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4

PSYCHOLOGY I

Soul and the Senses

Introduction

For Avicenna, as well as most ancient and medieval philosophers, philosophical psychology is one of the special sciences of physics or natural philosophy. The reason for this classification becomes clear once one recalls that for Avicenna the proper subject of natural philosophy generally is body, inasmuch as it undergoes motion or change. As for the proper subject of psychology, Avicenna identifies it with *living* bodies, inasmuch as they undergo and perform those activities, that is, motions and changes associated with a living thing, such as self-nourishment, growth, reproduction, and in the cases of higher life forms, sensation, locomotion, and even rational thought. In short, psychology treats a subset of natural bodies, namely, animate bodies, and it is for this reason that ancient and medieval natural philosophers subsumed psychology under physics as one of its so-called subaltern sciences.

In this chapter, I first look at Avicenna's discussion of the cause of the activities associated with a living body, which he identifies with the soul, as well as those life activities themselves. After very briefly discussing Avicenna's comments on the powers of the vegetative soul, I focus on the powers of the animal soul. I begin with his discussion of perception via the external senses, namely, the well-known senses of hearing, sight, smell, touch, and taste, with

a particular focus on the power of vision and the role he sees light playing in vision. I then turn to the so-called internal faculties or senses that Avicenna identifies. As a first pass, internal faculties or senses for Avicenna include, for instance, those acts of sensory perception that do not require the immediate presence of an externally sensible object for that perception, such as remembering some past event, or imagining some future one, or even dreaming of a pink elephant. Also, the internal faculties include instances of sensory acts that involve the awareness of something (perhaps) external that is not immediately perceived by the external senses, like, for example, one's awareness that time has passed (time's passing is certainly not directly seen, heard, or the like) or perceiving that some food is good to eat (it might have a particular smell or visual appearance but these are different from recognizing that it is good to eat). Here, I look at the criteria by which Avicenna deduces his list of the various kinds of internal faculties with a particular focus on the compositive imagination and cogitative faculty. An understanding of Avicenna's conception of sight and light as well as the roles of these internal senses, helps pave the way for appreciating his account of the human intellect and its proper act of cognition, as well as his account of self-awareness, which are the subjects of the next chapter.

Soul and Life

For Avicenna, as has been noted, sciences are concerned with uncovering and investigating the causes of various phenomena. Consequently, the science of psychology is primarily interested in the cause (or causes) belonging to living bodies that explains that set of activities unique to them as living. Thus, in I.1 of the *Psychology* of the *Cure*, Avicenna begins by pointing out that it is simply a matter of empirical observation that certain bodies sensibly perceive and move about voluntarily, as well as taking in nourishment, growing, and reproducing. These activities, he continues, cannot belong to them simply inasmuch as they are bodies, for otherwise all bodies would manifest these activities, which they clearly do not. A stone may be split in two or fall to the ground, but no one would say that in such cases it has reproduced or moved around of its own will. Given this difference between the natural activities of different kinds of bodies, living bodies must have some other principle or cause in addition to their mere corporeality. It is

this principle for Avicenna that explains why those bodies perform these very activities that distinguish them from nonliving bodies. The cause or principle "out of which these activities issue and, in short, anything that is a principle for the performance of any activities that do not follow a uniform course devoid of volition," Avicenna concludes, "we call 'soul' (*nafs*)" (*Psychology*, I.1, 4.5–7).

While Avicenna has introduced the notion of the soul very early, it is important to note that his conception of the soul, at least as presented here, is not a metaphysically loaded one. It is merely a tag to indicate that thing or things, whatever it or they might be, that living bodies have that nonliving bodies lack and on account of which the living bodies do those activities that define them as living. Any of the religious or metaphysical biases one might have about the term "soul" need to be left behind at this point. It may turn out that, in fact, the soul (or at least some souls) can, for example, survive the death of the body, receive eternal blessing or punishment, and the like, but such positions require independent demonstrations, and cannot simply be inferred from the fact that souls, understood as animating principles, exist. For, as Avicenna insists, "for now, we have established the existence of something that is a principle only of what we have stated [namely, it is a cause of various activities associated with being alive] and [then only] in the sense that it has a particular accident" (*Psychology*, I.1, 4.10–11). The accident in question is that the soul has a certain relation to the body, since "relation" is understood as one of the traditional Aristotelian categories of accidents. In other words, the foregoing proof that souls exist tells one nothing about what Avicenna calls "the substance of the soul" and what belongs to the soul in itself, but only that it is something related to the body that explains the activities in question. In this respect, Avicenna emphasizes that he has merely established that there is a certain mover for the activities of a living body but not what that mover is (ibid., I.1, 5.2–3).

Avicenna's focus thus far, and indeed a focus that continues throughout his *Psychology*, is on the activities, motions, and changes associated with being alive. In Avicenna's time, just as today, philosophers, psychologists, and biologists alike were hesitant to give a simple definition of life. Instead, they preferred to give a list of activities or functions by which one can identify a living thing. In broad strokes, Avicenna, following Aristotle, divides this list into three general sorts of activities (*Psychology*, "preface," 1): those activities associated with the most basic life forms, namely, plants, and include the activities of self-nourishment, growth, and reproduction; those

activities associated with higher life forms, namely, animals, and include, as a minimum, sensation (at least touch, which could register pleasure and pain), while in higher animals would encompass all of the senses as well as the activity of volitional motion; and finally, that activity or function that ancient and medieval natural philosophers viewed as setting humans off from brute animals, namely, understanding or intellection (*'aql*).[1] The possession of a vegetative soul, then, explains why plants are able to nourish themselves, grow, and reproduce. The possession of an animal soul not only encompasses all of the activities definitive of plant life, but also explains why animals can perform the various activities unique to them. Finally, possession of the human soul explains all of the aforementioned lower activities, plant and animal alike, as well as the proper human activity of thought.

In his smaller encyclopedic work, the *Salvation*, Avicenna explains that the soul belonging to a living thing is dependent, in large part, upon the elemental mix that makes up the natural body of the living thing (*Salvation*, "Psychology," 1, 318.2–4). As noted in the previous chapter, for Avicenna there are four basic elements: earth, water, air, and fire. The element earth, recall, was associated with the qualities of cold/dry; water with cold/wet; air with hot/wet; and finally fire with hot/dry. Each of these qualities is in turn also associated with certain very basic powers: acting on in the case of hot, being acted on in the case of cold, while wet has the power to receive and dry the power to retain. It was believed, then, that the more well balanced the elemental mixture constituting a body, the larger the range of activities that that body can potentially perform.

