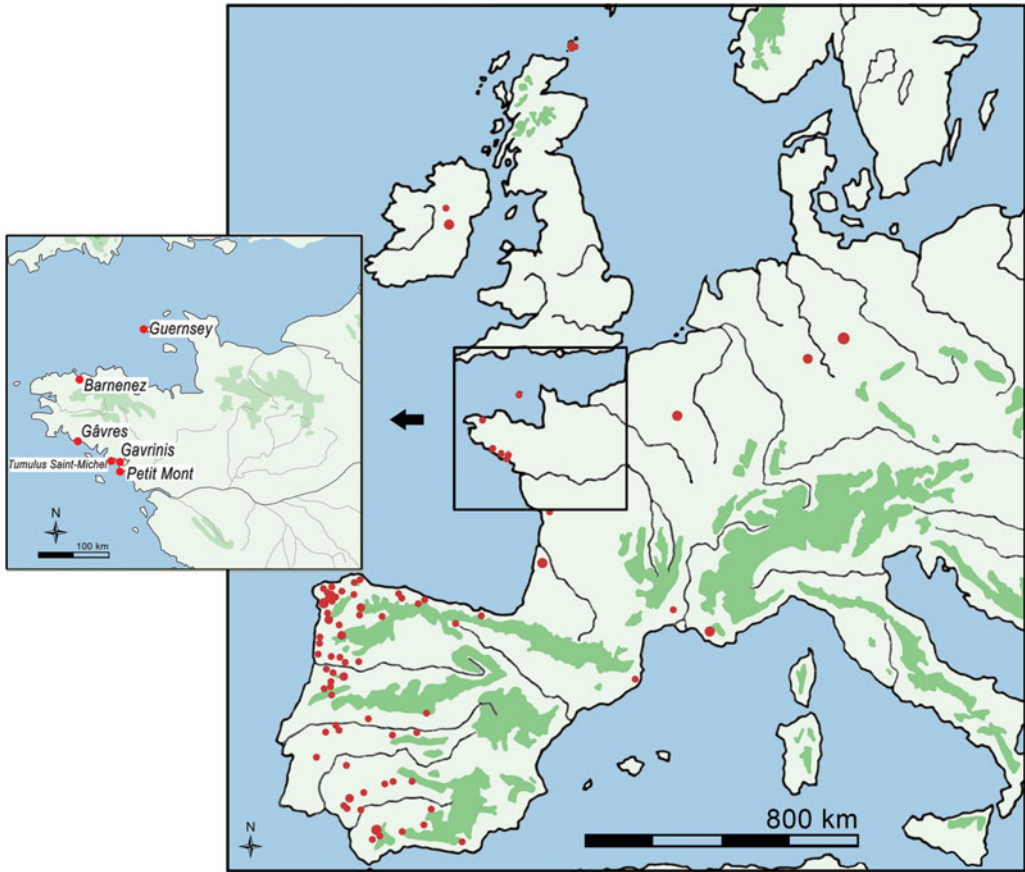


Figure 1. Location of megaliths with traces of painting in Europe, showing the sites in Brittany mentioned in the text.

images. The final image is a composite combining the optimal lighting perspectives for each of the documented parts of the stone. This final product requires intensive work, including verification in the field. The optimal image that is obtained is called the “photographic restitution” (Bueno Ramírez *et al.* 2009: 905, fig. 16), and provides the basis for the tracings.

More than 85 per cent of Iberian megalithic tombs with painted motifs have been recorded using this photographic methodology. However, the application of pigment analysis offers further advantages and was also employed in our study. Not only does it permit the identification of specific pigments, it also defines their quality and the level of work that has been invested in their preparation. It can also enable the source of the pigments to be determined. Samples can be taken for laboratory study, but analysis in the field is also possible using portable instruments such as Raman or energy-dispersive X-ray fluorescence (EDXRF) spectrometers. Both of these latter techniques are non-destructive and can distinguish components without damaging the pigments.

## The Brittany research programme

As noted above, Brittany was unusual among the megalithic regions of Atlantic Europe in the abundance of engraved megalithic art and the absence of painted motifs. Potential traces had, however, been remarked by a number of previous observers. These included possible red pigments in Barnenez chamber H, which had been closed since the excavations by Pierre-Roland Giot in 1955–1968 (Giot 1987). The presence of pigments in this tomb was supported by testimony from Charles-Tanguy Le Roux, Michel Le Goffic and Yannic Le Cerf (all *pers. comm.*), all of whom had participated in the original fieldwork. Traces of black paint had also been reported in the angled passage tomb of Göerem at Gavres in southern Brittany, along with traces of red colouration (Gouézin *et al.* 2013). The style of the motifs is recognisably similar to that of Iberian examples (Figure 2).

Although there were no confirmed observations of painted motifs, the role of colour in the megalithic chambered tombs of Brittany had already been remarked. This was shown in a number of cases by differences in the choice of natural stone colours. Giot, for example, had observed the choice of specific stone colours for the façades of the Barnenez cairn (Plouezoc'h, Finistère), an observation subsequently echoed by L'Helgouach (Giot 1987; L'Helgouach 1997). The dark façades of the initial quadrangular monument, built of local stone, contrast with the lighter façades of the western extension, built with granite of a more distant origin. Recent research by Florian Cousseau is focusing on the systematic analysis of stone colour inside these burial chambers. For example, for the construction of Barnenez chamber G', dark stone was used for the base and white granite for the corbelled vault, the passage capstones and the façade (Figure 3).

## Barnenez revisited

The impressive multi-chambered cairn at Barnenez had not been studied systematically since Giot's excavations half a century ago (Giot 1987). During an initial visit to Barnenez in April 2011, we were able to distinguish black and red painting on some of the orthostats, arranged in fundamentally geometric themes. Our survey focused on chamber H, in the eastern half of the cairn. In the course of our work, we discovered additional engraved motifs to those described in the excavation report (Figure 4). Moreover, we reviewed the photographs taken when chamber H was discovered. The painted decoration was at that date more widespread than today, with visible indications of well-preserved black on almost all of the slabs on the southern side of the chamber (Figure 5).

