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# Astronomy and its application to the study of the religion of ancient Iberians.

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#### Abstract

This paper reviews some of the main results of archaeoastronomical fieldworks carried out in sanctuaries and temples belonging to the Iron Age Iberian culture. Most of this work has been done in close collaboration with archaeologists. The orientation pattern of the Iberian sacred buildings seems to be related to the rising sun. A significant fraction of the sanctuaries show astronomical markers over topographic elements of the local horizon, most of them indicate the rising sun at the equinoxes or the temporal midpoint between the solstices. Iberian cave-sanctuaries – that tend to be oriented to the west – show illumination phenomena in their interior at sunset in singular moments of the solar calendar.

# 1 Introducion

Without any doubt, astronomy and archaeology are among the scientific disciplines that attract the most attention of the general public. Since astronomy is devoted to the study of things distant in space, archaeology is dedicated to the recovery of the images and memories of the human past, distant in time. On the other hand, knowledge of the origins and history of human collectivities is of paramount social and political interest. Therefore, archaeoastronomy is an interdisciplinary activity that can play a significant role in science outreach. Archaeoastronomy has still a short history, although raised some controversies in its beginnings, has now an increasing academic recognition in the field of humanities. Since the 1990s this discipline has had an increasing presence in Spanish sicence. In fact, the papers published in Spanish refereed archaeological journals are each year more numerous and it is becoming customary to see astronomers presenting works in meetings on archaeological topics. However, as an interdisciplinary activity, the best possible archaeoastronomy is that made in collaboration of both, astronomers and archaeologists, the first ones scrutinizing the sky and the second ones excavating the ground.



Figure 1: Orientation diagram of a sample of Iberian temples with direct orientation measurements and where the position of the entrance has been well established. SS: summer solstice; WS: winter solstice; NMS: northern major standstill limit of the moon; SMS: southern major standstill limit of the moon.

# 2 Archaeoastronomical fieldwork in Iberian sanctuaries

The Iberian culture developed in the east and south of the Iberian Peninsula from the sixth century BC up to the Roman conquest of the territory in 206 BC, during the so-called Late Iron Age. The Iberians were the product of the acculturation of Bronze Age indigenous populations due to the presence of Phoenician, Punic, and Greek colonies in their coasts since the beginning of the first millennium [11]. The main Iberian deity was apparently a fertility goddess. Its image is influenced by exogenous models and sometimes represented with attributes of Eastern goddesses such as Astarte, Tanit, Artemis or Demeter [9]. Iberian sanctuaries were usually located in open-air deposits on the top of mountains, within caves or in proximity to springs. Their temples were usually of small size, containing a statue of the divinity and a large number of offerings [1].

Since the end of the 1990s and in collaboration of archaeologists, I have surveyed several tens of Iberian sanctuaries across the territory once occupied by the Iberian culture. The measurements are taken with a theodolite and a precision compass. The fieldwork at each site is based in the measurement of the orientation of the standing constructions, the entrances and main axes of the temples or caves and - in all the cases - the astronomical analysis of the horizon surrounding the sites. The technical description of the measurements can be found in [5].

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# **3** Orientation pattern of Iberian temples

Analyses of the orientation pattern of the entrances of Iberian sacred buildings have been presented in [2] and [3]. In Fig. 1, we show a compilation of data for temples with direct orientation measurements and where the position of the entrances has been well established. From the figure, it can be seen that Iberian temples are orientated in a non-random manner. In fact, most of them are facing the zone of the horizon where the sun (or moon) rises along the year. As it was discussed by [3], the orientation pattern of the Iberian sanctuaries is different from that shown by Roman and Etruscan temples but similar to that of Greek ones of Magna Graecia and Sicily and of Punic sanctuaries.

### 4 Equinoctial markers in Iberian sanctuaries

The most remarkable archaeoastronomical result in Iberian sanctuaries is the discovery of equinoctial markers in an important fraction – about 40% – of the sites studied, from Aragon to Andalusia. This clearly indicates that equinoxes – or dates close to them – were important moments of the Iberian ritual. The markers are produced on the horizon surrounding the sanctuaries, i.e. the sunrise at the equinoxes occurs over conspicuous topographical elements, usually mountain peaks (El Amarejo, La Serreta, La Carraposa, Sant Miquel de Llíria, Mazaleón) or even nearby islands (La Malladeta). Several of these sanctuaries also contain a temple oriented to the equinox, increasing the likelihood that the astronomical relation was deliberate.

Although we generically call them "equinoctial markers", most of the evidences indicate that the target of the orientations should be the temporal midpoint between solstices (hereinafter TMPS) also known as "megalitic equinox", introduced by [12]. This corresponds to the day just in the middle between the exact dates of summer and winter solstices and occurs between one or two days after spring equinox or before the autumn equinox. The declination of the sun at that moment is between  $+0.3^{\circ}$  and  $+1.0^{\circ}$  in the moment of the sunrise closer to the TMPS. Therefore, the TMPS permits to divide the year in four equal parts in coincidence with our seasons at intermediate latitudes, and seems to be an intuitive concept with more practical utility than the equinox. In some places, the equinoctial markers are spectacular, as in El Amarejo [2] or La Malladeta ([4], see Fig. 2) but most of them lack of spectacularity, indicating that it should be better used as a practical tool for pinpointing the calendar and not for a public ritual.

