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Archaeoacoustic analysis of Xaghra Hypogeum, Gozo, Malta

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Abstract

Archaeoacoustics offers a new way to interpret anthropological questions pertaining to ancient architecture and populations. Studies conducted at a number of ancient sites throughout Europe and Asia, have found the presence of natural phenomena capable of influencing the human brain. Earlier studies show that ancient populations most likely through use of empirical methods chose the location of their ceremonial sites for this reason. In Xaghra Hypogeum a stone circle located on the island of Gozo, Malta, infrasounds and audible low frequencies capable of affecting the brain were discovered. The caves and surrounding stones act like a musical box amplifying the natural sounds present and it is possible the natural caves could have been modified to enhance this aspect. Similar natural characteristics were also discovered at other archaeological sites in Europe and Asia, including Epidauros in Greece and Göbekli Tepe in Turkey. This is the third and final article on results of our researches in Malta e Gozo islands (Mediterranean Sea) from archaeoacoustic point of view.

Keywords: Archaeoacoustics, low vibrations, Gozo, Malta, Epidauros, Göbekli Tepe.

Introduction

Starting from the premise that past ages were not devoid of noise or spent in silence, the human voice amplified through singing or chanting along with sounds produced by musical instruments, remained the highest expression of culture for a long period during the Neolithic Age. Several civilizations made use of natural sound phenomena to create impressive rites, with some ancient structures modeled in such a way as to direct sonic vibrations capable of influencing the mind towards a particular state of consciousness (Debertolis, Tirelli & Monti, 2014; Debertolis, Coimbra & Eneix, 2015; Debertolis & Gullà 2015). Archaeo-acoustics, a complementary discipline of archeology and anthropology, is an emerging scientific field which investigates such sound characteristics. This method helps to inform our understanding of the speficic properties archaeological sites have and why certain sites were considered sacred.

Using modern digital recording techniques, it is possible to record inaudible sound frequency bands such as ultrasound or infrasound. In previous investigations Super Brain Research Group demonstrated the existence of a relationship between frequencies present at some Neolithic temples and associated brain activity (Debertolis et al. 2012 - 2016). This area of research began in the nineties most notably with the work of Jahn, Devereux & Ibison (1996). Frequencies reproduced under laboratory conditions confirmed their influence on the brain, in some cases

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directly effecting the human body without the subject being aware of the associated mechanical vibrations (Cook, Pajot & Leuchter, 2008; Jahn, Devereux & Ibison, 1996).

Since 2010 SB Research Group has studied sites in Europe and Asia (England, Italy, Portugal, Malta, Turkey and Greece, Bosnia, Serbia, Slovenia, Macedonia, Slovakia) publishing our conclusions.[4] After analysis of approximately thirty ancient sites SBRG's working hypothesis that some archaeological sites feature measurable natural audio phenomena that enhance their mystical properties has been validated. Recordings taken at Göbekli Tepe in Turkey, Tarxien Temples in Malta, Alatri Acropolis in Italy, Felix Romuliana Palace in Serbia and Epidauros in Greece show all these sites are located over natural sources capable of influencing the brain such as low frequencies or magnetic fields.

Any severe and artificial extreme sound imposed on the sonic environment has a profoundly destabilizing effect on the individual, indeed infrasound has been used in the context of wars in the area of acoustic weapons (Debertolis & Bisconti, 2013) and 18Hz for example, can be used to keep subjects awake for the purposes of torture. In contrast however, natural low frequencies with their absence of high pressure can have a positive health influence. Such frequencies have an influence on brain cells without passing through the acoustic organ, which means they can also have an influence on people with hearing loss. Indeed, some people perceive very low-frequency sounds as a sensation rather than a sound (Debertolis & Bisconti, 2013). Infrasounds may also induce states of awe or fear and given they are not consciously perceived, it may make give rise to feeling that a strange or supernatural event is being experienced (Tandy & Lawrence, 1998). In light of this, is possible to hypothesize that ancient populations considered places where a lot of natural low vibrations are present, to be "sacred" (Debertolis & Bisconti, 2013) and used to enhance ancient rites and rituals (Debertolis et al., 2012 – 2016). Archaeoacoustical analysis provides a method to demonstrate knowledge of acoustic phenomena in the past, a technique undertaken at the compound of Ggantija, Malta (Debertolis, Coimbra & Eneix, 2015; Debertolis, Earl & Zivić, 2016). This formed part of a wider study at some of Malta's Neolithic temples, where good results were also obtained at the Xaghra Stone Circle on Gozo.

