

Mauro Peppino Zedda

Contents

Introduction	1404
Archaeoastronomical Studies of Nuraghes	1406
Cross-References	1411
References	1412

Abstract

This article describes the issues raised by a 20-year research project on the astronomical orientation of nuraghes, the main type of ancient megalithic edifice found in Sardinia. They were constructed during the Bronze Age together with megalithic graves, the so-called “Tombe dei Giganti” (“giants’ tombs”).

Today the nuraghe has come to be the symbol of Sardinia and the architecture produced by its distinctive “Nuraghic” culture. This produced an extraordinary number of Cyclopean buildings, making Sardinia a region with one of the highest concentrations of prehistoric constructions on the planet.

The orientations of the nuraghe entrances themselves, of the towers on the periphery of complex nuraghes, and the positioning of the nuraghes in the landscape reveal the clear and sophisticated astronomical thinking underlying their construction.

M.P. Zedda
Agorà Nuragica, Cagliari, Italy
e-mail: maurozedda@tiscali.it

Introduction

Some 7,000 nuraghes are scattered around the island of Sardinia (24,000 km²).

Nuraghes are dry-stone, Cyclopean buildings shaped like a truncated cone, built between the beginning of the second millennium and the twelfth century BC. The Sardinian population at that time was driven by a compulsion that resulted in the construction of thousands of nuraghes (Fig. 122.1), in addition to Tombe dei Giganti (Fig. 122.2) and villages.

After the twelfth century BC, nuraghes and Tombe dei Giganti were no longer built. Instead, Sardinian people started constructing sacred wells together with “megaron” temples, although only a few dozen of them were built rather than thousands.

Prehistoric and protohistoric Sardinia was a pre-urban society. The first cities were founded by the Phoenicians and later ones by the Carthaginians and the Romans.

Nuraghes can be classified as “simple”, comprising a single tower, or “complex”, consisting of various towers built around the main one. Complex nuraghes make up 20 % of the total.

The diameter of the base of a simple nuraghe is between 10 and 15 m; its height is between 10 and 22 m. Its sides are inclined at 10–16° to the vertical.

The entrance is usually about 1 m wide and 1.5–2.5 m high. It is topped by an architrave which can be over 2 m³ in volume and 5,000 kg in weight. There is no evidence to suggest that the entrance held a door. Inside the nuraghe there could be one, two or three superimposed chambers covered by a tholos, whose dimensions decrease from bottom to top. The chambers on the higher floors have a large window (a sort of “door window”) which has the same orientation as the entrance.

The entrance leads to a corridor which, on the right hand side, presents a niche, and on the left hand side develops into a spiral ramp which runs around the thick walls of the tower and leads to the upper chambers and to the terrace.

The walls constitute almost 90 % of a tower’s surface.

The tholos covering the main chamber has a diameter between 3.5 m and 6 m, and a height between 5 m and 11 m. The most common dimensions are 4.5 m in diameter and 8 m in height. The chamber can have up to 3 niches 2 m high and equally deep. The chamber on the third floor had a diameter of 2 m at most, although none of them has been preserved.

A simple nuraghe 12 m in diameter occupies an area of 113 m². If the chamber had a diameter of 4.2 m then its surface area would be 13.8 m²; if 10 m in height, its volume would be 1,000 m³, of which 900 m³ comprised stones weighing 2,000 kg per cubic meter. Thus, 87 % of the volume within a simple nuraghe 12 m in diameter is made up of stones while only 13 % (140 m³) is empty space. There is no practical reason that can justify such a huge construction effort with the aim of obtaining such a small interior space. Conceptually speaking, a nuraghe is more similar to a bell tower than a church.

