The Auditory Field:

The Spatial Character of Auditory Experience

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Abstract

It is widely accepted that there is a visual field, but the analogous notion of an auditory field is rejected by many philosophers on the grounds that the metaphysics or phenomenology of audition lack the necessary spatial or phenomenological structure. In this paper, I argue that many of the common objections to the existence of an auditory field are misguided and that, contrary to a tradition of philosophical scepticism about the spatiality of auditory experience, it is as richly spatial as visual experience — and in some ways even more so. By carefully considering the spatiality and boundedness of audition, along with how sounds or their sources are experienced as occurring within the surrounding acoustic environment, we can gain a better understanding of (i) our auditory experience of space and (ii) the conditions for the existence of spatial sensory fields in general in a way that does not privilege vision over the other senses.

Keywords: auditory experience, hearing, spatial perception, spatial fields, the visual field, phenomenal character, silence, reverberation.

1. Introduction

Human visual experience uncontroversially has a rich spatial structure that is typically characterised as presenting a *visual field*. Though the precise content and geometry of

this field remain controversial (Matthiessen 2016), its existence is widely accepted by philosophers and scientists alike. The existence of comparable spatial structure in non-visual sensory modalities, including audition, however, is disputed, with many theorists who accept the existence of a visual spatial field rejecting the analogous notion of an *auditory field* on metaphysical or phenomenological grounds. In this paper, I examine whether such scepticism is justified and evaluate whether auditory experience meets a number of plausible conditions upon the existence of such a field.

In particular, I consider the role of spatial boundaries—both variant and invariant—in auditory experience, and how this relates to the perception of auditory absences, or silence. This in turn highlights some important though often overlooked aspects of auditory phenomenology, such as how we experience sounds and/or their sources as located in surrounding spaces, that bear upon the nature and existence of an auditory field, and of spatial fields more generally. The primary aim of the paper is to set out these features of auditory spatial phenomenology and examine their relation to the notion of a spatial field. Though this falls short of providing a full set of necessary and sufficient conditions for the existence of such a field, by illustrating how various putative necessary conditions apply to modalities other than vision — in this case audition — I aim to make substantive steps towards such a theory. Moreover, by refuting some common objections to the existence of an auditory field I argue that we can rid ourselves of an unfortunate and unwarranted visuocentrism that stands in the way of a more comprehensive general account of the spatiality of perceptual experience across multiple sensory modalities.

I begin by examining various philosophical conceptions of the visual field (§2) along with some common sources of scepticism about the spatiality of audition and auditory experience (§3). I then examine the spatial character or content of auditory experience, focusing upon three commonly cited objections to the existence of an auditory field as compared to the senses of vision and touch. These concern:

(i) the spatial extent or boundaries of auditory space (§4)

(ii) the experience of auditory absences, or silences (§5)

(iii) the way in which auditory experience presents space (§6).

I conclude in each case that the spatial character of audition more closely parallels that of vision than may initially be apparent, though equally there are notable differences; e.g. in the perception of reverberation and enclosing spaces. Consequently, audition meets corresponding putative conditions upon the existence of a spatial field in much the same way as vision. Absent any more compelling argument to the contrary, we have as much reason to regard audition as both richly spatial and field-like as we do for vision, and so should be similarly committed to the existence of auditory and visual fields.

2. The Visual Field

The existence of a spatial sensory field, or *spatial field* for short, in a given modality or combination of modalities, e.g. audiovisual, relates to both (1) the kind of information we gain via that modality, namely spatial information, and (2) how spatial properties are presented, or represented, in experience.[1] The resulting *spatial character*, as I will call it, forms part of the overall qualitative or phenomenal character of experience that the various theories of the metaphysics of perception — intentionalism, Naïve Realism, adverbialism, and so on — purport to explain. In order to evaluate the adequacy of these theories, then, it is important to understand the spatial characteristics of vision, audition, and other experiential modalities. Such understanding also enables the comparison of different sensory modalities, and interactions between them. For example, whether vision, audition and touch share a common spatial frame of

[1] I intend for claims about the presentation of spatial properties to be neutral between representational and non-representational views of experience. Similarly, though I will mainly talk of the character of experience rather than its content, such claims could equally be formulated in representational terms.

reference or involve independent sense-specific spaces that are mapped onto one another at a later stage of perceptual processing in part turns upon how — and indeed whether — we experience space in vision, audition, and touch. Finally, understanding the spatial character of experience helps us to better understand how the brain processes sensory stimuli, which in turn contributes to understanding sensory impairments and how we might use different senses to augment or replace one another through various forms of sensory substitution (cf. Kiverstein, Farina & Clark 2015).

The core notion of a visual field is that of a spatial or space-like region within which visible objects and/or properties are presented. However, this is where agreement ends. One historically influential account is that of a spatially organised array of sensations or impressions. Broad (1923, 1925), for example, invokes this notion when he claims that "[w]henever I open my eyes I am aware of a variously coloured field" (*ibid.* 33). Indeed, for sense-datum theorists like Broad and Moore (1925, 1953), the visual field was the primary explanandum of visual experience — a view that would have been relatively uncontroversial to their contemporaries, though it is more so today.

The conception of the visual field as an "array of impressions" (Clark 1996: 477) may be contrasted with the "field of view", or "sum of distal, physical phenomena" (*ibid.*). On one version of this conception, the visual field's shape and size are bounded by the facing surfaces of opaque objects, and so vary from one moment to the next depending upon what, if anything, falls within the perceiver's view at a given time (Price 1950: 108). Call this the subject's *actual field of view.* Alternatively, the field of view may be held to extend indefinitely into space, creating a cone-shaped region that extends outwards from the eyes and within which individual objects of vision are located (Martin 1992: 199). Call this the subject's *possible field of view*. Since the region that falls within a subject's possible field of view is dependent only upon the direction of their gaze along with the nature of their visual system, in typical perceivers its shape and size will remain fixed and invariant. As a result, it can contain unseen regions, e.g.

due to occlusion or darkness — something that is not possible on Clark's conception (Richardson 2009).[2] Note also that, at any given time, the subject's possible field of view will contain their actual field of view (see §4 for discussion). In both cases, however, the notion of a field serves to indicate a region of space that contains or adjoins those parts of objects that are — or appear to be, in the case of hallucination — visible to the subject.

As Clark (1996) highlights, the notions of an "array of impressions" and "field of view" are not independent features of the visual field, but distinct conceptions of it. Indeed, the difference between them as much concerns *what* is presented in vision — sense-data, physical objects, and so on — as it does *how* those objects are presented; e.g. in a field-like manner. Clark goes on to argue that their existence, along with that of a third intentional notion of the visual field, does not have the status of an observational datum, but reflects the competing views of the metaphysics of experience offered by sense-datum theory, Naïve Realism and representationalism, respectively. He concludes on this basis that the notion of the visual field is ambiguous and a mere proxy for theorists' prior metaphysical commitments (cf. Johnson 2011).

