Cork oaks and Neolithic megaliths: The Almendres Cromlech (Portugal)

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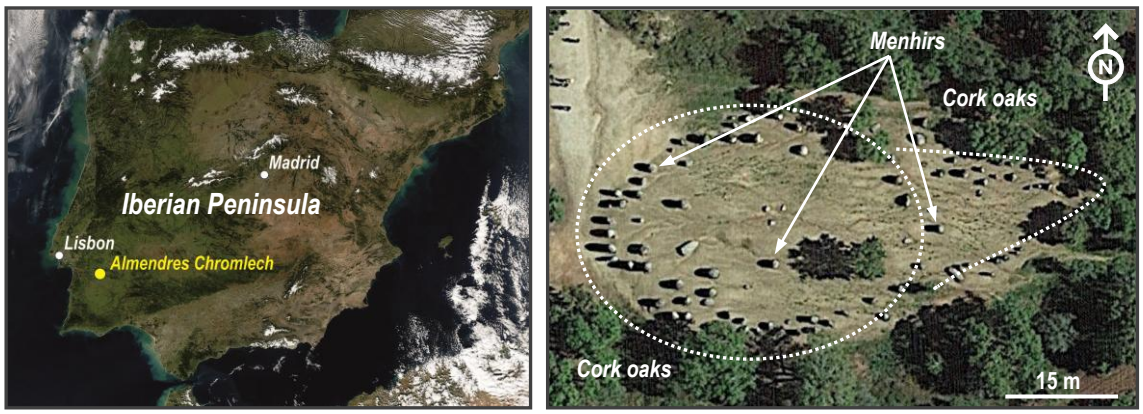
Menhirs from the Almendres Chromlech (Évora-Portugal) and cork oaks (Quercus suber). Image: P. Cubas

Cromlech is a term that comes from the French language, which in turn is derived from two Breton words "kroum" (*crown*) and "lech" (*stone*), and it is applied to megalithic monuments formed by menhirs inserted into the ground, adopting a circular or elliptical shape similar to a wall surrounding a piece of land (*Wikipedia 2021a*). The Almendres Cromlech (Évora - Portugal) is the largest megalithic monument in the Iberian Peninsula and one of the oldest in Europe. This Iberian megalithic monument is surrounded by cork oaks (*Quercus suber*), and consists of large granitic stones (*menhirs*) of rounded elliptical shape (*Seglins et al. 2019*) forming an E-W oriented (*major axis*) figure of about 63 x 30 m, where a large oval (*to the West*) and another less defined shape to the East can be seen.



A: Location of Almendres Chromlech in the Iberian Peninsula (base image: Descloitres 2003). B: The Almendres Chromlech from above (base image: Google Earth).