A complex nuraghe is composed of a main tower, similar to that of a simple nuraghe, around which more towers have been built. As far as space is concerned,

Fig. 122.1 Nuraghe Ponte at Dualchi



Fig. 122.2 The Tomba dei Giganti of S'Ena e Thomes at Dorgali

a complex nuraghe has a lower ratio of empty space to space filled with solid stone than a simple nuraghe. For instance, the nuraghe of Barumini occupies a volume of 620 m^3 , of which 60 m^3 represents the courtyard, 70 m^3 the five chambers topped by a dome, and 490 m^3 the walls. The courtyard links the four tholoi of the peripheral towers, and so the walking space occupies 70 m^3 of 620 m^3 of the total space (walls plus courtyard). The walls make up 80 % of the total space, while the chambers account for 11.2 % and the courtyard 9.8 %.

The people responsible for this extraordinary building phenomenon are conventionally referred to as “Nuraghic”. Linguists disagree about their language, but a plausible hypothesis is that the Nuraghic language was of Indo-European origin, and more precisely the “Italoid” substrate (Renfrew 1987).

While villages show where the Nuraghic people lived, and the Tombe dei Giganti indicate where they buried their dead, there are several competing hypotheses as to the function of the nuraghes. At the beginning of the twentieth century the dominant theory, due to Antonio Taramelli, was that nuraghes were fortresses. The archaeologist Giovanni Lilliu embraced this theory for the whole of his academic career. However, this theory was harshly criticised by the linguist Massimo Pittau, who claimed that nuraghes were sacred places of worship. Ugas (2006), acknowledging that the nuraghes were places of worship during the Late Bronze Age, hypothesizes that a period of “nuraghe-fortresses” was followed by one of “nuraghe-temples”, due to their transformation into places of worship. Mulas (2012) provides evidence that nuraghes functioned as cult places from their time of construction.

While there are some disciples of Lilliu who still adhere to the idea of “nuraghe-fortresses”, it is clear that the interpretation of nuraghes is currently undergoing a radical paradigm shift.

Archaeoastronomical Studies of Nuraghes

Both nuraghes and Tombe dei Giganti have been the object of archaeoastronomical studies.

The Tombe dei Giganti are predominantly oriented toward the north-east and south-east, with a peak in the direction of sunrise at the winter solstice (Zedda et al. 1996; Hoskin 2001, pp. 183–188; Zedda 2009). There are some exceptions to this rule, such as Domu 'e s'Orcu in Quartucciu, which is one of only four among over 3,000 megalithic tombs and temples in the western Mediterranean that is found to be oriented within a few degrees of north (Hoskin 2001, p. 256, see ► [Chap. 95](#), “[Patterns of Orientation in the Megalithic Tombs of the Western Mediterranean](#)”).

To set the discussion of the astronomical meaning of the nuraghes’ orientation in a broader timeframe, it is useful to consider the results of archaeoastronomical research on older monuments.

During the Neolithic, in the late fourth and early third millennia BC, the so-called Domus de Janas (meaning “houses of the fairies”) were built. These are artificial caves carved in rock, with funerary and cultic purposes (there were both domus-tombs and domus-temples). During this period, the peoples of Sardinia