Xaghra Stone Circle and the site of Ggantija

Together with Hal-Saflieni Hypogeum, Xaghra Hypogeum is regarded as one of the most important archaeological hypogea in Malta (Tagliaferro, 2007). It is an underground structure adapted from a natural coralline limestone cave surrounded by stone blocks arranged in a circle. The site managed by Heritage Malta, was partially excavated between 1987 to 1994, with the remains listed on the National Inventory of the Cultural Property of the Maltese Islands. Due to the fragility of its megaliths which are liable to collapse, only a small portion of the site was excavated. Much remains unstudied and currently lies buried under sandbags and soil to protect it.

A few decades ago, archaeologists believed Malta and Gozo began to be inhabited during the Bronze Age around 2,300 B.C. Radiocarbon dating however has pushed this to circa 5.000 BC, with the construction of the Maltese temples at around 3.600 BC, making the temples one of the oldest structures on Earth) after the ancient complex of Göbekli Tepe (ca. 9500 BC, Şanliurfa – Turkey). From pottery and stone decorations, archaeologists were able to establish the site had several phases, of relevance to this research are the Ggantija Phase, 3600-3000 BC and the Tarxien Phase, 3000-2400 BC (Serio, Hoskin & Ventura, 1992). The Xaghra Hypogeum located only a short distance from the more widely known South-East facing Ggantija Temple complex belongs to these periods.

The Ggantija Temple was the first Maltese structure of both structures to be cleared from debris during excavations led by Col. John Otto Bayer in 1827. Unfortunately, after his excavations, the soil and remains were abandoned and the site of Xaghra Hypogeum was filled in, until the government acquired the site in the 1930s. The complex of Xaghra Hypogeum (once known as The Brochtorff Circle, from the name of the artist that initially

4 Note. Super Brain Research Group (SBRG) is an international and interdisciplinary non-profit organization of researchers from Italy, Finland, U.K., Croatia, Serbia and Macedonia, researching on archaeoacoustic and anthropological properties of ancient sites and temples throughout Europe and Asia (www.sbresearchgoup.eu).

depicted it in 1788) was rediscovered in the 1960s and brought to light between 1987 and 1994 by a joint team from the University of Malta, the Maltese Museums Department and the University of Cambridge. These last excavations revealed a funerary complex consisting a maze of underground caves and spaces for burial and ritual, some of which dated to the Zebbug Phase (between 4100 and 3800 BC) (Tagliaferro, 2007). During the excavation, archaeologists discovered about 220,000 human bones belonging to between 450 and 800 individuals.

Furthermore, these dead bodies were brought to the site and ritually dismembered. But what is impressive is that these dismembered body parts were then carved up and collected in separate sites on the basis of the different anatomical characteristics (skulls, femurs, etc.) (Grima, 2010). In addition, the excavation revealed different archaeological finds that included two important examples of Malta's fine art: a group of nine limestone figurines called "shaman' sticks" and a couple of twin figurines depicting the Mother Goddess sitting down, one holding a baby, the other a container (Tagliaferro, 2007). The entrance to Xaghra Hypogeum is indicated by several megalithic blocks, with the entire site surrounded by a boundary wall made from stone blocks (ca. 120 meters circumference). Into the underground space there was a central hall enclosed by an altar and divided internally by large stone slabs. These caves were prone to collapse, and the structure became so weak that megaliths were used in an attempt to stabilize the roof. The structure finally collapsed at some point before 2000 BC. During the Bronze Age, the site was probably used for non-funerary domestic purposes, and the land was exploited for agricultural use until the 20th century (Grima, 2010).

Materials and Methods

Equipment for the sound recordings consisted of two types of dynamic high-end microphones extended in the ultrasound field, with a digital portable recorder (Tascam DR-680 of TEAC Group, whoose maximum sampling rate was 192KHz), results were controlled with other digital recorders (Tascam DR-100 and Marantz PMD661) with less technical characteristics. Professional studio microphones with a wide dynamic range and a flat response at different frequencies (Sennheiser MKH 8020, response Frequency 10Hz - 60.000Hz) with shielded cables (Mogami Gold Edition XLR) and gold-plated connectors (Fig. 3) were also used.

Fig. 1: Sound recording equipment & set-up at Tarxien Temple, Malta

Before recording a spectrum analyzer (Spectran NF-3010 (Fig. 2) from the German factory Aaronia AG) was used to search for any electromagnetic phenomena which could have an influence on the results. Additionally, a computer analysis was carried out using a sensor connected to the recorder (Demiurg Laboratories, Zagreb).

Fig. 2: Spectran NF-3010 from the German factory Aaronia AG.