While there may be some truth in Clark's observation that philosophers' description of visual phenomenology is somewhat theory-laden, his analysis fails to capture an important distinction between the mere experience of spatial properties and the perceptual presentation of objects or sensations as occupying or constituting a spatial field, where the latter concerns the way in which space is presented in experience. Though visual experience is uncontroversially spatial in the first sense, one might reasonably differ over whether a given modality presents things in a field-like manner, with this corresponding to whatever distinctive feature of experience that the notion of a spatial field is intended to capture. Precisely what this amounts to remains controversial, as I discuss below. However, given that each of Clark's three conceptions of the visual field is compatible with at least some variant of each of the major

[2] I thank an anonymous reviewer for highlighting this point.

metaphysical theories of perception, not to mention with each other,[3] the problem is not merely one of terminological ambiguity. Rather, it concerns how best to characterise the seemingly field-like nature of human vision, and potentially other sense-modalities.

Martin (1992) adopts a more promising approach, stating that "the visual field and visual space are taken to be features of the phenomenology of visual experience, aspects of which can be identified independent of a commitment to any specific theory of perception" (*ibid.* 198). In Martin's view, then, as a starting point for theorising about vision, we should aim to give a metaphysically neutral characterisation of its spatial phenomenology. Soteriou (2011: 194) endorses a similar methodology, characterising aspects of the visual field, such as its boundedness (§4), as "relatively invariant" features of visual experience that are not explicable solely in terms of the properties of external objects. Martin and Soteriou thus aim to characterise the manner in which spatial properties are presented in experience, i.e. its "structural features" (*ibid.*), while remaining neutral on the underlying metaphysics. This in turn yields a specification of what I will call the *spatial character*[4] of experience in a way that may be used to test the adequacy of competing theories of the metaphysics of perceptual experience; e.g. sense-datum theory or Naïve Realism. If a given theory is unable to accommodate the spatial character of a given sensory modality, then so much the worse for that theory.

In keeping with Martin and Soteriou's phenomenological approach, then, in what follows I aim to provide a metaphysically neutral characterisation of the spatial character of auditory experience. The resulting character is, I argue, closely analogous to and at least as rich as—indeed, in some respects richer than—their accounts of the visual field, despite differing in various important respects including directionality (§4)

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[3] For example, one might think of an array of impressions or sense-data as presenting an objective region of external space in virtue of representing that space, in which case all three of Clark's notions would apply.

[4] I include in spatial character both aspects of an experience's spatial character that vary over time, such as boundedness by external objects, and invariant structural features in Martin, Soteriou and Richardson's (2009) terms (see §4 for discussion).

and the perception of surrounding spaces (§6). This in turn helps to clarify some putative necessary conditions upon the existence of a spatial field in a given modality or modalities. Furthermore, I argue that auditory experience is capable of meeting these conditions in much the same ways as vision, and so, to the extent that we are inclined to think of these conditions as motivating the claim that there is a visual spatial field, we should be similarly committed to an analogous claim for audition.

Before setting out this positive case, however, I first wish to set aside some common sources of scepticism about the spatiality of audition and auditory experience that have somewhat unfortunately come to dominate the philosophical literature.

3. The Spatiality of Audition

It is widely acknowledged that human auditory experience is spatial insofar as it enables us to locate external objects or events. Indeed, some theorists take audition to function as a kind of early warning system to enable rapid deployment of the other senses — in particular vision — toward external stimuli, such as a possible food source or approaching predator (Scharf 1998). It is therefore perhaps surprising that so many philosophers have sought to challenge the presumption that, like visual experience, auditory experience is inherently spatial.

One influential source of such scepticism is P. F. Strawson (1959) who states in Chapter 2 of *Individuals* that sounds "have no intrinsic spatial characteristics" (*ibid.* 65) — a claim also endorsed by Nudds (2001: 213–4). Strawson's principal interest in this chapter is to examine whether it would be possible for a subject equipped with only a single non-spatial sense to identify external particulars. As O'Callaghan (2010) argues, however, nothing in Strawson's argument turns upon his choice of the auditory modality. Indeed, he might equally have appealed to olfaction instead of audition (though this too is controversial — see Millar 2019). Nor does Strawson give an argument for his claim that audition is non-spatial. Rather, he presupposes it. Hence, even if one endorses Strawson's conclusion concerning the connection between

spatiality and objectivity, nothing concerning the spatiality of auditory experience follows from this since the crucial assumption is already built into the premises. Moreover, as O'Callaghan (2010: 136) points out, were we to analyse vision or touch on the basis of experiences as impoverished as those that Strawson considers in relation to audition, we might falsely conclude that these too were intrinsically non-spatial.

A related but distinct form of scepticism is found in O'Shaughnessy (2009), who argues that we never perceive sounds at a distance. Rather, just as we see external objects in virtue of light falling upon our retinas, we hear external objects or events in virtue of proximally located sound waves hitting our eardrums. While this is undoubtedly an accurate characterisation of the physiology of hearing, it leaves open whether auditory experiences present sounds as occurring at, or originating from, distal spatial regions, or as located at the ears — a claim that cannot be settled by metaphysical reasoning alone.[5] O'Shaughnessy goes on to reject the spatiality of auditory experience on the basis of a conception of a spatial field that is private or 'internal' to the subject (Martin 1992: 208–9). However, as I argued in §2, we need not be committed to this conception of a spatial field, and so the question concerning the spatiality of auditory experience remains open.

Nudds (2009) goes even further, claiming that we do not strictly speaking hear sounds as located in space at all. Instead he claims that the spatial character of audition is explicable solely in terms of the spatial properties of sound sources, i.e. the objects or events that produce or cause the sounds we hear. According to Nudds, whenever we hear something that seems to be located at or originate from some distinct spatial region, this is because our auditory system attributes that sound to an object or event at that location, and not because of any experienced spatial property of the sound itself. Nevertheless, Nudds allows that our experiences of sound sources are spatial in virtue of the spatial properties of sound sources — a claim that I take to be compatible with

[5] The metaphysics of sound is similarly contentious, with available options including property-, particular-, e.g. sound wave, and event-based views. See Casati & Dokic (2014) for an overview.

the phenomenological conception of a spatial field I set out here.[6] Nudds' view, however, might be used to motivate other arguments against the existence of an auditory field that I discuss in §6.

