CHAPTER 5

Soundscape and Religious Experience at Dodona

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A Divine Soundscape

Our auditory system plays a major role in the way that we understand and interact with the world around us. Perceiving sounds informs us about the events, environments and bodies in the world that produce sounds. Even when the ears cannot perceive a sound, sound vibrations and motion are still felt by our bodies. Our brains detect regularities in the temporal patterns of sounds, and form predictions that influence our perceptions and actions.[1] Therefore, sound events matter. It is not surprising that the most compelling sound events of our environment, the wind, rain, thunder, rivers, seas, volcanoes, earthquakes, were thought to be of divine origin, and projected onto Zeus and Poseidon, the two major Greek gods routinely described in early literature as deep-crashing (*baruktupos*), loud-roaring (*erispharagos*) and loud-sounding (*eriktupos*).[2]

The sanctuary of Zeus at Dodona offers the opportunity to explore a complex sonic environment, a land 'full of voice' (*omphēs meston*),[3] in a space where direct communication and consultation with the god was made possible for the pilgrims. Different sounds may have alerted the pilgrims to the divine presence, which was manifested around the land and in the sanctuary in different ways. These sensory inputs are replete with symbolism, often quite abstract and multifaceted, and their perception makes the meaning of symbols palpable. But the worshippers are never passive listeners, and their own emotions and psychological states can influence their perception of the sonic stimuli they receive, as it will be shown.

[1] Mills 2014: 41, Iversen 2016, Van der Schyff and Schiavio 2017. Pre-empting the biological role of sound and hearing, Aristotle commented that hearing was more important for the development of intelligence and thought than sight (Arist. *Sens.* 437a4–14).

[2] Hes. *Theog.* 388, 441, 456, 818, 930, *Hom. Hymn Apollo* 186–7.

[3] Philostr. *Imag.* 2.33.

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The natural landscape of 'wintry Dodona' (*Dōdōnēs . . . duscheimerou*)[4] made it a very audible place, which perhaps was one of the reasons it became the focus of cult activity early on. There is no doubt that the emotive nature of this landscape, and the interconnectedness that Dodona afforded to the local communities both in the prehistoric period and in the historical era have equally played their part in the establishment and shaping of the cult, and in its development and transformation over time.[5] A phenomenological and archaeomusicological approach to the Dodonaean landscape and soundscape, supported by a breadth of scattered, yet informative, literary references, reveals the intense sonic impact of human interaction with the natural elements in the religious configurations at Dodona. In what follows, I will consider some examples.

Thunder

Mountainous Dodona is described in the Homeric epics and elsewhere as wintry, with heavy winters.[6] Rain and thunderstorms are common in the whole region, with the mountainous massif of Tomaros and the oaks at its base attracting strong thunder activity. The recurrent nature of this phenomenon, in all probability noticed by the ancient inhabitants of the wider region, may have endowed the place with its numinous character as an indication of divine epiphany and divine presence. The gorges and corridors which make Dodona an ideal intra-local meeting place also result in torrents and gusts of wind which often blow along the Dodonean valley, filling the space with eerie sounds. The precinct that the sanctuary occupied in the valley, however, was partially protected from the strong north winds, facing the rugged east slopes of the Tomaros massif.[7]

It is well known that such dramatic weather was projected onto the god, Zeus: Homeric formulae such as 'Zeus' wind',[8] 'Zeus' lightning',[9] 'Zeus' lightning bolt'[10] and 'Zeus' rain',[11] and Homeric epithets of Zeus such as *hupsibremetēs* ('thundering on high'),[12] *erigdoupos* ('strongly thundering')[13] and *smerdalea ktupeōn* ('terribly thundering')[14] demonstrate the imprint of the sonorous weather phenomena on Zeus' divine character during the Early Iron Age. At Dodona, the experience of such an impactful sonic

[4] Hom. *Il.* 16.234.
[5] On the development of the sanctuary from an archaeological and phenomenological perspective, respectively, see Vasileiou and Chapinal-Heras in this volume.
[6] Hom. *Il.* 16.234. [7] Kleitsas 2021: 49. [8] Hom. *Il.* 14.19. [9] Hom. *Il.* 11.166.
[10] Hom. *Il.* 21.198. [11] Hom. *Il.* 5.91. [12] Hom. *Il.* 1.354. [13] Hom. *Il.* 7.411.
[14] Hom. *Il.* 7.479.

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environment may have been reflected in the material dedications made at the sanctuary: in the historic period, these include, most obviously, statuary. An iconographic type of Zeus striding and hurling his thunderbolt became widespread in the late sixth and first half of the fifth century BCE, with a considerable number and some of the earliest examples found at Dodona, but it would not be surprising if this had been conceptualized much earlier.[15] It is the thunderbolt that Zeus used like a spear[16] in the crucial battles for sovereignty against the Titans, the Giants and Typhon,[17] and with the power of the thunderbolt he also obliterated mortal kings and their sovereignty.

Less obviously, but perhaps just as powerfully, this relationship between thunder, storms and Zeus is reflected in Bronze and Iron Age dedications of weapons, in particular, axes. The symbolic connection between the axe and the thunderbolt from an early age has been convincingly argued by Zolotnikova. She has shown that the battle axe (together with the triple lightning) was emblematic of the Indo-European Storm God from the second millennium onward in Anatolia, and has demonstrated the literary analogies between the thundering nature of Homeric and post-Homeric Zeus and that of the Syro-Phoenician Storm God Baal.[18] Kleitsas has suggested a similar symbolism for the large number of axes found along with other weaponry at Dodona.[19] These include stone axes from the Early Bronze Age,[20] and complete and fragmentary bronze axes from the Late Bronze Age, continuing into the Early Iron Age, many of which were made of sheet metal and did not have a utilitarian function.[21] Stone and bronze axes are polyvalent cutting tools, also used in war (as offensive weapons), hunting, and as sacrificial tools; due to these functions they also served well as status or ceremonial symbols.