This method was used to identify noise interference at all archaeological sites. If any interference is found however, recordings need to be cleaned in the audio studio.

Fig. 3: Demiurg Laboratories (Zagreb) 300ohm Sensor, which transforms electromagnetic impulses into electrical impulses via the digital recorder.

Praat program version 4.2.1 from the University of Toronto and Audacity open-source program version 2.1.2 for Windows and Linux were used to analyise the audio recordings.

Archaeoacoustic measurements at Xaghra Hypogeum were carried out at two locations: 1) a deep well on the side of the walkway leading to a stone staircase that leads to the central hall of the hypogeum; 2) a collapsed cave that overlooks the main hall of the Hypogeum (**A** and **B** respectively in figure 4). The microphones were lowered from the surface in a spot sheltered from the wind and suspended above the wells (suspending in this way avoids ground friction which can generate spurious noises affecting the recordings). Several recordings were made with a long pause in between. Once the mircophones were in position, prerecording tests were conducted by clapping to determine if the microphones were affected by any environmental noise (Fig. 8).

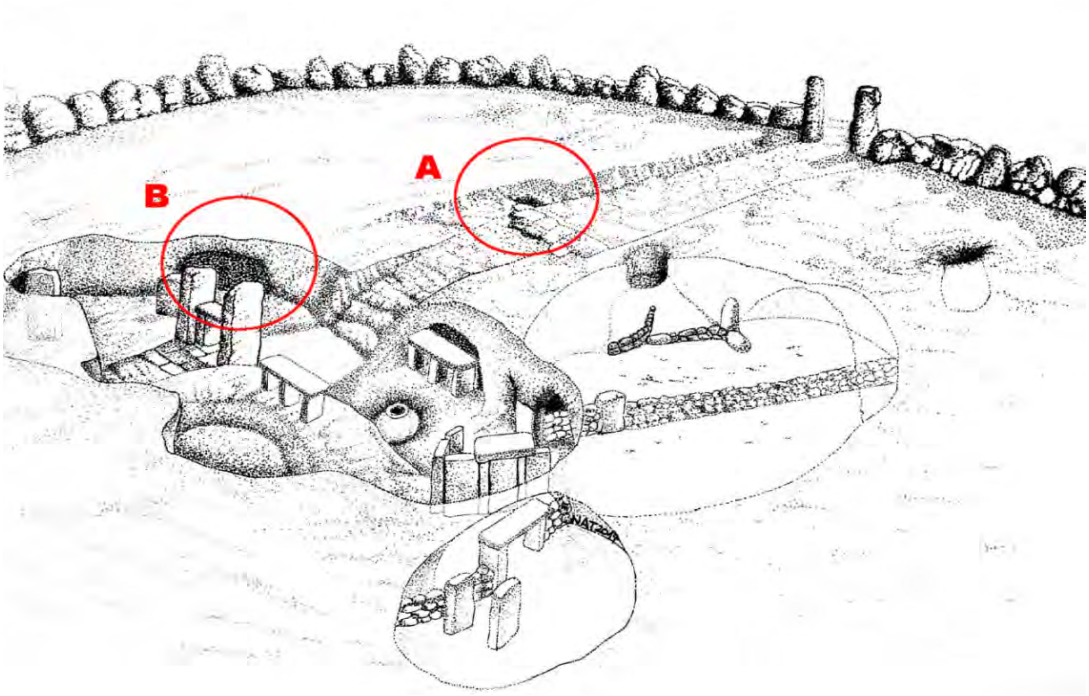

Fig. 4: Graphical reconstruction of Xaghra Hypogeum showing the locations where the microphones were placed (A & B).

Similar recordings were carried out at Ggantija Temple at a number of locations. Instruments such as bells and drum were also used in an attempt to stimulate the resonance from the structure.

Fig. 5: Placement of microphones above the well by the walkway leading to the hypogeum (position A, Figure 4).

Results

After thorough testing at Ggantija the only frequencies found were in the form of noise pollution from a nearby access road, it was devoid of underground frequencies. At nearby Xaghra Hypogeum however, extremely powerful natural frequencies were found. These are comparable to what was found at Tarxien temples, but with a slightly longer high frequency range with a small amount of oscillation. They have a broad peak of between 25Hz and 34Hz with a volume between -17db and -23db (audible). The frequency peak at Xaghra Hypogeum falls within the infrasound frequency range extending into the audible band at 40Hz. Such frequencies are perceptible to an attentive ear, or for those more sensitive they can be felt by the vibratory sensors of the body (Meissner mechano-receptors). Previous research at other archaeological sites found such vibrations are perceived by people who are sensitive as unspecified energy from the ground, with a clear effect on the human body and in particular brain activity.