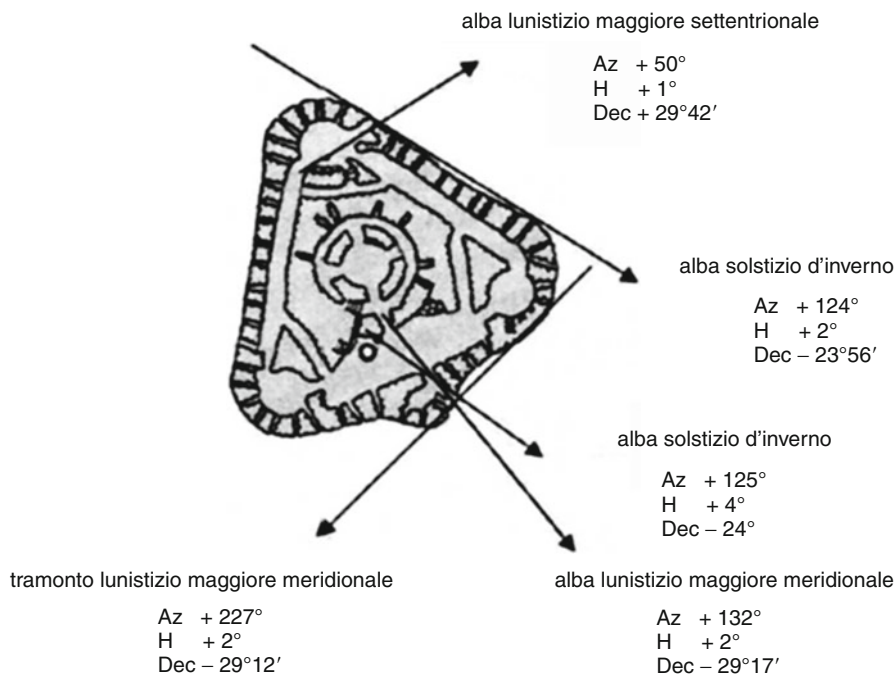


Fig. 122.3 Plan of Nuraghe Santu Antine at Torralba, and its astronomical connections

practiced a religion based on the cult of the Mother Goddess. The entrances of the Domus de Janas are oriented within the horizon arc between the points where the sun rises and sets at the summer solstice, with peaks toward south, east, and sunrise and sunset at the winter solstice. The easterly peak is not toward the equinoctial sun, and may point in the direction where the stars of Taurus first appear (Belmonte and Zedda 2007).

In the third millennium, dolmens began to be erected in the northern half of Sardinia (perhaps owing to a southern French cultural influence). Compared to the Domus de Janas, the orientation of the dolmens (Hoskin and Zedda 1997; Zedda 2005) covers a much narrower horizon arc but one that is identical to that of the later Tombe dei Giganti in the northern half of Sardinia (Zedda et al. 1996). The Sardinian dolmens have the same orientation as the Corsican ones and the Franco-Iberian ones in general (Hoskin 2001).

At this point in time, archaeoastronomical studies of nuraghes are focusing on the following aspects:

- The orientation of the entrances of simple nuraghes and of the main towers of complex nuraghes (Zedda and Belmonte 2004)
- The orientation of the lines tangential to the peripheral towers of complex nuraghes (Fig. 122.3) (Zedda 1997, 2000; Zedda and Belmonte 2004)
- The analysis of the orientation of alignments between nuraghes in the valley of Brabaciera (Fig. 122.4) (Zedda 1992, 2009; Zedda and Pili 2000).



Fig. 122.4 Summer solstice sunrise as seen from nuraghe Nueddas in the direction of Nuraghe Longu, at Isili

These studies show that the entrances of the simple nuraghes and of the main towers of complex nuraghes are oriented within the horizon arc between the point of sunrise at the winter solstice and due south (azimuth $120\text{--}180^\circ$) in northern Sardinia, while in southern Sardinia the range is slightly wider (between 120° and 210°). We interpreted these orientations as being toward sunrise at the winter solstice, toward the moon at the major southern lunistice (southern major standstill limit), and toward the rise and culmination of the stars of Centaurus and the Southern Cross in northern Sardinia. On the other hand, in southern Sardinia there are orientations toward the setting of the stars of these constellations (Zedda and Belmonte 2004).

The slight difference between the peak of the orientations of the simple nuraghes and that of the complex nuraghes, which was evaluated in conjunction with their different chronologies, seems to confirm the astronomical stellar hypothesis (Zedda and Belmonte 2004; see also Ruggles 2005, p. 314; Magli 2007). On the other hand, Pásztor (2009) argues that it would make little sense to orient the entrance of the main tower of a complex nuraghe toward the rising of the stars of the Centaurus–Southern Cross constellation and then to block the view with the peripheral towers. However, this fails to take into account that the main towers of complex nuraghes have two superimposed chambers, each with a door-window oriented in the same direction as the entrance below. Thus, the rising of the stars of Centaurus and the Southern Cross, in line with the entrance of the main tower, could still be observed from the upper floors (precession permitting). This means that the orientation of the entrance of simple nuraghes and of the main towers of complex nuraghes might have retained their significance well after the time of construction, although it is also possible that the orientation only had a ritual function in the foundation stage.