[15] Kowalzig 2007: 339 n. 26 offers a non-exhaustive list; Vasileiou 2019: 116–117. This iconographic type is identified as Zeus Keraunios (of the Thunderbolt) or Zeus Areios, an aspect of the god associated with warfare (Elderkin 1940, Barringer 2010: 161–164, Barringer 2015). Five bronze warrior-type figurines of the Geometric period that decorated the handles or rims of bronze tripods from Dodona may also have evoked the powerful, thunderous male god (Eleutheratou and Soueref 2016: 59 nos. 25, 26).

[16] Pind. *Ol.* 13.77. For a similar idea (Zeus' flying thunderbolt) on an inscription from Rodotopi, near Dodona, based on which the local sanctuary has been identified as belonging to Zeus Areios, see Chapinal-Heras 2019: 155–156 (with bibliography).

[17] Hes. *Theog.* 514, 689–710, 839–840.

[18] Zolotnikova 2016, Zolotnikova 2019b: 18–21.

[19] Kleitsas 2017: 406, Kleitsas 2019: 35 n. 9, citing Plin. *HN* 37.51.135 on *keraunia*, magical axe-shaped stones that provided protection from lightning strikes; Vasileiou 2019: 113–114, n. 4.

[20] Eleutheratou and Soueref 2016: 41–42 no. 2. Zolotnikova 2019a: 96.

[21] Kleitsas 2017: 405–406, Kleitsas 2019: 35–39, fig. 2–6, 8, Kleitsas 2021: 80–105, 114–115.

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Images and votive axes visually encapsulate the god's command of an explosive, incinerating, threatening sonority that has a profound effect on the world order and renders him invincible.[22] To the pilgrims of Dodona, hearing the god's thunderclap could have been an affective experience that forged a deep sensation of awe, compliance and connection with the god who pronounced their fate.[23]

Water

Even more so than thunder and lightning, which would be sporadic in the summer months, it was the sound of running water that would have accompanied the pilgrims at some point in their journey to the sanctuary, with the river Arachtos flowing at the east of the valley, the Smolitsas stream rushing from the valley into the river Thyamis to the west, the great number of springs emanating from the slopes of Tomaros, and undercurrents crossing the valley itself.[24] The permeating impression of water in the Dodonaean landscape is reflected in the mythological tradition recorded by the fifth-century BCE Athenian mythographer Pherekydes, which connected with Dodona a group of Nymphs referred to as Rain Nymphs (*Hyades*) and Dodonean Nymphs (*Dodonides*), designated in the Latin tradition as Naiads (Nymphs of fountains, springs and streams).[25] Worship of the Nymphs is also indicated by an oracular lamella (370–350 BCE), which contains a question about pacifying (?) the Nymph.[26] Latin sources and Late Roman and Byzantine commentators mention a sacred spring whose murmurs conveyed prophetic utterances, the existence of which has not been confirmed archaeologically at the sanctuary and has been contested by some scholars.[27] Nevertheless, it is certain that the sounds of water continued to be experienced within the sanctuary during the

[22] Goslin 2010: 364–366 demonstrates how in Hesiod's *Theogony* the pervasiveness of the sound of Zeus' thunder foretells not only the outcome of the battle against Typhon but also the new ordering of the world.

[23] Divination by thunder, understood as the voice of god Adad, is also evidenced in Akkadian oracular tablets (Rendu Loisel 2016: 292). On fear and reverence aroused by thunder see Tuzin 1984: 583.

[24] Chapinal-Heras 2021: 12–13, Palles 1858: 15. Pliny the Elder refers to hundreds of springs at Dodona (*HN* 4.1.2 (citing Theopomp. *FGrH* 115 F319).

[25] *FGrH* 3 F90b-d, Hyg. *Poet. astr.* 2.21, Hyg. *Fab*. 182.2.1–2, *FHG* 46 = *Schol. Homer. Il.* Σ, 486, Zolotnikova 2019a: 90–91.

[26] DVC 2358+2329B, Dodona Online project (https://dodonaonline.files.wordpress.com/2020/06/ciod_dvc_23582329b.pdf).

[27] Serv. *Ad. Aen.* 3.466, Lucr. 6.879–889, Plin. *HN* 2.106 (228), Mela *De Chorographia*, 2.43. Georgoudi 2019: 138–140, Zolotnikova 2019a: 93. See Petrocchi 2020 for other cultural traditions of divinatory water springs.

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purification rituals that each pilgrim had to perform before or upon entering the *temenos* and possibly inside as well, in order to access the most sacred precinct of the sanctuary.

Amongst the rivers and the beautiful pastures, the vast number of springs turned part of the valley into marshland which, according to Apollodorus and Proxenus, surrounded the sanctuary.[28] The marsh biotope, rich in lush but uncultivated vegetation, fauna and decomposing organic matter, would have created a vibrant sonic environment, which may also have had a spiritual dimension. Places replete with life and unspoiled natural beauty, but also difficult to access and filled with dangers, the marshes may have been evocative of 'that chaotic primordial landscape previous to the coming of mankind and, consequently, of culture'.[29] Just like other bodies of water, marshlands were also understood to be populated by specific nymphs, the Heleionomai Naiads.[30]

As the pilgrims were getting closer to the sanctuary of Dodona, they would have encountered these marshy landscapes, inadvertently immersing themselves in a natural (and potentially spiritual) soundscape. This was just one part of the vibrant and rich sonic environment that a pilgrim would have been exposed to as they approached the sanctuary, and which was an important part of the pilgrim's religious experience.

Oak

Above all that could be heard at Dodona, it is the sound of the epicentre of the cult, the sacred oak itself, that is singled out in the literary sources as the acoustic wonder and the source of the oracle.[31] It may not have been the only oak: according to some ancient authors, the sanctuary was originally located in an oak grove.[32] The famous age-old oaks (*Quercus*) of Dodona,

[28] Palles 1858: 13, Carapanos 1877: 247, Apollodoros *FGrH* 244 F198, Str. 7.7.10 and Proxenus *FGrH* 703 F7. Despite the health hazards associated with wetlands (for example Str. 17.1.7), the presence of towns and sanctuaries in or near marshy areas was not uncommon in Greece and the Italian peninsula, as they offered economic potential and performed a remarkable function of defence; see Borca 2000.

