

# Archaeoacoustic analysis of a dolmen on Mount Freddone, Italy

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**Abstract**—Archaeoacoustic analysis provides a complementary method to understand archaeological sites as opposed to a stand alone methodology. Such analysis however, can provide useful insights in cases where there is little or no historical documentation. In such cases, a medical anthropological approach can explore any connection between the structure and the interaction with the human physiological can provide insight. This study of a Neolithic dolmen located on a peak in the Apuan Alps, Italy has no historical documentation. A medical anthropological approach was applied to the archaeoacoustic results and compared to a dolmen in Portugal. Subsurface vibrations, which have the effect of entraining the brain into a relaxed state, are present. Indeed, the large dolmen stones act like a transducer distributing strong infrasonic vibrations directly above and below the capstone. In the past this site covered a larger area than that found in the present day; on the opposite side of the mountain lie collapsed stones from another dolmen and a nearby quarry provides evidence of where the stones were mined. Both dolmens are orientated towards the equinox.

**Keywords** - *archaeoacoustics, dolmen, Apuan Alps*

## I. INTRODUCTION

Archaeoacoustics is increasingly becoming recognised as a discipline that complements both archeology and anthropology, helping to expand our understanding of why certain sites were revered in ancient times. Within the field of archaeoacoustics a new argument is starting to emerge: that within prehistoric monuments or temples that are devoid of an acoustically induced resonance phenomena, other phenomena more natural in origin are frequently found. Such natural phenomena include infrasonic vibrations and magnetic fields both of which can influence the human mind, expanding perception or sensitivity or even inducing altered or 'mystical' states of consciousness. After seven years of studying archaeoacoustic phenomena at over fifty sites, Super Brain Research Group (SBRG)<sup>1</sup> has discovered that they share

similar properties; natural vibrations or magnetic fields that have a physiological influence on brain waves and consequently on one's emotional state, a phenomenon previously observed by researchers: Jahn, Devereux & Ibison in 1996 [27] and Cook, Pajot & Leuchter in 2008 [2]. By using modern digital recording techniques, it is now possible to record those non-audible sound frequencies (in the ultrasound or infrasound bands) that can influence human brainwaves. SBRG is also developing a methodology that utilises UV imaging and photography with dedicated software to reveal the presence of magnetic fields through the micro-movements of air, an important breakthrough given the physiological influence magnetic fields have [21, 22]. SBRG's early hypothesis was that at some archaeological sites, revered for thousands of years, exist measurable natural audio phenomena that give the place unique mystical properties [3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,28,32,33,34].

This study looks at two dolmens located on the Apuan Alps in Tuscany dolmens are a rare find in Italy as most of them were destroyed during the Christianisation period. Only one of this pair of dolmens survives today most likely due to its difficult to access location hidden amongst mountain terrain.

## II. MOUNT FREDDONE DOLMEN ON APUAN ALPS IN ITALY

The name "dolmen" commonly refers to a Neolithic monument, consisting of two or more vertical standing stones, mounted by a large horizontal capstone. The archaeologist Wilke believes the oldest dolmen in Europe was constructed in the fifth millennium BC, with the more recent large cemetery tombs built around 2,000 BC [36]; according to Fimmen, the oldest forms of the dome-shaped cell dolmen on the island of Crete date back to the proto-Minoan, but remain until at least the Mycenaean period. Crete has no early dolmens [25].

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archaeoacoustic properties of ancient sites and temples throughout Europe and Asia from 2010 ([www.sbresearchgroup.eu](http://www.sbresearchgroup.eu)).

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<sup>1</sup> Super Brain Research Group (SBRG) is an international and interdisciplinary non-profit research organization with legal personality studying the

Their function is still subject to discussion today. Some dolmens host individual or collective tombs, including furnishings dating to the Neolithic or pre-Neolithic periods; others contain remains of embossed and sometimes painted embellishments. Many archaeological findings (offerings, altars, galleries, etc.) suggest that such monuments might have had a religious function. In Italy, many dolmens and other Neolithic monuments were totally destroyed by later civilizations or by the Church, as a result only a few remains today, even less so in a reasonable condition (Fig. 1). In contrast Portugal's dolmens escaped the ravages of the Church, and were in some sense preserved (Fig. 2).