The elemental mix then is preparatory for the body's having the soul that it does (and thus for performing the activities that are definitive of whatever species of life to which it belongs); nonetheless, it is the soul according to Avicenna that completes and perfects the body with respect to its species. Consequently, he argues that since the soul belongs to the given body, and indeed perfects the existence of that body such that it is actually a specific plant or animal, the soul must belong to the very subsistence of that body (*Psychology*, I.1, 5.3–6). In other words, the soul must be related to the body as one of its inherent causes, namely, either that principle by which it is in potency (that is, the material principle of the body) or that principle by which the potency is made actual (that is, the formal principle of the body). Again, the elemental mixture associated with a body explains the *potential* range of activities that belong to it. So, there can be no doubt, says Avicenna,

that the body is that through which the living thing is what it is potentially. Now, if the soul likewise were merely something by which a living body is what it is potentially, then the soul would not in fact complete and perfect the living thing insofar as it is plant or animal. That is because it is not merely potentially being able to perform the various activities that completes and perfects the plant or animal but actually being able to perform those activities. Hence, if the soul only explained the living body's potential capacity to perform the activities associated with life—in other words, if the soul were simply the material principle of the body—there would need to be yet another principle that explains the actual capacity to perform those activities. Yet, as has been seen, the soul is the very principle that explains the actual performance of those activities. Thus, the soul cannot be the material principle of a living body. Therefore, concludes Avicenna, the soul "is a form, or like a form, or like a perfection (*kamāl*)" (*Psychology*, I.1, 6.1).

In fact, Avicenna is hesitant to identify the soul with form, as Aristotle in fact did (*De anima*, II 1, 412a19–20). In the end, Avicenna prefers to think of the soul as a perfection of the natural body rather than a form. In part, this preference reflects Avicenna's adherence to what in fact was the canonical Aristotelian definition of the soul, which Avicenna repeats: "The soul is the first perfection of a natural body possessed of organs that performs the activities of life" (*Psychology*, I.1, 12.6–8).[2] The distinction between first and second perfection, which was already encountered when considering Avicenna's definition of motion, reappears here in his use of "first perfection" to define the soul. In this context, Avicenna writes: "The 'first perfection' is that by which the species actually becomes a species, like the shape that belongs to the sword. The 'second perfection' is whatever comes after the thing's species, such as its activities and passions, like the act of cutting that belongs to the sword" (ibid., I.1, 11.7–10). In short, the use of "first perfection" in the definition is to emphasize that the soul is what completes and perfects the body. The soul is that which gives the body the actual powers to perform those activities definitive of being alive even when the living thing is not actively performing those activities—as, for example, when the animal is asleep and so not sensing or moving—whereas the second perfection is the actual performance of those activities.

Still, there were additional philosophical and historical reasons that also influenced Avicenna's preference for taking the soul to be more properly a perfection rather than a form. For Avicenna, following certain earlier

philosophers,[3] the very essence and existence of a form is spoken of in relation to matter.[4] Form makes matter determinately exist. Hence, while it would be wrong to say that the matter causes the existence of the form, a form for Avicenna cannot exist independently of matter, for again the form essentially informs matter (ibid., I.1, 7.2–6). Consequently, if the soul were simply the form of the body, the presumption would be that it could not exist separate from the body, yet this was a question that Avicenna wanted at least to leave open. Moreover, there were no less than two philosophical traditions flowing into Avicenna's own discussion of the soul: the Aristotelian one, which views the soul as the very form of an organic body, as well as the Platonic or Neoplatonic tradition, which sees the soul as an immaterial substance distinct from the body that merely uses the body in the way, for example, a charioteer uses a chariot.[5] Here again, Avicenna wants to keep these two alternatives alive. Given these concerns, Avicenna plumps for the use of "perfection" when defining the soul. That is because:

> While every form is a perfection, not every perfection is a form. For the ruler is a perfection of the city, and the captain is a perfection of the ship, but they are not respectively a form of the city and form of the ship. So whatever perfection that is itself separate is not in fact the form belonging to matter and in the matter, since the form that is in the matter is the from imprinted in it and subsisting through it (*Psychology*, I.1, 6.13–17).

In fact, as I note later, one of the characteristics that distinguishes Avicenna's psychology from that of most other medieval thinkers working within the Aristotelian tradition is his advocacy of a substance dualism in the case of the human soul or intellect. In other words, for Avicenna the human body and soul are two distinct substances, one material the other immaterial. For, again humans have in Avicenna's mind a unique activity that defines them as humans, namely, rational thought, and in book V, he will argue that this activity can only be accounted for if the human intellect is an immaterial substance.

Despite his substance dualism in the case of humans, Avicenna is keenly aware that even between a human's body and his or her soul there exists a very close relationship. In fact, with the exception of the last book of his *Psychology*, most of Avicenna's psychological work is dedicated to the powers of the souls with respect to bodily functions, such as the external and internal senses, both of which absolutely require a body, and altogether cease with the destruction of the body. As has already been seen, Avicenna

classifies these powers, or faculties (sing. *qūwa*), into three basic sorts: those associated with the vegetative soul, those associated with the animal soul, and finally those associated with the human soul.

Although I consider some of these activities in more detail later, I should at least gesture at them here to provide a general introduction to Avicenna's psychology. Again, Avicenna identifies the activities associated with the vegetative soul with self-nourishment, growth, and reproduction. The first, and most general, divisions of the powers associated with the animal soul are those powers that bring about motion and perception. Motive powers, in turn, might be such as to provide the individual with an incentive to move, whether inasmuch as the individual desires something (the appetitive faculty), or fears/is angered by something (the irascible faculty). Additionally, motive powers include the power distributed throughout the muscles and nerves that actually produces motion in the animal, and thus moves it toward the desired object in the case of appetite and causes it to flee or fight in the cases of fear and anger. The animal's power of perception is also of two sorts: external perception and internal perception. Finally, the human or rational soul, which is also called "intellect," is likewise of two sorts: the practical and the theoretical intellect. As an image to help grasp the relation between the practical and theoretical intellects, Avicenna likens them to two faces of the human soul: the one worldly, the other, as it were, otherworldly. For the practical intellect is turned downward toward the management of the body, being influenced by the body and material needs and desires, while the theoretical intellect is turned upward toward the higher principles and causes, which are the source of all knowledge and understanding (*Psychology*, I.5, 47.14–18; *Salvation*, "Psychology," 4, 332.8–13).

Despite the great diversity of powers associated with living things, Avicenna sees them all as closely interrelated, indeed even forming a hierarchy. It would be best, he says, if one thinks of each of the lower souls as being a condition for what follows. In fact, suggests Avicenna, one might take the vegetative soul as a genus for animal souls, and animal soul as a genus for the human soul (*Psychology*, I.5, 40.4–13). Moreover, there is for Avicenna a relation of "ruler and ruled" found among them. Thus, the theoretical intellect rules the practical intellect, which in turn rules the internal senses. The internal senses are served by the external senses, which provide the former with their contact and raw data about the world. These perceptive powers themselves are served by the motive or moving powers, where the inciting powers rule over the powers that produce motion. The powers of

the vegetative soul are in their turn subservient to the powers of the animal soul. Finally, among the vegetative powers, the power of reproduction is followed in nobility by the power of growth, which is itself followed lastly by the power of self-nourishment.