In order to determine the composition of the pigments and validate the new discovery, three micro-samples were taken from orthostats C and E. The extracted micro-samples are heterogeneous at microscopic level, containing a large number of microparticles from the pigment as well as microparticles from the rocky substrate. The first step was therefore to differentiate between these two components by means of their Raman spectra. This was achieved by selecting the Raman spectrum of the pigment in which its characteristic 'fingerprint' takes the form of strong, narrow and well-resolved bands. A high spatial



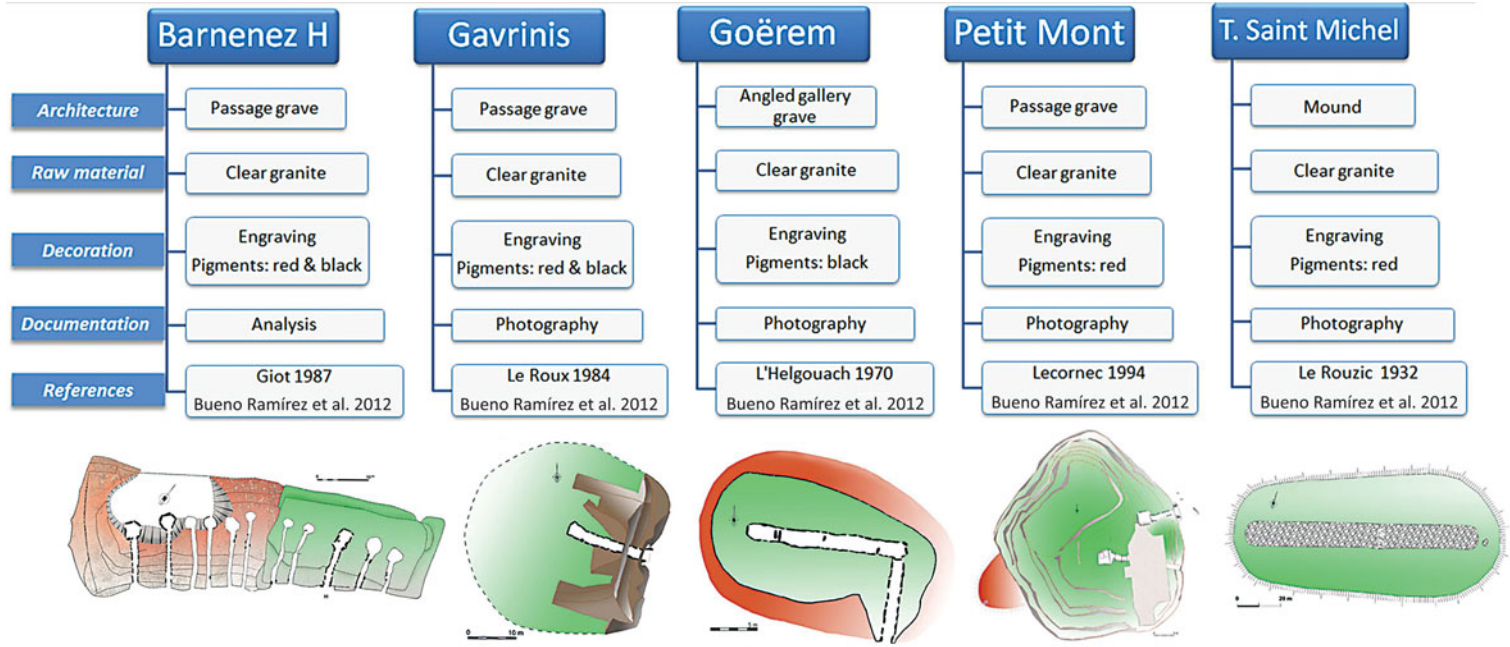


Figure 2. Raw materials and artificial pigments from Breton monuments described in the text.

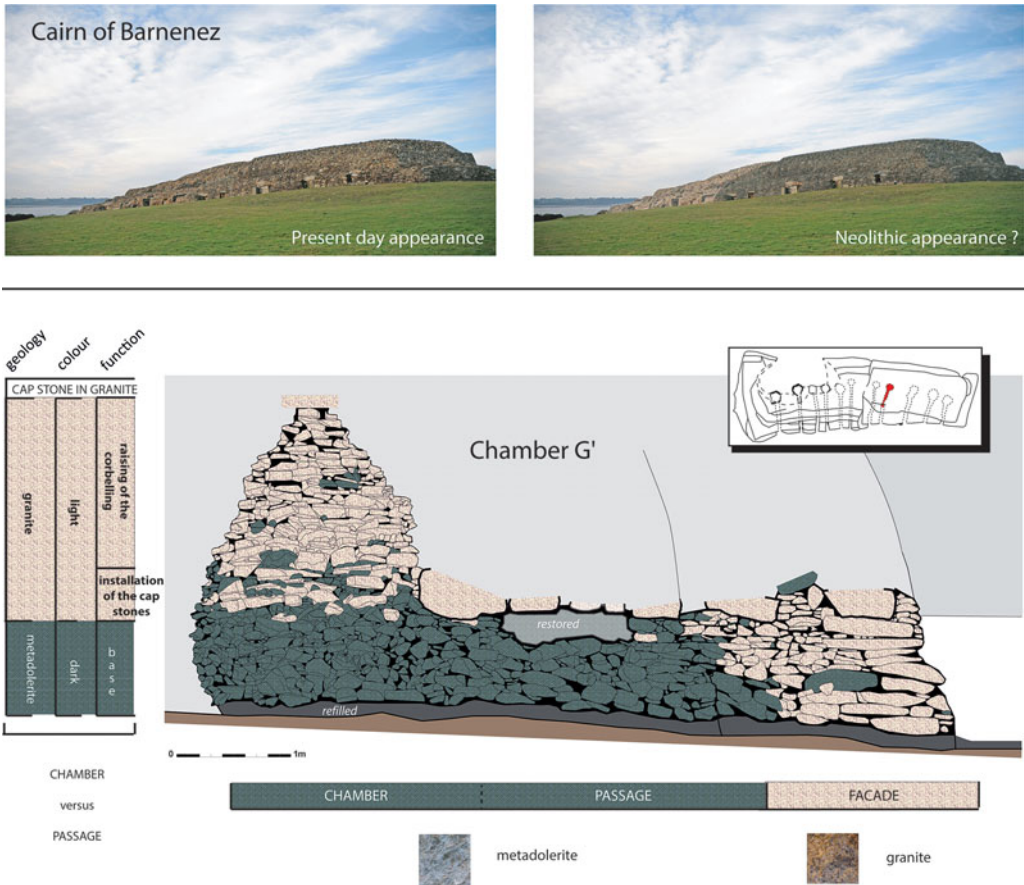
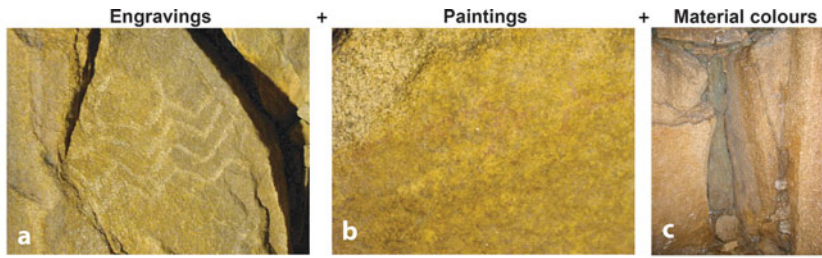