[29] Borca 1997: 3. For sanctuaries in marshy regions associated with deities of vegetation and transitions, see Cole 2004 (Artemis): 191–201, Lonsdale 1993: 128 (Dionysos), Salyer 1947 (Italic Marica).

[30] Ap. Rhod. *Argon.* 2.821 and 3.1219.

[31] Aesch. *PV* 830. Parke 1967: 26–33, Charisis 2010: 131–132, Katsadima 2019, Vecchio 2019: 49–50, Johnston 2008: 65. The sacred oak is described as extremely tall (Hom. *Od.* 12.360, 14.327), giving the impression that it reaches heavens (Eust. *Od.* 1, 419), and ancient (Soph. *Trach.* 174, Paus. 8.23.4). When fully grown, it could have been 30–35m high, with a canopy of 20–25m wide and a 2m wide trunk (Charisis 2019: 289).

[32] Soph. *Trach.* 1165–1170. Aesch. *PV.* 829–835 speaks of more than one tree.

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nowadays growing at the foot of Tomaros among other trees, would have probably occupied a good part of the Dodonean valley in antiquity.

Sacred groves were often associated with Greek sanctuaries, especially so with oracular ones, as the lushness of the grove was a token of the presence of the god and its power of inspiration.[33] At Dodona, although the landscape has changed dramatically in modern times, we can still envisage that a grove providing shelter from strong north winds at the end of the valley would have offered a pleasant retreat for all kinds of affairs of regional and intra-regional importance. Its sonic tranquillity would further nurture the sensation of divine presence. Indeed, Pliny remarked on the psychological effect of the stillness of groves, that inspired as much reverence as chryselephantine statues.[34] The grove's serenity would be gently animated with the sounds of animals, birds and indeed the trees themselves. From the peacefulness of such idyllic sonic environment, which in the case of Dodona can only be re-imagined with the help of literary descriptions of similar groves,[35] emerge oracular sounds of unexpected character.

If this was the case, then pilgrims would interact with the grove's most prominent feature, the sacred oak in this case.[36] The tradition of the earliest servants of the oracle, the *Selloi* or *Helloi* who lay/slept barefoot on the ground,[37] betrays an emphasis on bodily contact with the tree and its environs. This may have been similar to the practice of *enkoimesis,* and/or may have included other complex ritual activities, for example, the shaking or pulling of branches to instigate portents or induce trance states in worshippers or priests/priestesses, facilitating communication with Zeus.[38] In any case, whether by inducing the tree or not, the sacred oak itself was believed to announce the will of Zeus to those that inquired. Some late references suggest that the prophetic indication was given through the natural shaking and creaking of the branches,[39] which would offer a sign that needed to be interpreted by the priests or priestesses of the

[33] For Greek and Roman groves see Birge 1982, de Cazanove and Scheid 1993, Bonnechere 2007, Lowe 2011.

[34] Pl. *HN* 12.2. [35] For example, Theoc. *Id*. 7.131–157.

[36] The tree's exact location is not known; recently Charisis (2019) argued that it was standing prominently within the area east of the Sacred House, and south of the Early Byzantine Basilica.

[37] Hom. *Il.* 16.233–235.

[38] For similar activities depicted in several Minoan epiphanic scenes, see Goodison 2009, Day 2012, Tully and Crooks 2015. For barefoot priests (like the *Selloi*) in the Levantine tradition, see O'Bryhim 2001: 69. Ritual interaction with trees might relate to ways they were harvested for food; for the oak as source of nourishment see Leroy, Plomion and Kremer 2019, Vecchio 2019: 50 n. 155.

[39] Ovid *Met*. 7.629–30, Symmachus Epistulae 4.33, Suda s.v. *Dodonē*, Parke 1967: 27–28, Charisis 2017: 376.

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sanctuary.[40] Most Greek writers, however, imply a communication with actual words that spring directly from the tree.[41] This is sometimes associated with the sound of doves: the local foundation legend recorded by Herodotus features a talking dove perched on the oak manifesting the god's will, which the historian associates with the *Peleiades* (translated as 'Doves' or 'Old Women'), the priestesses of Dodona.[42] Bronze windcharms, which may have also hung from the tree, would add to the multivocality of this most sacred area of the sanctuary.[43]

An Animated Environment

The conception of an animated natural environment in Greek religious thought intensifies and elaborates the meaning that is attributed to the sounds of the landscape, especially in places where the belief in the presence of the divinity has been firmly established through ritual.[44] The sacred grove at Dodona is such a locus. Consequently, here the encounter with the divinity is anticipated to occur through the materiality of the landscape either spontaneously or when prompted ritually through the formal process of consultation. This ritual setting sets the agenda for human response to acoustic cues. Divinatory sounds are not precisely described and are generally mentioned as voices.

Angliker has recently related the experience of human voices in the nonhuman sounds of the Dodonaean soundscape to the demonstrated

[40] A state consultation by the Dodonaeans inquires whether a sign (*samēon*) appeared at the sacred oak (DVC 2519B + 2518A) but does not specify the nature of the sign sought or perceived; on oracular signs, see Georgoudi 2012: 58–68.

[41] Hes. F 181 Most (cf. F 270), Hom. *Od*. 14.327–330, 19.295–299, Soph. *Trach*. 1165–1170, Aesch. *PV* 829–835, Pl. *Phdr*. 275b, Ap. Rhod. *Argon*. 1. 523–527, 4.580–592. On oracular words: Georgoudi 2012: 76–84, Briquel 1993.

[42] Hdt. 2.55.1–2, Arnott 2007, s.v. *Peleia, Peleias, Pelëïas*, 249. Recently Charisis (2017: 377–378) suggested a different etymology, connecting the word with the Aiolian *pella* and its cognates, bearing the meanings 'receptacle, basin, cauldron', and thus associating the foundation myth with a ritual stealing of a cauldron (*tripodephoria*) from Egyptian Thebes. Speaking doves and their association with the priestesses of Dodona: Soph. *Trach.* 171–172, Proxenus *FGrH* 703 F 7 with an alternative foundation myth involving the talking dove (Vecchio 2019: 49 n. 152); further references and discussion in Parke 1967: 34–40, Eidinow 2007: 67–68, Georgoudi 2012: 79–80; Johnston (2008: 64) suggests that 'behind these stories was a practice whereby the sounds made by real doves kept in the sanctuary at Dodona were interpreted prophetically by priestesses called Doves'.

