SCHOLASTICISM AND THE PHILOSOPHY OF MIND:
The Failure of Aristotelian Psychology*

1. Introduction

THERE are many kinds of scientific failure: experimental results that are incompatible with or unexplained by scientific theory; the specific invalidation of a given hypothesis; the abandonment of a promising theory. Yet these are not the kind of failure I will address. Rather, I am interested in the most general kind of scientific failure, namely the collapse of a research programme. A research programme need not collapse when a scientific theory is discarded, for the failure of a particular theory may not invalidate the general approach which the particular theory embodies: the nexus of common assumptions, the method of exploration and validation, the promising lines of development and research, even the very terms in which the debate is couched, may well all survive the demise of a particular theory. These features characterize a given research programme—or 'scientific paradigm,' if you will—and their persistence typifies a (reasonably) unified scientific tradition. Conversely, substantial changes in these features, or their wholesale abandonment, marks the failure of a research programme.

The failed research programme with which I shall be concerned is the mediæval articulation and development of aristotelian psychology. Its failure is instructive and complex. Briefly, I shall argue for the following theses: (*i*) the mediæval paradigm for psychology was such that it generated an insoluble problem, namely what I shall call the 'problem of transduction'; (*ii*) that the failure to resolve this problem was instrumental in the eventual abandonment of the mediæval paradigm itself; (*iii*) that its successor, cartesian psychology, is directly indebted to the collapse of the mediæval paradigm. And apart from the historical argument of (*i*)–(*iii*), the failure of

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aristotelian psychology is interesting, for the problem of transduction—and the features of the mediæval research programme which led to its formulation (and perhaps its insolubility)—again occupies center stage, in the burgeoning field of cognitive science.

What psychological mechanisms, functionally defined, have to be postulated to account for the facts of mental life? The contemporary ring to this question is due to its prominence in recent work in cognitive science and the philosophy of mind—largely spurred by issues in the philosophy of psychology and artificial intelligence. Yet the very same question could have been asked with equal propriety during the heyday of the 'aristotelian revolution' in mediæval philosophy, the century of High Scholasticism (1250–1350), which concentrated on issues pertaining to 'mental architecture.' According to the standard 'aristotelian' analysis, the soul possesses cognitive faculties, that is, sensitive and intellective capacities. Less grandly put, they could feel and think with their souls, just as we do with our minds—and that is the question to be discussed here: whether mediæval philosophers found it necessary to postulate a psychological mechanism mediating the cognitive faculties of sense and intellect, and, if so, how such a mechanism functions. The inability of the Scholastic tradition to reach consensus on a response to this question eventually led to the wholesale collapse of the aristotelian approach to the mind.[1]

I proceed as follows: §2 sets forth the elements of the problem of transduction; §3 canvasses the common mediæval understanding of aristotelian psychology; §4 will be devoted to mediæval transductive accounts of understanding, namely abstractive theories and illuminative theories; §5 discusses the rejection of transductive mechanisms and the problems which arise from such a rejection; §6 turns to cartesian psychology and its central theses in the context of the mediæval agenda.

2. The Problem of Transduction

Are there special conditions that a psychological mechanism mediating the cognitive faculties of sense and intellect must satisfy? Zenon Pylyshyn has recently argued that there are; such a mechanism must be what he calls

[1] If anyone wants to quibble with my use of 'mind' as applied to the Scholastics, insisting that this term is misapplied to historical figures prior to Descartes, please feel free to substitute 'soul' throughout; no substantive point will be affected. The aristotelian approach to the mind, whether the discipline be termed 'psychology' or 'philosophy of mind,' was understood to be a scientific enterprise, according to the canons of scientific inquiry of the time.

a 'transducer,' which can be described as follows:[2]

- A transducer is, roughly, a stimulus-bound mechanism which is data-driven by its environment, operating independently of the cognitive system.
- The behavior of a transducer is to be described as a function from physical events onto symbols.
- The function carried out by the transducer is primitive and is itself non-symbolic. At least, the function is not described as carried out by means of symbol processing; it is part of the functional architecture of the mind.

A transducer is a stimulus-bound mechanism in that the input for its activity derives from environmental rather than cognitive sources; as part of the functional architecture, it is at least relatively independent of cognitive processes—susceptible to gross influences such as changing the direction of one's gaze, but not altered by changes in cognitive states such as beliefs or desires. It is data-driven by the environment in that the input, in this case states of the sense-organ(s), is modified by the environment. A transducer, then, is a psychological mechanism which is 'cognitively impenetrable.' To mediate between sense and intellect, a transducer must map physical input, such as the deliverances of the senses specified physiologically, onto output which is 'intellectual' in nature. A minimal condition for being 'intellectual' is that the output be describable symbolically: roughly, that it be language-like at some level, producing as output tokens which may then be susceptible to rule-governed manipulations, as words are grammatically combined into sentences. Yet the function which the transducer performs must itself not presuppose any 'symbolic' operations; it is useless to try to explain the transformation of the elements of sense into elements of the intellect by presuming some form of intellectual operation involved in the transformation. This is precisely the 'homunculus' mistake in the philosophy of mind. Fi-

[2] Three points of disanalogy should be mentioned at the outset. First, Pylyshyn is concerned with any point in a system in which it is appropriate to describe input as 'physical' or 'from the environment' and output as 'symbolic' or 'computational.' Therefore, his concerns are more general, not restricted to what in the case of humans we might call the faculties of 'sense' and 'intellect.' Second, Pylyshyn also argues that the transformation of the input to the transducer, described physically, to the ensuing tokened computational event, also described physically, should follow from physical principles. This claim is in the service of his avowed physicalism, and we shall ignore it here, since for mediæval philosophers the intellective soul is paradigmatically non-physical. Third, Pylyshyn takes 'meaning' to consist in the rule-governed manipulation of tokens, but this is inessential to his account of transduction; all that is required is that the output be 'meaningful' in some sense (which permits Scholastic "mental language" to qualify).

nally, the function accomplished by a transducer is primitive with regard to the rest of the cognitive system (a 'one-step' process): it performs a single operation with no internal cognitive steps.

The question at hand, then, is whether a psychological mechanism meeting these requirements can be found to mediate between the faculties of sense and intellect, which I shall call the problem of transduction. Three principles generally accepted in the Scholastic period made the problem of transduction pressing and acute: (*i*) the difference between sensing and understanding is a distinction in kind, based on the difference between the faculties of sense and intellect (this is not to say that the sensitive soul and the intellective soul are in some sense really distinct entities, although this is the customary mediæval position; a single entity may have qualitatively different features; see n. 7); (*ii*) understanding may be characterized linguistically, so that concepts are thought of as (literally) mental words;[3] (*iii*) the intellect is initially a *tabula non scripta*, so that its mental 'vocabulary' must be acquired. The conclusion typically drawn from (*i*)–(*iii*) is that the 'words' making up the intellect's 'vocabulary' are somehow derived from, or intimately related to, sense—that is, that there must be a transductive mechanism.

Of those mediæval philosophers who accepted the need to posit a transducer, two general accounts of the transducer's function predominated: one group held that the transducer is abstractive, the other that it is illuminative.[4] Those who took the transducer to be abstractive, such as Thomas Aquinas and Duns Scotus, argued that the elements of the sensitive soul are literally taken up and transformed; those who took the transducer to be illuminative, such as Bonaventure, Matthew of Acquasparta, and Henry of Ghent, argued that the elements of the sensitive soul are not themselves operated on but rather viewed in a new light. Other philosophers, such as

[3] The Scholastics vacillate between describing concepts pictorially, with the full vocabulary of 'resemblance,' 'image,' and so on, and describing them linguistically, where the concept is the *verbum mentis*; usually both descriptions are present. The theory of mental language, elaborated by Walter Burleigh, William of Ockham, Jean Buridan, and others, explicitly cashes in on the linguistic approach: there is a fully-developed grammar and syntax of concepts, which have definitions. Yet even prior to the elaboration of mental language, the notion of the the mental 'word' is a Scholastic commonplace, found as early as Augustine.

[4] The debates in the Scholastic period often concerned questions about the transducer's nature as well, specifically whether it was a faculty possessed by each individual soul, a suprapersonal single faculty, or in some sense divine—that is, the controversy with so-called "Latin Averroism." I shall concentrate on the transducer's function, ignoring such other issues.

Peter John Olivi, Durand of St.-Pourçain, and William of Ockham, rejected the need to posit a transducer (or a specific and identifiable mechanism for transduction), arguing instead that no such mechanism is necessary.