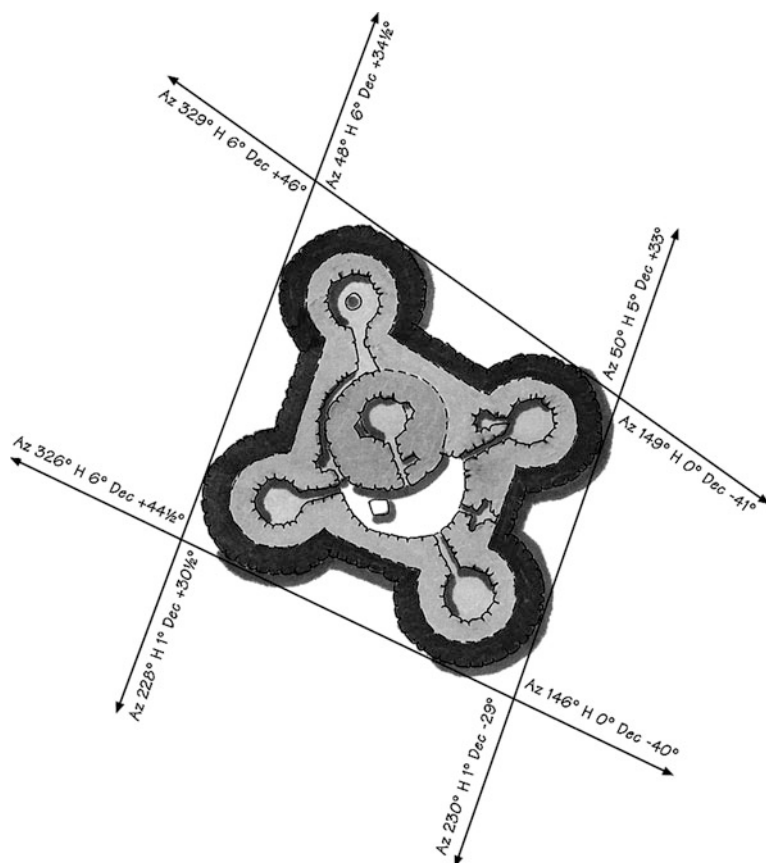


Fig. 122.5 Plan of Nuraghe Barumini, with lines marking the tangential orientations

The analysis of the orientation of the lines tangential to the peripheral towers of complex nuraghes shows a clear predilection toward the points where the sun and the moon rise and set at the solstices and standstill limits (Zedda and Belmonte 2004; Zedda 2009).

Complex nuraghes can be divided between those that are simply “astronomically oriented” and those that may have been “astronomically conceived”, in the sense that their architectural shape is the product of astronomical considerations.

The nuraghe Su Nuraxi in Barumini (Fig. 122.5) belongs to the first category. This is a nuraghe with four lobes where two out of the four lines tangential to the towers frame the point of the horizon between azimuth 228° and 230°, namely the point where the moon sets at the major southern lunistic. In other words, this building is oriented toward that point. This may have been important ethnologically but is unremarkable from a technical point of view.