[43] For a bronze wheel (*trochiskos*), perhaps originally a tripod handle, that might have been reused as a bronze *iynx* suspended from the sacred tree at Dodona, see Charisis 2017, Eleutheratou and Soueref 2016: 66 no. 41; cf. Johnston 2008: 67.

[44] See Schliephake in this volume for discussion of the numinous significance of the environment of Dodona.

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potential for repetitive and monotonous sounds to convey the acoustic properties of speech.[45] This psychological phenomenon, known as auditory pareidolia or apophenia (patternicity), forms part of the general tendency for human perception to impose a meaningful interpretation onto incoming sensory information.[46] As the mind primarily perceives and categorizes experiences into a conceptual framework that already exists, the expectations of observers can have a major effect on what is perceived, potentially resulting in the enhancement of an already existing belief.[47] Prior expectations and suggestion actively shape perceptual experiences, especially for ambiguous stimuli (i.e. the perception of voices in noises),[48] but it has further been suggested that increased illusory pattern perception is a compensatory mechanism induced by the distressing experience of lacking control.[49]

The level of alertness, psychological factors, as well as individual parameters of processing sensory information, may have been conducive to identifying voices in the sonic repetitiousness of symbolically charged constituents of the oracular environment in general (and in Dodona in particular), that can be heard as speech even though the linguistic message is not readily recognisable. In principle, however, this conceptual transformation of symbolically important vegetal and animal natural sounds of the sacred grove into meaningful speech represents the result of divine modification of the normal landscape and soundscape. The new and extraordinary soundscape that has now been created offers a median space between the human and the divine worlds, where divine knowledge can be communicated, received and understood.

Dodonaean *Chalkeion*

In addition to the marvel of the talking tree, the soundscape of the oracular sanctuary hosted another remarkable sonic source, the never silenced *chalkeion*. Descriptions of this sound device derive largely from late antique dictionaries which record the expression *Dōdōnaion chalkeion* (the Dodona bronze/copper vessel) as a proverbial saying that compares

[45] Angliker 2021: 46. For perceiving speech in sounds that do not contain speech waveform characteristics, see Remez et al. 1981.
[46] Bendarik 2017: 101–102, who points out the biological value of this neurological mechanism for survival.
[47] Sheen and Jordan 2016.
[48] Nees and Phillips 2015: 16–17, Williams and Blagrove 2022: 13, 21.
[49] Whitson and Galinsky 2008: 116. Cooper-Rompato (2017) similarly reports on the unnerving perceptions of breastfeeding mothers hearing their breast pumps talk and voice their concerns.

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its prolonged resonance to those who talk too much. According to the sources, there were two different versions of the *chalkeion*.[50] Stephanus of Byzantium (s.v. *Dōdōnē*) and Suda (s.v. *Dōdōnaion chalkeion*) present these in the fullest detail.

The first version, allegedly associated with the earliest period when the open-air sanctuary was unwalled, consists of many different tripod cauldrons placed closely together, side by side; if/when one was touched, they would all resound one after the other. Repeated almost verbatim in the sources, this account is attributed to the Attic annalist Demon, author of *Atthis* and some forty books on proverbs that he composed around 335–323 BCE.[51] This has formed the basis of hypothetical visual reconstructions of a ring of cauldrons around the sacred oak in the vicinity of the unwalled Sacred House,[52] but others have challenged this reconstruction.[53]

The second version presents a very different artistic group comprising two pillars of unequal height. The shorter pillar was surmounted by a single small bronze cauldron (*lebēs*); the taller by a votive statue of a boy holding a bronze whip (*mastigophoros*) whose lashes were fitted with bone knucklebones (*astragaloi*), which struck the cauldron, when set in motion by the wind. This version of the *chalkeion* is mentioned by the early second-century traveller Polemon of Ilium (possibly quoting a fourth century source), and was linked to another proverbial phrase, 'the scourge of the Korkyraeans'.[54] It probably replaced the circle of cauldrons due to the sanctuary's reorganization and building programme in the mid-fourth century BCE, which included the construction of a tall peribolos wall around the Sacred House.[55]

Both versions of the *chalkeion* at Dodona reflect the established dedicatory practices of votive tripods in Greek sanctuaries from the eighth century BCE on, with significance for both groups and individuals as tokens of prestige,

[50] Cook 1902: 6–7, Parke 1967: 86–91, Bosman 2016, D'Alessandro 2013, Intrieri 2018, Charisis 2017, Chapinal-Heras 2016.

[51] Demon *FGrH* 327 F 20a (= Steph. Byz. s.v. *Dōdōnē* [Δ 146.114–122 Billerbeck, Zubler 2011]), Suda s.v. *Dōdōnaion chalkeion* [δ 1445 Adler] 1–5, Eust. *Od.* 14, 327. Further references in Cook 1902: 6–7.

[52] Evangelides and Dakaris 1959: 119 fig. 91, 124 fig. 92, pl. 6.

[53] Charisis 2010: 133–134, 137–138, 161–162, 175–176 proposed that the circle of cauldrons was introduced after the sixth century BCE, when the sanctuary came under Molossian control, to mark the focus of the cult while the sanctuary was still unwalled, and perhaps to be used as an oracular source at a time when the prophetic oak had been damaged.

[54] Strabo 7 *frag.* 3; Steph. Byz. s.v. *Dōdōnē* [Δ 146.122–145 Billerbeck, Zubler 2011] adds that there were more vessels nearby. *Suda* s.v. *Dōdōnaion chalkeion* [δ 1445 Adler], Eust. *Od.* 14, 327. See Cook 1902: 8–13, 20–21, Bosman 2016, Intrieri 2018.

