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Common Sense and Metaperception: A Practical Model

Abstract

Aristotle famously claimed that we perceive that we see or hear, and that this meta-perception necessarily accompanies all conscious sensory experiences. In this essay I confront Aristotle's account of meta-perception with three main models of self-awareness to be found in the contemporary literature. The first model countenances introspection or inner sense as higher-order perception. The second model rejects introspection altogether, and maintains that judgments that we see or hear can be directly extracted from the first-order experience, using a procedure sometimes called "an ascent routine". The third model insists that the first-order experience has a twofold intentional structure: it is directed both at the perceived external object and at itself, i.e., reflexively. Although Aristotle's own account is certainly closer to the third model (as Brentano rightly observed), the latter does not exhaust Aristotle's insights on meta-perception. One of the functions of the common sense in Aristotle's theory of perception is apparently to monitor the activity of our sensory modalities, and to make us aware that we see or hear independently of the sensory contents of our experience. I shall suggest that the monitoring function of perception is best understood in relation with contemporary cognitive science research on metacognition. Common sense is or involves a metaperceptual ability distinct from both object level sensory perception and metarepresentational knowledge about our senses.

Paper

1. Introduction

In this essay, I examine Aristotle's famous claim that we perceive that we see, hear, touch, taste or smell the world around us. In other words, according to him, we enjoy genuine metaperceptual experiences. I argue that Aristotle might have had in mind a robust notion of metaperception, which is different from introspection, intellectual reflection or the reflexivity of first-order perception. I then sketch a model that deals with Aristotle's own examples of metaperception, especially the perception of darkness and silence. On this model, metaperceptual awareness is grounded on specific practical knowledge, which involves control-oriented monitoring of perceptual processes. My aim here is not exegetical. I only claim that the practical model makes best overall sense of what Aristotle says about our metaperceptual skills, in light of the achievements of both contemporary philosophy and cognitive science.

2. Aristotle's Claim

We are perceptually aware of the world around us, by using one or several of our senses (sight, audition, touch, etc.), but we can also be aware *of* having first-order perceptual experiences, or *that* we have them. I am aware of a flower by seeing it, but I can also be aware of seeing the flower. Aristotle's famous claim is that meta-awareness of first-order perceptual experience is itself genuinely perceptual. In other words, we have a capacity of *metaperception*:

(A1 – or Aristotle's Claim) We perceive that we see (hear, etc.).

In *De Anima* (III.2, 425b11), Aristotle says that "it is through sense that we are aware that we are seeing or hearing". Following several scholars (e.g., Caston 2002, Gregoric 2007), I assume that Aristotle's use of a *that*-clause should not be taken to entail a conceptualist account of the content of metaperceptual awareness. As Gregoric (2007, 169) puts it, such a use "may suggest to the modern reader that he is talking about something rather conceptual, but Aristotle does not seem to make a difference between verbs of perception construed with direct object and with 'that' clauses.

To Aristotle's mind, the perception that we see and hear does not differ significantly from the perception of seeing and hearing". Indeed, as we shall see later (see claim A5 below), non-human animals lacking the concept of seeing can still possess metaperceptual abilities, and be aware that they see or hear.

Yet, the use of a that-clause is still significant, for it suggests important epistemological implications. Genuine metaperceptual awareness should be able to play a substantial role in the justification of reflective or metarepresentational judgments such as "I am seeing", or "I am seeing a flower". While first-order perception can justify judgments about the world around us, metaperception should be able to justify judgments about our ways of perceiving the world. In appropriate conditions, metaperceptual awareness gives rise to *knowledge* that we see (hear, etc.).

In this essay, I set aside the important question of whether metaperceptual awareness is really about veridical perception in contrast to mere perceptual experience. When we perceive (see, hear, etc.) that *p*, the proposition that *p* must be true. In other words, verbs like "perceive", "see", "hear", etc., are factive. Now, it might be argued that the content of our metaperceptual awareness is actually of the form "I *seem* to see a flower", where the phrase "seem to see" is not factive. Much of what I have to say here does not hinge on this question, so I will continue to talk about the content of metaperceptual awareness in terms of factive verbs of perception.

Aristotle seems to have offered a more specific claim about the nature of metaperception:

(A2) We perceive that we see (hear, etc.) by means of the common sense.