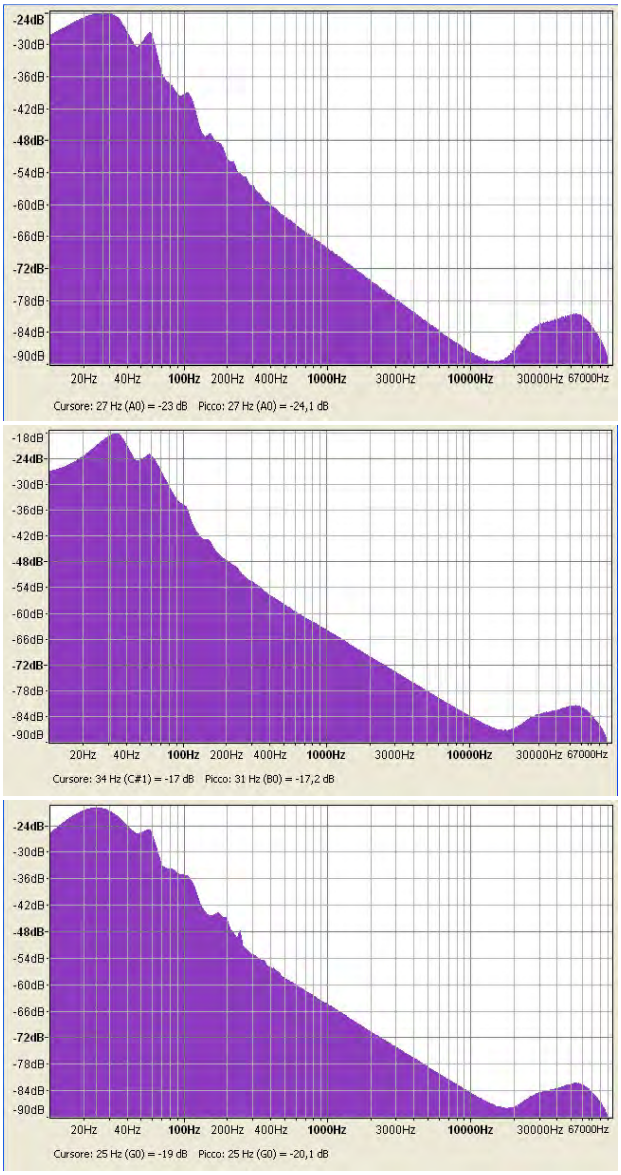

Fig. 6: The extraordinary low frequency peak present in all recordings made at Xaghra Hypogeum.

Discussion

In both locations where the microphones were placed (about twenty meters apart), the same low vibrational frequency signature as an engine in motion was detected. There were no factories or man made activity capable of generating such a noise of this frequency in the neighbouring vicinity that we were aware of. The pre- recording tests conducted by clapping found the microphones were placed deep enough as to be scarcely affected by the external noise environment.

Underground streams were another unlikley source due to the scarcity of this natural element in the Archipelago of Malta. SBRG found simlar low frequencies at Tarxien Temple, Malta and the temple of Cybele at the archaeological site of Felix Romuliana, Serbia (Debertolis & Zivi ć, 2015). One plausable theory as to their origin is due to the frictional movement between the African and Eurasian tectonic plates located close to the archipelago of Malta (Serpelloni et al., 2007) discussed in a previous paper on Malta temples (Debertolis, Earl & Zivi ć, 2016).

Fig. 7: One of the caves at the hypogeum.

If the hypogeum or stone circle was covered at any time, such a structure would have acted to intensify any natural frequencies present, in a similar way to how a sound box of a musical instrument works. Such vibrations would have a definite effect on the emotional sphere of those involved in any religious rites or ceremonies thereby enhancing the natural space (Debertolis & Zivi ć, 2015).

Fig. 8: Prerecording tests to determine if the microphones were affected by external environmental noise.

Fig. 9: The Sound Frequencies Detected Were Similar At Both Locations (Position A&B, Figure 4).

Fig. 10: Ggantija Temples.

The research also aimed to establish if there was any resonance phenomena inside the apses by playing musical instruments. However the presence of metal scaffolding designed to support the huge stones meant this was not possible, as they would act as interference by the reflecting the sound waves.

Fig. 11: The presence of scaffolding inhibited any attempt to verify the presence of a resonance phenomena stimulated by musical instruments (eg. drums or percussion bells).