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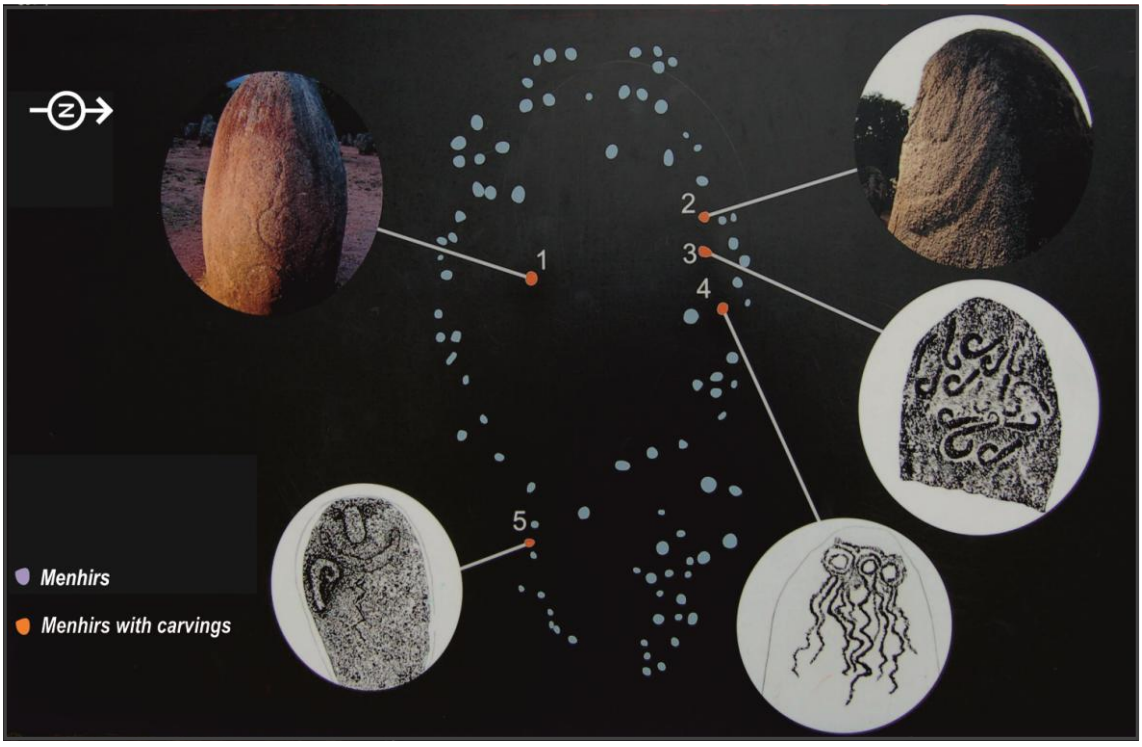
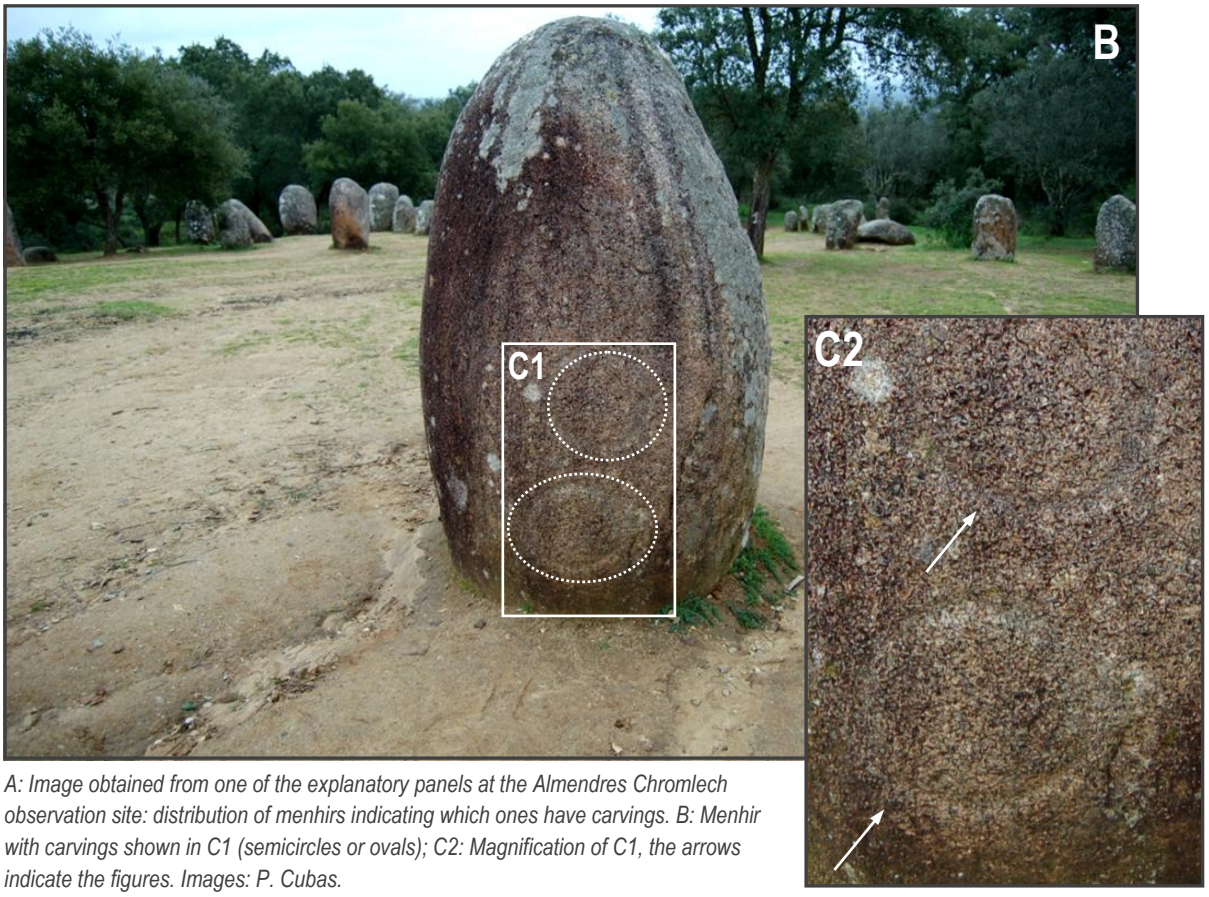
The Almendres Chromlech was built more than 6000 years ago (5000-4000 BC, Batista et al. 2017), during the Neolithic Age, when the first communities of shepherds and farmers emerged in Western Europe. The Almendres enclosure, whose original plan most likely had a horseshoe shape open to the east, seems to have undergone extensions and remodeling. The current form of the monument, relatively complex, is the result of these ancient interventions and others of more or less recent disturbances. Currently, it has about a hundred monoliths, some of them with carvings [*Explanatory Panel at the Almendres site*].





