Avicenna
On Nature, Book 6, Part 2 *
Translated by Erik Norvelle

Chapter VI: Chapter on Smell and Sound

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Concerning smell, although man is of greater talent in smell than all [other] animals, and in making occult odors sensible through rubbing, [a talent] which the rest do not have, and attenuates them in order to sense them by smelling, in which [talent] the other [animals] share with him, nevertheless he does not thereby receive odors strongly, so that from them firm similitudes might be produced through mental images, as are acquired from touch and taste. Therefore it appears that the discernment of odors in man's soul is weaker, and thus for men odors do not have names, except in two ways: one, according to whether they are pleasing or displeasing, and thus they are called "redolent" or "fetid"; this is as if flavors were to be called "flavorful" or "flavorless" without distinguishing their differences or giving them distinct names. In a second way, they are given names according to their similarity with tastes, such that an odor may be called "sweet" or "acidic", as if odors which typically go together with flavors could not be compared without them, nor known without them. But it appears that the ability to sense odors in man is like that for sensing the bodies of things and their colors in animals that have hard eyes, for indeed they appear to not perceive anything other than uncertain similitudes, as a distant body is sensed via weak vision. Indeed, many hard-eyed animals have a maximum ability for sensing odors, like bees and similar animals, which do not need to smell [actively], but smells are carried to them in the air.

But the medium for smelling is an odorless body, such as air and water, which carry the odor of things which are fragrant. However, men have different opionions about how smell occurs. Some say that odor is transmitted by a change in the medium, through the infiltration of parts of the body which is sensed. Others state that [smell] is transmitted only by the permutation of the medium [R 78], and that no body deriving from the odor-emitting body is mixed with it. Finally, some state that odor is transmitted without mixing of anything of the odorous body and also without a change to the medium. Their theory is that the odorous body acts on a non-odorous body, and between the two bodies there is a medium in which it does not act, but the medium is the transmitter of the action from this [body] to that [body], i.e. as has been stated to occur in the principles of sounds and colors.

But we should consider this question and make a decision, taking from each of these opinions the truth which it contains. Those who posit vapors and fumes reason by saying that unless an odor is diffused by the dissolution of something, heat--and whatever creates heat through friction or evaporation and similar effects--would not excite odors, nor would cold hide them. Therefore it is clear that odor does not come be smelled except by a vapor which evaporates from the odor-emitting thing, and mixes with air and is diffused through it, and thus, since an apple will remain fragrant for a long time, it will shrivel due to the great [amount] which separates off from it.

But those who speak of a change [of the medium] have reasoned by saying that, if the odors which fill a great space were derived from an evaporation of something, the odor-emitting thing would have to become less heavy, and it would decrease in quantity due to the evaporation of that which is separated from it.

On the other hand, those who posit transmission especially claim that it is not possible that a vapor be separated off from an odor-emitting thing and be diffused over great distances, up to a hundred leagues or more. Furthermore, it cannot be claimed that an odor-emitting thing cause greater than in bodies than fire does from its heat; for a great fire only heats that which is nearby to it, but if it were to heat even as far as a stone could be thrown, it would be something greater. But

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* This translation is based on the Latin text contained in *Avicenna. Liber de Anima seu Sextus de Naturalibus, parts I-III. Avicenna Latinus (Brill, Leiden, 1972)* This translation is for informational purposes only, and should not be cited for the purposes of academic publications without prior comparison with the Latin text.

we discover that odors reach to distant places, [R 79] which leads us to doubt that anything that diffuses so far could be from a diffused vapor, or from the causing of change [in the medium]. For it is known that in the lands of the Greeks and Occidentals vultures had never been seen, and indeed between those lands and habitat of these birds there is a great distance, nearly as much as we stated earlier; but at a certain time a war occurred in those parts, and vultures appeared, with nothing leading them there but the odor; therefore [the phenomenon of] odor indicates to us that it cannot be the case that vapors or permutations of the air travel such a long distance.

But we say that it is possible that the fragrant thing be vapor, and it is also possible that vapor be permuted by the fragrant thing and thus produce odor, and [thus] it would be the same as vapor, because whatsoever has subtle parts and tends to diffuse, when it touches the organ of smell and makes an impression on it, be it vapor or air, it will be changed into odor and thereby odor will be sensed. But it is already known that every medium is sensed via permutation: and indeed the thing sensed, if it could be brought to the one sensing, would also be sensed without the medium. There is evidence that indicates that the permutation is contained in this manner. For instance, if we evaporate camphor such that the entire amount is dissolved, and so that it will give off an odor that would be diffused all the way to some limit, it will also be possible for the odor to be diffused over twice this area, due to the mutation and position of the individual parts of it among the individual parts of all of that area, so that individual parts of twice the area would be redolent with the same odor as [the first] was. But since from any given minimum part of it something evaporates, the conjunction of those vapors which are separated off of the camphor in all of its parts which are beyond the aforesaid limit will be twice the total vapor of the first evaporation compared with it: therefore it must be the case that the loss which occurs to [the camphor] in this case be nearly the same, or else interchangeable with it < ... >. Therefore it is clear that permutation is not excluded by this [argument].