The Vegetative Soul and the External Senses

The Vegetative Soul

My comments concerning Avicenna's views about the vegetative soul are short because Avicenna's own account is short, consisting, in the *Cure*, of one single small chapter at the opening of his discussion of the external senses (*Psychology*, II.1). In general, Avicenna argues that one must assign plants and animals the powers or faculties of the vegetative soul because one sees them nourishing themselves, growing, and reproducing. They simply could not do these acts if they did not have the powers to do them. The three powers are seen to be distinct from one another since one observes that plants and animals may manifest one of the powers while not manifesting another (save nutrition, which, as noted when discussing the hierarchy of the soul's power, is the most basic of all life activities). Thus, for example, reproduction is different from self-nourishment, since while an infant clearly has the power to nourish itself and grow, it does not yet have the power to reproduce. Similarly, a decrepit or even fully mature plant or animal may stop growing, while not lacking the power of self-nourishment, and thus these powers must be distinct too.

In general, the nutritive power involves the taking in of food or nutriment, and then the body's breaking it down into something like itself, which is then followed by the transmission of the usable nutriment so as to replace what the body has used up. In the case of growth, the aliment has the potential to extend between two adjoining parts of the various organs, muscles, and the like and causes them to move apart and so settle between those bodily parts, in which case the size of the body expands. This expansion, says Avicenna, is not haphazard but ideally is directed toward reaching the plant or animal's perfection of growth, that is, a magnitude that falls within the proper range of size and shape relative to whatever species it is.

In the case of reproduction, Avicenna continues, that power separates off a part of the parent body, namely, the seed in the case of plants, or semen, whether male or female,[6] in the case of animals. The reproductive power, then, inheres in that part. When the matter and place are prepared to receive that part—as, for example, a fertile womb in the case of semen—and that part possessing the reproductive power comes to be present there, the power begins to perform its function. For Avicenna, the proper function of the reproductive power is strictly speaking simply to prepare the matter for the soul that will then complete and perfect the living thing with respect to its species. In other words, the reproductive power merely brings about a body whose elemental mixture is suitable for a soul of the same kind as the parent. It does not produce or educe the species soul by which there actually is an individual of that species. The actual infusion or impressing of the soul into the body comes to be, according to Avicenna, through that immaterial principle that he dubs the "Giver of Forms" (*wāhib aṣ-ṣuwar*), which was mentioned in the last chapter. I shall have more to say about the Giver of Forms, which Avicenna also identifies with the "Active Intellect," in the next chapter and again in chapter 7.

Perception and Abstraction

Like the powers of the vegetative soul, Avicenna has little to say about the various motive powers that belong to the animal. In the case of the motive power that produces motion, certainly the reason for Avicenna's rather superficial treatment of it in the *Psychology* is that it more fittingly belongs to a discussion of anatomy and physiology. As for the powers that incite motion, namely, the appetitive and irascible faculties, they are intimately wound up with the powers of perception (*idrāk*). Thus, it is perception that is for Avicenna the most significant activity of animals (and even to a certain extent of humans, for it is intellectual perception that is our proper function). Given the importance of perception to Avicenna's overall psychology, it is important for one to consider his understanding of this activity in some depth.

According to Avicenna, all perception "is nothing but taking in the form of the perceptible in one way or another" (*Psychology*, II.2, 58.2–3). More precisely, perception involves, in the case of perceiving material objects, the percipient individual's being impressed by either the form (*ṣūra*) or connotational attribute (*ma'ná*) of that object (or even the thing itself [*dhāt*] or

essence in the case of intellectually perceiving, although for the moment I shall set aside such perception).

Most animal perception, then, has as its object either a form or connotational attribute, the two of which Avicenna is very careful to distinguish.

> Form is something that both the internal and external senses perceive, but the external sense perceives it first and then relays it to the internal sense. . . . The connotational attribute is something that the soul perceives from the sensible without the external senses first perceiving it (*Psychology*, I.5, 43.6–11).

The example Avicenna gives in the *Psychology* of perceiving the form is a sheep's perception of a wolf. The sheep sees the color and shape of the wolf; it smells the wolf; it hears its growling; and if it is not careful it feels the wolf's weight upon it. All of these are perceptible features that follow upon the wolf's form, and are all immediately perceived by the sheep's external senses. Via the external senses this data is then perceived by the sheep's internal senses. Thus, for instance, all the data from the external senses is fed into the internal sense of *fantasia*, the so-called common sense (*ḥiss mushtarak*). Avicenna's use of "common sense," a notion that can be traced back at least as far as Aristotle, as is much of Avicenna's discussion thus far concerning sensation, should not be confused with sound judgment or wisdom; rather, it is that internal sense faculty that brings together all the disparate pieces of sensory information into a unified sensible experience, in this case a unified wolf-perception. Should the sheep survive its encounter with the wolf, the form of this unified wolf-perception is in turn stored in the retentive imagination (*khayāl*) or form-bearing faculty (*qūwa muṣawwira*). In short, the sensible form is immediately perceived by the external senses and only then, through their intermediacy, perceived by the internal senses.

In contrast, the *connotational attribute* is perceived only by the internal senses and not at all by an external sense, despite the fact that the connotational attribute is there in the sensible object. So, returning to the sheep example, when it encounters the wolf, one of the things that it perceives is that the wolf is dangerous. Clearly, the perceived danger presented by the wolf is not some color, shape, smell, or the like belonging to the wolf, and yet there is some feature or features about the wolf that the sheep's internal senses recognize and by which it perceives the wolf as a threat. Other examples of connotational attributes given by Avicenna in such works as the

Physics are time, space, and motion. In all of these examples, the connotational attribute is some nonsensible feature (in the sense of not directly perceived by the external senses) that nonetheless belongs to and is conveyed by material things, and so insofar as it is nonsensible it must be perceived only internally.

Given Avicenna's distinction between forms and connotational attributes, it should be no surprise that he distinguishes different kinds of perception. There is perception performed by the external senses, which has just been considered, namely, seeing, hearing, tasting, smelling, and touching. There is the perception of the internal senses, such as imagining, as well as the perceptive operation of the estimative faculty, which I discuss shortly. There is likewise the intellect's perception of universal concepts or intelligibles (sing. *maʿqūl*), such as humanity as opposed to a particular human, a form of perception that is the human's proper act of understanding. While the distinction between forms and connotational attributes goes some of the way toward showing what specifically differentiates the various kinds of perception, it is the degrees of abstraction (*tajrīd*) involved in the particular perceptive acts that Avicenna explicitly uses to distinguish the different kinds of perception (*Psychology*, II.2, 58–61).

In its most general sense, abstraction for Avicenna involves extracting the form, connotational attribute, or even intelligible species from matter.[7] Avicenna also describes abstraction as peeling away the material concomitants—such as having a certain quantity, quality, or even having spatial and temporal locations—that are the hallmarks of natural bodies studied by both general physics and psychology. Indeed, as was seen in chapter 2, the essences of natural things considered in themselves—which in a very real sense are the proper objects of animal perception—are particularized by their presence in matter, and can be conceptualized only insofar as one ignores, sets aside, or in someway disregards the accidents that follow upon matter. The various degrees of abstraction simply are the various degrees of grasping essences in themselves independent of matter and their relation to matter.[8]

Thus, in sensation, the sensible object, Avicenna observes, is not wholly abstracted from the matter itself (*Psychology*, II.2, 59.11–14). This is clear from the fact that in order for one to perceive sensibly a given material object, the sensible perception requires the very presence of that object. Once the object is removed from the sensory field, the correlative sensation ceases. Thus, while in sensation there is spatial separation between the perceived

material object and the sense organ, the material object must nonetheless remain within the sense organ's immediate field of operation if the perception is to continue.