Figure 1. Dolmen "Placa", Melendugne, Lecce, Italy.



Figure 2. A dolmen transformed in a small church in Portugal.

The Apuan Alps, High Versilia and Garfagnana are part of the Apuan Alps Park (Fig. 3), it is a region rich with petroglyphs and archaeological finds which are, in part, unknown and not precisely datable. These areas have been inhabited since Neolithic times, but the meaning and the reason for the petroglyphs and other artifacts such as sacred altars and thrones is unknown. However these can be viewed as a stone atlas to provide some insight as to the historical roots of this region. To the south west lies the island of Corsica culturally linked to the Apuan Alps through a common identity matrix written about by classical historians. Corsica presents some examples of dolmens which like those in the Apuan Alps appear to fall into the latter typology, although these have only been partially studied.



Figure 3. A map showing the location of the Apuan Alps, Italy.





Figure 4. Mount Freddone, Apuan Alps.

The most important artifact today is the dolmen situated close to the summit of ancient Mount Freddone (1,489m) (Fig. 4), in the municipality of Stazzema (Lucca). The alpine pastures of the ancient village of Terrinca at one time encompassed this area. Mount Freddone was at one time mined for copper by Eneolithic Bronze Age man, and later by the Apuan-Ligurians who extracted minerals until the end of the nineteenth century. The dolmen (Fig.5 and Fig.6) is oriented towards the Spring Equinox sunset, in 2015 Calzolari assumed that it could have been built to observe the spring equinoctial phenomena [1]. He also suggests its horizontal capstone forms a gnomon, which relates to the semantics of the TAU symbol representing life or resurrection in ancient times.



Figure 5. Mount Freddone dolmen taken from East.



Figure 6. Mount Freddone dolmen from a different angle of view (West).

The dolmen is oriented towards the Springsunset Equinox when the sun sets on the summit of Altissimo mountain, which is situated in front of Mount Freddone. The light fully illuminates its interior chamber, with the upper beam oriented exactly in a north-south direction. Today Italy has very few examples of dolmens in such good condition. It was probably saved from destruction due to its difficult access even today; if this was a tomb, why was it placed in such an inaccessible location? A stone quarry is situated close to the summit and the strata reveals some missing stones. Is it possible the ancient civilization quarried the dolmen stones from these original layers before transporting them to their current location? (Fig.7).