The nuraghe Losa in Abbasanta (Fig. 122.6) belongs to the second category. The architectural layout of this building incorporates precise alignments upon the rising

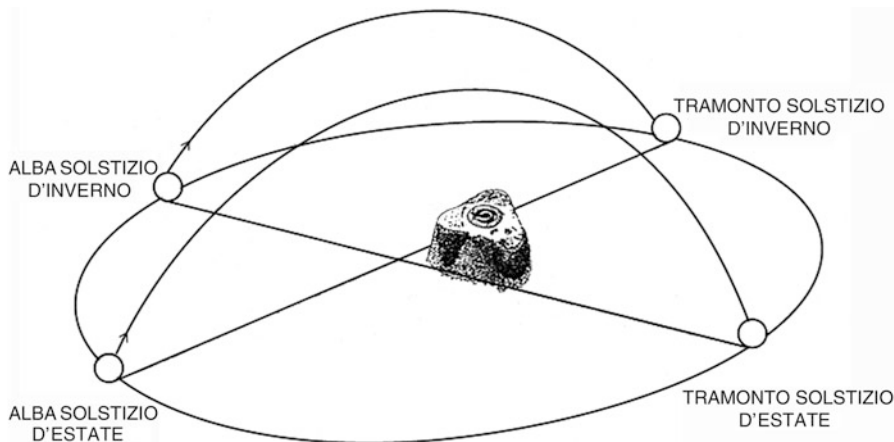


Fig. 122.6 The design of Nuraghe Losa at Abbasanta, with its scheme of solstitial alignments

and setting of the sun at both solstices. This implies that Losa was carefully planned according to a very particular astronomical scheme.

Pásztor (2009) has criticised this theory, pointing out that if a complex nuraghe with three lobes had one long side deliberately oriented north–south, then the other two sides would be oriented solstitially as a consequence. However, this may be muddling cause and effect. The question we should be asking is: “why did the Nuraghic people build triangular-shaped structures?” A number of nuraghes with four and five lobes have at least one of the lines tangential to the peripheral towers in line with a solstice or standstill limit, strengthening the argument that the triangular shape is a consequence of a desire by the Nuraghic master mason to align the building along the solstitial or lunar axes.

Aside from studies of the orientation of the nuraghes themselves, investigations of their locations have found that a number of alignments between nuraghes were directed solstitially or upon a lunar standstill limit. This does not imply that nuraghes were positioned in the landscape according to a pre-ordained astronomical scheme, but rather that the placement of later nuraghes took into account the solar or lunar alignments along the sides of the pre-existing ones. In other words, the positioning of the nuraghes in the landscape did follow an astronomical logic, because their builders took into account the alignments built into the existing nuraghes and constructed the new ones making sure that they were perfectly aligned with the relevant rising or setting points of the sun or moon (Zedda and Pili 2000; Zedda 2009).

Their astronomical orientation aside, Laner (2011) has recently put forward a hypothesis on the cosmological significance of nuraghes, arguing that those with four lobes, and the so called nuraghe-miniatures (Fig. 122.7), represent the Nuraghic universe, which was supported by five columns – a central one and four outer ones.

The stylization of the nuraghe-miniatures supports Laner’s proposition and places the Nuraghic people of Sardinia among the many cultures who conceived

Fig. 122.7 Model of nuraghe with four lobes (in the Sanna Museum at Sassari). It is clearly not a realistic model of a nuraghe, being disproportionately high, but may be a cosmological model



the universe as being supported by five columns. Nuraghes stopped being built around 1150 BC, at the transition between the Late and Final Bronze Age, and nuraghe-miniatures were crafted instead, out of bronze or stone. Laner's proposition implies that these miniatures should be interpreted not as models of nuraghes but as cosmic models. At this time, the first sacred wells were being built. Arnold Lebeuf has highlighted how the architecture of the Santa Cristina well could have permitted it to function as an instrument for lunar observations and particularly for predicting eclipses (see ► [Chap. 123, "Nuraghic Well of Santa Cristina, Paulilatino, Oristano, Sardinia"](#)).

Acknowledgements The author thanks Laura Contini for translating the article from Italian, and Paolo Littarru and Donatello Orgiu for their advice and support.