Avicenna next observes that between sensation and the act of the retentive imagination there is a higher degree of abstraction, and so a different kind of perception (ibid., 59.14–60.10). In the case of imagination, the imagined object is abstracted from the very matter of the object itself and so can be perceived even in the absence of the material object. Still, the imagined object is not fully abstracted from the concomitants or accidents of matter, "since the form that is in the retentive imagination depends upon the sensible form and on a certain quantification, qualification, and position" (ibid., 60.4–6). In other words, an animal cannot produce an image or picture in the imagination that does not have some imagined size, shape, color, and position of its part, all features, as noted in chapter 2, that follow upon matter. Thus, even though imagination, unlike sensation, can operate in the absence of a material concrete particular, it still has a very decided connection with matter.

The degree of abstraction between the retentive imagination and the estimative faculty is even greater (ibid., 60.10–61.5). That is because, as has been seen, the estimative faculty for Avicenna perceives the nonsensible aspects of material things (or even the imaginable aspects, in the sense of forming a picturelike image). Examples of the objects of the estimative faculty are, again, things like the sheep's perception of danger, our perception of space, motion, and time, and here, Avicenna further adds, one's perception that certain things are good or not good.[9]

The final degree of abstraction, where all associations with matter and its accidents are removed, occurs in the case of intellectual perception, which is discussed more fully in the next chapter. To sum up before turning to Avicenna's discussion of the external senses, that activity that defines animals and humans alike is perception. Perception, as Avicenna observes, can be of different kinds that are distinguished by the degree to which the perceptible object is abstracted from matter and the concomitants of matter.

The External Senses

Again the most basic or rudimentary act of perception is sensation. In general, for Avicenna all sensation involves a certain power or faculty, which is

arrayed in a corresponding sense organ, and in the act of sensation that sense organ is impressed by a sensible form proper to that power (*Salvation*, "Psychology," 3, 323.8–10). So, for example, according to Avicenna, the faculty of hearing is a power arrayed in the nerve dispersed on the surface of the ear canal, which is disposed so as to perceive "the form of what is transmitted to it from the air's oscillation between what causes [the air] to vibrate and what receives [that] vibration, [with] the air so oscillating that it produces sound" (*Psychology*, I.5, 42.1–3). When hearing occurs, the eardrum is impressed by these oscillations of the air and vibrates in harmony with them. It is this affection of the eardrum, namely, its vibrating at the same frequency as the oscillating air, that Avicenna identifies with hearing.

As for smell, Avicenna identifies it with "a faculty, [which is] arrayed in the two appendages in the anterior part of the brain resembling two nipples, that perceives what is transmitted to it by the air in the nasal passages, such as the odor present in the vapor mingled with [the air] or the odor imprinted in it through alteration by an odoriferous body" (ibid., 42.5–9). As one might expect, Avicenna locates taste on the nerves spread throughout the tongue, where the sensation of taste occurs when the chewed substance begins to dissolve and the sensible forms of tastes found in it mingle with the salivary fluids so as to effect the tongue (ibid., 42.9–11).

To this point, much of Avicenna's accounts concerning the mechanics and chemistry of the various senses should not to be too unfamiliar to modern readers. The situation changes in the case of the sensation of touch, for, whereas it is common for us to identify touch with a single sense modality, Avicenna has doubts as to whether it is a single, unified modality. He, instead, thinks that the term "touch" (*lams*) encompasses four different sorts of sensation (ibid., 42.11–43.1). These are for Avicenna the categorically different sensations of (1) hot and cold, (2) wet and dry, (3) hard and soft, and finally (4) rough and smooth. The reason that one often thinks that touch is a single faculty, argues Avicenna, is that all four of the powers come together in a single organ, namely, they are arrayed in the nerves of the skin and flesh of the entire body. Like the other sense modalities, however, the various senses of touch involve the perception of what comes into contact with the body and causes an alteration of the bodily temperament and elemental configuration, such as, for example, the hot/cold and wet/dry features that in a sense are constitutive of the body's elemental mixture.

The final faculty of sensation is vision, which I treat more fully in the next section. In summary form, however, this faculty is for Avicenna

arrayed in the so-called hollow nerves—or what we would today call the "optical nerves." Vision occurs when the visible forms are impressed upon the vitreous humor in the optical nerves. More precisely, according to Avicenna, the visible forms are the sensible images of bodies possessing color that are transmitted through actually transparent bodies, such as air or water, to the surface of the eye by means of radiant light, and then from there excite the vitreous humor.

To sum up, then, for Avicenna every case of perception by one of the external senses involves some material object's transmitting a sensible form or sensible species of itself to the relevant sense organ. That sensible form, then, impresses itself on the correlative sense organ, where the corresponding act of sensation is nothing more than that organ's being so impressed. Since this manner of perception involves something's coming from without and impressing itself *into* the sense organ, Avicenna adopts what has historically been termed an "intromission model or theory of perception."

Vision

Avicenna thinks that it is obvious in the cases of taste, touch, smell, and hearing that they occur according to the intromission model of perception, again, the theory that claims that perception involves something's coming from without and entering into the perceiver and impressing itself on the sense faculty. In the case of vision, however, Avicenna observes that there have been differences of opinion: Some saying (Aristotle and Avicenna among them) that, as with the rest of the senses, vision too occurs according to the intromission model, whereas others advocated what has been called an extramission model of vision.[10]

According to the extramission model of vision, seeing takes place not by something's entering the eyes, but by something's exiting from the eyes, whether it be some sort of ray, as the mathematical models of Euclid and Ptolemy assumed, or an optical *pneuma* or spirit that purportedly alters the surrounding air so as to make it usable as a tool by the animal's visual system, as the materialistic model of the Stoics and the physician Galen required. While the extramission theory of vision might seem odd to us today, it had some apparent advantages over the intromission theory that made it a real contender in at least the ancient and early medieval periods. First, one does not have to countenance specterlike sensible forms being transmitted

through the air or other medium. Second, if perception is nothing more than the reception of a sensible form, as the intromission model of perception maintains, and the intervening air or water between a given sensible object and a perceiver are also receiving the sensible form, it seems that, based upon the intromission model's own principles, the air or water should likewise perceive those forms.[11] Such a problem obviously does not arise for the extramission theory. Third, and arguably the most significant reason for adopting the extramission model, is that it allowed for an elegant mathematical explanation of a number of problems related to visual perspective, as, for example, why an object appears smaller the farther it is away from the perceiver. So, for example, Ptolemy in his *Optics*, maintained that a visual flux emanates from the eye so as to form a cone. The introduction of a cone, then, allowed Ptolemy to apply simple geometrical theorems and explanations to physical problems associated with vision, such as, again, explaining the relative size of objects seen at different distances, as well as several other such phenomena. In this instance, he simply lays it down that the smaller the angle through which an object is seen, the smaller the object appears. Thus, consider the diagram presented in figure 4.1. Let the object EF initially be seen at some distance such that it forms the angle BAC. Next, let EF be moved to a further distance and call it E′F′. In this case, E′F′ is now seen through the smaller angle DAC. Given this situation, Ptolemy simply claimed that since the angle DAC is smaller than the angle BAC when EF is further away, E′F′ (again that is EF at the farther distance) in fact appears smaller, just as we perceive it.