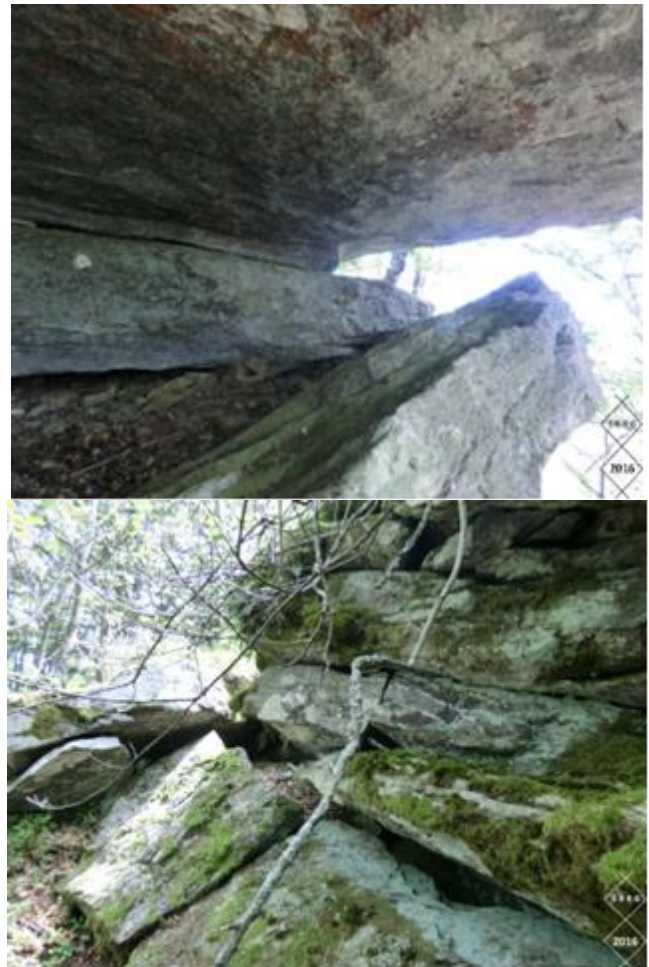


Figure 7. The quarry on the top of Mount Freddone, showing some evidence of stone extraction.

On the other side of the mountain another dolmen can be found, but unfortunately it has been destroyed. One plausible reason for this is likely due to an earthquake in which the two pillar stones opened up causing the horizontal capstone to fall (Fig. 8). This area is close to a geological fault and the stones are set in a very soft soil. The path to the dolmen on the summit of Mount Freddone is marked by a great number of menhirs (Fig. 9), such artifacts are typical of a “ceremonial landscape”. It is worth noting that local myths passed on in the oral tradition, speak of mystical rituals at this site in the ancient



past. For these reasons an interdisciplinary investigation into the archaeoacoustic characteristics of this site was carried out.



Figure 8. The destroyed dolmen on the opposite side of the summit on Mount Freddone. The capstone appears to have fallen between the opened stone pillars.



Figure 9. One of the small menhirs lining the path to the summit of Mount Freddone, forming part of the ceremonial landscape.

### III. MATERIALS AND METHODS

Equipment for the sound recordings consisted of two types of dynamic high-end microphones extended in the ultrasound frequency range, with a digital portable recorder (Tascam DR-

680 of TEAC Group, with a maximum sampling rate of 192KHz). 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. 10) were also used.



Figure 10. Sound recording equipment & set-up below the dolmen.

Before recording a spectrum analyzer (Spectran NF-3010 from the German factory Aaronia AG) was used to detect the presence of any electromagnetic phenomena which could have influenced the results (Fig. 11).



Figure 11. Spectran NF-3010 from the German factory Aaronia AG.

Archaeoacoustic measurements at Monte Freddone dolmen were carried out at two locations: in the chamber below the dolmens capstone and at a distance of approximately 500 meters to the West. It was impossible to measure to other directions because the deep ravine. To avoid surface vibrations, the microphones were placed on isolated tripods directly on the top and below the capstone. Only the vibration from the air was recorded (there was no wind present throughout the recordings), and there was a 10 minute pause between each recording. Once the microphones were in position, pre-recording tests were conducted by clapping to determine if the

microphones were affected by any external environmental noise.

#### IV. RESULTS

High volume infrasounds (low frequencies) in the 7-12Hz frequency range (with an average of 8Hz) were recorded inside the dolmen at a volume of -37- 56db (with an average of -46db). Previous research at other archaeological sites found similar vibrations. A constant frequency in the audible band of around 65Hz with a volume of around -62db, was also present; this most likely source of this was ambient noise coming from a small river in the valley below (Fig. 13). Those individuals who consider themselves to be sensitive state they often sense such vibrations as unspecified energy emanating from underfoot, and other physiological effects on the body relaxing the brain in particular. Such infrasound frequencies are able to enter the brain without passing through the hearing organ, entraining the brainwave rythm into an Alpha-Theta state.