But their claim concerning the aforementioned transmission is impossible, because transmission does not occur except via combination with something, and in some place which is between that which is being transmitted and the place to which it is be transmitted. But an fragrant body does not require any of these things. Imagine that the camphor has already been moved or carried to another place where its smell could not come to you; it would in no way have been annihilated, nevertheless nothing prevents its odor from remaining in the air, and this without a doubt occurs via permutation or admixture.

But in regards to that which attracted the aforementioned birds, it could be that strong winds carried the odors of the vapors with are emitted by the cadavers, as far as the above-mentioned space at the height of the aether; in this way, [animals] which have a stronger sense [of smell] than man will sense it, such as the birds mentioned above, and similar animals. But you know that, just as odors come to many animals more than they do to men, in a similar way visible things are carried to them from far-away places and over extremely high mountains; indeed, these [birds] circle in the air while they are elevated far above [R 81] very high maintains, and the [objects of their] vision arrive from far away, passing over [the mountains]. For we frequently see vultures circling, elevated above very high mountains < ... >, and later you learn in geometry the causes of the elongations by which something is seen as bigger and bigger. Therefore it could be that these birds were highly elevated in the air until the cadavers appeared to them across that breadth of that space, so that they could seem them. Therefore, if [the opponents of visual detection] negate that the bodies of cadavers can come to them [by vision], they should even more strongly deny that odors could be transmitted to them, since the transmission of odor is weaker. Finally, just as it is not necessary for every animal that it move its eyelid and eye in order to see, in a similar way it is not necessary for every animal that it smell [actively] in order that it be able to detect odors, for it happens that many of these [animals] perceive odor without smelling.

Chapter V: On the Sense of Hearing

[R 82] Next, now that we have spoken of touch, taste and smell, it is appropriate to speak about hearing. Therefore we say that, in order to speak about hearing, it is necessary first to speak about sound and its essence, and it is also appropriate to speak about "ringing" [echo]. First, let us state that sound is not something of a stable essence, nor does it have a fixed being, as we concede to whiteness and blackness, and figures which have a stable being, such that it would be possible to establish its being; it is as though it had no principle of being and becoming, nor is it said [to be] except in regards to something. But it is clear that sound is something that occurs, but it does not occur except through cutting or percussion [striking].

But percussion is what occurs when a stone or wooden beam is struck, whereby sound results; "cutting", on the other hand, is the separation of the parts of one thing from its other parts, such as in a beam which is cut apart, with its parts being separated one from another along its length. But not every percussion produces sound: for if you strike [percuss] a soft body like wool, you will not hear a sound. Therefore the body which you strike must have some solidity, so that its motion--by which the sound is perceived--will reverberate due to the percussion and thus be heard. Similarly, if you cut a small thing or something that does not have hardness, the cutting will not make a sound in any way. But percussion qua percussion is not diverse, and cutting qua cutting is not diversified, because it is a single thing which produces the percussion and another [single thing] which produces incision. But causing something to be struck may differ in its strength and velocity; and similarly one [instance of] cutting differs from another in a similar way. But [striking and cutting] always involve touching another, and it is necessary that the place of the body touched be evacuated, and that it be moved in the direction [of the blow]. In the case of cutting, this other thing has already evacuated its place, and [the place] seeks another [body] which can come into it; this motion occurs in a thing which is soft and easily movable without delay, [R 83] like water or air. Therefore in any given percussion or cutting there comes to be a motion of the air or another [body] of this sort, either slowly or quickly, and which is moved or attracted forcibly. Therefore, [we conclude] that there must be something which is necessary in order that sound occur, and this is the strong motion of air or something similar.

However, we should note that sound will either be the percussion or cutting itself, or else it will be the motion of disturbance which happens to air because of this, or else will be some third thing which occurs due to [percussion or cutting], or else accompanies them. But cutting and percussion are sensed by vision and via color: but no sound is sensed via color; therefore percussion and cutting are not sound; however, if it is necessary that they be, they will be causes of sound. There has, however, been doubt concerning the motion [involved], and it has been proposed that sound is the very disturbance of the air; But this is not the case: for the genus of motion is also sensed by other senses, although this may occur via the mediation of the other things which are sensed. That which specifies and makes sound come to be is sometimes sensed so much as to cause pain, as happens due to the sound of thunder, which sometimes collapses mountains and can harm or even kill animals; and often men use the sound of trumpets to help in bringing down high towers. But in the sense faculty of touching, as we have already stated, something is suffered due to motion qua motion, and [this faculty] does not sense sound, nor does someone who knows himself to be moved by something [thereby] know sound. However, if sound were certain to be the motion itself, then sound would be known as soon as motion was known, even were there no consequent nor accompaniment. But this is not the case: for one and the same thing cannot be known and not known simultaneously, except in regard to two parts or two dispositions. Therefore, the essential and specific principle of sound is not the same as the specific and essential principle of motion.