A: Image obtained from one of the explanatory panels at the Almendres Chromlech observation site: distribution of menhirs indicating which ones have carvings. B: Menhir with carvings shown in C1 (semicircles or ovals); C2: Magnification of C1, the arrows indicate the figures. Images: P. Cubas.

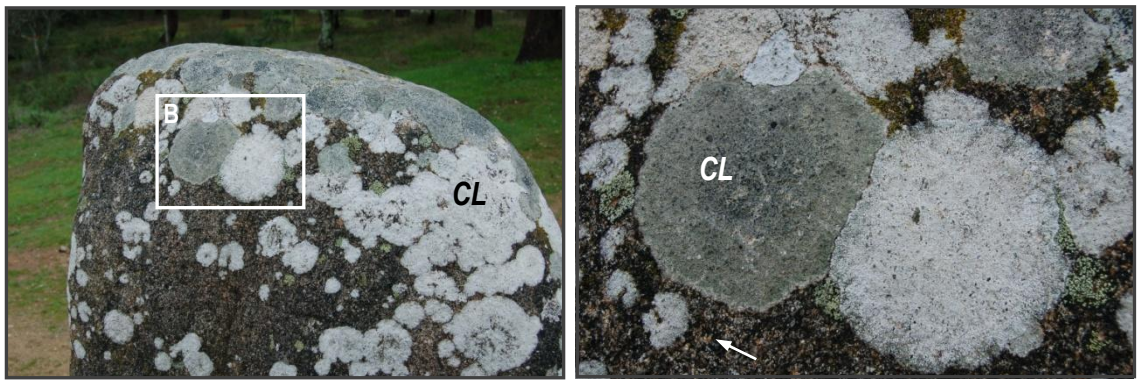
A partial view of the site. Image: R. Oyarzun.

The choice of the place where this monument was erected surely included the physical structure of the landscape, in particular the hydrological network, and also the most notorious astronomical phenomena, related to the annual movements of the Sun and the Moon on the horizon [*Explanatory Panel on the Almendres site*].

Granites and megaliths: a constant along the Atlantic border of Europe

Megaliths and granites are part of the landscape in regions such as Brittany in France, but also in Portugal and Spain (*Galicia*), that is, on the Atlantic coast of Europe. In all these cases another constant is repeated, these rocks are part of the Hercynian massifs (*formed in the Upper Paleozoic by the Hercynian orogenesis*), the Armorican in France and the Hesperian in Iberia.