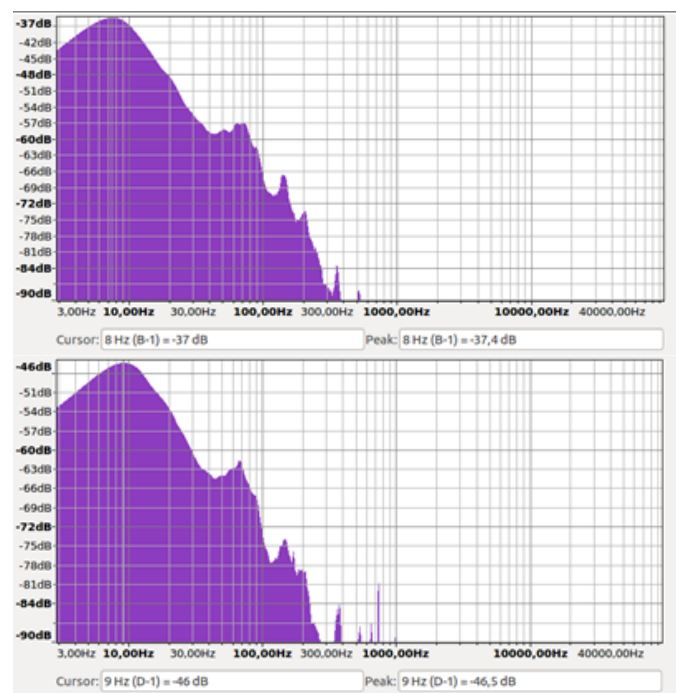


Figure 13. The extraordinary low frequency peak present in all recordings taken at Monte Freddone dolmen.

Some clarification of the characteristics of these results in respect of the measured volume should be mentioned: in that there is a distinction between using decibels to measure sound pressure levels as opposed to signal levels. Sound Pressure Levels (SPL) are a measurement of air pressure which is caused by sound or noise, this results in physical forces moving against the diaphragm of a microphone and in the acoustic environment this translates to volume. Measurements of this nature are usually expressed as dB SPL (decibels of sound pressure level) and are measured in positive numbers. For example a rock concert can reach 110db or a jackhammer 100db, moreover a person whispering is around 20-30db. When dealing with signal levels, decibels are used a little differently. In this case, 0 dB is the highest signal level achievable without

any distortion ; all signal levels below this point are then represented as negative numbers. A volume fader may be labeled with a “0”, part way up to mark the point at which that fader is neither boosting nor attenuating the signal.

The measurements taken at Mount Freddone dolmen show a level of -37db which is a loud volume despite the fact it is inaudible due to it being below the range of human hearing (infrasound).

#### V. DISCUSSION

It is possible that the stones that form the dolmen act as a transducer of vibrations coming from underground. Above and especially inside the dolmen the vibrations have a good transmission to the air. Similar results were obtained in Alatri where using a slightly different setup the polygonal stones that formed the original wall of the acropolis on top of Alatri acted as transducers [12, 23]. A scientific paper published in 2015 [10], highlighted the world of physics has been fast approaching the arena of neuro-sciences and offering an alternative perspective to quantum vibrations. The aim of this research was to build on earlier archaeoacoustic research to investigate the relevance of conscious studies from the Microtubule Neurological System (MNS) perspective along with other related biological materials. Neurophysiologists have neglected to consider materials beyond the neuron considering them only as particular cells. However recent discoveries within the MNS field have shown that proteins and other materials, (as the discovery of a resonance chain that connects DNA to the brains final architecture) make it possible to better understand brain activity. In particular the discovery of a resonance chain that covers an astonishing frequency bandwidth of several orders of magnitude within the brain, that could bring both neurophysiologists and consciousness researchers to a unified approach and better understanding of brain responses (VlaamCultuuhuis de BrakkeGrond, 2014) [35]. Further, the discovery by Hameroff and Penrose [26] of quantum vibrations in the microtubule architecture located within the cerebral cells, influenced SBRG theory around the natural environment found at ancient sites. They proposed that brain waves recorded by electro encephlography (EEG) originate from the brains neurons microtubule structure which vibrates. Penrose and Hameroff consider that even thoughts could originate from this system and quantum vibrations are orchestrated by synaptic connections (Orchestrated Objective Reduction or “Orch OR” theory) [26]. This theory was initially highly critised because many researchers considered the brain too complicated to host delicate quantic processes. But recently Orch OR theory was confirmed by Anirban Bandyopadhyay’s research group with the Intistute of Science of Materials in Tsukuba (Japan) [30, 31] and by Eckenhoff’s team from the University of Pennsylvania[24]. In particular the latter research demonstrated that general anestesia can act on the microtubule system of neurons without interfering with other cells functions, thereby operating on the conscience without influencing non-conscience brain functions. Moreover, brain memory is now considered a deformation of the resonance chain. Penrose, Hameroff and Bandyopadhyay explored their theories during a session on "Microtubules and the Big Consciousness Debate" at the Brainstorm Sessions, a public three-day event at the BrakkeGrond in Amsterdam



