

Averroes on Sound and Echo [On De anima 419b25-419b33]

*From the Long Commentary on the De anime, Book II, distinction 80**

Having explained the things from which sound is produced, and how it comes about, he begins to explain the being of a certain accident of sound, which is called "echo", and which is an iteration of sound, preserving its figure, as occurs in uninhabited houses. And he says, *But echo*, etc. That is, "but echo comes to be from air which is made one, i.e. limited and enclosed, according to that by which it is contained, and prohibited from exiting". Since, given that its motion is produced by the first striking thing, air is driven out by the sides of that by which it is contained, and strikes itself with a second percussion similar to the first, which produces the sound and thus the same sound is heard as a repetition of it, as though it were responding to the first.

And he likens this to a rebounding ball, since, when the ball rebounds, there occurs in it a motion similar to the first motion, and an echo is heard after the first sound, as though it were a response, because it has already been stated that between any two motions there is a rest. But it should not be understood from what he has said ("a mass of air having been unified") that a unity of air has been produced that is distinguished by its motion from other parts of the air, like a stone when thrown, or a spear, but rather it must be understood that he means by "one air" a [mass of air] that is bounded and contained in a jar. For air which is in such [a state], when some passion and strong motion occurs in it, there then occurs by percussion something similar to what occurs upon the fall of a stone into water, i.e. that the motion is not completed because it terminates itself; whereby the second [motion] rebounds from the sides of the containing jar, and thus there comes about a second passion similar to the first, whereby the sound is repeated. Therefore, Aristotle compares air in this motion to a ball, which, when it is thrown, is thrown back with a motion away from that which opposes it, when its motion is not completed, by a throwing-back similar to the first motion; he does not mean that one single part of the air is that to which this second reflection and throwing-back occurs.

Next he states, *It is probable that in all generation of sound an echo occurs*, though indistinctly heard.. And he indicates by this how a motion [similar to that] of the ball occurs in air due to percussion. For such a motion does not occur in air by percussion except in the manner of a reflection. For the percussing thing first throws off the air in a straight line away from itself in the direction in which the percussing thing is moving, and unless there occurs a motion of doubling back to the parts of the air, this motion will not come equally (or almost equally) from all parts of the thing which has been percussed, such that from it there would come to be a spherical (or nearly spherical) figure, whose center is the thing percussed. And he states:

It is probable that in all generation of sound... That is, it is also probable that the cause by which echo occurs, i.e. a doubling-back, always occurs in sound production, but more weakly. For if a similarly strong abiding passion in the air were to form, which is distinct in number from the first passion and similar in quality, then echo would arise.

Next he states, "It occurs the same way with light, for light is reflected," etc. That is, that which happens with sound is similar to that which happens with light. For light has two reflections, a strong one and a weak one. For the strong light makes the second light, and it is the doubling-back which is caused by shiny bodies, and it is similar to the reflection which causes a second sound in air. But it is this second weak light by which we see things in shadow, and it is similar to the doubling-back by which a man hears his own sound, and is it that which does not reach to this, which would be like the doubling-back that happens off of water and copper, which makes the second light in a part opposite to the first light, just as the strong doubling-back causes there to be a second voice in the part opposite to the first voice.

And that by which we know of this doubling-back of light, as he states, is that we can see in places where the sunlight does not fall. For it is natural that light be emitted from something bright

* Translation based on the 1953 Crawford Latin edition, "Averrois Cordubensis : commentarium magnum in Aristotelis de Anima libros"

according to straight vertices [extending] from the luminous body to the part opposite the shining part, as the writers of books on "*On Perspective*" have stated. Therefore, if doubling-back were not to occur in those parts, then there would be darkness in all parts save the part which is opposite to the rays, wherefore, if the movement of the air which makes sound were to be only in the part occupied [by the air] pushed by the percussing thing, then sound would only be heard by those who are in that part. But sound is heard in all parts of the thing percussed; and therefore we know that that which happens to light of a spherical figure, is similar to that which happens to the motion of percussion in air. Therefore, from this it can be derived that there is a similarity between these two reflections. But if a body were luminous from all parts, there is no doubt that it would make a lighted sphere, and this is stated in "*On Perspective*". Therefore, the difference between this sphere and the first is that light is the same in this, and distinct in that, according to strength and weakness.

And it also appears that the sphere of light made by a luminous body from one of its own parts, if this is not similar to itself in light, will also not have a perfect roundness, i.e. that the longest diameter is that which leaves the luminous body to the circumference in the part to which the rays are opposite, and shortest in the opposite part (and this is the part where there is heaviest shadow of all the parts, and there is the least light).