Figure 3. Façades of the cairn of Barnenez (Plouezoc'h, northern Brittany), and elevation of passage tomb G' showing contrasting stone colours.

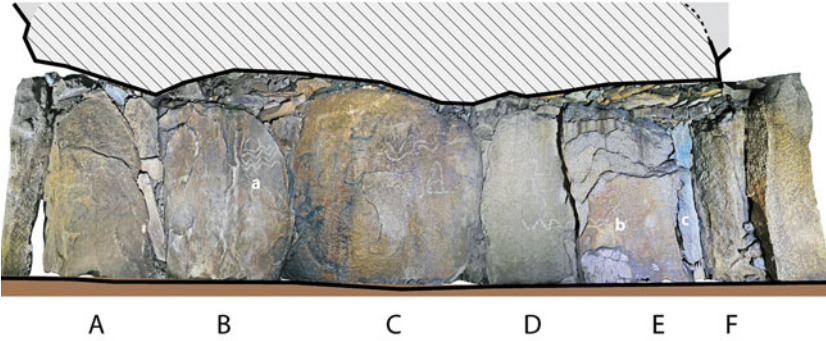
resolution (between one and two microns of lateral resolution) was achieved by Raman microscopy. The results confirmed that they were artificial pigments: manganese dioxide for the black and iron oxide for the red.

A second level of analysis revealed specific information about the pigments. Two samples of black pigment were taken from orthostat C. Using Raman microscopy, in sample M1 we detected  $\alpha$ -quartz, amorphous charcoal, haematite and pyrochroite. The latter are respectively an iron oxide and a manganese hydroxide. Online supplementary Figure S1 shows a Raman spectrum in which the characteristic haematite (*b*) bands are visible along with the D and G bands of amorphous carbon (*ac*). The first *ac* band, at approximately  $1350\text{cm}^{-1}$ , appears to overlap with the strong haematite band at  $1312\text{cm}^{-1}$ . The other amorphous carbon band seems to be well differentiated at  $1585\text{cm}^{-1}$ . The absence of bands in the  $970\text{cm}^{-1}$  region indicates that the black pigment is not necessarily from bone material but vegetal charcoal or soot. This combination of results assures us that the haematites and the amorphous carbon are closely connected. Moreover, a very clear

*Natural and artificial colours*



**New observations**



**Interpretation**

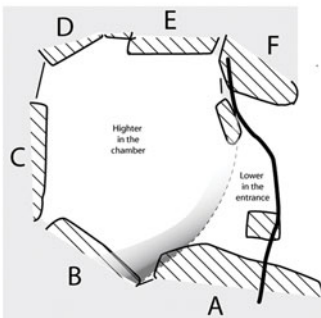
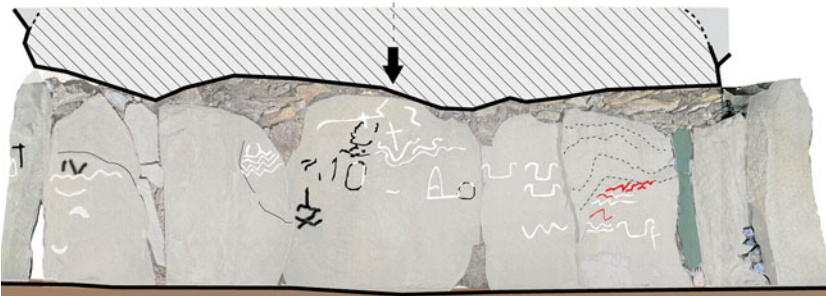


Figure 4. Raw materials, applied pigments and engraved motifs in chamber H at Barnenez. Photographic composition of elevation and plan with letters identifying the individual orthostats from Giot (1987).





Figure 5. Barnenez chamber H at the time of its discovery.

pyrochroite (*pyr*) spectrum is visible. This provides evidence for a pigment ‘recipe’, in the sense defined by Menu *et al.* (1993) for Palaeolithic art.

The spectrum of sample M3 (see online supplementary Figure S1), taken from orthostat E, confirms the presence of red iron sulphate colouring. It is possible this comes from a geological area with a high iron content, as it has sometimes been found in pigments from the Iberian Peninsula. On the other hand, indications of manganese dioxide hint that orthostat E not only had red colouring, but also black colouring that has now disappeared. The mark left by a recent repair using synthetic resin to consolidate the stone was also visible, but the microparticles of the pigments are easily distinguished from this. It was completely isolated from the old pigment.