Despite the advantages that an extramission theory might bring, Avicenna ardently defended the intromission model of vision. In fact, so much so that he dedicates the whole of book III of his *Psychology* to developing his own version of the intromission model of vision as well as presenting and severely

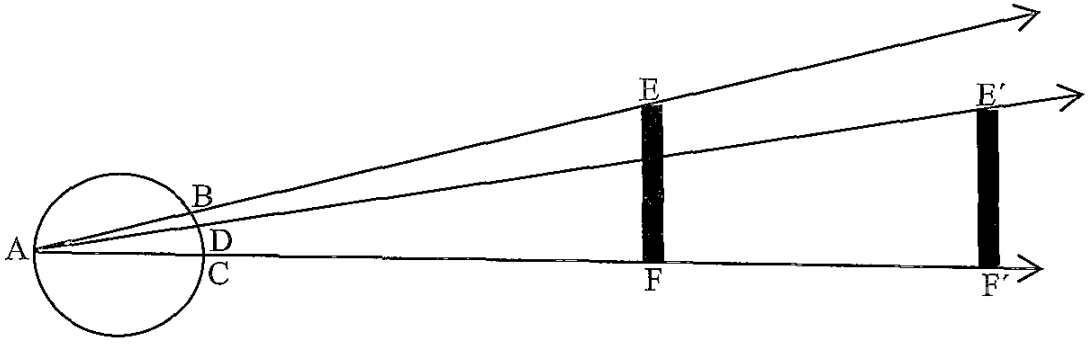

FIGURE 4.1.

criticizing opposing theories. The major proponent of the intromission theory in the ancient world was Aristotle; however, Avicenna's own adherence to that theory is not due to any slavish devotion to Aristotle, since in many respects Avicenna's theory of vision and its accompanying theory of light are radically different from Aristotle's. Indeed, Dag Hasse[12] has brought to our attention the fact that Avicenna's mature theory of light—which is closely connected with his theory of vision—is not at all the standard Aristotelian account, where light is understood as the state or affection of the medium when that medium is transparent.[13]

Avicenna, instead, has other reasons for preferring the intromission theory. First, it gives a symmetry or simplicity of explanation to his overall account of how external sensation works, and indeed, to how all the various kinds of perception work, internal sensation and intellection included. Second, Avicenna's own variety of the intromission theory represents what might be thought of as the cutting edge of optical theory of his time.[14] Third, and finally, for virtually all ancient and medieval cognitive theorists alike, human cognition is modeled on one's model of vision. A number of the innovations that Avicenna introduces in his theory of vision are in no doubt motivated by a desire to accommodate certain novel features of his own account of how intellectual perception works. Having said that, let me turn to Avicenna's optical theory.

Avicenna's Theory of Light and the Transparent

In a move that anticipates modern optical theories, Avicenna intimately joins his theory of vision with a theory of light. Thus, book III of his *Psychology* begins, "We now should discuss vision, but discussing it requires discussing light, the transparent, and color, as well as how the connection between sensation and the visible object of sensation occurs" (*Psychology*, III.1, 91.1–3). What immediately follows in the first chapter of this book is an in-depth discussion of the vocabulary of light. Avicenna begins by noting that as a matter of linguistic convention the Arabic terms *ḍaw'*, *nūr*, and *shuʿāʿ* are often used interchangeably, all roughly corresponding with "light." For the purposes of discussing vision, however, he wants to assign each term a technical meaning. In the present context Avicenna says that he is not particularly concerned with *shuʿāʿ*, a term that one can safely translate as "ray," and which I discuss more thoroughly later. Instead, here he focuses

on *ḍaw'* and *nūr*. The first term, *ḍaw'*, one might render as "luminous light." Luminous light is that which is observed when one considers luminous bodies like the Sun or fire without taking into account the light's color, as, for example, its being yellow, white, or red. Such light belongs essentially to luminous bodies, and it is by that luminous light that those bodies themselves are essentially visible. He next defines *nūr* as "the thing that radiates (*yasṭa'u*) from [the body having luminous light], and is then imagined to fall upon bodies, in which case [this type of light] will appear white, black, or green" (ibid., III.1, 91.8–9). For present purposes, one can term this kind of light "radiant light."[15]

Having provided general descriptions of luminous light and radiant light, he now approaches them from a different angle, namely, the bodies to which they belong. He notes that there are two classes of bodies. On the one hand, there are those bodies that when positioned between a would-be-perceiver and a luminous body, such as fire, hinder the perceiver from seeing the luminous body behind them. They are what one might term "opaque bodies." On the other hand, there are also those bodies, like air and water, which do not hinder one from seeing a luminous body that is positioned behind them. Such bodies are, Avicenna notes, "transparent" (*shaffāf*). Opaque bodies are again of two kinds: those that are themselves luminous, and those that are not. So, for example, a wall of fire, which is a luminous body, can just as effectively prevent one from seeing some light on the opposite side of it as a brick wall. The class of bodies that are self-luminous can be seen of themselves and need nothing further to be seen except that the body between them and the perceiver be a transparent one. Nonluminous, opaque bodies, however, cannot be seen merely given a transparent medium but need something else. Avicenna identifies nonluminous, opaque bodies with "colored objects," which, if they are to be seen, need the radiant light of a luminous body in addition to a transparent medium.

Up to this point most of what Avicenna has had to say about light, while, certainly going beyond Aristotle and the Aristotelian tradition more generally, is not at odds with that tradition. Where Avicenna's position is at odds with the Aristotelian account concerns the states of potentiality and actuality of transparent and colored objects. On the traditional Aristotelian theory, color is in a sense always actualized. It is only the medium, according to Aristotle, that is sometimes potentially transparent, and so actually dark, while at other times actually transparent and so light. That is because in

Aristotle's technical sense, light simply is the state of the actually transparent medium as such. Thus, for Aristotle a colored object fails to produce sight in a properly situated perceiver, not because there is no actual color in the object, but because the tool, namely, the medium, by which color acts upon the perceiver, is not in a proper state, that is to say, the medium is not at that time actually transparent and so light. Stated another way, the potentially transparent, that is, the dark, acts as an obstacle that prevents vision. In short, on the traditional Aristotelian model, color is always actualized, whereas it is only the medium that is in either a state of potential or actual transparency.