(Netherlands) January 16-18, 2014 [30,31,35] and concluded that “Consciousness depends on a harmonic vibration of microtubules inside neurons, similar to certain kinds of Indian music, but unlike Western music which is harmonic vibration” (Hameroff) (VlaamCultuuhuis de BrakkeGrond, 2014). Further they found resonance vibrations not only generate electric activity (as detected by EEG) but also light (Rahnama *et al.*, 2011) [29]. This aspect was confirmed by Debertolis & Gullà in 2015 [10]. Is it also possible that some very low vibrations can influence the state of consciousness in anyone exposed to these frequencies, through a process of entrainment which cause the microtubules inside the neurons to vibrate. SBRG research group has demonstrated that sound vibrations can influence brain activity without passing through the hearing organ [6], therefore it can be supposed that infrasounds at certain frequencies have a strong effect on the human state of mind altering cognitive perception. Similar infrasonic vibrations were discovered at a number of ancient sites analysed between 2010 to 2017 (Debertolis *et al.*, 2012-2018). Below a dolmen located at Parque Megalítico Dos Coureleiros, Castelo de Vide, in Portugal (fig. 14) is discussed. This site features several dolmens, but only the dolmen known as “Anta 2” is in good condition.

able in some way to affect human brain, as we showed in various previous scientific papers (Debertolis *et al* 2012–2018).



Figure 15. Radioactivity measured by Geiger counter. Left: outside the dolmen it is 0.16  $\mu\text{Sv/h}$ , that is normal in an open space for Portugal; Right: inside the dolmen the radioactivity is three times than inside, it is 0.40  $\mu\text{Sv/h}$ .



Figure 14. Anta 2 dolmen, Parque Megalítico Dos Coureleiros in Portugal. Left: the dolmen today; Right: the sound recording set up inside the dolmen.

During this research it was observed that inside the dolmen those natural infrasonic vibrations present actually reverberate more strongly inside rather than outside the dolmen which in turn affects the brain. Radon gas radioactivity originating from underground is higher inside the dolmen compared to outside the dolmen. It is more than three times higher, but below dangerous levels (Fig. 15).

A peak of 28Hz at -34db (Fig.16) in the audible band was discovered, very similar to other sites studied in Europe and Anatolia, for example Xaghra Stone Circle and Tarxien Temples in Malta (Debertolis, Earl & Tarabella, 2017) [20], Epidaurus in Greece or Gobekli Tepe in South-East Anatolia (Debertolis, Gullà & Savolainen, 2017)[22].

It appears that this dolmen works in a similar manner to a transducer of vibrations that originate from the subsoil and are

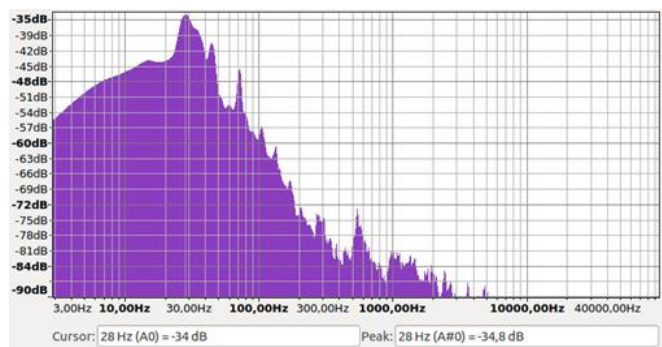


Figure 16. The audio spectrum taken inside the Portuguese dolmen. There is a peak at 28Hz at -34db in audible band.