[55] Charisis 2010: 134–136, 138, 162–163 noted that this new *chalkeion* would rise considerably above the peribolos walls to catch the winds. Chapinal-Heras 2016: 30, envisaged that the peribolos walls would have amplified its sound further.

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kleos and victory. We can only assume that the overlapping tripods of the first version of the *chalkeion* were set up as private or communal dedications at Dodona, either as boundaries to the open-air sanctuary or nearer to the epicentre of the cult.[56] At other sanctuaries, tripods were the focal points of ritual dances and agonistic events, often closely associated with the establishment of sanctuaries.[57] Because tripods were often given as prizes at competitions (especially poetic), their dedication served as a testament of high ability, achievement as well as gifts that were conferred by the gods.[58] Tripods set up as trophies commemorating communal victories were often arranged in groups and sometimes also included figures.[59]

A votive *lebēs* can differ from another considerably in terms of size, shape and design. The sounding cauldrons of Dodona would most likely have been plain, without decorative attachments that could compromise their resonance. Not much is said about the craftsmanship of the overlapping cauldrons of the first version of the *chalkeion*, which suggests that they were visually indistinguishable from other similar votives in various sanctuaries. We do know something about the second version of the *chalkeion*: according to Stephanus of Byzantium, the single cauldron was moderate in size, and another fragmentary manuscript in the Royal Library of Paris remarks on the brightness of its metallic surface, described as *leukos* ('white') in a rather Homeric fashion.[60] Since in music the adjective *leukos* denotes a clear, bright, highly perceptible sound or voice,[61] its singular use in the manuscript could be an allusion to both modes of perception, the visual and the aural.

The single cauldron of the second version of the *chalkeion* fits better the singular form of the proverbial expression (see above). The group most likely was a communal dedication of the Korkyraeans who, as we know from the lamellae, consulted the oracle for both personal and communal matters and may date to the fourth–third centuries BCE.[62] The association of the whip with pedagogy and rigid discipline was proverbial for the city of Korkyra.[63] The well-known practice of flagellation that formed part of the education system and rites of passage in the Doric world, as a testament of endurance, perseverance, as well as corporeal punishment, later also

[56] Fragments of tripod legs and handles (eighth to sixth centuries BCE) and better-preserved tripod dedications from later periods have been found at Dodona (Eleutheratou and Soueref 2016: 69–72, 129 nos. 48–58, 129).
[57] Papalexandrou 2008: 256. [58] Papalexandrou 2005 and 2011.
[59] Papalexandrou 2008 and 2014.
[60] Steph. Byz. s.v., *Dōdōnē, Anecd. Par.* 4, 259. Cf. Hom. *Il.* 23.267–8.
[61] Barker 2019: 107, Weiss 2018: 240. [62] Katsadima 2017; Dating: Intrieri 2018: 159–160.
[63] D'Alessandro 2013: 275–276, Intrieri 2018: 139–145, Ducat 1995: 364–366. Cf. Spartan initiation rituals at Artemis Orthia (Bonnechere 1993, Ducat 1995: 353–358).

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became associated with mystery cults, perhaps as a means of purification.[64] In addition to being a ritual instrument, however, whips were used by Epirote shepherds in leading their flocks, which Intrieri has argued may have been symbolic of the Dodonaean *mastigophoros*.[65] Several fragments of bronze votive whips dating to the fourth and third/second centuries BCE have been recovered from excavations at Dodona.[66] This votive practice may have been more widespread in the Greek world, as bronze whips have also been dedicated at the Messenian Sanctuary of Apollo Korythos at Longa,[67] and a whip fitted with *astragaloi* has also been found in a grave at Taras.[68]

Contextualizing the Sound of the *Chalkeion*

The multi-vessel *chalkeion* of the first description resounds due to a harmonic phenomenon known as sympathetic resonance or sympathetic vibration, whereby an actively vibrating body may cause a formerly passive vibratory body to vibrate without contact or impact, provided the two bodies have similar natural vibration frequencies.[69] Sympathetic vibration could have been routinely experienced in everyday life, for instance, with flexible components rattling after a loud sound such as a thunder. The phenomenon was well known in Greek antiquity for vibrating strings, with crucial relevance for ancient Greek harmonic theory, the concept of harmony and the definition of the concord.[70]

According to Vitruvius, it was also exploited for augmenting the acoustics of theatres by strategically installing bronze vessels of specific frequencies in the *koilon* of the theatre, known as *ēcheia*, that would reverberate when similar harmonics were sounded.[71] Since no such vessels have been found in theatres, Vitruvius' account has been considered by many as purely theoretical. However, the essential understanding of the acoustic phenomenon and its practical application are undisputedly evidenced in Polybius' account of the Roman siege of Ambracia in Aetolia in 189 BCE.

[64] Association with mystery cults: e.g. a third–second century BCE inscription mentioning the dedication of a whip (and a top, *astragaloi* and torch) at the Theban Kabeirion (Kalligas 1976: 66–67), and a reference in Pausanias (8.23.1) to the practice of flagellation at a festival of Dionysos (*Skiereia*) at Alea in Arcadia (Ducat 1995: 354).
[65] Intrieri 2018: 148–149. Thucydides (4.47.3–48) reports the Korkyraeans using whips for keeping humans in line in the stasis of 425 BCE.
[66] Eleutheratou and Soueref 2016: 73 nos. 59–61, Kalligas 1976: 63–66, fig. 2–5.
[67] Kalligas 1976: 62, fig. 1. [68] Barbara Carè, personal communication.
[69] Helmholtz and Ellis 1954: 36–40. [70] Barker 1984: 96–97, 214 n. 17, 238, 489, 492 n. 200.
[71] Vitr. *De arch.* 5.5.1–7, Pöhlmann 2021.

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According to the historian, by placing along the side of a trench parallel to the fortification wall a row of very thin bronze cauldrons (*chalkōmata*) which vibrated to the enemy's digging sounds outside the wall due to sympathetic resonance (*dia tēs sumpatheias*), the besieged Aetolians were able to identify the exact location of the subterranean tunnel that the enemy was opening to breach the wall and enter the city.[72] The exploitation of the vessels' resonating properties in a military context that eventually led the Ambraciots to victory may take on an oracular gloss in the light of the Dodonaean *chalkeion*.