These philosophers were all in some sense 'aristotelians'; at least, their scientific research was carried out against the background of aristotelian philosophy, even when Aristotle's own analysis was rejected. Therefore, a preliminary discussion of the aristotelian 'science of the mind' will set the stage for the debates over the problem of transduction during High Scholasticism. First, however, some caveats are in order. Concentrating on a single problem will inevitably distort the actual historical development of positions: by concentrating on mental architecture, I will put aside epistemological worries about knowledge and its justification, which often motivated the debates; by concentrating on transduction, I will put aside issues having to do with *e. g.* perceptual illusion and the physiology of perception. Yet the problem of transduction is interesting in its own right, and organizing the vast quantities of mediæval literature around this problem will allow certain thematic developments and positions to stand out more clearly than they might otherwise. Note finally that the version of Aristotle I present will necessarily be simplified, and indeed I hold no brief for it being Aristotle: it is rather the common mediæval reading of Aristotle.[5]

3. Aristotelian Philosophy of Mind

For the aristotelian, the distinction between the living and the non-living is a matter of the presence of 'soul' (*anima* or ψυχή): an entity postulated to explain obvious differences between the living and the non-living, such

[5] The simplified model of aristotelian cognition presented in §3 is deficient in two important respects. First, it only accounts for occurent sensing and understanding, not for cases in which the external object is absent or otherwise causally inactive. To get around this difficulty, two 'internal senses' in addition to the common sense are postulated, namely imagination or 'phantasy,' and memory. The imagination is a faculty which serves as the storehouse of forms (*thesaurus formarum*), from which such forms could be drawn by memory in the absence of the thing. Second, the model makes no provision for either judgment or discursive reasoning. The former is described in *De an.* 3.6 $430^a 26$–28 as the power of the intellect to engage in 'combination and division,' that is, to combine (affirm) concepts or to divide (deny) concepts. (No sharp distinction is present in Aristotle between juxtaposition, as in 'the white sheep,' and predication, as in 'the sheep is white'; because of this assimilation the power of combination and division is sometimes taken to reside in the imagination rather than the intellect.) These abilities were taken to presuppose the acquisition of concepts, and therefore to be appropriate to a later stage of analysis.

as understanding, sensing, local movement, nutrition, growth and decay.[6] Living beings, composites of body and soul, are paradigmatically things—beings structured and governed by internal principles, unlike, say, mud, fingernails, or the conjunction of my left earlobe and the dark side of the moon. The unity of soul and body is the tightest possible in aristotelianism: soul and body are related as form and matter, where the soul is the form of the body in a literal sense, as that which informs the (merely) physical organic construction which is the body and makes it be the kind of biological unity it is. Just as a given shape organizes a lump of bronze into a statue, so too soul organizes a lump of bodily organs into a living being. Form and matter are generally related as act and potency; the given shape makes the lump of bronze, only potentially a statue, into an actual statue; the shape actualizes the potentialities of the bronze in a determinate way—the shape makes a potential statue (the lump of bronze) into an actual statue, and so may be called the 'actuality' of the statue. Soul, likewise, is the actuality of body.[7] The potentialities of body which soul actualizes—nutrition, growth, movement, sensing, understanding—are present only in a hierarchy: bodies which sense assimilate nutrition, but not conversely. There seem to be three 'kinds' of soul, that is, clusters of principles which are actualized: (*i*) nutrition and growth, as in plants; (*ii*) sensing and movement, as in brute animals; (*iii*) understanding, as in humans. These are known respectively as the vegetative soul, the sensitive soul, and the intellective soul.[8]

[6] See Aristotle, *De an.* 2.2 413^a22–25: "That which has soul is distinguished from that which does not [have soul] by life; but since 'life' is said in many ways, we say here that a thing is alive if any of the following is present: understanding (νοῦς), sensing (αἴσθησις), local movement, as well as the movement implied in nutrition and growth or decay."

[7] Aristotle offers a general characterization of 'soul': "the first actuality of a natural body structured by organs" (ἐντελέχεια ἡ πρώτη σώματος φυσικοῦ ὀργανικοῦ, *De an.* 2.1 412^b5–6). It is the 'first' actuality because there are grades of modal distance from the actual; a sleeping person is in second potency to speech, while someone awake but not speaking is in first potency to speech. The physical body is similar to someone awake but not speaking: it is structured by organs which are connected in the physiologically correct way, but which are not yet animated.

[8] In complex entities, such as human beings, are the clusters of principles which individuate the 'kinds' of soul distinct entities? That is, how many souls are there in humans—one, two, or three? The answer to this question will turn on views about the unity of substantial form. We need not address this issue here; other animals have only sensitive souls while humans have intellective souls as well as sensitive souls, and any analysis of the sensitive soul in humans must be continuous with the analysis of the sensitive souls of other animals. Hence it does not matter whether the souls are really distinct in humans or not, since the principles defining the sensitive soul are

Aristotelian philosophy of mind is constructed around the following central principle: understanding is to be thought of after an analogy with sensing.[9] Thus the analysis of the sensitive soul, itself based on an analogy, will provide the key to the intellective soul. Aristotle describes the process of sensing as follows (*De an.* 2.12 424^a17–24):

> Sense is that which has the power to receive into itself the forms of sensible objects without the matter, just as a piece of wax receives the impression of the signet-ring without the iron or gold [of the ring itself]; what produces the impression is the iron or gold [signet-ring], but not as iron or gold. In a similar way, sense is affected by what is colored or flavored or sounding, but not by what the substance of each of these is; rather, only as having a certain quality, and in virtue of its definition.

An external object causally acts on the sense-organ, such as the eye, putting it in a new physical state.[10] Each particular sense-organ corresponds to a particular sense-faculty; the eye is the sense-organ of the faculty of vision, the ear the sense-organ of the faculty of hearing, and so on. In general, the sense-faculty is the form of the sense-organ—a particular instance of the form-matter relation between soul and body.[11] The signet-ring leaves an impression on a piece of sealing-wax; analogously, the external object acts on the sense-organ to leave in the sense-faculty an "impression." Three points of comparison stand out:

the same in humans and other animals, and humans are distinct in kind from other animals—which is a sufficient difference for our purposes here.

[9] Aristotle enunciates this principle in *De an.* 3.4 429^a12–15: "Understanding is like sensing, and so it is either a process in which the soul is acted upon by what is understandable—or something else which is analogous to that (ἢ τι τοιοῦτον ἕτερον)."

[10] External objects act through the appropriate medium; the details of this causal interaction are dealt with by the appropriate science: in the case of vision, optics. We may ignore the details here, although the tradition of *scientia perspectiva* underlies many of the claims made about perception and the powers of the sensitive soul. Questions arising from this tradition, as for example difficulties dealing with illusion and hallucination—and so the motivation for Peter Aureoli's claims about *esse apparens*—are bypassed in this presentation, as noted in §2. A fuller account would take note of these points.

[11] Each sense-organ is therefore ensouled, a view known as the doctrine of 'animated sense' (note the suggestion that phenomenality is physically interpreted). This doctrine marks one of the great differences between aristotelian and cartesian philosophy of mind: for Descartes, sensations are purely mental events, fortuitously corresponding to events in the soul's associated bodily machine; for Aristotle, sensings are largely physical matters, or at least the functional states corresponding to the physical configuration of the organs—see further §6 below.

- The sealing-wax itself, while possessed of a determinate nature ('wax-hood'), can take on many different physical configurations; it can be stretched, shaped, *etc.*, while still remaining wax. The limits of these possible configurations are determined by its nature.
- When acted upon by the signet-ring, the sealing-wax takes on a determinate configuration; it becomes something new, the 'composite' entity which is the seal. Different seals correspond to different configurations.
- The sealing-wax takes on formal features of the signet-ring, the shape of the seal, but not the material features; the iron or gold of the signet-ring is 'left behind.'

Wax can be in different physical states due to its malleability and ductility, which are part of the nature of wax. The sense-organ, analogously, has a determinate (organic) nature, and its ability to be in distinct physical states is due to the organ being animated—that is, being the material organ of a given sense-faculty, which must be part of a living being; the rods and cones of a corpse's eye do not register the effects of light. While the actual material structure of the eye is part of its organhood, the reactivity of the eye, its receptivity to causal affection, is due to the animated nature of the sense-organ. The sense-faculty, in conjunction with the material composition of the organ, determines the possible physical states the sense-organ may occupy. The sense-faculty is potentially any of the admissible physical states of the organ, as the sealing-wax is potentially any seal. When the sense-organ is put into a new physical state by the causal action of the external object, a 'composite' is formed, as when the wax is impressed by the signet-ring, the composite entity which is the seal is the result. The signet-ring actualizes some of the potencies inherent in the nature of wax so that it becomes determinately wax which is a seal, or wax which is the matter of the seal. In the case of the sense-organ, the new 'composite' is the sensing of the object. The external object actualizes some of the potencies in the sense-faculty so that it becomes determinately a sensing of the object, and the sense-organ in the given physical state is the matter of the sensing. The state of the sense-organ and the sensing are one and the same in just the way that the matter of something and that of which it is the matter are one, namely by being the determinate actualization of a potency.[12]

Now an iron or gold signet-ring impresses its formal structure (a geometrical pattern) on the sealing-wax, but without its matter: the sealing-wax

[12] See Aristotle, *De an.* 412^{a}6–9: "There is no more need to ask whether body and soul are one than whether the wax and the impression it receives [from a signet-ring] are one, or generally whether the matter of each thing is the same as that of which it is the matter; while 'one' and 'being' are said in many ways, the main way is as 'actuality.'"

remains wax rather than iron or gold, and it is 'one' with the impressed pattern, the formal structure of the signet-ring, as a determinate actualization of a potency. The seal is the embodiment of the formal structure of the signet-ring in wax. Analogously, the sensible object impresses its formal structure on the material sense-organ, but without the matter. The sense-faculty formally becomes 'one' with the object, that is, takes on the form of the object—not merely similar features, but identically the same form. The sensing of an object embodies the form of the object in the sense-organ: it formally is the object. The form in the external object inheres in matter, and so makes the object to be the very object or the kind of object it is (say, a sheep); the form as inherent in the sense-faculty does not make the sense-faculty into a sheep, but into a sensing-of-a-sheep. It is one and the same form in both cases, differing only in the mode of inherence.[13]

Sensing is of an object, not of a form (whether the form in the soul or the form in the object)—a fact which immediately leads to a complication.