For instance, Aristotle writes in *De Somno et Vigilia* (2, 455a15-16) that "all [the individual senses] are accompanied by a common power, in virtue whereof a person perceives that he sees or hears".

It is far from obvious what Aristotle exactly means by "common sense"; there are two mainstream interpretations in the literature. Some have argued that the common sense is like a sense with perceptual powers on its own. Others have argued that the common sense is not for Aristotle an additional perceptual capacity, but rather the perceptual system as a whole, comprising the five senses.¹

These interpretations have implications for the question of *how* we perceive that we see. Some scholars have claimed that according to Aristotle, it is *by sight* that we perceive that we see, whether or not this means that we *see* that we see. This claim is not incompatible with A2. For instance, one might suggest that what is exercised in visual metaperception is the *common* function of sight rather than its special function, which is at work when we see colors or colored things.² Another crucial question is whether a metaperceptual experience and the first-order perceptual experience it is about constitute two mental episodes or only one. This question is somewhat orthogonal to the previous one. Even if we perceive by sight that we see, sight as a faculty might be said to generate both a first-order and a higher-order visual experience.³

A methodological *caveat* is in order before we proceed. Aristotle's Claim is about the nature of our self-awareness of perceptual experience. It is supposed to explain what Aristotle took as an obvious datum, namely that we are somehow aware that we see (hear, etc.) the world around us. However, Aristotle's Claim does not yet embody any general theory of *consciousness*. As it stands, it does not entail either a higher-order or a same-order theory of consciousness. All these theories

¹ Many scholars (see, e.g., Brunschwig 1996) have favored the first interpretation, which Gregoric (2007) calls "the standard view". The second interpretation is, e.g. Marmodoro's view (forthcoming, Ch. 4). This essay is only about the metaperceptual function of the common sense. According to Aristotle, the common sense is also involved in simultaneous perception, perceptual discrimination within and across sensory modalities, and cross-modal binding. However, it is unclear, from the contemporary philosophy of mind point of view, whether a single competence can underpin all these functions.

² See Gregoric (2007). Note that Aristotle clearly acknowledged the possibility of perceiving by sight that we do *not* see; see below the section on the perception of darkness.

³ See Johansen (2006), and for critical discussion Caston (2002) and Gregoric (2007).

share the assumption that a mental state M_1 is conscious only if it is represented in an appropriate way by a mental state M_2 . On the higher-order theory of consciousness, M_2 is existentially distinct from M_1 ; it may be either an introspective perceptual experience or a higher-order thought or judgment.⁴ On the same-order theory of consciousness, M_2 is identical with M_1 , so that the same token mental state can be directed outwards but also, marginally, towards itself.⁵ In other words, whatever theory of consciousness can be attributed to Aristotle, it is at least *prima facie* possible to defend Aristotle's Claim without endorsing the view that metaperception is what makes the first-order perceptual experience conscious. This *caveat* holds even though Aristotle himself also presents his Claim as a special case of a more general phenomenon:

[I]f he who sees perceives that he sees, and he who hears, that he hears, and he who walks, that he walks, and in the case of all other activities similarly there is something which perceives that we are active, so that if we perceive, we perceive that we perceive, and if we think, that we think. (*Nicomachean Ethics*, 9, 1170a29-b1; see also *De Sensu et Sensibilibus*, 7, 448a26-30)

Even if our first-order perceptions are always, perhaps even necessarily accompanied by metaperceptions (see claim A4 below), it does not follow that the latter are what make the former conscious. In this essay, I shall be concerned only with Aristotle's Claim and its lemmas and not with a theory of consciousness *per se*. As far as we are concerned here, a first-order perception and a metaperception directed onto it could both operate below the threshold of consciousness.

3. The scope of metaperception

The content of metaperceptual awareness has been so far informally characterized as "I see (hear, etc.)" or "I see a flower"; but we are now in the position to be more explicit about its structure. To begin with, a metaperceptual experience is about a particular first-order perceptual experience. Thus, we can assume that part of its content can be expressed by a demonstrative of the form "this experience", which designates (in the relevant context) the first-order experience it is about. What more can there be to the content of a metaperceptual experience? Here are some potentially relevant candidates, from the most general to the most specific (the list is of course not exhaustive):

- (i) This experience is *occurring*.
- (ii) This experience is a case of *perception* (rather than, e.g., *imagination* or *memory*).
- (iii) This experience is a case of *vision* (rather than, e.g., *audition* or *touch*).
- (iv) This experience is a case of *faint vision* (rather than, e.g., *clear* or *optimal vision*).