Another application of the cauldron's reverberating and amplifying potential is demonstrated by the *tripous*, a complex musical instrument invented by the early/mid-fifth century BCE musician and theoretician Pythagoras of Zakynthos and reported by Athenaeus.[73] The instrument resembled the Delphic tripod, from which it got its name, and it was played like a triple *kithara*. Three groups of strings were attached over the spaces of the three legs of the tripod and tuned to the three *harmoniae* (Dorian, Phrygian and Lydian); at the top, a *lebēs* joined the three soundboxes that were fixed beside it. The *lebēs* acted as an amplifier to the soundboxes and was also aesthetically pleasing. A revolving base allowed the swift turning of the three sides of the instrument, so that 'if one did not actually see what was happening, but judged by hearing alone, one would think that one was hearing three *kitharai*, all differently tuned'.[74] What motivated the conception of such a complex instrument, evidently, was the desire to fit seamlessly together all harmonies, which would thus be performed uninterruptedly without the need for intermediate tuning of the instrument. It is worth considering whether the inventor and his post-Pythagorean empirical circles might have conceived of this new instrument and system as the effort to emulate the cosmic harmony articulated through the divine *logos*, whose unfailing symbol is the tripod. Pythagoras' *tripous* indicates that the harmonic sound potential of bronze cauldrons was recognized, at least among learned circles.[75] Whether such

[72] Polyb. 21.28, 8–9. Evangelides and Dakaris 1959: 115 n.6.

[73] Ath. 637b-c, quoting the third-century BCE grammarian Artemon of Cassandreia. Pythagoras of Zakynthos belonged to the group of theorists that took an empirical rather than a mathematical approach to the subject of harmonics and endeavoured to identify and record perceptual data; see Barker 2007: 74–75, 81.

[74] Barker 1984: 299–300, 2007: 75. The instrument's technical difficulty led to its abandonment after its inventor's lifetime.

[75] For other experimentations with bronze acoustics by Pythagoreans and empiricists, see Barker 2007: 84–85, West 1992: 128.

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preoccupations had influenced at all the construction of votive tripod cauldrons, sadly, cannot be known.

Due to their shape, size and the ways that they were sounded according to our sources, the acoustics of the cauldrons would be comparable to those of larger bells (with a circular profile) and of singing bowls – a type of standing bell played by striking or rubbing its rim with a wooden or leather-wrapped mallet or, in the case of Chinese singing bowls, by rubbing the vessel's handles with moistened hand.[76] This excitation causes the sides and rim of the bowl to vibrate and produce a rich sound. Bells and singing bowls have a distinctive, lasting resonance even when they are knocked softly with the tip or the knuckle of the finger, especially near the rim, or as a result of friction with a soft or hard implement. The contour and weight (mass) of their sounding body, the material and its thickness, and the thickness of their rim determine their complex vibration patterns, which simultaneously execute two kinds of oscillations (cross-sectional and longitudinal).[77]

The frequencies of the overtones (the 'harmonics') of larger bells and of singing bowls are not necessarily harmonically related, nor are they multiples of the fundamental frequency (the first and lowest frequency on the spectrum) that provides the definite pitch of a harmonic sound, as is the case in stringed or wind instruments.[78] Because of this, their spectrums of harmonics are usually 'anharmonic', resulting in a multi-harmonious acoustic colour/timbre that may even undermine the sensation of their definite pitch. The overtones fade at different rates, with higher frequencies dampening more rapidly than lower ones, resulting in a tonal decay that undergoes a subtle and continuing transformation, which varies according to the size and profile of the individual instrument.

In the first version of the *chalkeion*, if the cauldrons were of similar dimensions, mass and material, or if variation in size was balanced by variation in thickness, reverberations in the same frequency (pitch) could be propagated from the first to the second and so on.[79] If, however, the vessels were not identical, the difference in dimensions and mass would

[76] By analogy with the playing method of Chinese singing bowls, Charisis (2017: 373–374) hypothesized that rubbing the ring handles of tripods may have made them sound.

[77] Due to the particularities of their vibration patterns and sound, the literature on the acoustics of bells is extensive; see concise accounts in Fletcher and Rossing 1998: 676–686, Siegert 2013: 110–118. Singing bowls: Jansen 2002: 36–37, Inacio, Henrique and Antunes 2006, Wang, Tsai and Wu 2018.

[78] In church bells in particular, the impression of a definite pitch is the product of the mixture of harmonics that are responsible for its acoustic colour; it is a perceived fundamental that has a lower frequency (i.e. lower 'pitch') than the instrument's overtones (Siegert 2013: 113–114).

[79] Cook 1902: 7.

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alter the initial sound. Therefore, the make-up of the line of tripods could affect the acoustic result, and it would have to be curated to ensure a concordant, harmonic resonance, if that was indeed required. A more harmonious acoustic effect would probably be achieved with the single vessel *chalkeion,* where only one cauldron is excited with the touch of the scourge. Indeed, Ps.-Nonnus, Suda and other Byzantine sources describe the sound of this *chalkeion* as *enarmonios* (musical, harmonious).[80] This term has a variety of meanings: in classical antiquity, it generally designates a harmonically well-adjusted set of sounds and is also a technical term for one of the three genera of Greek music;[81] but in late antique discourse and in particular in Neoplatonic thought, *enarmonios* acquires a broader philosophical meaning, denoting the musical man whose essence is harmony (from which he is inseparable once he acquires this knowledge).[82] Building on that notion, the fourth-century CE grammarian Theodosius of Alexandria, whose work *Kanones (On Grammar)* was a major didactic tool for teaching classical Greek over many centuries, associates the *enarmonios phonē* (voice/sound) with the (harmonious) prosody of the human voice and the sounds that imitate it.[83] In this way, for these later writers, the *enarmonios* sound of the *chalkeion* is rendered oracular, transposing in human voice the inarticulate voice of the daimon; this meaning, however, cannot be retrojected to the classical period.