[13] The form of the visible object is present only as a determinate configuration of the eye, which already has a physical form (retina, cornea, *etc.*) animated by the sense-faculty; the identity referred to here is the identity of the form of the visible object with a determinate physical configuration of the animated eye—a pattern of rod-and-cone firings. Furthermore, the identity must hold between ordered sequences of rod-and-cone firings, not a single static pattern, since objects present different color-expanses at different angles and different distances. The form in the soul and the form in the object have different subjects of inherence. It is a further question whether the forms in themselves, considered without regard to their subjects, are identical or not. However this be resolved, the 'identity' of the form in the object and the form in the soul, despite the different mode of inherence, is a matter of encoding. Encoding is neither a matter of representation nor of isomorphism. Encoding is not representational, since it is the very individual itself which may be encoded. For example, in speaking into a telephone, the actual utterance-token is encoded into a pattern of electrical signals. Encoding need not be an isomorphism, since the 'code' need not reflect all the features of the 'message' in its previous environment (*e. g.* the size of the inscription is not preserved in an utterance of the written message). The point is that in different realms, such as writing, speaking, telephoning, and so on, one and the same pattern, or 'form,' may be encoded; the given realm determines the exact encoding and embodiment of the form, and the form is identically the same in each of these cases. The mediæval analysis talks of the "similarity" of the form in the soul and in the object, but this need not have anything to do with resemblance; there were three categorial senses of 'sameness' in mediæval philosophy, namely identity (sameness in substance), equality (sameness in quantity), and similarity (sameness in quality). To say that the form in the object and in the soul are 'similar' is to assert what we would call their identity. At least, such is often the intention; due to Aristotle's comments about 'natural similarity' (*De int.* 1 $16^a 7$–8) and reasoning based on mental images, some mediæval philosophers explicitly adopted a resemblance-theory of concepts. But there is nothing in the aristotelian theory which forces one to hold this.

The wax is not molded into the exact shape of the entire signet-ring, so that in addition to the iron ring there is a wax one; rather, the wax takes on one aspect of the formal structure of the signet ring, namely the geometric pattern on the face of the ring. The wax is formally identical to the facing shape of the ring, not the ring itself. Analogously, in sensing, the sense-organ takes on an aspect of the formal structure of the object. The faculty of vision is formally identical to the visible elements of the formal structure of the object, the faculty of touch is formally identical to the tactile elements of the formal structure of the object, and so on for each of the five external senses. Now the distinct sense-modalities are usually referred to one and the same object: it is the sheep which looks, feels, smells, *etc.*, a certain way. To account for this unity, an 'internal sense' parallel to the five external senses is postulated, called the "common sense," which unifies the distinct sense-modalities.[14] The common sense functions in exactly the way the external senses: it takes on the various modal forms reported by each of the senses, and is put into a determinate physical configuration. The receptivity of the common-sense faculty to being put in such configurations is a matter of its being animated; the determinate actualization of the common sense's potencies is called the 'sensible species.'[15] Therefore, the sensible species, which is the product of the common sense, includes the totality of the object 'for sense': it unites the three-dimensional colored expanse, the single pungent odor, and so on, into an object—the sheep.[16]

[14] Technically each sense-modality has a domain of 'proper sensibles,' as the faculty of vision is associated with the visible (or, more exactly, with color), and may also be able to incidentally discern 'common sensibles' (motion, rest, shape, magnitude, number, and unity). Thus the faculty of vision reports on discrete three-dimensional color expanses. In *De an.* 3.1 425^a14–28 Aristotle describes the common sense, pointing out that the common sense unifies the proper sensibles of each modality with the common sensibles to produce a distinct sensing of an object. Aristotle also claims that the common sense allows the sense-modalities to be distinguished from one another, but he is not clear that this is by means of the common sensibles or in another manner.

[15] Some terminology. The form, viewed solely as the determinate physical configuration of the sense-organ, is called the *species impressa*. The form viewed as the determinate actualizing of the potencies which are the sense-faculty is called the *species expressa*. A similar distinction applies to the form as affecting the common sense; the determinate actualizing of the potencies which define the common sense is also called the *species sensibilis*. When this determinate actualization is stored in memory, or at least retrieved by memory, it is called the phantasm. The terminology here is not stable. Different authors will regiment the terminology along different lines, and, indeed, individual authors are not always consistent. But this description seems to fit the usage of the majority.

[16] Note that the sensible species does not distinguish between a sheep and a wolf which

To summarize: the aristotelian analysis of sensing turns first on an exact understanding of the form-matter relation of the sense-faculty to its associated sense-organ, and then on treating this relation as a variety of the act-potency relation. The object and the sensing are formally identical. The sense-faculty is merely passive[17] to begin with, and is only potentially its objects (formally speaking). In general, something is reduced from potency to act only by an agent cause, that is, whenever there is some actualizing process going on there is an agent which causes the occurrence of that process.[18] The sensed object is the agent cause of the determinate actualization of the potencies of the sense-faculty. External objects are actually sensible; in standard circumstances, they causally bring it about that they are actually sensed. The distinction of external and internal senses seems required by the evident facts of experience, but each faculty is given the same kind of analysis.

Therefore, aristotelian philosophy of mind endorses a potency-act-cause analysis of sensing. Since understanding is analogous to sensing, it too will be given a potency-act-cause analysis. Understanding, like sensing, is a process of taking on the form of the object:

> [*De an.* 3.4 429^a16–20]: The intellect, although impassible, must be receptive of the form of the object, that is, it must be potentially the same as its object without being the object: as the sensitive is to what is sensible, so too the intellect to what is intelligible.
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> [*De an.* 3.5 430^a22–23]: Actual understanding is identical with its object.

Just as the sense-faculty takes on formal features of the external object, the intellect too takes on formal features of the same object. The faculty in the intellective soul which is passive and receptive (of the form of the object)

is in sheep's clothing, wearing eau de mouton perfume, and the like. Nor should it; we can be fooled by imitations. Nothing in the aristotelian theory insists on the "veridicality" of sensing. The mediæval development of theories of 'intuitive cognition' will bring this point to the fore.

[17] The sense faculty is not totally passive; it is the potency of a living sense-organ, and as such is one step removed from an inanimate receptacle such as a mirror or lump of wax. The point is that sensation must involve an act of the sense-organ, which is something an inanimate object could never provide.

[18] The argument is simple: unless there were an agent cause for the actualization of the potency, there would be no more reason for the potency to be actualized at one time rather than another; hence the process would either always be actualized or never be actualized at all, each of which is evidently contrary to experience. Note that this argument does not require an external cause—Aquinas accepts this stronger claim, but Scotus rejects it.

is called the "possible intellect" or the "material intellect." The reception of the form of the object determinately actualizes the intellect, previously only potentially the same as the object, such that the intellect is actually identical with the object (formally speaking). When the intellect takes on a form and so is determinately reduced to act, it becomes a thinking of the object.[19]

Thus far everyone is in agreement. Yet since nothing is reduced from potency to act without an agent cause, and the intellect is only potentially the same as its object, there must be an agent cause of understanding. The difficulties and disagreements arise with regard to identifying (*i*) the 'form' taken on by the intellect; (*ii*) the agent cause of understanding. Aristotle's remarks that purport to address (*ii*) are famous for their obscurity:

> [*De an.* 3.5 430^{a}14–19]: The intellect as we have described it is what it is because it becomes all things. There is another which is what it is because it makes all things: this is a kind of positive state like light, for in a way light makes potential colors into actual colors; the intellect in this way is separable (χοριστὸς) impassible, and unmixed, since it is essentially an activity—for the active factor is always superior to the passive factor, and the originating cause [is always superior] to the matter.

The possible intellect 'becomes all things': it is the "form of forms," taking on any form of any object. But the sensible species produced by the common sense are only potentially intelligible, just as colors are only potentially seeable until light shines on them. According to one interpretation of this passage, the phrase "there is another" picks out an intellective faculty distinct from the possible intellect, called the 'agent intellect,' which transduces the potentially intelligible into the actually intelligible, as light transforms the potentially seeable into the actually seeable. The agent intellect, then, acts as the 'light of the mind.' According to another interpretation, "there is another" picks out another way of describing the activity of the intellect, and the transduction of the potentially intelligible is a primitive and indivisible function of the intellective soul itself. Philosophers who adopt the first interpretation offer transductive accounts of understanding, those who do not offer non-transductive accounts.

[19] This description suggests that conformality also provides an explanation of intentionality. If so, then is sensing, which is also explained through conformality, intentional? Some distinctions have to be drawn to avoid conflating the phenomenality of pains, the 'pseudo-intentionality' of sensing, and the genuine intentionality of thinking; drawing these distinctions was an important project in Scholastic philosophy of mind.