Finally, it is sometimes claimed, though not to my knowledge in print, that the physical layout of the primary auditory cortex precludes the existence of a spatial field for audition. Unlike the primary visual cortex, which in humans is arranged spatiotopically in a manner roughly isomorphic (though not identical) to the layout of visual space, the auditory cortex is organised tonotopically on the basis of frequency.[7] This is perhaps unsurprising given the extensive frequency-based processing that is required to group and identify multiple concurrent sounds or "auditory streams" (Bregman 1990). The objection, however, conflates the spatial structure of the presumed vehicles of auditory experience with its experiential character or content. Indeed, the precise mapping between the physical layout of brain areas and their functions is notoriously complex. Moreover, it is unclear to what extent primary sensory cortices are, strictly speaking, vehicles of conscious experience as opposed to merely being necessary for it, though both claims are contentious. It is therefore entirely possible that human auditory experience might be *as of* a spatially extended field without the spatial properties of this field being reflected in the physical layout of the auditory cortex, rendering the objection unpersuasive.

Outside philosophy, however, it is widely accepted that auditory experience is inherently spatial. Indeed, the mechanisms of sound localisation and auditory processing are relatively well understood and draw upon a range of factors including:[8]

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[6] In what follow, I remain neutral on whether sounds and/or their sources are objects of auditory experience, and so potential occupants of the auditory field, though for brevity I will sometimes leave the qualification implicit.

[7] The brains of certain birds and mammals (Hoffmann *et al.* 2016) are known to contain spatiotopic auditory maps, e.g. in the superior colliculus. Though comparable structures exist in humans, they are not solely dedicated to audition (Lima, Krishnan & Scott 2016).

[8] For an overview, see Darwin (2002: 57–60).

(i) sound reflections and selective filtering generated by the pinna (outer ear) that enable us to detect which direction a sound is coming from

(ii) differences in inter-aural level (ILD) and timing (ITD) between the signals arriving at each ear, enabling triangulation of direction and distance

(iii) the precedence or Haas effect (Haas 1951), which affects the perceived location of a sound without affecting other perceived auditory properties such as pitch or loudness

(iv) acoustic shadowing of certain frequencies by the head and/or other physical objects

(v) dynamical changes in amplitude and frequency profile as a result of external or self-generated movement, and

(vi) time-based reflectance and reverberation effects (§6).

Consequently, we can typically distinguish whether a sound is coming from the left or right, in front of or behind the head, along with the approximate distance, direction and loudness of the source both rapidly and without the need for conscious reflection or inference. Nor (*pace* Peacocke, 1983: 46) do such abilities entirely depend upon binaural hearing since many of the above effects also occur monaurally — as can be demonstrated by simply covering one ear. In fact, humans are capable of discriminating spatial location by audition alone to an accuracy of up to one degree, though this is somewhat reduced for sources located at either side of the head (Wang & Brown 2006), and much lower than visual spatial acuity.

Just as physical objects can visually occlude one another by blocking the propagation of light, objects can auditorily occlude one another by blocking the propagation of sound, albeit with some differences due to the fact that sound waves 'bend' or refract more noticeably than light. Moreover, a loud sound can mask, either entirely or in part, quieter ones in much the same way as a bright light can mask the

visibility of dimmer objects. Finally, just as, in the absence of suitable depth cues, visual experiences can be ambiguous between (1) large and distant or (2) small and nearby objects, auditory experiences can be ambiguous between (3) loud and distant or (4) quiet and nearby sources.[9] While there remain notable differences to vision due to the physics of sound as compared to light, as well as audition's lower spatial resolution, the mere possibility of such fine-grained discriminations and effects provides prima facie evidence for the inherent spatiality of human auditory perception.

Nevertheless, one might argue, as per Strawson, that our experiences of sound are not *intrinsically* spatial on the basis that the properties detected by the auditory system do not have any intrinsic spatial significance, but are merely causally correlated with the spatial properties of sound sources — a claim echoed by Nudds (2009: 79–80). On this basis, one might argue that we do not strictly speaking perceive, but rather compute — or "recover" (*ibid.*), to use Nudds' term — the spatial properties of objects or events on the basis of non-spatial properties of the sounds they make. As with O'Shaughnessy's objection above, however, this does not rule out our experiencing sounds as having spatial location or extension. Indeed, on teleological theories of content (e.g. Millikan 1989), what a given experience represents will depend upon the function of the resulting representations for the target system or organism. On this view, the content of auditory experience, if any, will depend upon how the resulting auditory representations are interpreted, e.g. spatially, rather than the properties of the proximal stimulus. Hence this kind of objection is neither convincing nor decisive.

4. The Spatial Bounds of Audition

Having established that auditory experience is spatial at least insofar as it affords an awareness of spatial properties such as location, I will now consider its variant and

[9] Differences in ILD and ILT mean that it is theoretically possible to disambiguate the latter pairings for off-axis sound sources, though to my knowledge this has never been tested empirically.

invariant spatial character. Here it is instructive to compare audition not only with vision, but touch.

In an influential paper, Martin (1992) argues that there is a clear contrast between how space is experienced in sight and touch. Characterising the visual field as "a region of public space containing the objects currently seen" that is "part of, or the form of, [visual] experience" (*ibid.* 198–9), Martin argues there is no analogous spatial field for touch. In Martin's view, while visual objects are experienced "as arranged in physical space" (*ibid.* 210), tactual space crucially involves a distinction between tactile sensations, which are typically located at or within the bodily boundaries, and externally located objects, which "press [upon the body] from the outside" (*ibid.*). Martin argues that this contrast between 'inner' and 'outer' regions of space, which he elsewhere claims is essential for tactual experience (Martin 1993), is not present in vision. Moreover, the space of tactual objects is not bounded in the same way as visual space since "there is no clear sense of what would be the limits to a tactual sense field in which (potentially) objects would be felt to be" (Martin 1992: 200). Instead, the 'limits' of tactual space are just the limits of objective physical space, making touch effectively unbounded from a phenomenological point of view. Coupled with the dependence of touch upon bodily awareness, Martin concludes that there is no tactual equivalent of the visual field.

While one might disagree with certain aspects of Martin's characterisation — for example with regard to the experience of absences (§5) — his discussion highlights a genuine and important difference between visual and tactual experience. Even if successful, however, the above argument does not rule out the existence of a spatially structured array of tactual sensations (Clark's first notion) located at or near the bodily boundaries. Rather, Martin's point is that such an array would not be directly analogous to the visual field since it is not a region within which external objects are experienced as being located. Instead, we feel tactual objects to be located in external space in virtue of their impinging or 'pressing in' upon this tactual array. Since the

experience of external space does not, according to Martin, play the same role in tactual experience as it does in vision, the resulting fields, if indeed they should be classed as such, are disanalogous.

Crucially for present purposes, we can read Martin as endorsing a necessary condition for the existence of a spatial field of the following form:

Boundedness: A spatial field has experienced spatial boundaries or limits.