Sounds and Meaning

The lexicographers and grammarians that describe the *chalkeion* do not avail themselves of the language that poets, philosophers and music theorists had previously used for describing the auditory qualities of musical and non-musical sounds, just as the oracular voices of the sacred tree and the doves are not qualified aesthetically in classical sources. Neither do we encounter allusions to the acoustic impressions of other percussion instruments. The consistency with which such language is avoided suggests that the sensory and emotive affect of the *chalkeion* was different, more subtle, perhaps even ineffable.

[80] According to Ps.-Nonnus (Greg. Naz. or. v. 32 [Migne xxxvi, 1045]), repeated almost verbatim by Cosmas of Jerusalem (Mai 1839: 2.172, see Mai 1839), those who wished to receive an oracle came to the place and prayed. When the god wished to give the oracle, the statue hit the cauldron with the scourge. The cauldron emitted *enarmonios* sound, and the priestesses were inspired and spoke the words that the daimon set inside them. In Suda (s.v. *Dōdōnē*), the *enarmonios* sound of the cauldron is subsequently contrasted to the inarticulate voices of daimons. See Cook 1902: 20–21.

[81] Barker 2007: 14, 37–41, West 1992: 162–166 and Barker 1984: 193 n. 21, 248 n. 258.

[82] Karamanolis 2007: 103–104.

[83] Göttling 1822: 60, lines 11–23.

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A unique reference to the loud volume of the reverberations ('*ēchos apeteleito megas*') is found in a manuscript collection; this draws from the work of Zenobius.[84] All other descriptions invariably focus on the long duration of the sound, and it is obvious that this was the outstanding aural quality of the *chalkeion*. Strabo states that one could count to four hundred before the sound faded out, which means that the cauldron could resonate for as long as five or six minutes.[85] Menander would have it sound all day in a comical and exaggerated fashion,[86] although this may not be far from the overall aural sensation in the Dodona sanctuary. For a quasi-perpetual sound to be tolerable, we must assume that it was a medium- or low-frequency sound, inviting attention without disturbing the natural calmness of the sacred precinct, and gently blending with the other sounds of the sanctuary as the reverberations faded away.

Such prolonged and uninterrupted resonance quality is lacking from the human voice or from sequenced instrumental sounds such as the musical notes produced by stringed and wind instruments.[87] On the other hand, longer-than-usual resonances would have been experienced in different performance or ritual contexts with the playing of cup or bowl shaped percussion instruments such as cymbals and bells, or with other cultic sound devices that likely had similar shape, such as the so-called *ēcheion* of the Eleusinian Mysteries,[88] and with the tuned bronze vessels (*ēcheia*) used for resonance reinforcement in theatres (see above).[89]

But even these would offer no comparison to the lingering, droning echo of the 'never-silenced' (*asigētos*) *lebēs* at Dodona.[90] The repeated reverberations of the *chalkeion* lacked the intentionality that characterized comparable ritual sounds. Instead, the prolonged echoing introduces to the listener the opportunity to detach the sound from its visible source and to sustain focus on the sound elements of the quasi-disembodied reverberation, relenting oneself to the sensations experienced in the process.[91]

[84] Codd. A.B.V, Cook 1902: 9, 11. [85] Strabo 7 *frag.* 3.
[86] Men. fr. 60 Sandbach (= Steph. Byz. s.v. *Dōdōnē* [Δ 146.156–171 Billerbeck, Zubler 2011]).
[87] Barker 2019: 100–101.
[88] Although we do not have actual descriptions of the *ēcheion*, the fact that Apollodorus (*FGrH* 244 F110) mentions it in tandem with the beating of a *lebēs* at the death of Spartan kings suggests that this, too, was a bronze vessel; see also *Schol. Theocr.* 2 (36) for the assimilation of *ēcheion* with *chalkeion*.
[89] Vitr. *De Arch.* V, 5.1–7. In his commentary on Aristotle's *De anima* (419b4), Byzantine grammarian John Philoponus attributes the longer resonance of these instruments to their hollow bodies withholding the vibrating air (Hayduck 1897: 355 lines 14–24).
[90] Callim. *Hymn* 4.286.
[91] For Echo and the disembodied voice, see LeVen 2021: 107–135 (esp. 117–118). Cf. Philostr. *Imag.* ii. 33.

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Lebēs, Sound, Oracle

To fully appreciate the oracular potential of the *chalkeion*, which is proclaimed in Byzantine sources in particular,[92] it is essential to consider the cognate aspects of the tripod cauldron as these emerged from the everyday modes of use of the object and shaped its ritual and symbolic significance in religious/political contexts. The Greek *lebēs* was a deep hollow metal vessel made of hammered bronze, which was chiefly used for cooking. It was thus inextricably linked to the household hearth, the dwelling's source of warmth and light, and also the focus of household ritual activity, the symbolic expression of the Greek *oikos* and its sanctity.[93]

Scholars have argued that cauldrons were instrumental in mental constructions of the 'civilised self' that consumes cooked rather than raw food, and upholds a value system that is ordained by law (*nomos*) which, among other things, dictates legitimate gain (as opposed to piracy) to be a major cornerstone of civilized society.[94] But cauldrons were just as instrumental in expressions of uncivilized conduct, and were equally implicated in a temporary reversal of the cosmic order, whereby the unnatural commensality of men together with gods was doomed by the act of boiling, mixing and serving of human flesh together with animal meat;[95] they could be a dangerous locus of murder where humans are 'cooked' in myth and ritual;[96] they could also be miraculous incubators for rejuvenation or immortalization.[97] It is not surprising that boiling cauldrons have found their way in the long list of oracular stories.[98] The cauldron is a transformative entity, and the outcome could be good or bad.

