

The Locations of Sounds

Casey O’Callaghan

1 Introduction

When you hear the sound of a car drive by on the street outside your window, you learn not only whether the car has a hole in its muffler or has squealing brakes. You also learn something about the location of the car because hearing furnishes information about the locations of its objects. By listening, you learn not only about the character of the things and happenings around you, but also about where they are in the surrounding environment. The question I wish to address is this: Do we hear the locations of sounds themselves, or do we merely hear the locations of sound sources—the objects and events that produce sounds? I shall argue that frequently we do hear the locations of sounds themselves, and that this is required in order to hear and learn the locations of sound-producing sources. This feature of auditory experience has consequences for the metaphysics of sounds. If we veridically hear the locations of sounds, then the most prominent conception of sounds is mistaken and we must revise our ontology.

2 Locational hearing

Hearing, like vision and probably unlike olfaction, is a locational mode of perceiving. When you hear the sound of a car passing or hear the sound of a plate breaking on

the kitchen floor behind you, you hear not just something about what is going on, but also something about where it occurs. Though hearing is neither as accurate nor as precise as vision, audition consciously presents information about the relative locations of audible events and objects. Jens Blauert says:

Research has shown that the region of most precise spatial hearing lies in, or close to, the forward direction and that, within this region, a lateral displacement of the sound source most easily leads to a change in the position of the auditory event. . . . The spatial resolution limit of the auditory system [about 1 degree of arc] is, then, about two orders of magnitude less than that of the visual system, which is capable of distinguishing changes of angle of less than one minute of arc. (1997: 38–39)

The spatial information conveyed in audition does not consist solely in directional information. Concerning what he calls “distance hearing,” Blauert reports that

For familiar signals such as human speech at its normal loudness, the distance of the auditory event corresponds quite well to that of the sound source. (1997: 45)

Blauert notes that even though distance localization is much less accurate for unfamiliar sounds, including “unusual types of speech,” (1997: 45) even in such cases “The auditory event is, to be sure, precisely spatially located” (1997: 46). This is representative of the intuitive and widely accepted view among auditory researchers that hearing informs subjects about the locations of things and events in egocentric space.¹

¹See, for example, Shinn-Cunningham (2001a, b), Bregman (1990), Mills (1972).

3 Located sounds

Hearing, I shall argue, consciously furnishes information about the locations of objects and events in the environment by consciously presenting sounds themselves as located in the surrounding environment. You hear the car passing or hear the plate breaking behind you by hearing its sound to have some location in the surrounding space. The experience presents the sound as occurring at some distance and in a particular direction. You turn to look at the passing jalopy or to see how much of a mess there is because, in a wide range of cases, sounds themselves seem to have more or less determinate locations outside the heads of their perceivers. Stanley Gelfand refers to this phenomenon as *extracranial localization*: “Sounds heard in a sound field seem to be localized in the environment” (1998: 374). Sound engineers make use of facts about localization to shape the experience of sounds in concert halls, movie theaters, and living rooms. Audible objects and events have audible locations because their sounds have audible locations.

That sounds are heard to be roughly where the events that cause them take place is evidenced in introspection, empirical research, and to some extent in ordinary language. A recent police tip sheet entitled, “How to Be a Good Witness” instructs individuals to “Look in the direction of the sound—make a mental note of persons or vehicles in that area.”² My phenomenological claim is that we experience sounds, in a wide range of central cases, to be located in the neighborhood of their sources. When we do not, as when a sound seems to “fill a room” or to “engulf” us, this is not a matter of the sound seeming to lack location. Rather, the sound is perceived to be “all around,” or at least in a larger portion of the surrounding space. Hearing a sound located “in the head” when listening to earphones is another sort of sound

²“Feeling That Witnesses Need a Hand, Police Offer One,” *The New York Times*, October 16, 2002.

location perception, though a bit odd.³

That audition consciously furnishes information about its objects by presenting sounds as located is best appreciated by considering that audition, distinctively, makes us aware of the audible qualities of pitch, timbre, and loudness. If location information is available in audition, it must be available in virtue the audible qualities, which are, first and foremost, qualities of sounds themselves. I shall argue in the following two sections that on any phenomenologically plausible account of locational hearing the audible qualities—qualities of sounds—are heard to be located in the neighborhood of their apparent sources. It follows that on any such account, sounds are heard as located.

It is notoriously difficult to argue for a phenomenological claim. That is what I hope to do, because, as I indicate in §6, our ontology of sounds and our perceptual account of audition depend upon this claim.