In contrast, for Avicenna, media, such as air and water, are strictly speaking always actually transparent, whereas it is color that might either be in a state of potentiality or actuality. Thus, he writes:

> Don't suppose that white, red, and the like actually exist in the bodies in the way that they are seen but that the dark air prevents the vision of it, for the air itself is not dark. What is dark is only that which itself receives the radiant light, whereas the air itself (even if there is nothing luminous in it) does not hinder the perception of that which receives the radiant light nor does it conceal the color when it exists in something (*Psychology*, III.1, 93.6–11).

He continues that in the absence of a luminous or radiant light one simply imagines that the air is dark. In that situation, because no light, luminous or radiant, is present, there is nothing stimulating one's visual system. Thus, it is not that one is "seeing" darkness; rather, one is simply not seeing at all. Avicenna likens this case to either being blind or having one's eyelids closed. Now, while Avicenna follows the Aristotelian tradition and occasionally speaks of the "potentially transparent," he is equally clear that a medium's becoming actually transparent does not involve any alteration in the medium itself. Instead, it involves an alteration or motion in another, either by some luminous body's moving into a given place or a radiant light's falling onto a colored object.

As for the term "color" (*lawn*), in its proper sense, Avicenna continues, it refers to the phenomenal colors, white, red, green, and so on, namely, the colors as we see them. One is simply using the term "color" equivocally, says Avicenna, if "color" is meant to refer to "various dispositions that are in the bodies, which when they receive luminous light, one of them comes to be something that we see as white and another as red" (ibid., III.1, 94.10–12).

Instead, in those bodies that are not luminous, and so not visible in themselves, a radiant light coming from a luminous body must fall upon them and blend or mix with the potential color or disposition in the body. The resultant of this mingling of radiant light and potential color is for Avicenna what one, then, perceives as the actual perceptible color (*Psychology*, III.3, 103).

Sometimes Avicenna speaks of the actual color that emanates from the illuminated body—which again is the combination of radiant light and potential color—as itself "luminous light" (*ḍaw'*), but since he almost as frequently also uses the term "ray" (*shu'ā'*), I shall use this latter term in order to avoid possible confusion. Thus, at *Psychology*, III.7, he says that a ray is what connects (*ittiṣāl*) the visible form or sensible species in the perceived object—namely, actual color—with the visual system of some perceiver in order that the object "might project its sensible image (*shabaḥ*) to the [perceiver]" (*Psychology*, III.7, 142.4–5). Also at *Psychology*, III.1, where Avicenna initially discussed light terms, he there defined "ray" as "the thing that is imagined, as it were, to well-up [from colored bodies], cloak their color, and then emanate (*yufīḍu*) from them" (ibid., III.1, 91.10–12). Avicenna more frequently expresses this sense of a ray's welling up and emanating from the body by saying that light has been reflected (*in'ikās*) from the body.[16]

Refutation of the Extramission Theory

Certainly one of the more historically important aspects of Avicenna's optical theory is his thoroughgoing criticism of the extramission theory of vision, which I mentioned at the beginning of this section, a criticism, I might add, that exploits his innovative thoughts about the nature of light and rays. Thus, returning to Avicenna's understanding of visual rays, he additionally claims that when one sees some visible object, the rays, which convey the object's sensible image, form a cone, whose base is at the sensible object and whose vertex is at the back of the crystalline humor that forms part of the eye. The sensible image projecting from the visible object affects the eye at the surface of the crystalline humor, rather than at the back of it where the vertex of the visual cone has fallen. Consequently, the sensible image affects the eye at a section of this visual cone, such as, the arc AB in figure 4.2. He next asserts that, "if the angle [at which the sensible image falls upon the surface of the crystalline humor] is larger because the thing is nearer, the

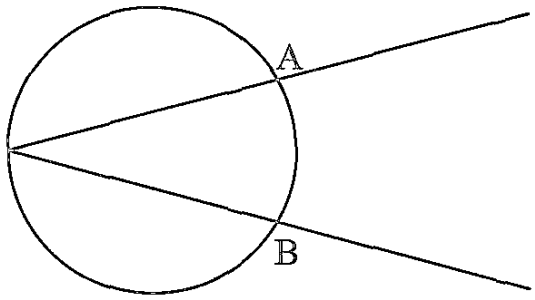

FIGURE 4.2.

section is greater and the sensible image in it is greater, whereas if the angle is smaller because the thing is farther away, the section and sensible image that is in it are smaller" (*Psychology*, III.5, 124.17–19). In effect, Avicenna's theories of light and color and the optical rays formed from their mixture allow him to appropriate what was seen as perhaps the greatest strength of the extramission theory, namely, its introduction of a visual cone that provided for the application of mathematical explanations to various problems of perspective. The real difference between Avicenna's intromission model and the earlier extramission model is that while the mathematicians had thought that the rays emanate from the eyes of the perceiver, Avicenna maintains that rays of light emanate or are reflected from the visible objects themselves and then impinge upon the visual system.

Having shown that his account has at least equal explanatory power as the extramission theory purportedly does, he goes on to argue that in fact the extramission theory cannot even take advantage of the very geometrical analysis that was thought to be its greatest strength. Avicenna argues thus: If vision involves a ray that purportedly emanates from the eyes and it comes into contact with a visible object, where the perception of that object results from the contact of that ray, then, when that ray extends to where the visible object is, one should in fact perceive the visible object according to how big the object actually is. That follows, maintains Avicenna, because the perceiver is in actual contact with the whole of the object according to its actual size via the ray emitted from the perceiver's eye. So, for instance, when there are similarly sized objects that are at different distances, the perceiver should not see them as appearing either smaller or larger just as one would not feel them as either smaller or larger even if one touched the very same object at a further distance. Moreover, if the extramission theorists claim that something comes back down the visual ray such that vision

takes place in the visual system of the perceiver, then, complains Avicenna, the emanation of rays from the eyes is redundant, since one needs merely posit, as Avicenna himself has done, that rays emanate from the visible object, either owing to the object itself in the case of a luminous body, or owing to rays reflected from the object in the case of a colored object. In short, Avicenna's intromission theory is just as empirically adequate as the extramission one, while also being the simpler scientific explanation.