Martin denies that the sense of touch meets this condition since the boundaries of tactual space are not experienced in the relevant way, hence there is no tactual field. As Richardson (2009) points out, however, we are aware of the boundaries of visible space in not only one, but two distinct ways: (1) via our sensory limitations, as is evident around the edges of one's field of vision, and (2) through our awareness of external objects that delimit our actual field of view (Clark's second notion). Insofar as each of these affects the extent of the visual field and visual phenomenal character, it can be considered constitutive of the spatial character of visual experience.

Richardson's distinction enables the formulation of two kinds of boundedness condition, *viz.*

Boundedness$_1$*:* A spatial field is experienced as bounded by a region in which external objects are experienced via the relevant sensory modality (or modalities) as located.

Boundedness$_2$*:* A spatial field is bounded by the experienced locations of external objects.

As previously noted, in human vision *Boundedness*$_1$ relates to the boundaries of one's possible field of view, which is relatively invariant and so a "structural feature" in Richardson and Soteriou's terms.[10] *Boundedness*$_2$ relates to one's actual field of view,

[10] Cf. fn. 5.

which varies over time according to the objects that fall within the field of view (§2). Human visual experience, which is widely thought to involve a visual spatial field, thus meets both of these putative conditions. The question is whether auditory experience does so.

In the case of *Boundedness*$_2$, we can define the spatial bounds of an auditory experience as extending from the subject's location to those regions of space that contain—or seem to contain (§6)—the most distant objects or events heard at a given time. Call this *the auditory horizon*. While it is an empirical question whether there is an upper limit to the distance we can experience sounds as seeming to occur, or whether we auditorily experience space as extending only to our current auditory horizon or beyond, analogous questions arise for vision. Consider, for example, seeing stars in a clear night sky. Do we experience the stars as located at some determinate distance (e.g. their actual distance) or as indefinitely far away? And what about the apparent darkness between them? The answers to these questions depend upon phenomenological features of visual experience that are directly analogous to the auditory case. Given this close parallel, it seems plausible that audition meets *Boundedness*$_2$ in much the same way as vision, though the boundaries of the former are less determinate or obvious, in part due to audition's lower spatial resolution.

In relation to *Boundedness*$_1$, however, there seems to be an asymmetry between visual and auditory experience due to the latter lacking obvious spatial boundaries, or 'edges'.[11] Unlike human vision, which is restricted to a roughly cone-shaped region in front of the eyes, human audition is largely omnidirectional, i.e. sensitive to sound from all directions, including from inside the body (though the latter are not marked out as distinct, as in the case of touch; cf. Martin 1993). The resulting lack of experienced edges to audible space might be taken to cast doubt upon whether

[11] This is not to say that these boundaries must be sharp, since the edges of the visual field are themselves somewhat vague or indistinct.

audition meets *Boundedness*$_1$, and so qualifies as field-like, but this conclusion would be too hasty.

First, the fact that our eyes are unidirectional and forward-facing whilst our ears are largely omnidirectional and located either side of the head is a contingent feature of human evolution. Were this arrangement reversed, the spatial character of the respective modalities might well have been different. In particular, our eyes can move to focus on objects of interest, whereas the location and orientation of our ears is fixed relative to the head. Some non-human animals, however — for example, deer — can reorient their pinna in different directions to enable sounds from particular directions to be isolated from the surrounding background (Heffner & Heffner 2010). While the physics of sound makes perfect isolation difficult,[12] it is conceivable that such a creature could — assuming they have conscious experience at all — experience the regions inside and outside of their auditory field as phenomenologically distinct in a manner that is closely analogous to the 'edges' of the visual field in humans. Such a creature's auditory sense would meet *Boundedness*$_1$ in much the same way as human vision. Conversely, there seems little reason to doubt that omnidirectional vision, as is found in gazelles (Ponce & Born 2008), for example, can be field-like on the grounds that a wrap-around field of view is every bit as spatial as a conical one. This casts doubt upon whether the awareness of outer boundaries is necessary for the existence of a visual spatial field. If so, by parity of reasoning, there seems no reason why such boundaries should be required for audition either.

There is, however, an alternative way of characterising the boundaries of a spatial field that suggests how *Boundedness*$_1$ can be met by human auditory experience despite its lacking obvious spatial 'edges'. In vision, one does not experience the spatial regions that fall outside one's visual field, e.g. behind the head, as dark or visually 'empty'. Rather, these regions simply do not feature in visual experience at all.[13] This in turn

[12] Though not impossible, as a variety of microphone pickup patterns illustrate (Eargle 2003).

[13] Or if they do, it is in a phenomenologically attenuated and distinctive way (cf. Noë 2004).

suggests that the boundaries of the visual field can be thought of as delineating a distinction between an *experience of sensory phenomena* (or the lack thereof; see §5) within the field and an *absence of experience* outside it. For the same to apply in the case of audition, we need to be able to make sense of the distinction between the presence and absence of auditory experience in a manner that is analogous to this distinction in vision. I aim to do this in two parts. First, by arguing that a parallel distinction applies in the case of audition, as below. Second, by examining whether it is possible to perceptually experience the absence of auditory phenomena, i.e. *silence*, as discussed in the following section.

The distinction between the presence and absence of auditory experience is highlighted by the intuitive contrast between the following cases:

> EXPLOSION: Beatrice is temporarily struck deaf by a loud explosion and can no longer hear anything. She sees that people around her are speaking or shouting, but auditorily speaking it seems to Beatrice as if everything is silent.
>
> CONCERT: Charles has profound long-term deafness. While attending a rock concert, Charles sees the band on stage playing their instruments and feels the vibrations created by the PA system, but does not hear anything.

In EXPLOSION, Beatrice can be characterised as temporarily experiencing, or perhaps hallucinating, silence until such time as her hearing returns. In the meantime it perceptually seems to Beatrice that everything is silent, though the resulting experience of auditory absence is misleading due to the temporary loss of function caused by the explosion. In CONCERT, however, this kind of description seems inapt, particularly if Charles's deafness is congenital and so he has never experienced any sounds at all (cf. Phillips 2013). Here it seems more apposite to describe the case as involving a lack of auditory experience such that Charles is not experiencing the world *as* silent, but rather

his experience is lacking any auditory dimension whatsoever. Consequently, Charles's experience is strictly agnostic as to whether there is sound or silence around him (though his non-auditory experience may suggest it).[14] This does not decisively rule against accounts, such as the one I discuss below, that explain the experience of silence in terms of an absence of experience. However, the intuitive distinction between these two kinds of cases and others like them plausibly marks a difference in the phenomenal character of these subjects' experiences, thereby making room for an alternative account (§5).[15]

Notably, in contrast with vision, the above distinction between the presence and absence of auditory experience is more readily apparent over periods of time, rather than throughout regions of space. This has led some philosophers to posit the existence of a "temporal field" (Soteriou 2013: 123; Phillips 2013) for audition within which the onset and cessation of sounds are experienced as occurring. However, since we experience the onset and cessation of stimuli in every sensory modality, the same is presumably also true for them. We might therefore think of the resulting fields as exhibiting both temporal and spatial dimensions, i.e. as *spatiotemporal fields*. While this is suggestive of one way in which audition might meet a version of *Boundedness*$_1$ in terms of the perception of sounds over time, i.e. diachronically, one might worry that the resulting notion of a field is too weak to provide a constraint upon the existence of a spatial field at a time, i.e. synchronically.