4 “Coming from”

Despite the phenomenological claim that sounds seem to perceivers to be located at some distance in a particular direction, it is natural to describe sounds as “coming from” their sources. We ask where the beeping sound is coming from and whether the hum is coming from above or below. If sounds seem to *come from* particular places, in a spatial sense of “coming from,” then locatedness as I have characterized it does not accurately capture the phenomenology of auditory spatial perception. Sounds, in that case, do not seem to be located, they seem to come from particular locations.

The virtue of this way of describing the phenomenology is that it is consistent with facts about our ability to acquire through auditory perception information about the

³Gelfand refers to this phenomenon as *intracranial lateralization*: “Sounds presented through a pair of earphones are perceived to come from within the head, and their source appears to be lateralized along a plane between the two ears” (1998: 374).

locations of objects and events in the environment. If sounds seem to come from their sources, then we can learn about where those sources are through audition without hearing sounds themselves as located just where their sources are.

How are we to take talk of sounds' being heard to "come from" a location? It might be that sounds are heard to come from a particular place by being heard first at that place, and then at successively closer intermediate locations. But this is not the case with ordinary hearing. Sounds are not heard to travel through the air as scientists have taught us that waves do. Imagine a scenario in which engineers have rigged a surround-sound speaker system to produce a sound that seems to be generated by a bell across the room. This sound subsequently seems to speed through the air toward you and to enter your head like an auditory missile. This would indeed be a strange experience, one unlike our ordinary experiences of sounds, which present them as stationary relative to the objects and events that are their sources.

Perhaps, instead, sounds are heard to *be* nearby, but to have *come from* a particular place, much as a breeze seems to have come from a certain direction. But feeling a breeze is like listening with earphones: the tactile experience of feeling a breeze, like the auditory experience of hearing a sound played through one earphone, includes direction but no distance. Earphone listening differs from ordinary hearing not just in where sounds seem to come from, but also in where sounds are heard to be. Imagine feeling *where the fan is*. Ordinary spatial hearing is not in this respect like tactile spatial perception.

Since sounds seem to come from sources in a sense that includes distance as well as direction, and not in a sense that includes travel, neither spatial understanding of sounds' seeming to come from their sources does justice to the phenomenology of ordinary auditory experience. Thus neither spatial understanding of "coming from" provides an explanation of how auditory perception furnishes information about the

locations of sound sources. The best sense to make of sounds' seeming to come from particular locations is that they have *causal sources* in those locations, that they are *produced* or *generated* in those locations.

5 Sounds without locations?

I have argued that sounds seem to have stable, distal locations, and that they do not seem to travel or come from their sources in any spatial sense. Part of the motivation for this line of argument is that our awareness in audition of the locations of ordinary things and happenings in the environment requires explanation. If we are aware of locations of sounds, and if sounds are located near their sources, then the beginning of an explanation is in hand. All we require is an explanation of why sounds seem to be located. Empirical research on spatial hearing has provided answers based on the physics of sound waves and on our ability to determine direction and distance information primarily in virtue of differences in wave characteristics at the two ears.

Might this process, which I have invoked to explain how sounds are perceived to be located, serve instead to explain why objects and events seem to be located in audition without adverting to located sounds?

A promising approach based on this idea again rejects the phenomenological claim as I have characterized it. This approach says that we hear sounds to have pitch, timbre, loudness, and duration, though not as having location. Rather, we hear ordinary events and objects as located and as the generators or sources of audible qualities that lack spatial qualities entirely. We simply fail to perceive the locations of sounds. Sounds are not heard to have locations, they are heard to have located sources. This claim is supplemented by an explanation in terms of sound wave transmission for how we acquire information about environmental source locations. A location is thereby ascribed to a source, though not to a sound.

This description provides a compelling account of the phenomenology of auditory experience without claiming that sounds are heard to have locations. To see why it fails we need to consider just how audition furnishes perceptual information about the locations where sounds are generated.

I have claimed that hearing provides information about ordinary objects and events around us—notably, information about where those things are and occur. The account we are considering is that we hear objects and events as located by means of the sounds they generate. But sounds are what possess pitch, timbre, and loudness. I claim that we cannot *hear* just non-located audible qualities and located objects, *full stop*. This would amount to a precarious perceptual situation. How could hearing non-located qualities provide perceptual information about sound source locations?