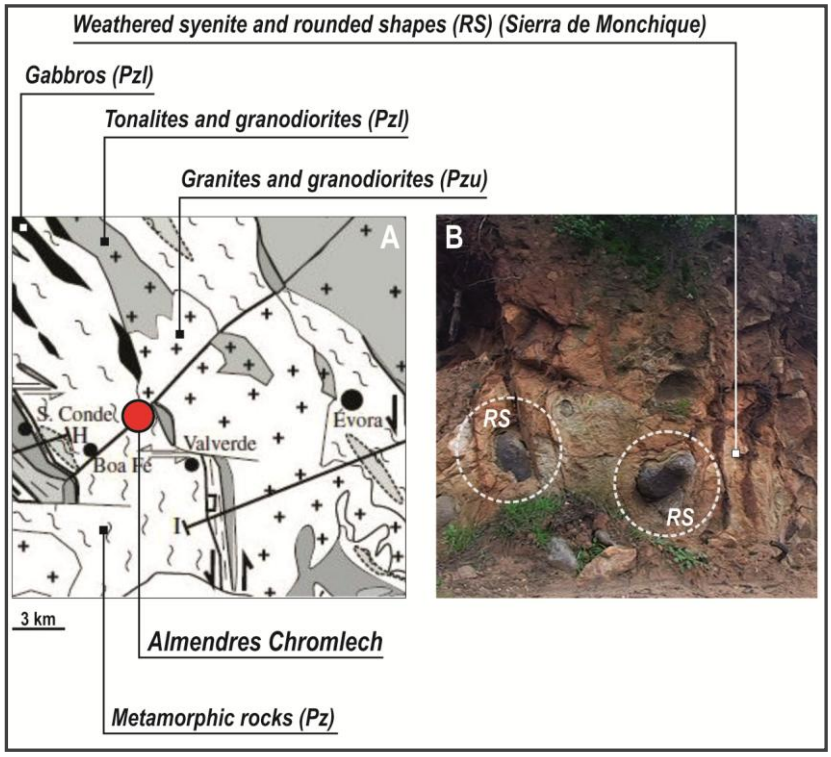
In the case of Portugal, weathered granite is part of the landscapes that surround the megaliths, at least in the Évora region. As expected, these monuments are located in areas where nearby granitic rocks crop out, and in this regard, the degradation by weathering of the menhirs is similar to that observed in the field outcrops (*Pope & Miranda 1999*). A strong alteration of the rock is observed in the menhirs of the Almendres, which makes its field classification complicated (*although the presence of quartz and feldspar is easily recognized*). On top of this, the massive coating of the granitic surface by crustose lichens does not help much.



A: Weathered granite surface with a strong coating of crustose lichens (CL) in the Almendres; B: Detail of the previous image (Image: P. Cubas). The pink minerals are feldspars (arrow).

Something that draws the attention in the Almendres menhirs is their important “rounding”, whose origin, rather than caused by the hand of man, seems to correspond to what is observed in the “granite chaos” of Brittany or Vendée (*France*), where we can observe the presence of large rounded granite blocks

(*"chirons"*), arranged one on top of the other or isolated as a result of the phenomena of erosion and transport. Thus it is possible that the inhabitants of the region in the Neolithic may have selected blocks that met two main requisites, rounding and elongation, being the latter perhaps the most important because after all they were required to build menhirs. An example of the importance and intensity of the processes of weathering and oxidation can be found in the figure below, in an "outcrop" of syenite in the Sierra de Monchique (*Algarve*).



A: Geology of the Évora region (adapted from Pereira et al. 2007) showing the proximity of the Almendres Chromlech to granite rocks. B: This image (P. Cubas) shows the rounding and oxidation capacity that weathering processes can have, in this case in syenites of the Sierra de Monchique (western Algarve). Pz: Paleozoic; Pzl: Lower Paleozoic; Pzu: Upper Paleozoic.

Besides, it is also clear that the granite source (*s.l.*) for the building up of the Almendres Chromlech could not have been closer to the site chosen for its location (*see geological map: the site is adjacent to Paleozoic granites and granodiorites)*. In this regard, these "Neolithic Iberians" were more practical than their counterparts from England, who had to go to sources located 30 km away (*for the "sarsen stones"*) and up to 250 km away (*for the "blues stones"*) during the construction of Stonehenge (*2900 to 2020 BC; from Late Neolithic to Early Bronze Age*) (*Parker Pearson 2016*).