More importantly for present purposes, the fact that we can make sense of the distinction between the experience of auditory absences, i.e. silences, and the kind of absence of auditory experience that is characteristic of long-term or congenital deafness suggests that there is a closer parallel between vision and audition than might be

[14] I bracket the questions of whether someone who is profoundly deaf is capable of experiencing auditory hallucinations, and whether recently deafened individuals experience silences. See Phillips (*ibid.* 347) for discussion.

[15] If the above contrast is unconvincing, consider someone watching TV in an otherwise silent room with the sound turned down.

immediately apparent. This would require, however, that we are capable of perceptually experiencing auditory absences, or silence.

5. Hearing Silences

In the previous section I suggested that we can think of the boundaries of a spatial field as delineating a distinction between the presence and absence of experience in a given sense-modality. If there is no auditory experience of silence, however, then the required distinction between the experience of auditory absence and the absence of auditory experience would collapse. In order for audition to meet *Boundedness*$_1$, then, it must be possible to explain the experience of auditory absences, i.e. 'hearing' silences, in a way that is distinct from merely hearing *that* it is silent on the basis of a lack of auditory experience.

More generally, one might take it to be a condition upon the existence of a spatial field in a given modality that it is possible to perceive an absence of sensory stimuli within its spatial boundaries in a way that is phenomenologically distinct from a mere absence of experience in that modality, *viz*.

> *Absence:* A spatial field enables the perception of both the presence and absence of sensory stimuli within its boundaries.

As Sorensen (2008) notes, we routinely orient ourselves towards and attach aesthetic value not to only sounds, but to the silences between them. Indeed, the silences between notes or at the end of a piece of music can be just as impactful as the melodies themselves — and sometimes even more so. The sudden cessation of a persistent but hitherto unnoticed sound can draw one's attention to its existence and location in much the same way as the sudden onset of a sound. While experiences of *absolute silence*, i.e. the complete absence of audible sounds, is rare, in part because our auditory system continually recalibrates to accommodate the quietest available stimuli, such silences are readily described as 'deafening' or oppressive. However, unlike the

visual experience of darkness, which involves an experience of colour, i.e. black, the auditory experience of absolute silence does not involve the experience of any sound (cf. Sorensen 2009: 133). Assuming that sounds are the proper objects of auditory experience, one might argue that there is no auditory experience in the absence of any actual or apparent sound that is experienced, and so 'hearing' silence is a cognitive rather than purely perceptual achievement.

This cognitive view of silence-perception, however, arguably over-intellectualises the nature of auditory experience. In attending to silences, one does not merely await the presence of sound, but is actively and perceptually attuned to the state of the surrounding acoustic environment such that the absence of sound is itself perceptually manifest to one. That is, auditory experience provides the basis upon which we cognise, and so come to know, whether there are sounds and/or silences in our immediate vicinity (cf. O'Callaghan 2010).

Furthermore, as Phillips (2013) points out, it is not clear why we should accept the cognitive view unless we subscribe to some principle according to which one cannot have an experience in a given modality, such as audition, unless it is an experience of a certain kind of object; e.g. a sound. We can generalise this assumption as follows:

> *Proper Kind Assumption* (PKA): For each sensory modality ϕ, there is a proper kind of object ψ such that one does not have a ϕ-experience unless it is as of some ψ.

On the assumption that absolute silence is the absence of audible sound[16] and not a sound in its own right, it follows from PKA that one cannot have an auditory experience of absolute silence (O'Shaughnessy 2000: 329). It is unclear, however, that we have good reason to accept PKA.

[16] It is implausible for a finite auditory system to represent the absence of sounds that are too quiet for it to detect, so experiences of absolute silence (if there are such) presumably represent the absence of audible sound rather than a complete absence of sound altogether. I assume this qualification below, and thank an anonymous reviewer for raising it.

First, it is not obvious that the proper objects of any other sensory modality form a metaphysically unified kind. Though the presence of visible light is a necessary condition for seeing objects, we do not normally take light itself to be an object of visual experience except in special cases. Rather, it functions as a causal intermediary or enabling condition for seeing a diverse range of objects ranging from medium-sized dry goods to events, clouds, rainbows, stars, and so on. Indeed, the proper objects of vision seem only to be unified in possessing the property of being visible to us. However, we can hardly define the proper objects for vision in this way without rendering PKA vacuous, and so non-explanatory. Similar considerations apply to touch as well as taste and smell (Aasen 2018). If such a diverse range of things are admissible as the proper objects of other modalities, then appealing to PKA as grounds for excluding silences as being among the proper objects of audition seems unjustified and *ad hoc*, thus undermining the argument for the cognitive view.

Phillips offers a further reason for rejecting PKA concerning the nature of sensory awareness. Following Moore (1903), many philosophers of perception characterise veridical experience as having an 'act–object structure'.[17] On this view, conscious acts of awareness are both (i) distinct from their object(s) and (ii) necessary for experience, despite not being readily identifiable via introspection due to their "diaphaneity" (*ibid.*). Moore's act–object analysis is neutral as to whether perception consists in direct acquaintance with external objects, as on relational views such as Naïve Realism, or mediated by sense-data or representational content. However, Phillips argues (*pace* Moore) that this allows that perceptual awareness could occur in the absence of a corresponding object, as in the act of listening, or "opening our attention to the presence of sound" (Phillips 2013: 350). On this view, attending to one's auditory experience is an act of perceptual awareness even in the absence of any real or apparent auditory object. If so, Phillips argues, we should think of listening as a form of perceptual experience irrespective of whether one hears, or seems to hear, any sounds.

[17] Though adverbialists standardly deny this (Pautz 2007: 500).

Phillips goes on to reject PKA, or the related principle of "object-exclusivity" (*ibid.* 338), on the grounds that it is overly restrictive to require perceptual experiences to have any actual or apparent object, making room for the kind of "objectless" awareness (*ibid.* 344) that occurs when hearing silences.[18] As such, an experience in which nothing is heard is not merely neutral as to whether or not there are audible sounds at a given time and spatial location, but affords the listener awareness of the lack of sound in the relevant spatiotemporal region. This contrasts with cases of deafness or inattention where perceptual experience is genuinely agnostic as to the presence or absence of sound. As suggested in §4, such cases are better characterised in terms of an absence of auditory experience.