One way has already been mentioned: locational information might be encoded temporally, for example, by time delays between waves reaching the ears. However, since we are auditorily *aware* of the locations of things and happenings—hearing is spatial—this information must be conveyed somehow in conscious perception. At the basic level of awareness, audition presents just complexes of pitch and timbre with loudness and duration,⁴ so an auditory experience that conveys information about the locations of material objects and events must do so by means of one’s awareness of these basic attributes. Temporally encoded location information is manifested through one’s experience of pitch, timbre, and loudness.

For an experience of the audible qualities to be an auditory experience of loca-

⁴This fact may be what led Strawson (1959) to claim that a purely auditory experience would be entirely non-spatial. That seems false if ‘purely’ means simply ‘wholly’. Even a tone presented by headphone to one ear carries some spatial information. Recent empirical research on neural representation of auditory space indicates that “Auditory space maps can be generated without visual input, but their precision and topography depend on visual experience. So, for example, owls raised as if they were blind end up with abnormal, or even partially inverted, auditory maps.” (Carr 2002: 30) What is true is that a non-spatial experience of just pitch and timbre, with loudness and duration, would count as a minimal (or “pure”) auditory experience. Nudds (2001) is an illuminating discussion of Chapter Two of Strawson (1959).

tion, the audible qualities must themselves bear spatial information. Since, as I have argued, sounds and their audible qualities do not auditorily seem to come from particular locations in a sense that involves travel or arrival, auditory awareness of location must occur thanks to an awareness of located audible qualities. Sounds, the bearers of audible qualities, must appear to occupy stable distal locations if we are to learn of those locations through auditory experience.⁵

A distinction can thus be drawn between hearing sounds themselves as located and perceiving information about the locations of material objects, stuffs, and events in the environment by means of audition. Given that we learn the locations of ordinary objects and events in audition, the question is whether the latter would be possible without the former. Since sounds seem to come from their sources only in a causal sense, and since auditory awareness of location must occur by means of awareness of audible qualities, hearing sounds and their qualities as located is required in order to perceive or form judgments about the locations of material objects and events through audition. Sounds are heard to have locations, by means of which they provide perceptual information about the locations of their sources.⁶

⁵‘Must’ here is meant loosely, in the following way. My claim is just that given facts about auditory phenomenology and plausible assumptions about the epistemology of perception, the audible qualities appear to provide the only plausible explanation for certain facts about what we learn through audition.

⁶Another way we might imagine the situation is as follows. We do not hear sounds as located in any way, but learn the locations of sound sources by an unconscious process something like what perceptual theorists call “blindsight”, in which the location information is represented through a course of subconscious perception (see, e.g., Block (1995)). In this case, the audible qualities do not bear location information, since by hypothesis it is not experientially manifested. How, then, do we explain our perceptual awareness of the connection between sounds and sources—how do we know that the thing located *there* is the source of *this* sound? Suppose we do acquire such information, perhaps by means of a related subconscious process. Then, my claim that audible qualities are consciously heard as having locations is false or due to widespread illusion. I think it is manifestly correct that audible qualities are heard as having locations, and that this is demonstrable by various behavioral and introspective tasks. If this appearance is illusory, and the blindsight explanation plausible, then we have a fresh example of reliable “perceptual” beliefs formed in the absence of genuine conscious awareness. This itself seems improbable. It is more improbable that we are not at all *aware* of object locations in audition.

6 Locatedness and the metaphysics of sounds

What hangs on this? The apparent locatedness of sounds has consequences for our account of auditory perception and its content, and also for our metaphysical theory of sounds. If the phenomenological claim is an accurate description of the experience of sounds, and if perceiving the locations of sound sources requires perceiving audible qualities and sounds themselves to be located, then either auditory perception is systematically illusory or sounds do not travel through the medium. So if auditory perception is not systematically illusory with respect to the perceived locations of sounds, then the accepted view of the metaphysics of sounds is incorrect.

The received view is that sounds are compression waves that travel through a medium. But if waves travel, then sounds are not waves since sounds are located near their sources.⁷ Either sounds are properties of their sources, or they are peculiar objects located near their sources, or they are events located near their sources. Since sounds appear to be distinct from but caused by their sources, and since they have duration and may involve change over time, I prefer the view that sounds are events located near their sources. Sounds are the products of collisions and vibrations in objects, and have as their causal products sound waves that travel through the medium. Sound waves therefore carry information about sounds, but are not identical with sounds.

References

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⁷Robert Pasnau (1999) first recognized that the phenomenology of locatedness, if veridical, is incompatible with the view that sounds are waves that travel through the medium.

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