## VI. CONCLUSION

Research at Monte Freddone dolmen found those vibrations discovered share similar characteristics with those found at other sacred sites throughout Europe.

In the absence of historical sources anthropological or archaeological research can be aided through better understanding of the characteristics of an ancient sacred site. In this case, both dolmen sites show how it might be possible to reach an altered state of consciousness from the vibrations originating from natural phenomena, which acts on brain wave activity in particular conditions. Further, ancient people appeared to be aware of this phenomena and purposefully placed stones in locations where natural vibrations were amplified.. There are also various scientific papers which confirm the connection between brain activity and natural physical phenomena (Debertolis *et al* 2012–2018) [3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,28,32,33,34].

Monte Freddone dolmen (Fig. 17) is unlikely to be a tomb because no burial artefacts have been found (Calzolari, 2015) [1]. But its true purpose is hinted at from the lined menhirs path that leads to the space on the top of the mountain. The audio analysis shows some characteristics capable of affecting states of conscious, because the volume of infrasound pressure was very high.

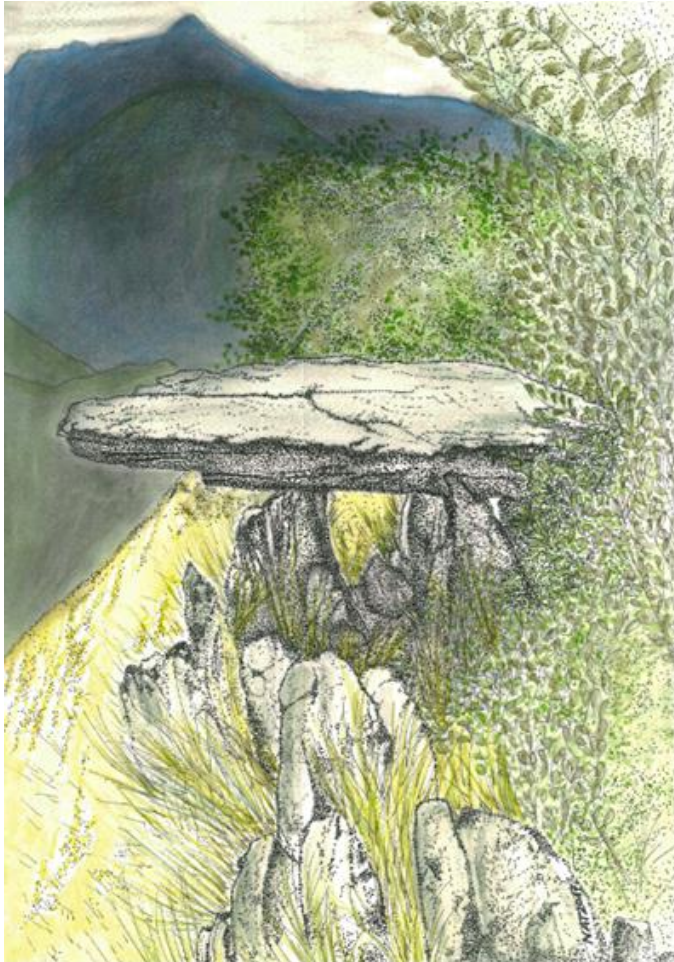


Figure 17. Mount Freddone dolmen as in image taken during our study (picture by N. Tarabella).

This suggests the capstone acts as an excellent transducer. Moreover the presence of a second dolmen on the opposite side of Monte Freddone summit is interesting. It suggests an astronomical connection with sacred rituals more impressive for the infrasound coming from below the soil.

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