Ergo, the occurrence of sound is a [R 84] consequence of the aforesaid motion and

accompanies it. But sound is heard when an agitation in air or water comes in contact with the sound-receiving nerve which is extended within the ear. Prior to [this nerve] there is a concavity in which there is quiet air, which is moved by the motion of that which comes in contact with it, after [this concavity] there is something resembling a wall, and above it there is the extended nerve which senses sound. But we are impeded from knowing about sound whether there be something which has being in itself, following per se from the essence of motion or joined to it, such that sound would not occur unless this were present where hearing takes place: but anyone can sense that sound does not have being per se, nor is it sensed without the touch of agitated air; on the contrary, among all things which touch the aforesaid place, sound happens there because of touch. And does sound itself come to pass from the agitation of the air which is in the nerve which is receptive of sound, or does it occur because of the touch itself? This is difficult to discern, because the opinion of those who negate that sound has its own being per se is not as stupid as that of those who negate the remaining things sensed. For these can explain the sensing of the noisy via the property which is known to produce sound, namely the disturbance of air. And the relation of the agitation to the sound is like the relation of the quality which is in a soft thing to that which impresses it upon the sense, while the difference is that the affection acquired from a soft thing in the sensing organ and from fire in the sensing organ is of that genus which is in those [organs]; since it also occurs sometimes that [R 85] that which senses heat, also heats something else, so as to bring about in it the [same] affection. But the disposition of sound and the agitation of air are not like this, because the agitation is one kind of thing, and sound is another; indeed the agitation is sensed by one organ and sound by another. The same quality, however, is not sensed by the other organ; neither is it necessary that whatever affects something in regards to some affection, have [that affection] in itself.

But we should also know with certainty how this would be. Therefore, we say that that which helps us to know that that which occurs to the hearing has being in itself, is that which, if it were not to happen except in the nerve itself, would have to be such that the agitation of the air would either be sensed by hearing qua agitation, or else not. If, on the one hand, the agitation of air, qua agitation, were to be sensed by hearing — and I do not mean that it would be sensed via the touch of the hearing organ —, either it will be sensed primarily, or else via sound.

On the other hand, if it is sensed primarily, while the first thing sensed by hearing is sound (in this regard there is no doubt), then the agitation of air, qua agitation, would be sound; we have already refuted this position, however. But if it were sensed via sound, whoever were to hear sound, would know that there is agitation present, just as anyone who sees the color of a square, by means of the square, knows that there is a square; this is not so, however. But if it were only sensed by touch, the result we have already mentioned would hold. Therefore it does not follow that if agitation is sensed, that sound will be heard.

But let us consider what must be said next. We say that sound, when heard, is heard from a direction. And it is necessary that either the direction will be heard via that which is the principle of sound, both to be from whence it is and from whence it comes, or else thusly, via the mobile required for hearing in which there is yet no sound, but produces [R 86] sound when it reaches the ear, [being] moved from that direction and percussed from that [direction], and on that account it appears that sound comes from that direction, or else from both of them. But if this were to come about due to <...> that the mobile itself is sensible: if, further, this were not this sense object, the direction would not be perceived from its principle; then it would be necessary that agitation of air be sensed by hearing, when the direction of the sound is sensed, which we have already shown to be impossible. But if it were due to both of those [causes], that impossible [conclusion] would follow also, and sound would be affirmed to accompany the agitation of air. Threfore it remains that [the sound] produces this because the sound itself is effected there and comes from there. For if sound

did not occur except just in the ear, it would not matter whether the cause of it came from right or left, especially since its cause would not be not heard, and it is this thing, i.e. the agitation of air, affecting the air in the ear to produce a likeness of itself; but sometimes its direction is not sensed: for it is not sensed except when it arrives: therefore how will a sound be sensed which does not occur except by the arrival of its cause? Therefore it is now clear that sound has a certain being per se, not from that which is heard in act, but from that which is audible in potency, and is a certain thing which is like a derivative of the effects of the agitation of the air, more than the agitation itself.