The most visible black pigments are found on the backstone of the chamber. They show geometrical themes, zig-zags, waves and rectangles that are associated with engravings. On the upper part of orthostat C, two opposed angles represent the head of a rectangular body. The same theme is repeated on orthostat B. A relationship to Iberian motifs is suggested by its similarity to the angles on the upper part of the backstone of the Santa Cruz dolmen in Asturias (Figure 6). On the upper part of orthostat A, carved lines overlies traces of black paint, and on the left-hand side of the stone, on its lower part, black paint overlies carvings.

© Antiquity Publications Ltd, 2015

The sequence *black painting–engraving–further painting* is also seen on orthostat E, although there the pigment is red in colour (Figure 7). The location of the painted decoration at the

left-hand edge of orthostat A suggests that this stone was already painted before it was placed in its present position. Thus, the evidence of orthostats A and E indicates that paint was part of the initial phase of decoration. Moreover, both of these stones may have been reused in the construction of chamber A, a process that can be related to the multi-phase development of this multi-chambered cairn.



Figure 6. Orthostat C in chamber H at Barnenez, with detail showing pecked engravings superimposed on black motifs.

same dimensions as the hafted axes engraved on other orthostats (Figure 8). On the same face of the menhir (north-west) there is an axe blade, with further examples on the north-eastern side of the menhir, where two further axe blades and a bow, carved with a deep angular line, are clearly visible. On the south-eastern face of the menhir, a horizontal series of shallow, pecked zig-zags exposes the whiter surface of the original raw material in a 'pictorial' fashion. This technique is used in the manner that a white pigment might be used, in order to contrast black with red (Carrera Ramírez 2011: 157), in megalithic tombs in the Iberian Peninsula. The horizontal series of zig-zags on the Portela do Pau dolmen in northern Portugal (Baptista 1997) provide another example of its use. The hidden brightness of the raw material is revealed when it is fully lit by the sun entering the tomb via the passage and entrance orientated towards the east (Figure 9).

This new evidence confirms the presence of painted decoration in Barnenez chamber H. Moreover, it suggests that these paintings had a complex role in the overall project of engraving and carving, including not only chambered tombs but the shaping and decoration of menhirs. Natural materials, mainly light-coloured, were transformed using artificially applied pigments. In addition, strong colour contrasts between the background and the surface were achieved by cutting into the surface of the stone to reveal the lighter material beneath using sophisticated engraving and shallow pecking techniques.

© Antiquity Publications Ltd, 2015

## Brittany, the Iberian Peninsula and Atlantic megalithic art

In the Atlantic megalithic tradition, the earliest dated monuments are found in western France (Normandy, Brittany, Poitou-Charentes) and the western and central parts of the Iberian Peninsula (Furholt & Müller 2011). The direct dating of megalithic painting in the Iberian Peninsula has demonstrated the antiquity of the role of paint in Iberian funerary contexts (Steelman *et al.* 2005; Bueno Ramírez *et al.* 2007).

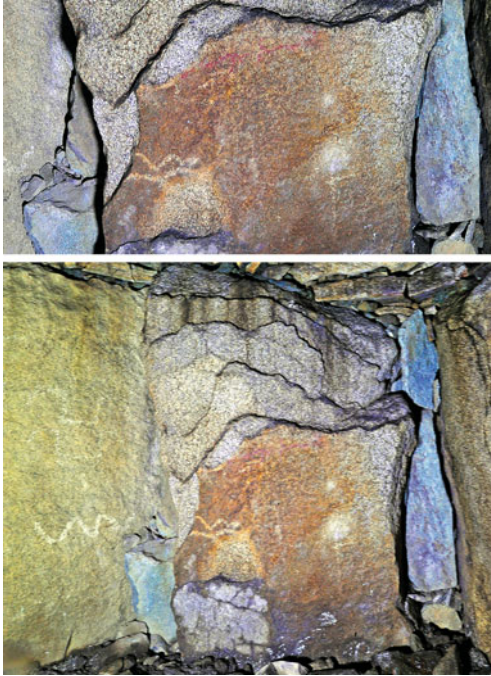


Figure 7. Orthostat E in chamber H at Barnenez, with detail showing pecked engravings superimposed on red motifs.

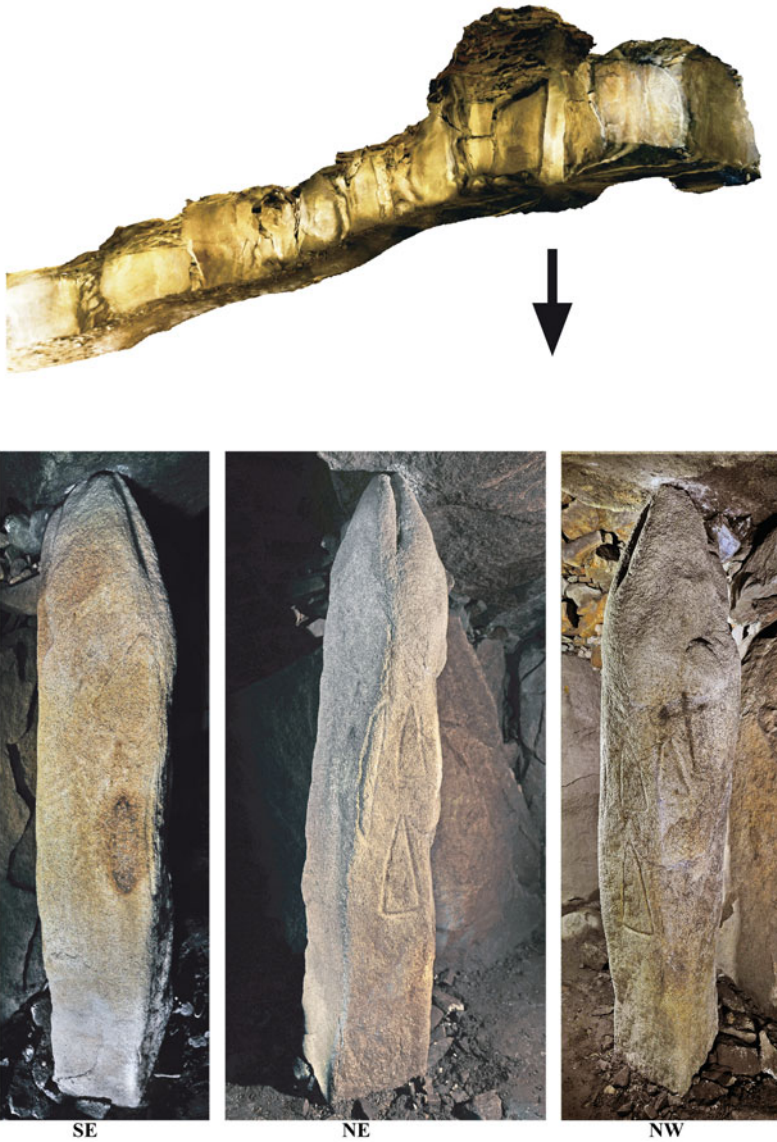
This study of the paintings from Barnenez chamber H represents another step in the investigation of exchange networks in Atlantic Europe. The idea of exposing the bodies of the ancestors on the floor of a chamber, inside a large stone monument, turns out to be a common formula. In addition, the decoration of the funerary house reveals a series of rituals in which a graphic component played a fundamental role.