Images of the Almendres showing the peculiar rounding of the menhirs

One might think that all menhirs are the same or at least very similar, but this is not the case. One of the outstanding features of the Almendres is the degree of rounding of the menhirs, something that is not observed everywhere, not even in the most emblematic place in Europe for the observation of menhirs: Carnac (*Brittany - France*).

In this regard, the Carnac alignments are the most famous and impressive megalithic assemblages of the Neolithic. Carnac is the prehistoric site with the greatest wealth of megaliths in the world, almost 3000 menhirs that were built between 6000 and 2000 BC; there are four different groupings: Le Ménec with

1099 menhirs, Kermario with 1029 menhirs, Kerlescan with 555 menhirs and Le Petit Ménec with 100 (Wikipedia 2021b).

Typical menhirs from Carnac; a fraction of Le Ménec alignment (Image: R.Oyarzun). Note the almost general absence of rounding at the apices and body.

Instead, as we can see in the following images of the Almendres, rounding is the main characteristic.

Menhires from the Almendres, notice the smooth and rounded shapes. Images: P. Cubas.

The Almendres cork oaks: a perfect landscape addition

The landscape in which the Almendres Chromlech is inserted is the Portuguese “montado” (*Batista et al. 2017*). Like the Spanish “dehesa”, the Portuguese montado is a unique system with high ecological and socioeconomic relevance (*Leal & Leal 2021*).

Left, distribution of the dehesa/montado in Spain and Portugal (de la Fuente 2018). Right, the typical landscape of the dehesa, in Badajoz (Extremadura - Spain) (Image: Filpo Cabana 2014).

This landscape is in fact an ecosystem of human creation, a deep modification of the Mediterranean forest of primitive holm oaks and cork oaks. It arose in the Middle Ages (*and perhaps already in Roman times; Lavado Contador et al., 2001*) as a consequence of human activity that snatched lands from the forest and used them for pasture to feed cattle; the process was developed in two phases, a first one in which the dense forest of holm and cork oaks was cleared and another in which the woody vegetation was controlled and the pasture was stabilized (*Penco Martín, 1992; San Miguel Ayanz, 1994; Lavado Contador et al. 2001*).

Cork oaks and a partial view of the Cromlech (to the right). Image: P. Cubas.

The cromlech is surrounded by a cork oak forest, typical of this area of Portugal. The cork oak (*Quercus suber*) is a tree with a persistent leaf that closely resembles the holm oak (*Quercus ilex*) from which it is easily differentiated by its bark, very thick, sometimes up to 15 cm thick, spongy, leathery and very light.

Above and below, cork oaks at the Almendres site. Images: P. Cubas.

This bark is called cork, and when used, the cork oak is even easier to recognize because the trunk, with the new smooth bark, develops a very intense red color as if it had just been painted.

Above, bark of a cork oak at the Almendres site. Below, extraction of part of the bark of a cork oak also in the Almendres site; note the dark red-brown color. Images: P. Cubas.

The main use of the cork oak is for this suberified bark (*cork*) that is used to make plugs, fishing gear, sound insulation, decoration, etc. The "peeling" or "uncorking" of the cork oak is usually done at the beginning of summer, in shifts of 8-12 years, taking care not to damage the inner bark so that the tree can regenerate new cork.

A final comment

There is a wealth of megalithic sites to visit around Évora. A list of these sites and their GPS coordinates is shown below (Visit Évora 2021)::

- *Almendres Menhir: 38.564722, -8.048056*
- *Almendres Chromlech: 38.557578,-8.061414*
- *Anta Grande do Zambujeiro: 38.539108,-8.014164*
- *Alto de São Bento: 38.580891,-7.937538*
- *Megalithic Évora: 38.569856,-7.915111*

Image obtained from one of the explanatory panels at the Cromlech site, showing the location of other megalithic monuments west of Évora.

Anta = Dolmen.

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