We should now lay out an explanation concerning that which is percussed and that which percusses. Therefore we say that in order to percuss, it is necessary that some motion precede and some motion follow. But the motion which precedes the percussion is sometimes from one body which contacts another, sometimes it is from both [bodies], and it is necessary that one or both of them resist the other sensibly; for if either of them is impelled or percussed, not so as to be sensed, but with an impediment such that it is not sensed, there will not be [R 87] sound there. Rather, both the thing which percusses and the thing percussed are makers of sound, but the harder and more resistant thing is more responsible for the effect, and indeed the same thing will have the greater part. The following motion, on the other hand, is the giving way or escape of the air, and its constriction between the [percussant and percussed]. But hardness aids in constraining strongly the air, and smoothness similarly, unless the air be received in concavities of something rough. Indeed whenever a percussed body is of a great softness and wetness, and when the motion occurs strongly and the air in the middle is force to penetrate [the body] and is squeezed between those, this same body would not permit air to penetrate itself nor to divide itself in a short time, but it would resist the air which is in the middle and would not give way to it; it also resists the percussant, which confines the much air being forced out in a short time, and it will not burst out, but would resist the percussant; also, when it thereby constricts the air in the middle, even though this were not due to the strength of the recipient nor due to the strength of the thing producing the percussion, resistance itself would also occur there in the location of the hardness. But you will see this if you attend to the fact that when you percuss water a little bit, you will be able to cleave it without effort; but if you strike quickly, it will resist you. And in addition to this, air also resists, but it might be that a certain part of the air itself resists, and there might be something constricted between itself and the percussant which makes the constriction. Moreover, it might be that air is composed of three parts: one that percusses, like the wind, another that resists, and another that is constricted [R 88] between them according to some disposition of the agitation. Indeed, hardness or constriction is not the first cause of the occurance of this agitation, but they have [causality] because they help to resist, and indeed the resistance is the first cause. Therefore sound occurs due the agitation of a soft energetic body, constrained between two contrary bodies which resist each other, insofar as it is thusly.

And just as water, air and heaven agree in nature for transmitting colore, which nature is called "clarity", similarly water and air agree in that they produce sound, and the name of this is "reception of agitation". But this does not occur due to water or air being a medium, just as clarity is not the result of heaven or air being a medium. But it appears that water or air, insofar as they are transmitters of odor or flavor, have something similar in which they agree, but which does not have a name; the wetness that transmits flavor is "sapidity", but that in which it agrees with [air] in the transmission of odor does not have a name.

But echo happens due to a [second] agitation which this agitation causes. For when someting resists this agitation, like a mountain or a wall, so that it makes it stop, it then also happens that between this agitation which is moved to strike the wall or mountain and between that which causes the [initial] percussion, another body of air is constrained and reverberates [against] this [air] and repels it backwards by constraining; the figure [of this second agitation] is like the first

figure and its disposition. Just as when a spear bounces off a wall, it is similarly necessary that air be agitated between them, and that [the spear] returns back; but we have already stated the cause for the spear bouncing back, and therefore the cause of the repercussion of the air will be the same.

But there remains to consider whether "ringing" is the sound which occurs due to the second agitation of the air agitated by the first motion, or whether it is a companion [R 89] of the agitation of the first air bouncing back again. But it would seem that there is ringing which is the agitation of the first air, which comes back to us again, so that it would be of a property of that [air] and due to its disposition, and that the percussion of this air does not produce sound due to the extremely light repercussion of the second air, since the percussion of this air is not strong. For if, in fact, it were strong enough to product sound, it would be harmful to the hearing. But it would seem that all sound has ringing, even though it is not heard; since all light reverberates. And it further seems that since this ringing is not heard in houses and mansions, the cause of this is that, since the space is small between the sound and the reverberation of the sound, it is not heard in two discrete times, but simultaneously, just as the sound and the percussion which goes with it are heard [simultaneously], although [the one] is certainly after the other. But if the reverberation were far off, there would appear to be a different thing sensed in the time which is between the two sounds. And if the thing percussed were hard and flat, so that it would produce many vibrations, [the sound] would last a long time, such as occurs in baths. Further, it appears that the reason why [sound] resonates in flat wildernesses more weakly, while under roofs it resonates more strongly, is because it is duplicated with the ringing which is heard is at the same time as the [sound], so that they seem one. But you should know that agitation of the air is not like local motion of one and the same air, but it is rather like the disposition of agitation of water, and which occurs due to the effect of percussions succeeding each other with quiet preceeding quiet. However, this agitation which makes sound, makes it rapidly, but it does not percuss greatly. But here someone will be able to object, "Just as we objected about touch, assigning many virtues to it by which many contraries can be apprehended, so also hearing apprehends the contrary which is between sharp and deep sounds, and the contrary which is between weak and strong, and the contrary which is between hard and soft and rough and the rest. Therefore why do we not assign many virtues to it?" [R 90] We respond as follows to this, [stating] that the first thing sensed by hearing is sound; but the accidents which accompany its first sensible, after which there is sound, are these [contraries mentioned]. There indeed, i.e. in touch, one of the contraries is sensed per se, and not as the cause of the another. Ergo let this be sufficient doctrine concerning sound and sensing.