Paintings and engravings help to determine sequences of use and also the maintenance of the chamber. This has also been shown by the study of painted motifs in tombs of the Iberian Peninsula. The possible reuse of orthostat E, which is now broken, would be confirmed if red pigment were present, indicating an initial phase of decoration. The black paint corresponds to a subsequent phase of decoration that was then enhanced and completed by pecked engravings. Such a sequence is visible in the central part of orthostat C. Along with

the engravings, a new phase of black painted motifs appears to extend to all of the chamber orthostats, especially the southern ones (although that may be due to differential preservation). This does not allow a chronological sequence to be determined; however, it does illustrate the sequence of actions carried out in order to produce the complex decorative scheme and to maintain and restore the monument throughout the period of its use.

The artificial pigment mixture in samples M1 and M2 show the complex sequence of actions required to obtain the strong black colour (see online supplementary Figure S1). This included the search for materials and the preparation, mixing and application of artificial colouring. The Iberian Peninsula provides similar evidence: some of the pigment samples from the Dombate chambered tomb in Galicia contain manganese dioxide mixed with charcoal (Carrera Ramírez 2011: 495). Similar mixtures have been identified at the Soto dolmen in Huelva, which is currently under analysis by our team.





*Figure 8. 3D model of passage tomb H, showing the location of the phallic menhir and its three decorated faces: south-east, north-west and north-east.*

The knowledge necessary for the construction of a megalithic monument is part of a cultural system, as is the creation of elaborate recipes for the pigments. Learning and experience are important factors. The knowledge of recipes and their transmission must have been part of the social reproduction of a specific body of expertise dedicated to ancestral cults.

The composition and character of the pigments, their relation to specific recipes, and their connection with engravings will now need to be studied more thoroughly. Furthermore, it

© Antiquity Publications Ltd, 2015





Figure 9. Left: eastern side of the phallic menhir in chamber H at Barnenez. Right: horizontal band of pecked zig-zag carvings at Portela do Pau chambered tomb in northern Portugal.

is important to extend the specific methodologies for the identification and documentation of pigment to other megalithic monuments in Brittany and adjacent regions. Evidence from other areas of France, such as the rock-cut tombs of the Marne and a number of chambered tombs and stelae in southern France, have already provided evidence for the use of paint elsewhere in French megalithic art (Bueno Ramírez *et al.* 2009). The confirmation of painted motifs at Barnenez should encourage more systematic research at other sites where traces have been found.

Several further observations arise from this study. The most obvious is the possibility of connections between the megalithic art of Brittany and the Iberian Peninsula (Bueno Ramírez & de Balbín Behrmann 2002). It has previously been suggested that the construction of chambered tombs in Brittany was preceded by a phase with menhirs (Midgley 2013: 422). There is increasing evidence from the Iberian Peninsula for the erection of large standing stones before the building of the first chambered tombs (Bueno Ramírez *et al.* 2007, 2012). It indicates that the use of standing stones was more extensive than previously thought, and that it was perhaps part of a general process of monumentalisation (Laporte 2010). Some megalithic tombs have been found to have been built around a pre-existing menhir (Gavilán Ceballos & Vera-Rodríguez 2005), but this has yet to be confirmed in the case of chamber H at Barnenez.

It is impossible to analyse the technical and thematic aspects of postglacial motifs without considering the possible link to earlier hunter-gatherer art. The material evidence for the symbolic capacity of European Mesolithic communities includes a series of wooden ‘menhirs’