Made through percussion and fire, with raw material mined from the igneous and sedimentary rocks of the earth, cauldrons can withstand fire and resound when percussed. These attributes may illustrate how the sound of bronze came to be thought as pure, apotropaic and animate.[99] The shape, hollow and resonant, emulates hollows in the body (i.e. stomach/nourishment, womb/birth) and in the natural environment, for example caves, which were loci of sonorous ritual activity since

[92] Cook 1902: 21–22. [93] Della Volpe 1990, Tsakirgis 2007. [94] Segal 1974.
[95] E.g. Eur. *Cyc.* 383–408; see Ekroth 2008: 99–100.
[96] E.g. Agamemnon was killed in a 'cauldron wrought in doom' (*dolophonou lebētos tuchan*: Aesch. *Ag.* 1129), and the priestess of Dodona was thrown in a boiling cauldron and thus murdered by the Thebans in the aetiological story of the *tripodēphoreia* from Thebes to Dodona (Zenob. ii, 84, Cook 1902: 21–22). On the *tripodēphoreia* see Kowalzig 2007: 331–350, Papalexandrou 2008: 266–271, Piccinini 2017: 101–123, Moscati Castelnuovo 2017.
[97] E.g. Medea and Aeson (Ov. *Met.* 7. 234–293). [98] E.g. Hdt. 1.48 and 1.59.
[99] Cook 1902: 14–28, Schatkin 1978.

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prehistoric times and considered as passages to the underworld, another hollow in the depths of the earth. As such, the funerary use of cauldrons was also fitting. Few objects could be as multifaceted as the cauldron and advocate their symbolism through their materiality as well as their acoustics. The superimposition of multiple cognate spheres is also the mark of a potent symbol.

The handling of cauldrons, replenished with symbolism, remains a tactile experience with acoustic parameters. Tripods are implicated in many foundation oracles, where the location of the new settlement is revealed through the dropping (i.e. Tripodiskoi in Megaris) or the stealing (i.e. Lake Tritonis in Libya) of a tripod.[100] An oracle related to the First Messenian War is of particular interest in relation to the first version of the *chalkeion* at Dodona. According to the oracle, the setting up of a hundred tripods around the altar of the sanctuary Zeus Ithomatas would grant victory and sovereignty over Ithome and Messenia.[101] In these sovereignty and foundation stories, the tripod is associated not with the invocation of the prophecy but with its fulfilment, which eventually comes to fruition with the handling of the tripod. Whatever sounds emanated from the tripods as they were carried, deposited or dropped became an integral part of the ritual experience; their sonic effect could be bright, distinct and prolonged.

An Emotive Soundmark?

With an agreeable but also unpredictable sound, which would not be contained within the parameters of a single unaltered pitch and could not be readily compared with other human-made or musical sounds, the *chalkeion* would have provided a captivating acoustic experience that could be perceived as ethereal and otherworldly. After all, one would be justified in expecting divine voices to have an unfamiliar and indescribable flavour.[102] This extraordinary sound installation masterfully combined the symbolically multifaceted tripod cauldron with purposeful human agency (either in the flesh or in the guise of the symbolically charged *mastigophoros*) and with divine agency palpable in the natural elements

[100] Hdt. 4.179, Paus. 1.43.7–8, Papalexandrou 2014: 134 n. 54.
[101] Paus. 4.12.7–10. Modern scholars date the oracle verses after the foundation of Messene by Epameinondas in 370/369 BCE (Papalexandrou 2014: 130).
[102] On the experience of the divine at Dodona, and the need for scholars to consider it from an emic perspective, see Flower in this volume.

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(strong winds); these relationships were articulated audibly via an unending sound, making the *chalkeion* Dodona's veritable soundmark.[103]

The emotive impact that the sound itself would have on the worshippers should not be underestimated. Although most of the literary sources explicitly linking the *chalkeion* with inspired divination come from Christian authors and should be handled with caution,[104] the possibility that its sound could stimulate the priestess to enter a prophetic state has been suggested by Johnston, based on a reference in Lucan.[105] The sound qualities detailed so far might corroborate this view – and it is further supported by archaeoacoustic research at various cult sites. This has shown that exposure to low resonance frequencies recorded at several prehistoric cultic sites can affect the human body. More specifically, persistent exposure to low–medium frequencies of 70–140 Hz (i.e. frequencies similar to a deep drum sound) was shown to be responsible for brain wave frequencies that indicated a state of 'oneiric experience with total consciousness but without the use of chemical substances'.[106] Every individual is sensitive to different frequencies, so the experience is highly personal.[107] The prolonged resonance of the *chalkeion* would add its resonance frequency to the place, and it is possible that the priestesses as well as pilgrims in proximity may have been affected by those frequencies in ways that could be described as an altered state of consciousness or deep meditation. Naturally, the results would vary from individual to individual, and familiarity or predisposition for meditation would also play an important role.

In this way, the *chalkeion* might have cancelled out the experience of other noises, voices and sounds in the sanctuary before entering the phase of oracular consultation. This sonic aspect of the sanctuary at Dodona stands in notable contrast with the sensations of a thunderous place and a thundering, forceful, even punitive deity that we encountered earlier. Instead, within the sanctuary an ambient sound was set in motion through the interplay of human and divine agency. Enveloping the area of the sanctuary where divination was observed, this immersive soundscape would create a special sensation of space, an acoustic 'hollow' separate

[103] Coined by Schafer, the term denotes sounds in the soundscape that are conspicuous, unique, respected, full of symbolic power, perhaps extraordinary or wondrous; Schafer 1977, Power 2019: 22. The wondrous character of the *chalkeion* as a kind of *automaton* (Johnston 2008: 68) is also pertinent.

[104] See previous discussion on *enarmonios* sound.

[105] Johnston 2008: 67–68 (based on Lucan 6.425).

[106] Debertolis and Gulla 2016: 35. Generally, the fundamental tone of singing bowls is also a low frequency sound; *cf.* Wang, Tsai and Wu 2018, 7 for a peak resonance frequency of 118.4 Hz.

[107] Debertolis, Tirelli and Monti 2014: 64.

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from everything else. Prolonged exposure to this particular acoustic environment might have helped those seeking consultation to gain relief from the stress of their anxieties, in a similar way that modern 'sound baths' are used for relaxation and healing.[108] Through this distinctive auditory experience, both the pilgrims and the consultants may have reached a state of focus, introspection and self-reflection, so that they could 'tune in' with the god and receive his divine insight.

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[108] Pasek and Bratina 2016.

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