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Digitalizing the sounds of the past: the soundscapes of World Heritage rock art landscapes from Spain and Mexico

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EXTENDED ABSTRACT

Anthropological studies and ethnohistorical sources show that most hunter-gatherer and early agricultural societies around the globe believe the world to be ensouled or numinous. This means that natural phenomena, including acoustic effects (echoes, for example), were perceived as being linked to supernatural agents (2) (3). Although the supernatural is everywhere, particular places in the landscape are identified as being special for transcendental communication. In prehistory, the information about these places is lost, except when they have been marked with rock paintings. In fact, rock art– when it is preserved – is situated precisely still in places where the artist chose to put it. Intriguingly, while experiencing rock art landscapes, one also occupies the same space where the artist was. This placement has particular advantages on the interpretation of rock art landscapes compared to other types of archaeological features, because the knowledge of its exact location in the environment can provide a powerful insight into what lay behind its production.

In our hypothesis, acoustics can be considered as one of the potential key element in the placement, production and use of rock art. We were not the first to address this issue, but some efforts have been made in the past to explore, for example, the role of echoes in rock art landscapes or the relationship of rock art with specific sonotopes (4). In archaeology, there have also been researches about the function of musical instruments found in the archaeological deposits associated to rock art panels, or about the meaning of musical instruments depicted in rock art panels – and, finally, about the use of the rock art support itself, i.e. lithophones (4), as a musical instrument. Other interesting approaches briefly addressed in the literature dealt also with the importance of sound and music present in rituals (5:21) (6) (7), including those performed in rock art landscapes (8:650) (9:39) (10) (11:248), see (12)).

It is in this context that since 2014 we have started a series of research projects aimed at exploring the acoustics of rock art landscapes. The aim of these projects has been to put together a group of researchers from different disciplines (i.e. archaeology, acoustics, psychoacoustics, anthropologists) to explore from different perspectives the sensorial experience sought by prehistoric communities and the potential use of landscape acoustics to produce sounds in the past. Regarding physical acoustics, measuring the acoustic properties of rock art environments is not a trivial task; it involves handling and moving equipment over highly demanding terrains (i.e. gorges, cliffs, canyons, etc.), while providing sound recordings that are as accurate and authentic as possible. Thus, the foremost problem that we overcame was designing a compact, small- sized, portable and battery-powered equipment to

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obtain a full range of detailed acoustic data relevant to our research objectives. Furthermore, this equipment must meet the requirements of the Impulse Response (IR) analysis (e.g. ISO 3382:2009), which is the measuring method that we used during our fieldwork data acquisition. This equipment is described in (13) (14). In this paper we discuss the results of our fieldwork in two World Heritage rock art landscapes, the “Rock Paintings of Sierra de San Francisco” (WHL property 714) in Baja California (Mexico) and the “Rock Art of the Mediterranean Basin on the Iberian Peninsula” (WHL property 874) in Spain.

The Rock Paintings of Sierra de San Francisco encompass an area of almost 1900 km² in El Vizcaino natural reserve in the northern part of Baja California Sur (Mexico). It includes more than 400 rock art sites where Outstanding Universal Value has been recognized by UNESCO in 1993 (<https://whc.unesco.org/en/list/714/>). Sites are composed by rock shelters and small caves mainly located along river canyons. Paintings and engravings are remarkably well-preserved because of the dry climate, the inaccessibility of sites and the low population density of the region. The most significant rock art tradition of this area is the so-called Great Mural style (fig.1), which is known since the end of the XIX century (15). The Great Mural rock art composition and size, as well as the precision of the outlines and the variety of colors, make this artistic tradition impressive. The Great



Figure 1 – M. Díaz-Andreu during IR measurements in Cueva Pintada (photo by C. Villalobos)

Mural rock art tradition is characterized by larger-than-life figures of people and animals. The style is mainly naturalistic although there are also some abstract motifs. Human motifs represent mainly adult men but there are also women and some infants. There are more than 30 species of terrestrial and aquatic animals represented in the rock art such as eagles, rabbits, turtles, whales, and fish, but the most frequently depicted and in close association to human motifs are deers, bighorn sheep (*borrego cimarrón*) and sand pronghorn (*berrendo*). There are also a few reptiles including turtles. The figures are mainly painted in red and black, and to a lesser extent white and yellow. The dating of the Great Mural paintings has been a matter of debate ranging from the 6th millennium BC to the 1st millennium BC (16) (17) (18:81-82) (19) (20:94, 337).

The Rock Art of the Mediterranean Basin on the Iberian Peninsula is a large group of prehistoric rock art sites recognized by UNESCO in 1998 (WHL property 874, see <https://whc.unesco.org/en/list/874>).