Phillips' analysis naturally extends to the experience of silences at specific locations or subregions of auditory space. An auditory experience in which one hears a sound as being located to one's left is not neutral as to whether or not there are sounds at other spatial locations. Rather, it affords an awareness of the spatial distribution of sounds in one's auditory environment. This includes both regions in which sounds are heard as occurring and regions that are currently silent. Though we typically attend to the sounds rather than the silences, we can nevertheless turn our attention to silent spatial regions and, to use Phillips' phrase, "open our attention to the presence of sound" at those locations. We can thereby experience localised regions of silence despite — indeed, partly in virtue of — the presence of other sounds in the vicinity.[19] The notion of objectless awareness thus enables us to explain how auditory experience can involve the awareness both of objects, e.g. sounds or sound sources, and their absence at distinct spatiotemporal locations.

If Phillips' analysis of hearing silences is correct then we can make sense of the distinction between perceptually experiencing, or hearing, silence, and the absence of

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[18] Such experiences may be explained in representational or relational terms, and do not depend upon a particular view of the metaphysics of experience.

[19] An analogous argument may be formulated in terms of sound sources (cf. §6).

auditory experience in a way that more closely parallels the phenomenology of vision than it does Martin's account of touch (§4). Moreover, it allows that we can auditorily experience both sounds and silences, i.e. regions in which no sounds are currently audible, in which case auditory experience meets *Absence* in much the same way as vision. Thus we can make sense of how an auditory spatial field can involve an experience of presence and absence not only diachronically, but synchronically. This in turn shows that auditory experience is capable of meeting $Boundedness_1$ on the basis that we typically hear a mixture of spatially located sounds (or their sources) and silences in an overall acoustic space, despite auditory experience lacking discernible spatial 'edges'. The boundaries of this space coincide with the region of which we are, at a given time, auditorily aware, regardless of whether this is an awareness of sounds or their absence.

The size and shape of this auditory space is a largely empirical matter and may fluctuate over time depending upon factors that include one's immediate physical environment, psychological state, and prior experience. In typical indoor environments, it may extend no further than the confines of the enclosing room, plus any additional external regions of which one is auditorily aware—via an open door or window, for example. Outdoors, it plausibly extends at least several hundred metres in all directions, and possibly much further. A loud and distant sound, for example, may temporarily extend one's auditory horizon (though not necessarily to the actual distance of the sound source) even if one is not normally auditorily aware of such distant locations. In both cases, however, these spatial boundaries delimit the actual space of auditory awareness at a given time, rather than the space of which we could counterfactually be aware. The resulting space may extend beyond our current auditory horizon to include regions that are currently silent, or else their boundaries may coincide. Even where these boundaries coincide, however, they remain logically distinct, and in many actual cases will differ.

To summarise, I have argued that we can make sense of the distinction between perceptual experience of auditory absences, i.e. silence, and the kind of absence of auditory experience that is characteristic of long-term deafness (§4). This distinction can in turn be used to delineate the spatial bounds of audition in a way that closely parallels the boundaries of the visual field while accommodating the unique features of each modality. Though how we experience these spatial boundaries differs between audition and vision, this is largely attributable to contingent evolutionary factors, such as the location and movability of the eyes, as compared with the largely omnidirectional nature of human hearing. Nevertheless, auditory experience can accurately be characterised as bounded by both (1) the subject's sensory limitations, as per *Boundedness*$_1$ cashed out in terms of the distinction between the presence and absence of auditory experience, and (2) external objects, as per *Boundedness*$_2$. Hence audition is capable of meeting both of these conditions, along with *Absence*, in a similar way to vision.

6. The Auditory Experience of Space

In the previous section, I suggested that we experience sounds and/or their sources as occurring in a larger acoustic space. But what does that mean, and do the objects of audition have the right kind of properties to occupy something analogous to the visual field? In this section, I consider two challenges to the claim that auditory experience has rich spatial character that arise from Nudds' (2009) account of audition. These in turn have consequences for how, and indeed whether, space is experienced in audition. Moreover, independently of Nudds' view, elucidating how sounds and/or their sources are experienced as located and extended in space helps to clarify how space is experienced in audition, and the relation between this and the existence of an auditory field.

Recall that Nudds claims we do not experience sounds as having spatial parts, locations, or extension. Rather, it is part of the function of auditory experience to

inform us about the spatial properties of *sound sources,* i.e. the objects or events that cause the sounds we hear. According to Nudds, it is the spatial properties of sound sources, which stand in spatial relations both to the perceiver and each other, that explain the spatial character of auditory experience. As noted above, Nudds' view primarily concerns the metaphysical grounds of auditory phenomenology, rather than the spatiality of auditory perception per se. Indeed, Nudds agrees that auditory experience is spatial insofar as our experience of sound sources is spatial, albeit not intrinsically so (§3). Hence Nudds view is compatible with the phenomenological conception of the auditory field that I defend here. Nevertheless, one might employ aspects of Nudds' view to motivate various objections against the existence of such a field as follows.

The first objection arises from Nudds' claim that, unlike the occupants of the visual field, sounds are not experienced as located in space, or as having spatial parts or extensions. On the face of it, this claim seems counterintuitive, not least because it renders mysterious how we can hear the locations of objects or events if not via spatial properties of the sounds they make — a point pressed by O'Callaghan (2010). Nudds, however, motivates his view by appeal to the way in which the human auditory system uses spatial and other cues to group frequency components into distinct sounds or "auditory streams" (Bregman 1990: 9). Citing Martin's account of touch (§4), Nudds (2009: 85) argues that rather than space being an object of auditory experience as in the case of vision, we are auditorily aware of the locations of objects or events that cause the sounds we hear. Thus, Nudds claims, the spatial properties of sounds affect our perception of sound sources without our experiencing the sounds themselves as located in or occupying space. If sounds and their absences, *qua* auditory stimuli, are not experienced as spatially located then, one might argue, *Absence* cannot be met, since it requires such stimuli to have an experienced spatial location. Alternatively, one might hold that the occupants of a spatial field must themselves be spatially divisible in the way that the elements of the visual field are, and so extended in space.

We can summarise these putative conditions upon the existence of a spatial field as follows:

Location: A spatial field presents sensory stimuli as located in space.

Extension: A spatial field presents sensory stimuli as extended in space.