Cross-References

- [Nuraghic Well of Santa Cristina, Paulilatino, Oristano, Sardinia](#)
- [Patterns of Orientation in the Megalithic Tombs of the Western Mediterranean](#)

References

- Belmonte JA, Zedda MP (2007) From Domus de Janas to Hawanat: on the orientations of rock carved tombs in the Western Mediterranean. In: Zedda MP, Belmonte JA (eds) *Lights and shadows in cultural astronomy*. Associazione Archeofila Sarda, Isili, pp 39–46
- Hoskin MA (2001) Tombs, temples and their orientations, a new perspective on Mediterranean prehistory. Ocarina Books, Bognor Regis
- Hoskin MA, Zedda M (1997) Orientations of Sardinian Dolmens. *Archaeoastronomy 22* (Supplement to the *Journal for the History for Astronomy 28*):S1–S16
- Laner F (2011) *Sa 'ena, Sardegna Preistorica*. Condaghes, Cagliari
- Magli G (2007) *I Segreti delle antiche città megalitiche*. Newton Compton, Roma
- Magli G, Realini E, Sampietro D, Zedda MP (2011) The Megalithic complex of Monte Baranta in Sardinia: a pilgrimage center of early Bronze Age? *Complutum 22*(1):107–116
- Mulas A (2012) *L'Isola sacra, Ipotesi sull'utilizzo culturale dei nuraghi*. Condaghes, Cagliari
- Pásztor E (2009) An archaeologist's comments on the prehistoric European astronomy. *Complutum 20*(2):79–94
- Pili P, Realini E, Sampietro D, Zedda MP, Franzoni E, Magli G (2009) Topographical and astronomical analysis on the neolithic "altar" of Monte d'Accoddi in Sardinia. *Mediterr Archaeol Archaeom 9*(2):61–69
- Renfrew AC (1987) *Archaeology and language. The puzzle of Indo-European origins*. Cambridge University Press, Cambridge
- Ruggles CLN (2005) *Ancient astronomy: an encyclopedia of cosmologies and myth*. ABC–CLIO, Santa Barbara
- Ugas G (2006) *L'alba dei nuraghi*. Fabula Editore, Cagliari
- Zedda M (1997) I trilobi orientati con le stazioni del Sole. *Sard Antica 11*:11–13
- Zedda M (2000) L'orientamento del nuraghe Su Nuraxi di Barumini. *Sard Antica 18*:6–10
- Zedda M (2005) Orientations of additional Sardinian Dolmens. *Journal for the History of Astronomy 36*:107–108
- Zedda MP (1992) *I Nuraghi IL Sole La Luna*, Studio archeoastronomico sui templi di Brabaciera. Cagliari
- Zedda MP (2004) *I Nuraghi tra Archeologia e Astronomia*. Agorà nuragica, Cagliari
- Zedda MP (2007) When astronomical meaning goes beyond orientation and becomes architectural design. In: Zedda MP, Belmonte JA (eds) *Lights and shadows in cultural astronomy*. Associazione Archeofila Sarda, Isili, pp 31–38
- Zedda MP (2009) *Archeologia del Paesaggio Nuragico*. Agorà nuragica, Cagliari
- Zedda M, Pili P (2000) Archaeoastronomy study on the disposition of Sardinian nuraghes in the Brabaciera Valley. In: Esteban C, Belmonte JA (eds) *Oxford VI and SEAC 99: Astronomy and cultural diversity*. Organismo Autónomo de Museos del Cabildo de Tenerife, Santa Cruz de Tenerife, pp 51–57
- Zedda M, Belmonte JA (2004) On the orientation of Sardinian nuraghes: some clues to their interpretation. *J Hist Astron 35*:85107
- Zedda MP, Belmonte JA (eds) (2007) *Lights and shadows in cultural astronomy*. Associazione Archeofila Sarda, Isili
- Zedda M, Hoskin MA, Gralowski R, Manca G (1996) Orientations of 230 Sardinian Tombe di Giganti. *Archaeoastronomy 21* (Supplement to the *Journal for the History for Astronomy 27*): S33–S54