It includes 758 sites with paintings in red and black color distributed across six Autonomous Communities of Spain from Catalunya to Andalusia. The paintings are mainly found in shallow rock shelters, but sometimes also in small caves and boulders. Depictions are usually placed on the front walls of rock shelters at different altitude from the ground, but sometimes also in the ceilings of shelters or in difficult locations to reach. The UNESCO list aggregates three different artistic traditions possessing different iconographies that can be related to different historical periods, territories and socio-economic realities of the prehistory of the Iberian Peninsula (fig. 3). The Levantine rock

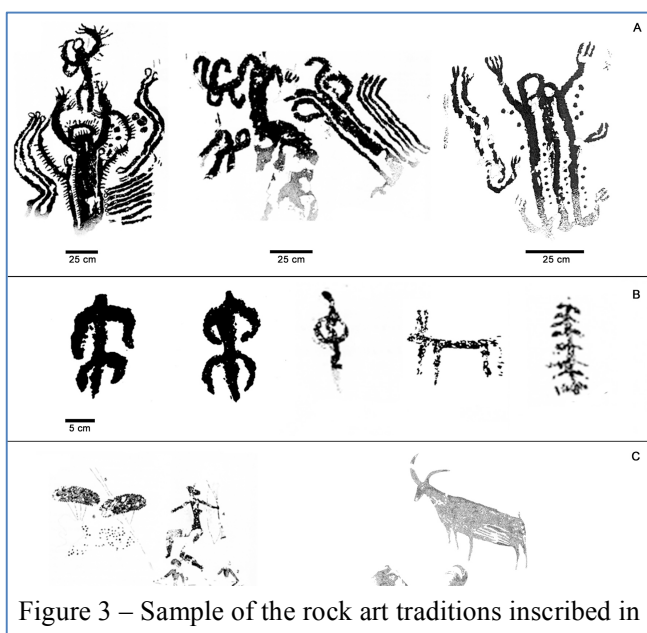


Figure 3 – Sample of the rock art traditions inscribed in the WHL property 87: (A) Macroschematic, (B) Schematic, and (C) Levantine motifs. (from (1))

art tradition is mainly confined along the Mediterranean coast and its immediate inland, the Macroschematic is witnessed exclusively in a limited mountainous area beyond the Cabo de la Nao promontory in the northern part of Alicante province (Hernández Pérez 2009:68), while the Schematic rock art tradition is widely distributed in different environments of the Iberian Peninsula and even beyond in a broader area that includes the central Mediterranean basin (France, Italy, Balkan coast; see (21) (22) (23)). The Schematic rock art is composed of smaller, basic silhouettes filled with pigments, representing anthropomorphs, animals, geometric motifs (such as lines, zigzags, dots), and symbols (24). In contrast to the two previous styles, Levantine art has a more naturalistic and narrative nature. The size of motifs varies, but they are typically around 10 cm in height. The scenes depicted provide us with highly relevant information about individual or group hunting activities, trapping and tracking of wounded animals, harvesting (such as honey), military confrontations, combats and dance (including also music) (25). The Macroschematic art is characterized by large, schematic motifs up to a meter high. They represent anthropomorphs with raised arms normally located in the center of the shelter and snake-like figures usually formed by a few parallel lines sometimes surrounded by dots and short lines and other geometric motifs (26:64-69). The chronology of these artistic manifestations has been the focus of fierce debate, partly because there are opposing views regarding the Neolithization process on the Iberian Peninsula (27, 28) Macroschematic rock art has been dated to the early Neolithic because of the similarities between some of its motifs and those impressed on the Neolithic cardial pottery found in caves such as Cova de l'Or and Cova de la Sarsa (29) (30). The superimposition analysis show that Macroschematic motifs are always beneath either Schematic or Levantine motifs (30:51– 85). It is also thought that the Schematic tradition originated in the earliest Neolithic but continued into the Chalcolithic and even later (24). Regarding Levantine art many authors believe it has a Neolithic affiliation (31, 32) although some researchers have claimed that its origin may be in the final stages of the Upper Paleolithic (33).

The geological setting of both Baja California and the Mediterranean Basin rock art landscapes very often coincides with deep and narrow canyons where shallow rock shelters' openings on their sides offered prehistoric people an adequate vertical support for the execution of paintings. From an acoustic perspective, this means that sounds produced within these rock art landscapes can propagate better than in other types of open-air natural environments. Hard vertical surfaces – like canyon walls, rocky cliffs, outcrops and boulders – can in fact increase multiple sound reflections and refractions, which can make sound travel over a long distance, create prolonged reverberation or strong envelopment to listeners (34:17). Although it may seem surprising at first sight, this type of rock art landscapes act like “city canyons”: narrow city streets with large building façades that can heavily affect the propagation and the perception of sound (35).

What role did the acoustics of these canyons played in the past? Did particular acoustic effects motivate prehistoric artists to choose specific sites or sectors of canyons to be decorated? Can we correlate specific acoustic parameters (such as Reverberation time, Strength, Speech and Music Clarity) to the placement, production and active use of rock art. In order to investigate this, we arranged a portable equipment for 3D Impulse Response particularly suited for fieldwork in remote and rough terrain. As sound source, we combined the use of large air balloons of 40 cm of diameter and a portable dodecahedron powered by solar batteries. The research reported in this paper have been undertaken within the framework of two funding schemes: the People Programme (Marie Curie Actions) grant of the European Union's Seventh Framework Programme FP7/2007-2013/ (REA Grant Agreement No. 627351) and a grant by the Fundación Palarq in 2018. This research has also benefitted from discussions undertaken in the umbrella of the ERC Artsoundscapes project (Grant agreement number 787842).

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