Certain physical absurdities, notes Avicenna, also result from the extramission theory. For example, among the things that one sees are the stars of the outermost heavens. Consequently, any animal capable of such vision, were the extramission theory correct, would need to be able to produce enough optical *pneuma* or visual flux to form a cone that extends to the outermost celestial sphere. This optical cone that is purportedly produced by the animal, Avicenna hastens to add, would at its base take in nearly one whole hemisphere of the heavens. Thus the animal, whose size when compared with that of the heavens is negligible, would be required to produce a staggering amount of optical *pneuma* or visual flux every time it peaks at the heavens. Additionally, this cone would have to be formed virtually instantaneously with the opening of the eyes. Moreover, mocks Avicenna, in the case of the Galenic account—where the optical *pneuma* alters the air so as to transform it into a tool or organ of sight—it should be that when many viewers are gathered together the amount of optical *pneuma* is of a larger quantity and so everyone's sight should be sharper, or, at the very least, those of poor eyesight should see better. Avicenna finds the consequences of the extramission model simply beyond credulity. In the end, he concludes, the purported mathematical and naturalistic explanations that initially made the extramission model seem attractive simply are not there.[17]

To finish up Avicenna's theory of vision, let me briefly consider his views concerning the physiology of vision (*Psychology*, III.8, 151–154). I have already noted that, for Avicenna, vision requires that the sensible image of a visible object be conveyed through a transparent medium via rays emanating from the visible object itself. These rays, which apparently emanate in all directions, again form a cone relative to a properly functioning visual system in a perceiver that is facing the visible object, where the vertex of that cone falls at the back of the crystalline humor, which makes up part of the eye. Once this sensible image impinges upon the eye, it stimulates or impresses itself on the crystalline humor; however, there is not vision at this point, Avicenna insists, since if there were, there would be two distinct

sensible images in the two eyes, and the single visible object would be seen as two. Instead, the sensible image is transferred via a conveying *pneuma* (*rūḥ*)[18] along the optical nerves, to the optic chiasma (*ṣalīb*), at which there is then vision.

After reaching the optic chiasma, the sensible image impressed in the *pneuma* is then conveyed to the anterior ventricle of the brain where it is again impressed upon the common sense—which is one of the internal senses that I shall take up in more detail in the next section. It is in the common sense that there occurs "the perfection of vision" (*Psychology*, III.8, 152.8), as Avicenna calls it. After the sensible image appears in the common sense, it passes on to the retentive imagination, also called the form-bearing faculty, which is arrayed behind the anterior ventricle of the brain where the image is stored until it is called up by the estimative faculty. At the time that the image is needed, Avicenna writes:

> [The estimative faculty] opens up the *cerebellar vermis* (*dūda*) by removing what is between the two porous appendages (which [just] are the *cerebellar vermis*) and [the form that is in the retentive imagination] conjoins with the *pneuma* harboring the estimative faculty by means of the *pneuma* harboring the faculty of the compositive imagination (which in humans is called the cogitative [faculty]). The form that is in the retentive imagination is then imprinted onto the *pneuma* of the estimative faculty, and the faculty of the compositive imagination, which serves the estimative faculty, conveys what is in the retentive imagination to it (*Psychology*, III.8, 153.10–14).

In the next section, I consider the various internal faculties mentioned in this passage in more detail. For now, however, this should give one at least a sense of how Avicenna sees data derived from vision, and indeed the external senses in general, being internalized and then stored in the brain.

Before turning to the internal senses, let me quickly sum up the most salient points of Avicenna's optical theory. Light is of two types. There is luminous light, which belongs to certain bodies like the Sun and fire, and by which these bodies are visible in themselves. Additionally, there is radiant light, which radiates from luminous bodies and mixes with the potential colors of certain other types of bodies. Thereafter the mixture of radiant light and potential color forms a ray that is reflected from the visible object. When this ray is connected with a perceiver who is facing the visible object, a sensible image of the visible object projects toward the perceiver and is seen as actual color, and therein there is vision.

The Internal Senses

Certainly one of Avicenna's main contributions to the science of psychology is his exploration and mapping of the so-called internal sense faculties. Indeed, many of the various operations that Aristotle had previously subsumed under the single internal sense of *phantasia*, Avicenna would disambiguate in a principled way. Moreover, despite the fact that Avicenna, as will become clear, is a dualist when it comes to the human intellect and body (that it to say, he believes that the intellect is an immaterial substance wholly distinct from the material substance of the body), he, nonetheless, assigns a large portion of our daily cognitive operations to the internal senses, and even grants that the activities of certain internal senses are at least preparatory for the intellect's operation.[19]

Avicenna identifies five internal senses: (1) the common sense (*ḥiss mushtarak*), also sometimes called *fantasia*; (2) the retentive imagination (*khayāl*), which he also terms the form-bearing faculty (*qūwa muṣawwira*); (3) the compositive imagination (*mutakhayyila*), which in humans is transformed into the cogitative faculty (*qūwa mutafakkira*) when it is being used by the intellect; (4) the estimative faculty (*qūwa wahmīya*); and finally (5) memory (*dhikr*). Avicenna's identification of these five internal powers is not haphazard but is the result of three distinct principles of faculty differentiation (*Psychology*, I.5, 43.1–44.3): (1) the principle of differentiation between different cognitive objects; (2) the principle of differentiation between receptive and retentive powers; and (3) the principle of differentiation between active and passive powers.

The Principles of Faculty Differentiation

The first principle, namely that faculties are differentiated on the basis of different cognitive objects, is one with a prestigious pedigree going back at least as far as Plato.[20] Still, Avicenna's application of this principle is unique because of his distinction between forms and connotational attributes, which was seen when considering one of the ways that Avicenna distinguished external from internal senses. To repeat some of that discussion again, forms, for Avicenna, are those objects of perception that are immediately grasped by the external senses and then, through the intermediacy of the external senses, are perceived by the internal senses. Connotational attributes, in contrast, are in no way perceived by the external senses but

only immediately by the internal senses, as, for example, perceiving that a wolf is dangerous, or that time has passed, or even that something is good or not good. In short, connotational attributes are nonsensible features inherent in material objects. Based on this principle of faculty differentiation Avicenna, then, distinguishes between the power of common sense (or *fantasia*), which perceives sensible forms, and that of the estimative faculty, which perceives connotational attributes.

The next principle of faculty differentiation involves the differences between receptive and retentive faculties. Avicenna bases this principle upon another one that is familiar within the Aristotelian psychological tradition, namely that a single power cannot both receive and retain its proper object. The reason for this limitation on a single power is that ultimately the internal senses are for Avicenna physiological faculties or powers harbored in the brain. In other words, they are corporeal. As such they have definite powers, qualities, and even limitations based upon the elemental makeup of that part of the brain where they are harbored. So, for example, when a given internal sense receives its proper object, that object impresses itself onto the internal sense. Being impressed, however, requires that the sense organ's compositional makeup have a certain degree of fluidity or malleability, which for the ancient and medieval scientists would be due to a predominance of elemental water existing in that organ. In contrast, what explains some impression's being retained and being stable is the qualitative dryness of the organ, which according to ancient and medieval chemistry is explained by a predominance of elemental earth in the organ. Hence, if the same organ were both to receive and to retain its proper object, it would simultaneously have to be predominantly wet and dry. Since these are contrary qualities, a single power's both receiving and retaining its proper object would involve a physical absurdity. Consequently, concludes Avicenna, different faculties must be assigned to these different functions: The common sense, as noted, receives the sensible forms, while the retentive imagination retains them, and similarly the estimative faculty receives the connotational attributes, while memory retains them.