3. Transductive Accounts of Understanding

3.1 Abstractive Transduction

Thomas Aquinas and Duns Scotus, for all their differences, agree that (*i*) there is an agent intellect which is a faculty distinct from the possible intellect, and (*ii*) the function of the agent intellect is primarily abstractive. With regard to (*i*), that there is an agent intellect distinct from the possible intellect, Scotus offers a straightforward argument for the claim that there is an active principle of understanding in the intellective soul: it is an evident fact of experience that we can understand something not previously understood, and, as this is a nonrelational property (an 'absolute form') in the possible intellect, it must be the result of some action; hence there is an active principle which brings it into existence.[20] Aquinas offers a somewhat different argument: since the forms of material objects (given in the sensible species or the phantasm) are only potentially and not actually intelligible, there must be an active principle which makes them actually intelligible, and this reduction from potency to act requires an agent cause—the agent intellect.[21] Note that on Aquinas's view the agent intellect has two distinct and logically sequential functions: (*a*) preparing the sensible species so that it is actually intelligible; (*b*) "impressing" this prepared sensible species, called the 'intelligible species,' on the possible intellect.[22]

[20] Duns Scotus, *Quodl.* 15.6; there is a similar argument offered in *Ord.* 1 d. 3 p. 3 q. 2 n. 486. The 'active principle' Scotus refers to here is not directly identified with the agent intellect; rather, Scotus argues at length that the agent intellect and the intelligible species function as partial co-causes of understanding, operating together as an integrated principle (in 15.19–35 and nn. 486–503 respectively). Given that Scotus allows for the possibility that the possible intellect is a partial cause of understanding (see n. 23 below), his argument is only effective in establishing that there is an active principle which produces the intelligible species—which is all Aquinas's argument, presented in the next sentence, appeals to. The claim that understanding involves an 'absolute form' is defended by Scotus in*Quodl.* 13 art. 1.

[21] Thomas Aquinas, *Sum. theol.* 1a q. 79 art. 3; see also *Summa contra gent.* 2.72; *De spiritualibus creaturis* art. 9; *Comp. theol.* q. 83; *Quaest. de anima* art. 4; *In De anima* 3 lect. 10.

[22] Scotus is less sure about this: in *Quodl.* 15 he describes two theories, argues for and against each of them, and ultimately does not decide between them—an extremely unusual fact for a mediæval philosopher! The first theory he describes is like that of Aquinas, where the agent intellect has two distinct functions; the second theory restricts the agent intellect to abstracting the intelligible species from the phantasm, and takes the possible intellect to reduce itself from potency to act. (Such a case is possible for Scotus since he has a complex theory of how things can be 'self-movers':

The key premiss in Aquinas's argument is that the forms of material objects are only potentially and not actually intelligible, suggested in the analogy with colors noted above; he justifies this premiss by taking the intelligible species to consist in the universal formal features of the object—which, of course, are not actually intelligible, since they are not apparent to sense.[23] Scotus also endorses this conclusion, saying that "the agent intellect produces the universal from the non-universal... since the universal as universal does not exist."[24] Thus the sense has as its medium the sensible species, which is particular, and the intellect has as its medium the intelligible species, which is universal. The agent intellect is the transducer, operating prior to any occurrent thinking, which turns the sensible species into the intelligible species.

This transduction takes place through abstraction. The universal form is said by Aquinas and Scotus to be 'abstracted' from the particular sensible species, by the removal of its individuating conditions.[25] Aquinas directly identifies the material conditions of the form as its individuating principles, while Scotus does not specify, but we can bypass these details here.[26] The

see his *Quaestiones subtilissimae super Metaphysicorum libros Aristotelis* 9 qq. 17–18; the essentials of the doctrine are alluded to in *Quodl.* 15.85.)

[23] The claim that the forms of material objects are only potentially and not actually intelligible is ultimately taken from Aristotle: see *Met.* 2.4 (994^b18) and 7.3 (1043^b19). Equally, there is solid textual evidence in Aristotle that the intelligible species corresponds to the universal features of the object; see *e. g. De an.* 2.5 417^b23–25.

[24] That is, *cum universale ut universale nihil sit in exsistentia*, *Ord.* 1 d. 3 p. 3 q. 1 n. 360. In this question, Scotus offers a series of arguments showing that there is an intelligible species; he bases his arguments on the possibility that the universal is understood, explicitly putting aside the question of intellective cognition of singulars as irrelevant for this discussion. Scotus, unlike Aquinas, offers a theory of intuitive and abstractive cognition, but the question the theory addresses, namely the 'existence and presence' of the object, does not affect the analysis he gives of abstractive cognition of the universal—a point Scotus explicitly notes in n. 348.

[25] Thomas Aquinas, *Sum. theol.* 1a q. 54 art. 4, q. 79 art. 3-4, q. 84 art. 2 and art. 6, q. 85 art. 1, q. 86 art. 1; *Summa contra gent.* 2.77, *De spiritualibus creaturis* art. 10 *ad* 4 and *ad* 17; *Quaest. disp. de anima* art. 4; *De ver.* q. 10 art. 6 *ad* 2 and *ad* 7; *In De anima* 3 lect. 8 and lect. 10; *De unitate int.* n. 111. Scotus describes the process of generating the universal intelligible species from the particular sensible species or phantasm, as in *Ord.* 1 d. 3 p. 3 q. 1 and *Quodl.* 15, but generally does not use the term 'abstraction' (although in *Quodl.* 15.53 he does so). Notice that both Aquinas and Scotus describe the abstraction as proceeding from the sensible species or phantasm, not from the external object itself.

[26] While Scotus is reticent about details, the obvious conjecture is that the agent intellect prescinds from the 'haecceity,' the individualizing differentia, combined with the common nature in the object. However, it is not clear how to reconcile this suggestion, as

elements of sense are transduced by abstraction into the building-blocks of the intellect's 'vocabulary,' attaining linguistic character in the process. Therefore, a closer look at abstractive transduction is in order.

Despite extreme differences in their respective underlying metaphysics, both Aquinas and Scotus agree that individuating conditions are not formal differences: they do not alter the formal content of the nature of the object which they individuate, but merely render it singular, distinct from others of the same kind; formal differences only occur at the specific and generic levels. Hence the process of abstraction does not formally alter the nature, but simply removes or cancels its surrounding individuating conditions. Yet since the individuating conditions do not alter the content of the form in the individual, the form in itself must have the 'abstracted' features, that is, the characteristics revealed through abstraction, though in combination with the appropriate principle of individuation the form is individualized in the object: the form in itself is 'universal.'[27] Aquinas and Scotus offer subtle metaphysical explanations for how the form in the individual can be individualized and yet universal in itself, and this is not the place to pursue the issue of the adequacy of their explanations; let us take it for granted, as they each did, that some satisfactory account can be offered. Now since the agent intellect operates on the sensible species and not on the object

well as the several places where Scotus talks about the individual particularity of the sensible species or phantasm, with his argument in *Ord.* 2 d. 3 p. 1 q. 1 nn. 20–22 that the object of the senses has a real unity which is less than numerical unity. The case of Aquinas is even more difficult: while holding that matter is responsible for individuation, he seems to have changed his mind about whether designated or undesignated matter is the principle of individuation—and, in any case, since the senses take on the form of the material object without its matter, there is a problem in individualizing the sensible species. (Aquinas's offhand remark in *Sum. theol.* 1a q. 75 art. 6 that the senses operate *sub hic et nunc* suggests a possible way out: the individualization accomplished by material conditions combined with the form in the external thing might correspond to the individualizing conditions of here-and-now combined with the form in the sensing). In any event, my discussion does not turn on the precise details of the account of individuation.

[27] Universality can be distinguished from commonness, as it is by Scotus (*e. g. Ord.* 2 d. 3 p. 1 q. 6), but nothing rides on this technical point: the form in the individual must be 'general.' For Scotus, the common nature is combined with the haecceity in the individual; the common nature is only modally distinct from the haecceity, and so in itself possesses commonness. For Aquinas, there is only a distinction of reason between the form in the object and the form conceived without precision; the form itself includes nondesignated matter, but in the object is combined with designated matter—according to Aquinas's early doctrines. The individualized form must still be in itself universal; both Scotus and Aquinas offer metaphysical explanations for how this is possible.

itself, the form as present in the sensible species must be universal in itself though individualized in the sensible species, in a manner analogous to the way in which the form is universal in itself though individualized in the object. The individuating conditions from which the form is released must be conditions present in the sensible species. The transductive function of the agent intellect, then, is to remove the individuating conditions from the form as present in the sensible species.