Archaeological findings at the sanctuaries showing equinoctial markers indicate that they were dedicated to a fertility goddess. Festivities related to agricultural fertility were common in the ancient Mediterranean, such as those dedicated to the "resurrection" of Melqart (Heracles) or the Great Mysteries at Eleusis related to the Greek goddess Demeter. These mysteries represented the annual growth cycle through the myth of the descent and return of Kore from the underworld. A similar mythic narrative, where the protagonist is a possible hero-god of vegetation, is shown in the reliefs of the Iberian funerary monument of Pozo Moro, that have been interpreted as a representation of the Labours of Heracles [9]. The symbol of the natural cycle of death and resurrection might be inspired in the annual



Figure 2: Left: Image taken at sunrise on March 22nd, 2017 – date corresponding to the temporal midpoint between solstices – from the Iberian coastal sanctuary of La Malladeta (Vila Joiosa, Alicante). The solar disc appears just over the southern slope of the islet of Benidorm. A surviving wall of the ancient temple is pointing toward the island. Photo taken by A. Espinosa Ruiz (Vilamuseu). Right: Sunset at the winter solstice as seen from the innermost area of the north gallery of the Iberian cave-sanctuary of Umbría de Salchite (Cueva de la Nariz, Moratalla Murcia). Photo taken by J. A. Ocharan Ibarra.

solar motion on the celestial sphere. The moments of death and descent of the divinity to the underworld and her subsequent rebirth or return to earth might be related to the autumnal and spring equinox, respectively.

The sanctuaries with equinoctial markers show a chronology in the interval from about mid IV until II century BC (see [3] for references). The absence of sanctuaries of this kind with earlier dating indicates a date *post quem* such rituals related to the equinox appeared in the Iberian world. According to different authors, the beginning of the IV century BC was a moment of consolidation of the aristocratic system and territorial expansion of the Iberian urban settlements, as well as the emergence of an ideological model based on the figure of a heroized ancestor (e.g. [10]). The relation between these changes in the social organization and astronomical aspects of the ritual is a promising field of future interdisciplinary investigation.

### 5 Iberian cave-sanctuaries and the sunset

The few archaeoastronomical studies carried out in Iberian cave-sanctuaries have provided striking results. In the cave-sanctuary of La Lobera, [7] found that the innermost part of the cavity, a kind of natural niche, is illuminated at sunset around the equinoxes through an

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opening located at the west end of the cave. The shapes of the niche and the sunlight spot fit better at the precise date of the TMPS. There are indications that the western opening was retouched at some point in the past. Another suggestive feature of the phenomenon is that the shape of the sunlight spot recalls the profile of some of the ex-votos found at the site and other Iberian sanctuaries that represent the typical schematic female figure that has been interpreted as an Iberian goddess. [7] propose that, in La Lobera, the Iberians were able to carry out a dramatization of a perceptive experience of the divinity as part of the ritual.

In the Iberian cave-sanctuary of Umbría de Salchite (also known as Cueva de la Nariz), [6] report another remarkable illumination phenomenon. This cave has a striking symmetrical morphology, with two parallel galleries of very similar dimensions. It is located on the western slope of a mountain, in an area of difficult access. Both cavities contain water springs and carved basins to collect the water in their innermost areas. By direct observations at the site, [6] found that, at the northern cavity, just during few minutes just before winter solstice sunset (see Fig. 2), sunlight illuminates the basin. Moreover, at the last moments of sunset, the reddish sunlight spot fits the shape of the basin and the canals carved in the rock. Especially suggestive is the tangential illumination of the water contained in the basin by last sun rays of the day.

A last example of astronomically oriented cave-sanctuary is Cueva Santa del Cabriel, an isolated contemporary place of popular Catholic cult to the Virgin Mary that was a sacred place in Iberian times or even earlier. The cave contains a water spring that is considered to have health properties. [8] has found that the narrow 12 m-long corridor that connects the entrance and the main gallery of the cave is very precisely oriented towards the sunset at the summer solstice sunset. This is the only moment of the year when the sun rays touch the cave interior.

Most of the caves considered as Iberian cave-sanctuaries show a westerly orientation. This contrasts with the orientation pattern of the Iberian temples or open-air sanctuaries, which face predominantly to the east. This dichotomy between cave and open-air sanctuaries should be associated with different characteristics of the cult carried out in both kinds of sites. The westerly orientation of cave-sanctuaries might be related to the chthonic character of the rites carried out in them or perhaps rites of passage. However, in Iberian temples or open-air sanctuaries we would have an emphasis on cosmic aspects of the worship.

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