If both conditions are necessary for the existence of a spatial field, then in order to qualify as field-like, auditory stimuli (e.g. sounds) must be experienced as located and/or extended in space. Conversely, if sounds are not experienced as spatially located and/or extended, then there is no auditory field. It is doubtful, however, that *Extension* is required for the existence of a spatial field in general, since point-like sensory stimuli might still be experienced as located within a spatially extended field. Thus one could reject *Extension* in the auditory case in favour of a spatial field that does not satisfy this condition. Nevertheless, I argue below that audition is capable of meeting both constraints in an interesting and important way.

Nudds argues that sounds are not experienced as spatially extended on the basis of the following empirical claim concerning the role of spatial properties in segregating distinct sounds or auditory streams:

(1) "Hearing simultaneous sounds as having distinct spatial properties is sufficient to hear them as distinct sounds" (*ibid.* 81)

He thus claims that while spatial cues are not necessary for grouping frequency components as distinct sounds, they are sufficient. On this basis, Nudds concludes that

(2) "we cannot simultaneously hear distinct parts of a *single* sound as standing in spatial relation to one another." (*ibid.*)

That is, were we — *per impossibile*, for Nudds — to hear parts of a single sound as standing in some spatial relation, then these differently located components would be

experienced as distinct sounds in their own right rather than as parts of a single spatially extended sound. Indeed, Nudds goes further, claiming that

(3) "we cannot make sense of *spatial* parts of sounds." (*ibid*.)

Each of these claims, however, is subject to counterexamples, two of which I describe below.[20]

The first counterexample involves the experience of *non-point sources*,[21] such as a large waterfall heard from nearby, or a busy road heard from a distance. Unlike, for example, the sound of an orchestra, which is recognisably composed of multiple instruments, the continuous 'wall of sound' that is experienced in these cases is not typically experienced as being composed of distinct sources. Rather, it is at least intelligible to think of *the sound itself* as having a spatial extension, or spatial parts that occupy the region of space throughout which the sound seems to be located. As such, we can identify or attend to the leftmost or rightmost parts of such a sound without necessarily hearing them as separate and distinct in the way that (1) suggests. While, due to their relative similarity, it may be difficult to get a precise fix on individual spatial parts in a way that is possible with instruments in an orchestra, this does not preclude it from having discernible parts.

The existence of such cases suggests that audition is able to meet *Extension*, at least for some auditory objects, with point-sources being a limiting case (as are points of light in the case of vision). Thus, contra (3), we can make sense of the idea that sounds, and not only sound sources, can seem to occupy an extended region of space. Of course, one could argue as Nudds does that the spatial character of auditory experiences is solely determined by the spatial properties of the relevant sound

[20] Low-pitched sounds can also seem to occupy larger spatial regions than high-pitched sounds, though I do not pursue this point here. See Isaac (2017) for discussion.

[21] I intend for 'point-source' to include any relatively localised sound source within the spatial resolution of audition as opposed sounds that are generated across a significant area or volume, and not only literal spatial points.

sources, as per the orchestra case, rather than the sounds themselves. Nevertheless, the fact that the above sounds are in fact produced by multiple discrete sources, i.e. individual water droplets or vehicles on the road, does not settle the spatial phenomenology of the resulting experience. In particular, it does not rule out our being able to make sense of the idea of sounds having spatial parts or being extended in space in the way that Nudds denies.

Nor would it help to argue, as Nudds (*ibid.* 88) does in a different context, that the locations of sound sources are experienced as indeterminate; i.e. that we do not experience sounds as coming from precise spatial locations or points, but as originating from less determinate regions or directions in space. Though human audition undoubtedly has lower spatial resolution than vision, this cannot fully account for the phenomenology of non-point sources, which seem to be located at relatively determinate spatially extended regions, thus putting pressure on (1) and (2).[22] Moreover, insisting that such cases involve the perception of multiple discrete sources conflicts with how these sounds are experienced as a single spatially extended unit. Alternatively, the proponent of Nudds' view could argue that the relevant spatial character is grounded in the extension of the relevant sound sources without these being composed of multiple discrete elements. As noted above, however, this is perfectly compatible with the notion of an auditory field I defend here, and so does not constitute an objection to the overall claim.

The second counterexample concerns the phenomenon of *reverberation*. Consider the sound of a person's voice heard indoors as opposed to outdoors. In each case, the sound wave that reaches one's ears will be a composite of (i) the original *direct sound* generated by the sound source combined with (ii) a variety of *early reflections* whose pattern, timing and frequency content depend upon the layout and nature of the surrounding acoustic environment and one's location within it. In outdoor

[22] This is not unlike how, in blurred vision, objects are experienced as having spatially extended, but somewhat indistinct blob-like shapes.

environments, these early reflections are typically few in number and created by the ground plus any surrounding objects. In enclosed spaces, however, sound waves are repeatedly reflected within the space, creating (iii) an increasingly dense and complex *reverb tail* before diminishing below the threshold of audibility. Given that most if not all natural environments contain surfaces that reflect sound waves, the combination of these three components creates what I will call a *reverberant sound field* that enables us to perceive the approximate dimensions, configuration and material properties of the surrounding acoustic space.

Despite its ubiquity, reverberation often goes unnoticed. This is in part because it typically takes place over a relatively short duration in the order of a fraction of a second, but also because we normally attend to the properties of direct sounds rather than any concomitant reverberations. In extreme cases, however, such as in a large and particularly reverberant room like a church hall or indoor swimming pool, the sonic signature of the space is clearly discernible from the direct sound despite overlapping both spatially and temporally with it. This makes reverberation a distinct phenomenon from *echoes*, which are caused by the reflection of sound waves over a longer interval to create a characteristic illusion of repetition.

Even subtle reverberation, however, makes a perceptible contribution to the phenomenal character of audition, without which our everyday auditory experiences would be greatly impoverished. People find the experience of being in an anechoic chamber, for example, where reverberation is almost entirely absent, unnerving precisely because we are accustomed to receiving auditory feedback about the size and shape of our acoustic environment. Mismatches between auditory reverberation and other sense-modalities, e.g. vision, are similarly jarring, such as when a badly dubbed line in a film seems to inhabit a different space from the one that is visually depicted, even if the overdubbed voice is perfectly synchronised with the actor's lip movements. Finally, as any sound engineer will attest, one can with practice learn to identify and

distinguish the contribution of reverberation to everyday sounds, or to 'hear' the acoustics of a room.[23]

To explain the distinctive contribution of reverberation to the spatial character of audition, the proponent of Nudds' view must either treat reverberations as (a) distinct sounds or sources in their own right, or (b) components of the sounds we ordinarily hear. Option (a) enables the view to explain the spatial characteristics of reverberations in terms of multiple sound 'sources', where this notion is extended to include reflective as well as sound-emitting surfaces in the perceiver's environment. However, this description seems phenomenologically inapt since we do not normally perceive reverberations as distinct from direct sounds or each other, as is demonstrated by the fact that their presence often goes unnoticed. Option (b), on the other hand, seems phenomenologically apt, but leaves us without any explanation of the spatial character of the resulting experiences since, according to Nudds, this is solely a consequence of the spatial extension of sound sources. In short, neither option looks particularly promising without an *ad hoc* blurring of the distinction between sounds, their sources, and properties of the surrounding acoustic environment. Indeed, it is difficult to see how the spatial aspects of reverberation can be explained in terms of properties of sound sources alone, as Nudds' account requires, since it is the shape and material properties of the acoustic environment, not the source, that determines the spatial character of the resulting reverberation.