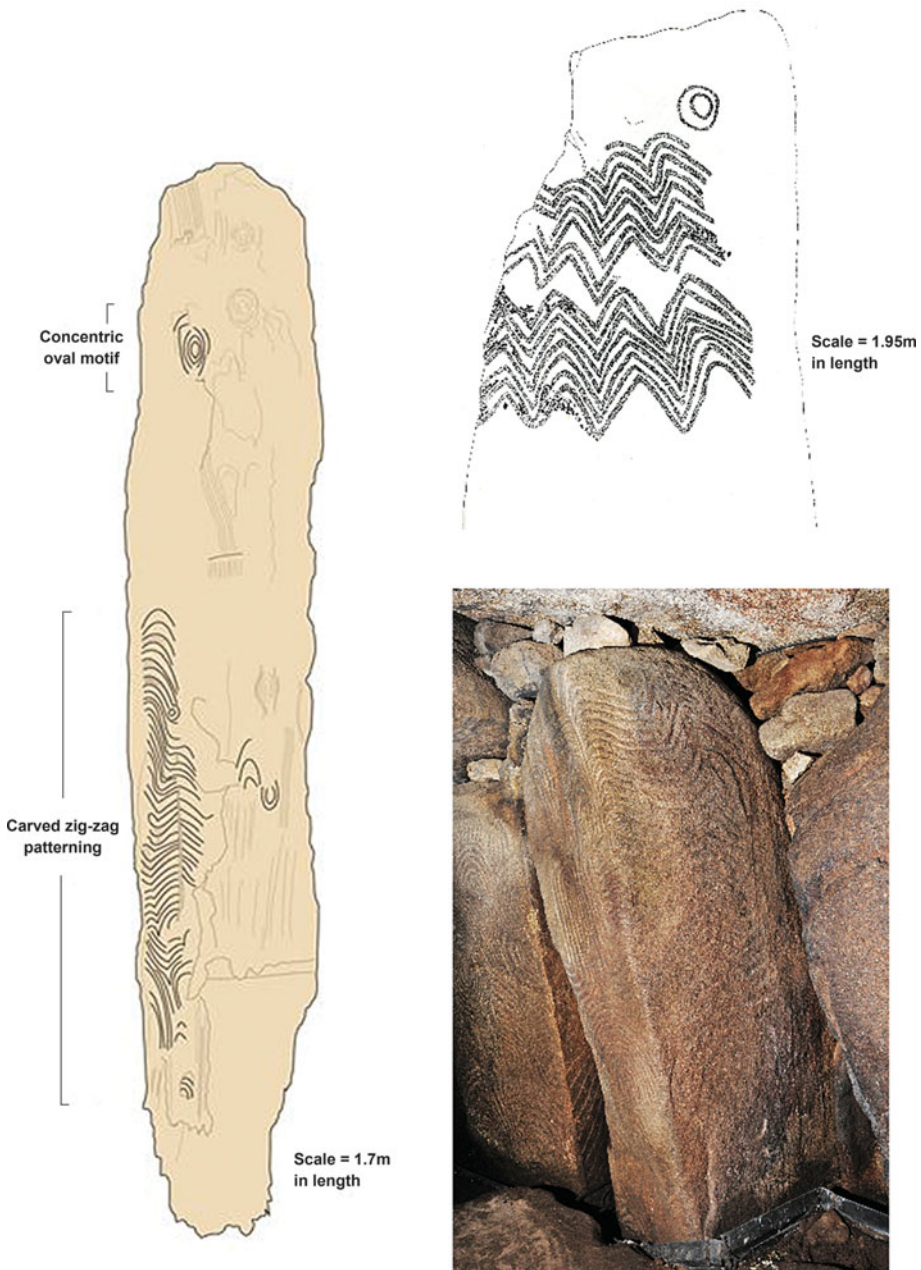


Figure 10. Left: angular and circular engravings on an oak beam from Maerdy (Glamorgan, Wales) (from Jones 2013); and right: parallels in the megalithic uprights of Gavrinis, southern Brittany (top), and Portela do Pau, Portugal (after Baptista 1997) (below).

(posts, totem poles, or upright beams) (Rust 1943; Cassen 2000). These menhirs find an interesting parallel, in terms of their raw material, in the recent discovery of a decorated wooden post in Wales (Jones 2013). Its motifs resemble those of the Neolithic chambered tomb of Gavrinis in southern Brittany and of several Iberian megalithic tombs (Figure 10).

© Antiquity Publications Ltd, 2015

Complex geometric motifs such as concentric circles and wavy lines are part of the technical and thematic repertoire of hunter-gatherer groups in Europe. In Iberia, some features of earlier hunter-gatherer art suggest that it may have been one of the sources drawn upon in the art of the first farmers (Bueno Ramírez & de Balbín Behrmann 2012: fig. 14.4). At present, only the Iberian Peninsula has chronological evidence for a continuous tradition of carvings or paintings extending from the Palaeolithic to the Neolithic and beyond. However, other European regions also offer indications of a continuous development of artistic traditions from the Palaeolithic to the Neolithic, including Mediterranean Italy, the Alps and northern Europe. This again suggests that it is a highly generalised cultural phenomenon.

Given the similarities in techniques and motifs, and the comparative chronologies between different regions, it is clear that the Iberian Peninsula played an important role in the generation and transmission of megalithic art in Atlantic Europe. However, we are not in favour of rekindling dynamics of a diffusionist nature (Cassen *et al.* 2012). We suggest instead that emphasis be placed on the long duration of interactions between the Atlantic, Continental Europe and the Mediterranean. The contribution of Upper Palaeolithic painted art should also be highlighted. Above all, however, these megalithic monuments constitute one of the clearest examples of the intensification of exchange dynamics, linked with powerful ideological expression.

## Acknowledgements

This work presents results from the 'Colours of Death' research project HAR2012-34709 of the Spanish Ministerio de Economía y Competitividad and the 'Barnenez, Plouezoc'h, Finistère', research project supported by the Direction Régionale des Affaires Culturelles de Bretagne and its Regional Archaeological Service. The original text was translated by Jadranka Verdonkschot. We are grateful to the reviewers for their comments and recommendations.