If this account, common to Aquinas and Scotus, is an accurate (though general) description of their position, the agent intellect *cannot* be a transducer, because the function it carries out is symbolic and not primitive. More exactly, the distinction between sensing and understanding cannot be maintained, since the faculty of sense must have recourse to conceptual categories at a level from which they have been excluded.[28] To see why this should be so, let us consider the conclusion of the preceding paragraph, that the agent intellect removes the individuating conditions from the form as it is present in the sensible species. In order to do so, sensing itself must be classificatory, that is, the act of sensing must structure the content of what is sensed: objects are sensed as being of a kind. The content of what is sensed can be represented as 'this φ,' where the 'this' represents whatever the individuating conditions may be, and 'φ' is a general sortal term giving the natural kind under which the thing falls. But classificatory sensing, structuring what is sensed in this way, presupposes access to gen-

[28] It is worth emphasizing that this conclusion only follows given the premiss that the form present in the object is combined with individualizing conditions to become individual—and I am indebted to Walter Edelberg for pointing this out to me. Mediæval philosophers who were committed realists, such as John of Jandun or Boethius of Dacia, could avoid this conclusion by holding that (*i*) an individual is composed of forms, at least some of which are universal; (*ii*) the qualitative difference between universal and non-universal features of the individual acts as a 'pre-sorting' mechanism, prior to sense; (*iii*) no transductive mechanism is required. The qualitative difference between the cognitive faculties of sense and intellect, characterized by particularity and universality respectively, is directly traceable to the qualitative ontological differences among the features which compose the individual. Upon coming into contact with an individual, the senses absorb its particular features and 'pass along' its universal features, without operating on them in any way, to the intellect, which simply receives them. On this account, the intellect is solely a passive faculty, and no transductive mechanism is required. There were two large minority traditions during the period of High Scholasticism which endorsed (*i*)–(*iii*): the so-called 'Latin Averroists' and the 'speculative grammarians' (not always sharply distinguished). We shall discuss the rejection of transductive mechanisms in §4, but for now it suffices to note that two reasons militated against this solution: first, metaphysical realism about universals was in general thought to be too high a price to pay; second, the passivity of the intellect was taken to be contrary to experience.

eral terms—to conceptual categories which brute animals are not supposed to have. The form as classified in sensing already has all of the 'abstract' features required for understanding, which requires there to be conceptual abilities in the sensitive soul.

This point can be made more sharply by distinguishing the kind of classificatory sensing the theory of abstraction presupposes from both differential response and sensing what something is like. The former, differential response, does not require conceptual classification; thermostats as well as sheep respond differentially to changes in temperature; it is merely a 'hardware' instantiation of the instruction "in S do A!." The latter, sensing what something is like, is a matter of 'being acquainted' with something, such as wolves. The sheep is 'acquainted' with wolves, responding to the presence of a wolf with fear, without classifying the wolf as something which belongs to a given (natural) kind.[29] The sheep responds differentially to members of different natural kinds, but this is not to be conflated with responding differentially to them as members of different natural kinds; the sheep responds differentially to blue, and is even 'acquainted' with the phenomenal feel of blue, without classifying blue as a color, a species different from green, and the like. The sheep need not even 'sense' the wolf as an animal, much less as an individualized case of wolfhood. Yet for abstractive transduction to perform as advertised, the sensible species must contain such information, such that what is sensed is an object as a member of a natural kind. But this requires conceptualization—the concept 'wolf' and the associated concepts of 'natural kind' and 'membership.' Hence there must be conceptual abilities present in the sensitive soul, and so the agent intellect cannot be a transductive mechanism at all.

Furthermore, if the agent intellect simply removes the individualizing conditions, the essence of the kind, given in the form, must already be determinately present in the sensible species. This renders abstractive trans-

[29] Following Aristotle, Aquinas says that the sheep possesses a 'natural estimative power,' which is the correlate to human 'cogitative power' (*Sum. theol.* 1a q. 78 art. 4 and also q. 81 art. 3; *Summa contra gent.* 2.60.1; *Sent.* 2 d. 20 q. 2 art. 2 *ad* 5), and he even speaks of the sheep judging that the wolf is inimical (*e. g. Sum. theol.* 1a q. 83 art. 1), although the judgment is stigmatized as 'unfree.' But in these passages it is clear that Aquinas is referring to the sheep's hardware configuration, such that when the sheep's common sense is put into a certain determinate class of physical configurations (including the configuration wolf) it will causally actualize the organs corresponding to motivation (*e. g.* heart, adrenal glands, and so on), producing fear and so triggering avoidance behavior. Different animals will have different hardware links to their motivational organs: sheep flee everything, wolves pursue sheep and flee lions, lions pursue everything. There need be nothing 'conceptual' in all this.

duction even more problematic: presumably it is part of the essence of the wolf that it is an irrational animal, yet 'irrationality' is not on a par with colored expanses, discrete tastes, and the like, which are what the common sense unifies in the sensible species.[30] Nor can we 'observe' the wolf's behavior and note that it does not exhibit rationality; the question at issue is how irrationality could be included in the sensible species for the purposes of abstraction, which takes place prior to any thinking—and to 'note' that the wolf's behavior is irrational is an act of thinking.

Abstraction, therefore, does not provide a solution to the problem of transduction. However, an alternate account of the transducer's function was offered by other philosophers, designed to overcome these and other difficulties with abstraction: illumination theories.

3.2 Illuminative Transduction

Aristotle said that things become intelligible through the activity of "a kind of positive state, like light"; the theories of 'illumination' presented by Bonaventure, Matthew of Acquasparta, and Henry of Ghent attempt to cash out this metaphorical description. (There were also other reasons, largely theological, for attempting to develop the 'light' metaphor.) The common thread uniting their theories is the claim that the elements involved in understanding are not present in the sensible species, however inchoate, but are contributed by the transductive mechanism itself. Transduction is accomplished when the agent intellect is guided by the Divine Ideas, which are the ideal patterns or archetypes in God's mind—they are exemplars (or exemplary forms) of mundane objects.[31] The exemplar explains why the mundane object is what it is, and so 'illuminates' the mundane thing: the

[30] This is a general difficulty with any property not strictly composed of proper or common sensibles, but most evident for dispositional or modal properties, such as irrationality and rationality. The difficulty prompted later philosophers, such as Ockham and Buridan, to distinguish sharply between the 'nominal' and the 'real' essence of things, holding that sense merely provides us with a handy grasp on the natural kind (the nominal essence), while it is the task of careful scientific investigation to determine the true nature of the kind (the real essence). This need not entail the rejection of abstractive transduction—the nominal essence could be the product of abstraction—but the argument in the preceding paragraph, that this requires conceptual abilities present in sense, applies as much to nominal as to real essences.

[31] Two distinct and independent reasons, not always distinguished, were combined in arguments for this common thread uniting illumination-theories: (*i*) the claim that unaided human powers are not sufficiently 'powerful' to attain conceptual knowledge; (*ii*) the claim that it would be impossible to have a local transductive mechanism since transduction requires access to Divine Ideas which no natural power can attain. Whereas (*ii*) entails (*i*), the converse does not hold; my discussion is concerned

exemplar is the actually intelligible structure of the mundane object. Thus illuminative transduction takes place when the exemplar of the form in the object plays a role in the process of understanding.

Two features of this account deserve further mention. First, the relation between exemplar and concrete form is not precisely that of instantiation, since the concrete form falls short of the ideal character of the exemplar. Imperfect circles—the only kind found in the mundane world—are neither perfect circles nor instances of perfect circles; they are what they are, namely circular, in virtue of participating in the exemplar. There is no ground in the concrete form itself for circularity. Therefore, abstraction cannot serve as the logical basis for transduction. Second, this account relies on God's activity in making the Divine Ideas available for use in transduction, and so transduction is not merely a local matter of a single individual's mental architecture—but it is no less transductive for all that; mentation need not be a local phenomenon.

Illumination theories have to explain what the 'activity' of the agent intellect consists in and how exemplars function in the process of understanding. On this score, Bonaventure's theory is not very enlightening; he takes the activity of the agent intellect to be the abstraction of an intelligible species from the sensible species, followed by a double impression on the possible intellect of the abstracted intelligible species (called the 'created exemplar') with the Divine Idea (called the 'uncreated exemplar') to produce understanding, which "co-intuits" the created and uncreated exemplars, though the latter only obscurely. This inherits all the difficulties with abstractive transduction, to say nothing of the apparent incompatibility between abstraction and exemplarism.[32] For these reasons, Matthew of Acquasparta and Henry of Ghent reject abstraction, and provide an alternative account of the activity of the agent intellect.

Matthew of Acquasparta holds that the process of abstraction is unnecessary, since forms in themselves are not individualized. The sensible species produced by the common sense is a necessary, but not sufficient, condition for understanding: the agent intellect and the exemplar are partial

with (*ii*), since the factual psychological incapacity asserted in (*i*) leaves the central question unanswered—assuming human cognitive capacities were more powerful, how then would transduction take place? (I am indebted to Joe Camp for pointing out this ambiguity in my account.)

[32] For abstraction in Bonaventure, see *e. g. Sent.* 2 d. 17 q. 1 art. 2 ad 4 and d. 39 q. 1 art. 2; *Itinerarium mentis ad Deum* 2.6. These passages are typical of many. The discussion of illumination here is taken largely from Bonaventure's *Quaestio disputata de cognitionis humanae suprema ratione*. It should be noted that Bonaventure's primary concern is to safeguard necessary knowledge, which requires illumination as well as abstraction.

co-causes of the intelligible species, which the agent intellect then impresses on the possible intellect.[33] In Scholastic terminology, the formal cause of the intelligible species is not the form in the object or the sensible species, as in abstractive transduction; rather, the agent intellect and the exemplar jointly constitute the formal cause of the intelligible species.[34] We understand by means of the exemplar, as we see by means of light. The color of the object and the light by which we see the color are partial co-causes of sight.