Contra Nudds, then, it seems that we can make sense of sounds having spatial parts, and so (2) and (3) are false. If, as Nudds claims, (1) entails (2), then (1) must also be false, at least under certain circumstances such as the perception of non-point sources or reverberant sound fields. Given the ubiquity of reverberation effects, it seems unwarranted and phenomenologically implausible to deny that sounds are experienced as being in any sense spatial, and so the objection based on Nudds' view

[23] See Young (2017) for illuminating discussion of whether we literally *hear space* in virtue of hearing spatially distributed reverberations—a claim that goes beyond what I argue for here.

fails (though this does not necessarily mean that Nudds' account of audition should be rejected).

A second argument advanced by Nudds in favour of his view concerns the manner in which sounds occupy space, and so whether audition meets *Location* and *Extension*. As discussed above, Nudds rejects the idea that sounds occupy the same spatial locations as their sources on the basis that sounds lack spatial parts. However, he goes on to reject the idea that sounds are located at their sources in a manner analogous to the way that colours appear to be (or are) properties of the surfaces of objects. Nudds argues that this would require a distinction between *how the sound of the object appears to be* and *how the sound interacts with its environment* that parallels the distinction between surface colour and illumination conditions in visual experience.[24] Nudds denies that any such distinction can be found in auditory experience, claiming that

> The appearance of a sound does not *appear* to be the joint upshot of the apparent sound-of-an-object together with the apparent alteration of the sound during transmission. That is, we cannot distinguish *in experience* between aspects of how sounds appear which are due to the sound-of-the-object and aspects of how sounds appear which are due to alterations of the sound during transmission. The appearance of the sound is simply determined by how the sound we hear appears to be.
>
> (*ibid.* 93; original italics)

This, however, neglects the contribution of reverberation to the spatial character of auditory experience. Indeed, due to reverberation, the sounds we hear precisely *do* appear to be the joint upshot of the "sound-in-the-object" or source, and how this is altered through interaction with the surrounding acoustic environment, as is evident in our everyday experience of reverberant spaces. Consequently, sounds are experienced in relation to space in two different ways: (i) they *originate from* spatially located objects

[24] Not to be confused with the distinction between *how a sound appears to be* and *how the source of that sound appears to be*, which Nudds acknowledges is present in experience (*ibid.* 93).

or events, and (ii) they *inhabit an acoustic space* that standardly corresponds to the space in which the sound is heard.

Though I agree with Nudds that sounds do not occupy space by seeming to be properties of external objects, there is an alternative mode of space-occupancy that is well suited to explaining the spatial character of auditory experience. Given the ubiquity of reverberation in natural environments and its contribution to the spatial character of audition, it makes good ecological sense that we do not typically hear sounds or their sources *simpliciter*, but rather *as being located in and distributed throughout three-dimensional spaces*. That is, we auditorily experience not only the relative locations of sounds and/or their sources, but also the approximate dimensions, configuration and material properties of the surrounding acoustic environment. Furthermore, according to realist accounts of the metaphysics of sound, sounds are in fact distributed throughout objective space in precisely this way. Thus there is no reason to think of the perceived locations of sounds as being somehow illusory or non-veridical, as Nudds (2009: 77–78) suggests. Rather, sounds appear to be in space because sound waves or events *are* distributed throughout space, and this fact is reflected in the spatial character of audition.[25]

On the resulting view, sounds are experienced as both located in and distributed throughout objective physical space in precisely the way that Nudds seeks to rule out. This meets *Location* on the grounds that sounds are — or at least can be, since their spatial aspects are not always attended — experienced as spatially located. Moreover, they are or can be experienced as extended throughout spaces, and not merely as occupying the same space as their sources, thereby meeting *Extension*. This is compatible with the fact that one can sometimes be mistaken about how these elements combine to produce the sounds that we hear. Indeed, this closely parallels the way in which one can be mistaken about whether apparent colour is due to a surface property

[25] That we do, on occasion, hear sounds in the absence of reverberation, e.g. via headphones, is not an objection to this general claim.

or unusual illumination conditions, and so does not yield any disanalogy with the visual case. Indeed, once we allow for the contribution of reverberation to the spatial character of auditory experience, we can see that it is closely comparable to vision in terms of spatial richness while containing distinctive features that have little or no parallel in the visual case; e.g. the experience of reverberant sound fields.

Even granting that audition has a rich spatial character, however, there remains the question of whether this is sufficient to constitute an auditory field. To insist that the spatial structure of auditory experience must precisely match that of vision, however, e.g. in terms of its specific geometry or sub-divisibility, seems question-begging and *ad hoc*. If we reject such unwarranted visuocentrism, as we undoubtedly should, then absent a more compelling argument to the contrary, there seems no principled reason to deny that auditory experience has the kind of spatial character that is usefully captured by the notion of a spatial field. Furthermore, this remains the case even if the spatial character of such a field were partly or entirely determined by the properties of sound sources, as Nudds claims, rather than, or in addition to, sounds. Hence Nudds' view does not rule out nor provide any strong objection to the existence of an auditory spatial field.

7. Conclusion

I have argued that the spatial character of auditory experience is more closely analogous, though not identical, to that of vision than many philosophers have assumed. Given this rich spatial character, coupled with the fact that many common forms of scepticism about the existence of an auditory field are ill-founded, there seems to be little reason to affirm the existence of a spatial field for vision while simultaneously denying the existence of such a field in audition. Though further work is required to establish an exhaustive set of necessary and sufficient conditions for the existence of a spatial field in general, the considerations presented above suggest that these should include: (1) the experience of spatiotemporal boundaries in experience;

(2) a distinction between the experience of absence in the relevant sensory modality and the absence of experience in that modality; and (3) that the occupants of the field are experienced as located and/or extended in space. Furthermore, I have argued that each of these conditions is satisfied by human auditory experience in much the same way as it is for vision. Hence, insofar as the notion of a spatial field may be thought to be captured by these conditions, and absent more compelling arguments to the contrary, we should be equally committed to the existence of the visual and auditory fields.

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