## References

- ANATI, E. & M.V. GOMES. 2013. *The Züschen I megalithic monument (Kassel, Hessen) and its engraved animal traction, ploughs, carts and wagons in Neolithic Europe*. Lisbon: IAP.
- BAPTISTA, A.M. 1997. Arte megalítica no planalto de Castro Laboreiro (Melgaço, Portugal e Ourense, Galiza). *Brigantium* 10: 191–216.
- BENÉTEAU-DOUILLARD, G. 2012. *Le complexe mégalithique du Bois de Fourgon à Avrillé (Vendée). Etudes archéologiques et techniques d'un ensemble de menhirs et stèles anthropomorphes en Centre-Ouest atlantique*. La Roche Sur Yon: Groupement Vendéen de Sauvegarde du Patrimoine Archéologique.
- BEYNEIX, A. 2007. Indices d'un art mégalithique en Aquitaine. *Bulletin de la Société Préhistorique Française* 104: 517–24.
- BRADLEY, R., T. PHILLIPS, C. RICHARDS & M. WEBB. 2000. Decorating the houses of the dead: incised and pecked motifs in Orkney chambered tombs. *Cambridge Archaeological Journal* 11: 45–67.
- BREUIL, H. & R.A.S. MACALISTER. 1921. A study of the chronology of Bronze Age sculpture in Ireland. *Proceedings of the Royal Irish Academy* 36 sect. C: 1–9.
- BUENO RAMÍREZ, P. & R. DE BALBÍN BEHRMANN. 1992. L'Art mégalithique dans la Péninsule Ibérique. Une vue d'ensemble. *L'Anthropologie* 96: 499–572.
- 2002. L'Art mégalithique péninsulaire et l'art mégalithique de la façade atlantique: un modèle de capillarité appliqué à l'art post-paléolithique européen. *L'Anthropologie* 106: 603–46.
- 2012. Holocene rock art of the Iberian Peninsula, 2005–2009, in P. Bahn, N. Franklin & M. Strecker (ed.) *Rock art studies: news of the world IV*: 45–59. Oxford: Oxbow.

- BUENO RAMÍREZ, P., R. DE BALBÍN BERHMANN & R. BARROSO BERMEJO. 2007. Chronologie de l'art mégalithique ibérique: C14 et contextes archéologiques. *L'Anthropologie* 111: 590–654.
- 2008. Dioses y antepasados que salen de las piedras. *Revista PH* 67: 46–61.
- BUENO RAMÍREZ, P., R. DE BALBÍN BERHMANN, R. BARROSO BERMEJO, J.C. LÓPEZ & A. GUENAGA. 2009. Frontières et art mégalithique. Une perspective depuis le monde pyrénéen. *L'Anthropologie* 113: 882–929.
- BUENO RAMÍREZ, P., R. DE BALBÍN BEHRMANN, L. LAPORTE, P. GOUZIN, R. BARROSO BERMEJO, A. HERNANZ GISMERO, J.M. GAVIRA-VALLEJO & M. IRIARTE CELA. 2012. Paintings in Atlantic megalithic art: Barnenez. *Trabajos de Prehistoria* 69: 123–32.
- CARD, N., J. DOWNES, J. GIBSON & S. OVENDEN. 2007. Bringing a landscape to life? Researching and managing 'The Heart of Neolithic Orkney' World Heritage site. *World Archaeology* 39: 417–35.
- CARRERA RAMÍREZ, F. 2011. *El arte parietal en monumentos megalíticos del Noroeste ibérico. Valoración, diagnosis y conservación* (British Archaeological Reports international series 2190). Oxford: Archaeopress.
- CARRERA RAMÍREZ, F. & R. FÁBREGAS VALCARCE. 2002. Datación radiocarbónica de pinturas megalíticas del Noroeste peninsular. *Trabajos de Prehistoria* 59: 157–66.
- CASSEN, S. 2000. Architecture du tombeau, équipement mortuaire, décor céramique et art gravé du V<sup>e</sup> millénaire en Morbihan. À la recherche d'une cosmogonie des premières sociétés agricoles de l'Europe occidentale, in P. Bueno Ramírez, J.L. Cardoso, M. Díaz Andreu, V. Hurtado, S.O. Jorge & V. Oliveira (ed.) *Actas do 3<sup>o</sup> Congresso de Arqueologia Peninsular (Vila Real 1999). Volume IV: pré-historia recente da Península ibérica*: 447–79. Porto: ADECAP.
- CASSEN, S., C. BOUJOT, S. DOMINGUEZ BELLA, M. GUIAIVARC'H, C. LE PENNEC, M.P. PRIETO MARTINEZ, G. QUERRÉ, M.H. SANTROT & E. VIGIER. 2012. Dépôts bretons, tumulus carnacéens et circulations à longue distance, in P. Pétrequin, S. Cassen, M. Errera, L. Klassen & A. Sheridan (ed.) *Jade. Grandes haches alpines du Néolithique européen. V<sup>e</sup> et IV<sup>e</sup> millénaires av. J.-C.*: 918–96. Besançon: Presses Universitaires de Franche-Comté.
- COELHO, J. 1931. Polychromie mégalithique dans la Beira, in *XV<sup>e</sup> Congrès d'Anthropologie et d'Archéologie Préhistorique*: 362–68. Paris: Nourry.
- DARVILL, T. 2011. Megaliths, monuments and materiality, in M. Furholt, F. Lüth & J. Müller (ed.) *Megaliths and identities*: 35–46. Bonn: Dr Rudolf Habelt.
- DEVIGNES, M. 1997. Les rapports entre peintures et gravures dans l'art mégalithique ibérique. Art et symboles du mégalithisme européen. *Revue Archéologique de l'Ouest* suppl. 8: 9–22.
- FURHOLT, M. & J. MÜLLER. 2011. The earliest monuments in Europe—architecture and social structures (5000–3000 BC), in M. Furholt, F. Lüth & J. Müller (ed.) *Megaliths and identities*: 15–31. Bonn: Dr Rudolf Habelt.
- GAVILÁN CEBALLOS, B. & J.C. VERA-RODRÍGUEZ. 2005. Neolítico y megalitismo prefunerario en Andalucía, in P. Arias Cabal, R. Ontañón Peredo & C. García-Moncó Piñeiro (ed.) *Actas del III Congreso de Neolítico en la Península Ibérica*: 535–41. Santander: Universidad de Cantabria.
- GIOT, P.-R. 1987. *Barnenez, Carn, Guenoc*. Rennes: Université de Rennes.
- GOUZIN, P., L. LAPORTE, R. DE BALBÍN BEHRMANN & P. BUENO RAMÍREZ. 2013. La couleur dans les monuments mégalithiques de l'ouest de la France. Découverte de peintures préhistoriques à Barnenez (Finistère) et quelques autres monuments du Morbihan. *Bulletin de la Société Préhistorique Française* 110: 541–45.
- GUTHERZ, X., L. JALLOT & N. GARNIER. 1998. Le monument de Courion (Collias, Gard) et les statues-menhirs de l'Uzege méridionale. *Archéologie en Languedoc* 22: 119–34.
- HAMEAU, PH., V. CRUZ, E. LAVAL, M. MENU & C. VIGNAUD. 2001. Analyse de la peinture de quelques sites postglaciaires de sud-est de la France. *L'Anthropologie* 105: 611–26.
- HASLER, A. 1998. Les stèles de la nécropole tumulaire néolithique de Château Blanc (Ventabren, Bouches-du-Rhône). *Archéologie en Languedoc* 22: 105–12.
- HERBAULT, F. & G. QUERRÉ. 2004. La parure néolithique en variscite dans le sud de l'Armorique. *Bulletin de la Société Préhistorique Française* 101: 497–520.
- HERNÁNDEZ, M. & B. MARTÍ. 2001. El arte rupestre de la fachada mediterránea: entre la tradición epipaleolítica y la expansión neolítica. *Zephyrus* LIII–LIV: 241–65.
- JONES, R.S. 2013. HRS Wales projects. Maerdy Windfarm, Glamorgan (2012–2013). Available at: <http://www.hrs-wales.co.uk/Projects.html> (accessed 15 July 2014).
- LAPORTE, L. (ed.). 2009. *Des premiers paysans aux premiers métallurgistes sur la façade atlantique de la France (3500–2000 av. J.-C.)* (Mémoires XXXIII). Chauvigny: Association des publications Chauvinoises.