Henry of Ghent elaborated these themes to an even greater degree. The agent intellect retains the sensible species in memory as something less fixed and definite, and hence less particular; they are called 'universal phantasms' for this reason—not because they present the essence, but because they do not definitely present an individual.[35] In so doing, the exemplar directly actualizes the possible intellect. Note that there is no call for an intelligible species; the exemplar takes its role, and the exemplar rather than the agent intellect acts on the possible intellect.[36] The activity of the exemplar is due to God's agency; God is even called a kind of 'second agent intellect.'[37]

[33] The sensible species or the phantasm, even taken together with the agent intellect, are not sufficient to produce the intelligible species: see Matthew of Acquasparta, *Quaestiones disputatae de cognitione* q. 2 *ad* 1 and *ad* 12; *Quaestiones De anima* 13 q. 5. It should be noted that Matthew retains the term 'abstraction' to describe the production of the intelligible species by the agent intellect and the exemplar, but the terminology is systematically gutted of its customary meaning—just as Aquinas and Scotus use the vocabulary of 'illumination' without being committed to any of the theory behind it.

[34] Matthew of Acquasparta, *Quaestiones disputatae de cognitione* q. 2: "the material cause of understanding is the external object, from which the [sensible] species of what is to be known is provided, but the formal cause is partially from within, *i. e.* from the light of reason, and partially from above." The 'light of reason' is the agent intellect, and the exemplar is the partial cause "from above." In q. 1 *ad* 22, Matthew also describes these factors as the formal cause of the occurrent understanding.

[35] Henry of Ghent, *Summae quaest. ord.* art. 1 q. 2, which is modified and amplified in art. 58 q. 2; *Quodl.* 8 q. 12 and 9 q. 15. Henry called the process of rendering the clear and lively sensible species into the vague and wispy universal phantasm 'abstraction.' Henry's theories underwent a marked evolution during the course of his career; my account is largely drawn from his later writings—in particular, those works composed after 1279, when he rejected the intelligible species. See Steven P. Marrone, *Truth and Scientific Knowledge in the Thought of Henry of Ghent* (The Medieval Academy of America 1985), for an excellent discussion of the complexities and subtleties of Henry's theories and development.

[36] See especially *Quodl.* 9 q. 15 and, to a lesser extent, III q. 8 and IV q. 9. Some traces of this doctrine are present in *Summae quaest. ord.* art. 58 q. 2.

[37] *Quodl.* 9 q. 15. This suggestion also appears in Roger Marston's *Quaestiones dispu-*

Unlike Bonaventure, in which the created and uncreated exemplars are co-intuited, and unlike Matthew of Acquasparta, in which the exemplar and the agent intellect jointly produce an intelligible species, Henry of Ghent finally came to see that the intermediate stages and doubling of exemplars was an unnecessary complication—that illuminative transduction does not require more than God's agency through the exemplar.[38] The final product of illuminative transduction is the sensible species or its generalized form in the imagination taken with respect to an exemplar.

Particular cases of illumination, therefore, are a matter of taking a sensible species (or its generalized form—hereafter I drop the reminder) as exemplifying, although imperfectly, a natural kind or divine pattern. The sensible species is naturally present in the sensitive soul as a matter of the aristotelian mechanics described in §2 above. In contrast to abstractive transduction, illuminative transduction need not assume that the 'informational content' of the sensible species has internal structure. To keep with the original metaphor, the sensible species is seen "in a new light," as presenting further information. According to the theory of illumination, there is classification taking place—insofar as taking something as exemplifying a divine pattern is 'classificatory'—but it is the work of the intellect rather than the senses. The sensible species is like the famous 'duck-rabbit' drawing: the drawing is what it is, but it may be seen as a duck or as a rabbit, and which the drawing is seen as is due to the intellect and not the drawing. Thus illumination avoids the trap in which abstractive transduction was caught, namely presupposing recourse to conceptual abilities at the level of the sensitive soul.

However, illumination theories as described do not satisfy the requirements for transduction. A transducer is supposed to function without any 'symbol processing,' that is, to perform without presupposing any conceptual capacities. Yet precisely which exemplar a given sensible species is taken to exemplify has nothing to do with the sensible species itself, but rather depends on God's agency in allowing the appropriate exemplar to have causal influence in illumination. And this depends, ultimately, on God's recognition that the sensible species is of a given kind, or caused by

tatae.

[38] This claim needs to be qualified. Henry's philosophical development tends toward this final simplification, but it is hardly as direct as suggested here. Even in its mature phase, as represented by *Quodl.* 9 q. 15, Henry distinguished the possible intellect as material (receptive of the exemplar) and the possible intellect as speculative (able to reflect on its actualization and so gain deeper insight into the exemplar). See Marrone, *op. cit.* 136-137.

a given kind of object, and granting causal power to the appropriate exemplar. But God's recognition is a cognition, and so itself involves conceptual capacities. A homunculus is no better for being divine and omnipotent, after all, and on this account God acts as a kind of 'super-homunculus.' Since the sensible species is not assumed to be structured in any way, nothing short of intellectual recognition on God's part can guarantee equiformity between the object sensed and the exemplar reducing the mind to act.[39] Thus illumination theories covertly appeal to intellectual agency, and so fail to provide a transductive mechanism; as Henry of Ghent says, God is the 'hidden understanding' operating within us.[40]

The appeal to divine agency might be thought less objectionable if the 'agency' in question were sufficiently general, that is, if God does not directly intervene in each case of understanding (called 'special illumination'), but rather structures the world, or perhaps only structures the human intellect, so that the appropriate exemplar is active in the presence of the given sensible species (called 'general illumination').[41] But two distinct projects have to be distinguished, namely describing the function of a transducer and offering an account of what it is to understand. General illumination provides the latter at the expense of the former: understanding is analyzed in terms of the subsumption of a given sensible species under an exemplar, but there is no account of the transductive mechanism, because the analysis of understanding does not provide a mechanism at all—there is no link between the sensible species and the exemplar, other than that provided by divine providence. The intellect is as passive as the senses, each faculty merely receiving the causal efflux of causes external to itself and responding in determinate ways; the 'activity' of the agent intellect has evaporated.

[39] Henry of Ghent offers the argument in this sentence as an argument for illumination: see his *Summae quaest. ord.* art. 1 q. 1 *ad* 7.

[40] Henry of Ghent, *Quodl.* 9 q. 15: God is the *intellegere abditum.* Note that a case could be made for 'deferred transduction': with regard to our faculty of understanding, God's agency is just a primitive and unanalyzable function, which suffices for the purposes of a (local) transductive account of understanding. Different problems entirely are involved in accounting for God's direct, and indeed non-conceptual, knowledge of the world, which may be deferred to different investigations—theological in nature. Yet this is to say that there is no general account of transduction, merely a handy local explanation ultimately resting on the inexplicable. While such a conclusion may be theologically sound, it is philosophically unacceptable.

[41] The term 'special illumination' is also applied to theories in which general illumination is presupposed but God's special and direct intervention is required for certain kinds of understanding, *e. g.* 'scientific' understanding. These theories may be treated without loss of generality as variant forms of general illumination.

Bonaventure allowed the agent intellect real activity, but only at the cost of accepting a theory of abstraction with all its associated problems. Matthew of Acquasparta asserted that the agent intellect cooperates with the exemplar in producing the intelligible species, but does not offer any account of how the agent intellect achieves this cooperation. The agent intellect does have the function of impressing the exemplar on the possible intellect, but, in the absence of any determinate function for the agent intellect to perform on its own, there seems to be no need to retain this vestigial function; the exemplar could inform the possible intellect directly, as Henry of Ghent realized. It is but a short step to giving up the agent intellect entirely; Henry restricts the agent intellect to performing functions Aquinas and Scotus had simply ascribed to sense—retaining generalized images in memory. Thus special illumination fails to be transductive by offering a mechanism which includes an illicit appeal to agency; general illumination offers no transductive mechanism at all.

Neither abstraction nor illumination can provide any satisfactory account of transduction. Other philosophers dispensed with transductive mechanisms altogether, taking the distinction between sensing and understanding not to be mediated by any mechanism—a kind of 'illumination naturalized.'

4. Non-Transductive Accounts

Aristotle's description of the intellect does not entail that the agent intellect is really distinct from the possible intellect, and the investigation of illumination made the agent intellect seem superfluous. Accordingly, William of Ockham denied that the agent intellect is a separate intellective faculty, claiming that the agent intellect and the possible intellect are really one and only distinct in reason.[42] With the elimination of the agent intellect, there was no reason to retain the apparatus of cognitive species, and so Ockham argued that the various functions performed by the intelligible species can be fulfilled by various dispositions (*habitus*) of the intellect.[43]

[42] William of Ockham, *e. g. Ord.* 1 d. 3 q. 6: "the agent intellect is distinguished from the possible intellect in no way; the same intellect has different denominations." See also Jean Buridan, *Quaestiones in De anima* 3 q. 7, who asserts that the intellect is a simple substance called 'agent' or 'possible' with regard to different rationes. (Buridan, however, retains the intelligible species: see *Quaestiones in De anima* 3 q. 8.)