Equally the areas without props have undergone alterations over the millennia, so as to alter their original form of a domed roof making it virtually impossible to conduct an adequate assessment of its sound resonance.

Fig. 12: Alterations or deterioration of the temples structures have meant that no resonance could be detected.

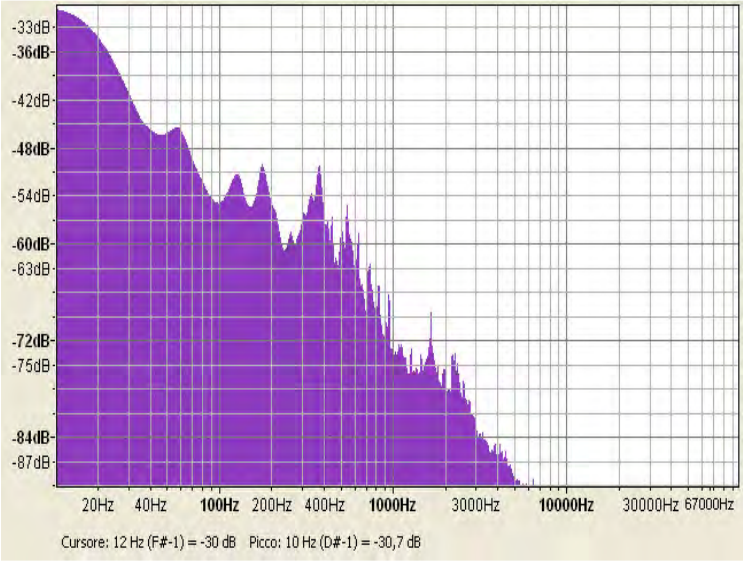

Fig. 13: Recording plot from Ggantija Temple, where unlike Xaghra Hypogeum, nothing unusual was detected. The peaks in the middle of the curve are simple ambient noise.

A base line to serve as a reference for the recordings in these temples was established, from a nearby hill in front of Ggantija, where there are still prehistoric settlements. Microphones were lowered through the entrance of a prehistoric well dug into the rock that is now dry. The track recorded was devoid of any frequencies from underground, confirming the uniqueness the Xaghra Hypogeum recordings.

Fig. 14: The hill facing Ggantija Temple, where the base line recording was taken.

Fig. 15: The dry well where the microphones were placed.

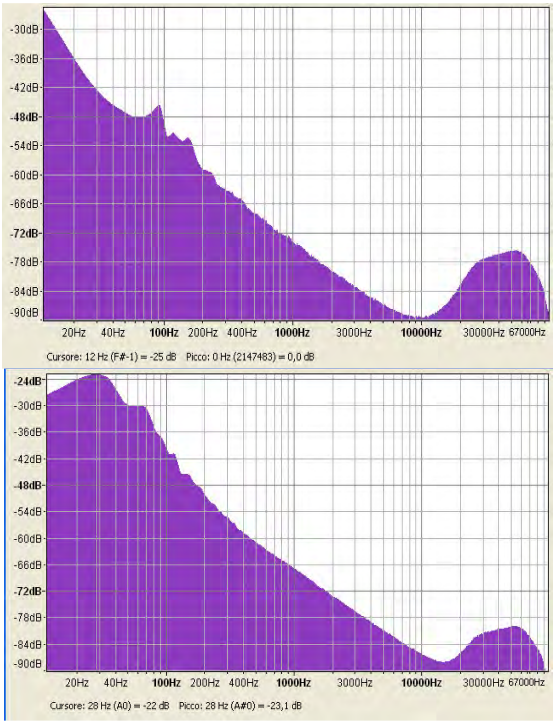

Fig. 16: Above: the recordings made in the well show nothing significant. Below: the sound curve from inside Xaghra Hypogeum showing a powerful vibration with a top peak of 28Hz.

How did ancient megalithic civilizations become aware of the vibrations present in the area around Xaghra Hypogeum? Given that some of the frequencies present lie within the audible spectrum, its plausible they could have been heard by placing an ear to the ground and therefore through the transmission of vibrations via bone conduction. It is plausible that these vibrations, close to the rhythm of brain wave frequency, created a sense of exaltation and mysticism in those present. When it was intact, it must have acted as a sound box for someone engaged in prayer or meditation. So we can suppose that probably the people staying in this site felt themselves enveloped in the sounds of the womb of the Mother Goddess, considering the great number of votive statues of this goddess found in this site, and in touch with the depths of the planet.

Fig. 17: Some of Mother Goddess' votive objects found during the excavations of Xaghra Hypogeum (Heritage Malta – Ggantija Museum).