The final principle distinguishes those faculties that are passive (and so are merely acted upon by their proper objects) and those faculties that are active (and so in some way manipulate their proper objects). To state the same point slightly differently, passive faculties merely perceive their proper objects as those objects present themselves, while an active faculty can alter what has been presented to the animal so that it has a perception

of something new and/or different from what in fact was perceived. For example, my common sense can only perceive the coffee in my cup as tepid and slightly burnt, but I can imagine it as piping hot and fresh. Using this principle, Avicenna thus distinguishes the compositive imagination (which can separate and recombine the retained forms and connotational attributes into new objects of internal sensation) from the common sense and estimative faculties (both of which merely receive and are impressed by forms and connotational attributes).

The Internal Senses

Based upon the best anatomical research of his time,[21] Avicenna placed the common sense in the anterior ventricle of the brain. Its function, as has been seen, is to receive all the forms imprinted on the external senses, which are then conveyed to the common sense. It is in the common sense that the distinct sensory input of each of the external senses is unified into an integrated sensible experience. It is because of this faculty that, for example, I experience the brown-colored, warm, hot-wet, coffee aroma, and flavor with the accompanying slurping sound when I drink it, as a single, unified coffee experience.

After the forms of the external senses are unified in the common sense, the form of that integrated, sensible experience is conveyed to the retentive imagination and stored there until the compositive imagination needs it. Because the retentive imagination bears the sensible forms, it also sometimes goes by the more descriptive name, "the form-bearing faculty." This faculty, Avicenna tells us, is arrayed behind the anterior ventricle of the brain.

Avicenna locates the estimative faculty at the back of the medial ventricle.[22] Its function, as has been noted, is to perceive the connotational attributes, which again are not perceptible to the external senses, but which are nonetheless in particular sensible objects. Avicenna also thinks that the estimative faculty frequently controls the compositive imagination's function of combining and dividing sensible forms and connotational attributes, a point to which I return momentarily. In all animals, other than humans, the operation of the estimative faculty is for Avicenna that animal's highest function. Indeed, even in humans it is the estimative faculty that undertakes most of our day-to-day interactions with the world around us. Thus, as Avicenna repeats frequently in his psychological works, it is the estimative faculty that perceives things like the goodness or pleasantness of some object, as

well as the harmfulness or ire-inciting properties of some experience. Thus, in all animals, humans included, it is the estimative faculty that, for example, recognizes that some ripe piece of fruit is good, or some individual is desirable as a mate. This information is in turn conveyed to the appetitive faculty that incites the motive faculty to move toward the fruit, the potential mate, and the like. Moreover, since in his *Physics* Avicenna also includes things like time and space as objects of the estimative faculty, it seems reasonable to conclude that for him this faculty aids in the animal's maneuvering toward the desired object. So, for example, I have presented Avicenna's explanation as to why the greater the distance an object is from the perceiver the smaller it appears; however, appearing as small or large on one's visual field is different from appearing as farther or nearer away, even if the latter is explanatory of the former. Yet it is knowing or estimating the distance from an object that is important for moving toward that thing. Inasmuch as the estimative faculty perceives things like spatial relations, it would seem that Avicenna envisions it as interpreting two-dimensional visual data as the three-dimensional space in which the animal actually finds itself and through which it has to move. Thus, the animal perceives that its immediate experience is not, for example, of a small berry immediately in front of it but of a medium-sized apple at a distance. In short, the estimative faculty is what sets the appetitive and irascible faculties into action, and then plays an important role in guiding the animal's motion toward or away from some given thing, which, again, for most animals are their most important animate activities.

The faculty of memory, which is arrayed in the posterior ventricle, has for Avicenna the function of retaining the insensible connotational attributes in particular objects perceived by the estimative faculty. Avicenna likens the relation between memory and the estimative faculty to the relation between the retentive imagination and the common sense.

The final faculty of animal souls is that of the compositive imagination, which, when under the control of the human intellect, goes by the name "cogitative faculty."[23] As noted, Avicenna locates this faculty in the medial ventricle of the brain at the *cerebellar vermis*. Concerning it, Avicenna writes:

> We know with certainty that it is natural for us to combine and separate parts of sensibles objects with other parts, not according to the form that we found in them externally nor even affirming that some of them exist

> or do not. Thus, in us there must be some faculty by which we do that. This [faculty], when the intellect is using it, is called the "cogitative [faculty]," while when the animal faculty is using it, it is called the "compositive imagination" (*Psychology*, IV.1, 165.19–166.4).

The compositive imagination is thus characterized for Avicenna by its power "to combine and separate parts of sensible objects with other parts." While such combining and separating can give rise to such fantastical images as paisley elephants with wings, it is neither limited to such outlandish images nor even merely pictorial images. It is in fact this faculty by which the animal may see itself in the future sating some desire, whether for food, a mate, or the like. It is likewise that faculty by which one imagines how certain foods would taste together. It, moreover, gives rise to dreams, whether daydreams or sleeping dreams. Indeed, in humans it is that faculty that vocalizes the words that one hears when one is engaged in internal discourse, and, as one might guess, it also imagines certain shapes, figures, or other images that one might use when trying to solve problems in mathematics or even other practical sorts of issues.

As for the compositive imagination's activity, it sometimes acts independently, and so is not controlled by anything else, while at other times it can be brought into the service of either the estimative faculty or the human intellect. In its free state, its activity of combining and separating sensible images is random and haphazard. Indeed, one might not even be aware that one is combining and separating such images, as, for example, when one has been daydreaming and only later becomes actively conscious that his or her mind has been wandering. Deborah Black describes this faculty in its free state thus: "In its absolute and uncontrolled state, then, the compositive imagination is characterized by incessant activity. That is, by its nature [the compositive] imagination composes and divides images and intentions continually and, as one would say now, subconsciously."[24] When the estimative faculty takes control of the compositive imagination, it puts it to use in order to imagine possible courses of action that are in some way beneficial to the animal: what to use as shelter, or how to obtain some food, or how to attract a mate. It is precisely because the animal's estimative faculty takes control of the compositive imagination and has it imagine possible courses of action that Avicenna believes that the estimative faculty is the highest function of the brute animal, for imagining courses of action is the closest thing to rational thought that nonhuman animals can do.

In humans, the compositive imagination can additionally come under the control of the intellect, and when it is under the control of the intellect, it becomes the cogitative faculty.[25] To be clear, it is *not* that humans have the cogitative faculty in lieu of a compositive imagination; rather, the cogitative faculty is a special name given to the human's compositive imagination only when it is being controlled by the human intellect. The activity (or motions) of the cogitative faculty is, for Avicenna, preparatory for the operation of the intellect. For instance, if one is presented with a geometrical problem, one might imagine a diagram in one's mind's eye, or one might literally talk through a problem in the form of an internally vocalized dialogue. Whether one imagines figures that one then divides, rotates, draws line through, and the like, or one internally vocalizes the propositions of an argument that one is considering, these, and activities like them, are all operations of the compositive imagination. Indeed, they must be since they all involve sensible representations inasmuch as they are internally seen, heard, or the like, and thus have not been completely abstracted from the concomitants of matter. At the instant that one has the "aha" experience, however, that is to say, one perceives the explanation that solves the problem with which one is wrestling, then there is an activity of the intellect. The intellect and its operations, however, are the topic of the next chapter, to which I now turn.