[43] Ockham argues against the intelligible species at length in his *Rep.* 2 q. 15, and in his *Expositiones* refers twice to the eliminability of the intelligible species (once while discussing Porphyry's *Isagoge* 2 and once while discussing Aristotle's *De interpretatione*, prohemium). It is mentioned as well in his *Ord.* 1 d. 2 q. 8 and d. 27 q. 2. He recites the standard list of functions performed by the intelligible species in *Rep.* 2 q. 15: to

Such intellective dispositions are themselves the result of prior causal interaction with the world; Ockham describes their formation through acts of intuitive cognition in the sensitive and intellective souls.[44] Ockham endorses the general claim that "given a sufficient agent and patient in proximity, the effect can be posited without anything else."[45] Applied to ordinary cases of cognition, the 'agent' is identified as the external object and the intellective disposition, as material and immaterial partial co-causes, and the 'patient' is the intellect; the effect is the occurent act of understanding. For the formation of the intellective disposition, the 'agent' is the external object and the 'patient' the sensitive and intellective souls. Hence Ockham simply declares it to be the nature of the sensitive and intellective souls that an object is both sensed and understood when it is present or "in proximity." No transduction takes place; sensing and understanding are distinct effects of the same cause, the former proximate and the latter remote.

The causal analysis proposed by Ockham had previously been rejected by other philosophers, such as Durand of St.-Pourçain, for the reason that material objects could not exert a causal influence on an immaterial intellect; Ockham brushes aside this objection by asserting that they can have such an influence.[46] Yet in order for an object to have such an influence, the intellective soul must have a potency for conceptualizing either the very object or the very kind of object. Hence the intellective soul is either predisposed to do so, presumably by God's ordering of things, or acquires the power on the occasion of causal contact, presumably by God's intervention.

inform the intellect, to unite the object with the potency, to determine the potency to the kind of act, to cause the act of understanding, to represent the object, and to account for the unity of mover and moved. Each function is taken up and discussed, with Ockham arguing that the function is unnecessary or can be accomplished by the disposition. It should be noted that Ockham rejected the sensible species as well as the intelligible species; in this he was certainly preceded by Durand of St.-Pourçain (see Durand's *Quaestio de natura cognitionis*, *Sent.* 2 d. 3 q. 6; further evidence that this is Durand's view can be seen in Walter Chatton, *Rep.* 2 d. 4 q. 1) and Gerard of Bologna, neither of whom, however, posited dispositions.

[44] The story Ockham proposes in q. 1 of the prologue to his *Ordinatio*, in *Rep.* 2 q. 15, and *Summa logicae* III-2 c. 29 is roughly as follows: beginning with an intuitive cognition in the sensitive soul of an individual material substance or quality, this cognition together with the object 'naturally causes' an intellectual intuitive cognition of the same object; given other intellectual intuitive cognitions of the same kind of object (or perhaps of the same object twice), the intellect compares them and constructs an abstractive general concept based on their global similarities and differences.

[45] William of Ockham, *Rep.* 2 q. 15 (*prima conclusio*).

[46] Durand of St.-Pourçain, *Quaestio de natura cognitionis*, calls the suggestion "absurd"; Ockham's rather brusque retort is in *Rep.* 2 q. 15.

And, indeed, Ockham explicitly admits that God is a partial cause of every act of understanding, at least through establishing the general causal order.[47] It is God, and God alone, who allows such material objects to have causal efficacy on immaterial intellective souls.

Therefore, Ockham offers a 'naturalized' version of illumination: the intellect is pre-disposed to ideate in determinate ways in the presence of different kinds of objects, without the additional (and mistaken) claim that illuminative transduction takes place. Other Scholastics were more forthcoming about this conclusion. Durand of St.-Pourçain straightforwardly held that sensing and understanding are 'immanent acts' of the soul, sustained by the ordained causal order, while Peter John Olivi—though giving lip-service to illumination—explicitly stated that acts of sensing and understanding occur only by a kind of coordination or harmony (*colligantia*) of the faculties of the soul with external events.[48] Much later, Francisco Suàrez, in his questions on the *De anima*, would reject both abstraction and illumination, offering instead a version of Olivi's theory, based on a harmony between objects, sense, and understanding.

The difficulty with rejecting transductive mechanisms is stated simply: all of the philosophical problems which drove philosophers originally to postulate transductive mechanisms are left in place, and such problems are not resolved or easily dismissed by maintaining that no such mechanism is called for.

Three separate strands emerge from the rejection of transductive mechanisms. The first is that any link between the cognitive faculties of sense and intellect is given up in favor of parallel processes of actualization in each faculty which are ultimately coordinated by God. The second is that the intellect has recourse to a set of predetermined concepts not 'derived' from sense, although sensing may be a *sine qua non* condition of their deployment, and these predetermined concepts are construed as dispositions.

[47] In *Rep.* 2 q. 25 Ockham insists that God is an immediate partial co-cause of every act of understanding in virtue of sustaining the ordained causal nexus. Because there are no real generalities in the world, Ockham has a difficult time making out the line that potencies are for kinds of responses rather than individualized. But it does not affect the argument if we admit generalized potencies; the point remains that the intellect is pre-disposed to respond to classes of objects in determinate ways, even if the object itself determines the precise response.

[48] Durand of St.-Pourçain, *Quaestio de natura cognitionis*; Peter John Olivi, *Sent.* 2 q. 58 and q. 74. Olivi says that he believes in illumination because "the most distinguished men" hold it, but he adds "I leave the explanation of the difficulties [with illumination] noted above to their wisdom" (*Quaestiones de Deo cognoscendo*, appended to the aforementioned edition). I owe this point to Paul Spade.

The third strand is more subtle. Theories of abstraction and illumination began with a well-defined analysis of the operations of the sensitive soul, and attempted to situate a transductive mechanism in their proposed analyses of the intellective soul. Philosophers who rejected the need for a transductive mechanism changed the conditions of the analysis. On the one hand, the contents of the intellective soul no longer had to differ intrinsically from their counterparts in the sensitive soul, whether by being more abstract and universal, or by subsuming sensible species under an exemplar. Rather, inherence in the intellective soul alone was sufficient to be counted conceptual or intelligible—a development which was fostered by the increasing concern with intellectual grasp of individuals. The difference between the sensitive and intellective souls was itself primary, and hence was of itself unexplained, a matter of the basic ontological gap between the material and immaterial. On the other hand, many of the principles which governed the intellective soul also applied to the sensitive soul, and the collapse of the one led to the collapse of the other. Ockham, Durand, and Olivi all sharply modified the aristotelian analysis of the sensitive soul, with Durand and Olivi maintaining that sensing, like understanding, is an 'immanent act' of the sensitive soul, and no longer tied to the physical configuration of bodily organs as functional states. Olivi went so far as to postulate a kind of 'spiritual matter' out of which the intellective and the sensitive souls were each composed.

The rejection of transductive mechanisms in High Scholasticism was reflected in developments in Suàrez and Renaissance Scholasticism; the three strands of thought emerging from this rejection would dominate the later Scholastic inquiries into the philosophy of mind.[49] Indeed, many of the programmatic concerns present in the philosophy of mind during the early modern period may be seen as extensions of the later Scholastic inquiries—new attempts to resolve the problems set by the agenda of the older debates.

This is especially apparent in the case of Descartes, whose familiarity with later Scholastic philosophy has been well established.[50] Moreover,

[49] Oddly enough, the three positions on transduction developed under High Scholasticism remain essentially unchanged in later Scholastic inquiries, despite the greater focus on the philosophy of mind in the Renaissance. Pietro Pompanazzi and Giacomo Zabarella largely repeat Aquinas's account of abstraction; Nicoletto Vernia offers a standard account of illumination; Alessandro Achillini follows Ockham's rejection of transductive mechanisms. Suàrez's rejection of transductive mechanisms is noteworthy in part because he develops an original critique of the role of the agent intellect, based on the aristotelian analysis of causation, showing that transduction cannot take place through any of the aristotelian four causes.

[50] Descartes was hardly alone in this regard; all of the great figures of the early modern

Descartes can be fitted squarely into the mediæval agenda: the innovation which more than any other serves to set Descartes apart from his Scholastic precedessors, namely the modern notion of 'mind,' directly addresses the problems which come from the rejection of transduction. More exactly, Descartes' theory of the mind was developed in an attempt to resolve the conflicting tendencies present in the third strand, described above. To see why should this be so, a closer look at cartesian philosophy of mind is in order.

5. Cartesian Philosophy of Mind

For the cartesian, the distinction between the living and the non-living had nothing to do with 'soul,' but is merely a distinction among types of bodies: 'life' is given a purely mechanical account, a description of a class of functioning machines. Other than the (arbitrary) restriction of life to working machines which are composed of certain materials, namely animal spirits flowing through nerves, we might with equal propriety talk of living watches and dead watches as we do living sheep and dead sheep.[51] Human bodies are no different from the bodies of sheep in this regard. The association of a human body with a cartesian soul is not causally responsible for human life; the separation of the soul from the body is not the cause of death, but rather death, understood as the breakdown of the bodily machine, is the cause of the separation of the soul from the body (*Les passions de l'âme* 1 §6, AT XI 330–331). A cartesian soul is itself a substance, related to but really distinct from the substance which is its associated bodily machine. The exact character of the relation between these distinct substances is a matter of the details of their interaction, but, before considering this, we need to examine the cartesian soul itself.