- 2010. Restauration, reconstruction, appropriation: évolution des architectures mégalithiques dans l'ouest de la France, entre passé et présent. *Munibe* suppl. XX: 15–46.
- LECORNEC, J. 1994. *Le Petit Mont. Arzon–Morbihan*. Rennes: Association pour la diffusion des recherches archéologiques dans l'Ouest de la France.
- LEISNER, G. 1934. Die malerein des Dolmen Pedra Coberta. *Jahrbuch der Prähistorie, Ethnologie und Kunst* 9: 23–44.
- L'HELGOUACH, J. 1970. Le monument mégalithique du Goërem à Gávres (Morbihan). *Gallia Préhistoire* 13: 217–61.
- 1997. De la lumière aux ténèbres, in J. L'Helgouach, C.-T. Le Roux & J. Lecornec (ed.) *Art et symboles du mégalithisme européen (Revue Archéologique de l'Ouest suppl. 8)*: 107–23. Rennes: Association pour la diffusion des recherches archéologiques dans l'ouest de la France.
- LE ROUX, C.-T. 1984. A propos des fouilles de Gavrinis: nouvelles données sur l'art mégalithique armoricain. *Bulletin de la Société Préhistorique Française* 81: 240–45
- LE ROUZIC, Z. 1932. *Carnac: fouilles faites dans la région. Tumulus du Mont Saint-Michel*. Vannes: Lafolye & J. de Lamarzelle.
- MAILLÉ, M. 2010. *Hommes et femmes de pierre. Statues-menhirs du Rouergue et du Haut Languedoc*. Toulouse: Archives d'écologie préhistorique.
- MENU, M., P. WALTER, D. VIGEARS & J. CLOTTES. 1993. Façons de peindre au Magdalénien. *Bulletin de la Société Préhistorique Française* 90: 426–32.
- MIGDLEY, M.S. 2013: Megaliths in north-west Europe. The cosmology of sacred landscapes, in S. Tarlow & L. Nilsson Stutz (ed.) *The Oxford handbook of the archaeology of death and burial*: 421–40. Oxford: Oxford University Press.
- MÜLLER, D. 1996. Ornamente, symbole, bilder-zum megalitische totenbrauchtum in Mitteldeutschland, in J. L'Helgouach, C.-T. Le Roux & J. Lecornec (ed.) *Art et symboles du mégalithisme européen (Revue Archéologique de l'Ouest suppl. 8)*: 81–96. Rennes: Association pour la diffusion des recherches archéologiques dans l'ouest de la France.
- RUST, A. 1943. *Die alt- und mittelsteinzeitlichen Funde von Stellmoor*. Neumünster: Karl Wachholtz.
- SANCHES, M.J. 2006. Passage-graves of northwestern Iberia: settings and movements. An approach to the relationship between architecture and iconography. *Journal of Iberian Archaeology* 8: 127–58.
- SCARRE, C. 2004. Choosing stones, remembering places: geology and intention in the megalithic monuments of Western Europe, in N. Boivin & M.A. Owoc (ed.) *Soils, stones and symbols: cultural perceptions of the mineral world*: 187–202. London: UCL Press.
- SHEE TWOHIG, E. 1981. *The megalithic art of Western Europe*. Oxford: Clarendon.
- 1997. Megalithic art in a settlement context: Skara Brae and related sites in the Orkney Islands. *Brigantium* 10: 377–89.
- SHERIDAN, A. 2005. Les éléments d'origine bretonne autour de 4000 av. J.-C. en Écosse: témoignages d'alliance, d'influence, de déplacement, ou quoi d'autre?, in G. Marchand & A. Tresset (ed.) *Unité et diversité des processus de néolithisation sur la façade atlantique de l'Europe (6<sup>e</sup>–4<sup>e</sup> millénaires avant J.-C)* (Mémoires de la Société Préhistorique Française 36): 25–37. Paris: Société Préhistorique Française.
- STEELMAN, K.L., F. CARRERA RAMÍREZ, R. FÁBREGAS VALCARCE, T. GUILDERTSON & M.W. ROWE. 2005. Direct radiocarbon dating of megalithic paints from north-west Iberia. *Antiquity* 79: 379–89.
- VASCONCELLOS, J.L. 1907. *Peintures dans les dolmens du Portugal*. Paris: Schleicher Frères.
- VILLES, A. 1997. Les figurations dans les sépultures collectives néolithiques de la Marne, dans le contexte du Bassin parisien. *Brigantium* 10: 148–77.

Received: 7 January 2014; Accepted: 26 February 2014; Revised: 25 March 2014