The cartesian soul is a "thinking thing," a *res cogitans*. According to *Med.* 2, a thinking thing is something that "doubts, understands, affirms, denies, wills, refuses, and also imagines and senses (*imaginans quoque et sentiens*)" (AT VII 28). Descartes defines "thought" in the appendix to his Replies to the Second Objections as "all that of which we are conscious of operating in us, and that is why not only understanding, willing, and imagining but also sensing (*sensuum*) are thoughts" (AT VII 160). Indeed,

period—Arnauld, Berkeley, Hobbes, Locke, Leibniz, Malebranche, and even (though to a lesser extent) Spinoza—were thoroughly grounded in the theories of their Scholastic predecessors. Yet Descartes, as the 'father of modern philosophy,' in many ways stands closest to mediæval concerns and problems.

[51] See Descartes's letter to Henry More of 30 July 1640, AT III 182, for this point, also made, though less clearly, in *Les passions de l'âme* 1 §6, AT XI 330–331.

Descartes more than once speaks of sensations as "confused" thoughts, as when he states in *Med.* 6 that "all these sensations of hunger, pain, thirst, and so on, are nothing other than certain confused modes of thinking" (AT VII 81)—a hallmark of so-called "rationalism." Therefore, thinking and sensing are treated on a par as phenomena which are equally grounded in the same thing, namely, the cartesian soul itself, distinguished only by degrees of clarity and distinctness.

This conclusion is not affected by Descartes's distinction of three "grades" of sense in the Replies to the Sixth Objections §9 (AT VII 436–438). The first grade, the nerve movements, is "common to us and the brutes" (486), and is solely a matter of the mechanical responses of the bodily machine. The second, which "would pertain to nothing but sense, if we should want to distinguish it carefully from the intellect" (437) is the perception of secondary qualities—at least, these are all he mentions—due to the "union" of mind and body. The third grade, the judgments of size, shape, position, done by an (unconscious) calculation based on "the extension of the color and its boundaries," is "commonly assigned to sense," and so called by Descartes a grade of sensory response, "yet it is clear that it depends on the intellect alone" (437–438). First-grade sensing is clearly non-mental, and Descartes offers a purely causal analysis of it; the second and third grades are states of the mind, the second grade confused and the third grade distinct.

With the location of second-grade and third-grade sensing on the side of the cartesian soul, divorced from the physiological sense-organs of the bodily machine, Descartes has created a unitary 'inner space': the mind. Its structure is minimal. A distinction of subject and object is possible, but the highly articulated Scholastic framework of distinct faculties is not present; it contains only a self and its 'thoughts,' confused or otherwise.[52] The defining mark of ideas in the strict sense is their character as representations, where representative character is cashed out as the 'objective being' of something in the mind. Whether objective being applies to all or at least to some sensations is not clear from the texts.[53] In general, Descartes admits two

[52] As Descartes says in *Med.* 6 (AT VII 86), "nor can the faculties of willing, sensing, understanding, *etc.* be called [the mind's] parts, since it is one and the same mind that wills, that senses, and that understands." The unity and indivisibility of the mind is the key factor in the unitary nature of inner space. This is not to deny, of course, the difference between the 'faculties' of intellect and will.

[53] Third-grade sensing, which involves judgments dealing with size, shape, and position, certainly seems to allow of objective being. Second-grade sensing is another matter entirely. My claim that representative character is cashed out as objective being

modes of awareness: (*i*) direct non-representational awareness of mental contents, and (*ii*) indirect representational awareness had by means of (at least some) mental contents. Furthermore, at least some ideas—the ideas of simple natures—are taken to be innate, *i. e.* not originally derived from external causes, a claim which is compatible with holding that external causes are responsible for their occurrent conceptualization.[54]

The relation between the cartesian soul and its bodily machine is sometimes said to be a "substantial union," as in the *Replies to the Fourth Objections* (AT VII 228), and the cartesian soul is there even called a "substantial form." This "union," notoriously, is supposed to take place through the unique relation of the mind and the pineal gland. But radically distinct substances cannot be united by terminological tricks, and Descartes eventually gave up trying to make an account involving the pineal gland to work, saying that the relation between soul and body is primitive and unanalyzable (see his letter to Elizabeth of 28 June 1643, AT III 690). Yet basic facts which are descriptive of the relationship between soul and body could be known, succinctly summarized in Part 1 of the late *Les passions de l'âme*. First, the cartesian soul initiates movement of the body through the relationship. Second, the relationship is responsible for the close parallel between changes in bodily state and occurrent sensations. Third, the relationship is responsible for the parallel between occurrent sensations and the associated ideas.

In summary: cartesian philosophy of mind endorses a unitary 'inner space' in which pains, perceptions, ideas, and truths are the immediate subjects of non-representational awareness; at least some of these elements are themselves representational, where 'representation' is analyzed as the presence of what is represented in objective being. The assimilation of sensations—pains and perceptions—to ideas and truths is motivated by construing the living body as a well-functioning automaton; the distinction among items in inner space seems to be grounded on the distinction between degrees of clarity and distinctness (although there may be non-trivial distinctions on the basis of representative character); at least some ideas are innate. The 'union' of cartesian soul and bodily machine, while primitive and unanalyzable, is seen in the tight fit between occurrent events

may need to be qualified: this certainly holds for 'true' ideas, distinct ones, but very confused ideas with virtually no objective reality also present themselves as if they represented something real. Fortunately, nothing hangs on this point, and I leave the matter to cartesian scholarship to decide.

[54] Descartes occasionally flirts with the notion that all ideas "which do not involve affirmation or negation" are innate (letter to Mersenne of 22 July 1641, AT III 414).

in inner and outer space.

The innovation which sets Cartesianism apart from Scholasticism is the creation of the mind, a bold combination of the conflicting tendencies present in the third strand following upon the rejection of transductive mechanisms. Descartes adopted the insight that there was a primitive and irreducible ontological gap, as did his Scholastic predecessors. But Descartes also adopted the Scholastic insight that sensing and understanding should be given a uniform analysis. To embrace both insights, Descartes found it necessary to locate the ontological gap not between the sensitive and intellective souls, as the Scholastics did, but between the bodily machine on the one hand and the cartesian soul on the other. This move, relocating the gap between the physical and the non-physical, is at the foundation of the modern notion of the mind: acts of sensing are thereby classified as non-physical, and the connecting links to the physiological sense-organs of the body are completely severed.

Descartes' solution, linking sense with thought on the other side of a primitive and inexplicable ontological difference from the body, was understood even at the time as a genuine breakthrough in resolving the problems in the philosophy of mind which had plagued the Scholastics, shattering the Scholastic paradigm.[55] Indeed, the other strands which emerge from the rejection of transductive mechanisms also have a place in Descartes's system. The first strand appears in Descartes as the absence of a link between the physical and the 'mental,' although events in one sphere are coordinated with events in the other sphere, a coordination ultimately due to God's ordering of the world—a particular instance of a pre-established harmony. As for the second strand, the intellect, or the mind generally, has recourse to a set of 'innate ideas' not derived from sense, though sensing is a condition of their deployment. It is no accident that these features, deriving

[55] This is not to say that Descartes had no difficulties in spelling out the relation between sensing and understanding, in particular between second-grade sensing and third-grade sensing; but the difficulties are of another character and order: explaining the introduction of the intellect in third-grade sensing as affecting only the degree of clarity or distinctness involved. The real puzzle in Descartes along these lines arises in his account of the relation between a purely intellectual understanding of extensive magnitude and a "distinct imagining" of extensive magnitude. But reconciling the role of the pure imagination with the mind's knowledge of which mental imaginative constructions 'match' given purely intellectual ideas (and hence which sensed shapes and sizes pure mathematics may be applied to) is not a problem which plagued the Scholastics, for better or worse, and is entirely different from accounting for the transductive mechanism (or lack thereof) linking sense and understanding in the first place.

from the mediæval agenda, also characterize the philosophical views of other 'rationalist' thinkers of the early modern period.

Descartes is only one figure in a long chain of thinkers who attempted to resolve the difficulties posed by the rejection of transductive mechanisms. Indeed, it is not unreasonable to see the bulk of modern philosophy of mind as running through an agenda which is essentially mediæval: whether ideas are acquired or innate, whether abstraction can serve to connect sense and understanding, and, in Kant, the question again posed explicitly—what psychological mechanisms, operating prior to and grounding the possibility of understanding, have to be postulated to account for the facts of mental life? To say this is not to deny the real accomplishments and innovations of the philosophers of the modern period, but to put them in their proper historical and philosophical perspective.

Conclusion

It is by now a generally accepted thesis in the history and philosophy of science that the creation of the modern 'exact' sciences, such as physics and chemistry, is indebted to a long mediæval tradition; it cannot be understood apart from that tradition; and the eventual failure and collapse of the aristotelian paradigm was crucial to the formation of modern science. I hope to have suggested a similar pattern for psychology and the philosophy of mind. Yet the Scholastic debates deserve a place of honor in the history of psychology not merely for their historical importance and influence, but because Scholastic philosophy of mind, with its emphasis on a 'faculty psychology' and the problem of transduction, may represent a more sophisticated philosophical approach to psychological problems than that found in the early modern period, bearing remarkable similarities to contemporary questions and accounts being developed in cognitive science. While further research is needed to understand the exact philosophical and historical developments which took place, particularly in Renaissance Scholasticism, the subtlety and penetration of the analyses offered by the Scholastics are unparalleled, and the questions they address can once again be seen as philosophically pressing and acute. It seems apparent, then, that the collapse of a research programme may not be the final death, but rather, like the phoenix, it may rise from the ashes at a later date with renewed vigor.

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