The first type of content is rather thin, in the sense that it says nothing about the nature of the first-order experience. In this respect, the other types of content are more specific. The second type identifies the experience as a kind of mental state among other kinds (e.g., perception), while the third type identifies species or sub-species within a given kind (e.g., visual perception). The fourth type of content is even more specific. As an illustration, consider a situation in which I faintly see that there is a horse in the mist. Arguably, the adverb "faintly" in "I faintly see that *p*" modifies the verb "see" rather than the content of my seeing (as expressed by the that-clause). So my visual experience has the property of being faint over and above the fact that it is about a horse in the mist. More generally, the fourth type of content has to do with the *quality* of the first-order experience, such as its degree of optimality, or the strength of the perceptual response.

In principle, all four types of content can fall under the scope of the notion of metaperception which is at the heart of Aristotle's Claim. Metaperception can make us aware, minimally, that some experience is occurring, but also, much more substantially, that this experience is a case of faint visual perception. The informal characterization "We perceive that we see or hear"

⁴ See, e.g., Armstrong (1968) for the former (higher-order perception) version, and Rosenthal (2005) and Van Gulick (2006) for the latter (higher-order thought) version.

⁵ See Kriegel (2009) and several essays in Kriegel & Williford (2006).

clearly points to the third type of content, but as will be apparent shortly, some of Aristotle's remarks suggest that he also had in mind the fourth type of content.

Let us call the specific properties referred to in contents of types (ii)-(iv) "modal properties", since they concern (at least *prima facie*) aspects of the intentional *mode* of the first-order experience in contrast to its content.⁶ Aristotle's Claim can then be generalized as follows:

(A3) We perceive modal properties of our perceptual experiences.

Bearing in mind the range of modal properties that Aristotle's Claim possibly covers, I would like to compare his Claim with three main contemporary models of our self-awareness of perceptual experience. Although Aristotle's view is certainly closer to the third model I will present, we shall see that none of them really fits his discussion. On the other hand, Aristotle's Claim as it stands requires a model that backs it up. I shall endeavor to offer such a model in the penultimate section of this essay.

4. The introspective model

The first model construes metaperception as inner perception or *introspection*. When I am aware that I see, my first-order visual experience is the intentional object of a distinct, second-order perceptual experience. The introspective model has been defended by several authors from John Locke to David Armstrong, and some scholars (e.g., Everson 1997, Johansen 2006) attribute a version of it to Aristotle himself.

Several objections have been raised against the notion of introspection itself, many of them hinging on the point that we do not seem to experience from the inside our mental states as intentional *objects*. The capacity of perception entails the capacity of object perception, but there is nothing like inner object perception, which would enable us to track and re-identify mental objects over time (see, e.g., Shoemaker 1996).

A related point has to do with the so-called "transparency" of our first-order perceptual experiences.⁷ For instance, when we try to introspect our current visual experience, we seem to be aware only of the worldly objects, properties, relations, etc., that we see. No entity over and above those that figure in the content of our perceptual experience seems to be directly available to introspection – *a fortiori* not the experience itself.

Independently of whether an intelligible notion of introspection as inner perception can be defended against these objections, the introspective model does not square well with Aristotle's own construal of metaperception. Consider the following claim, which can plausibly be inferred from what he wrote:

(A4) Metaperception necessarily accompanies any visual (auditory, etc.) experience.

For instance, in *De Sensu and Sensibilibus*, Aristotle says that "it is not possible to be unaware of perceiving and seeing something seen" (2, 437a27-8). In contrast, the introspective model allows for a first-order perceptual experience to exist without being the intentional object of any second-order experience. Not all of our perceptions are introspected. For instance, Armstrong's (1968) inattentive driver has a lot of perceptual experiences that are not introspected. It follows that the introspective model is not an adequate analysis of Aristotle's notion of metaperception.

5. The reflective model

In comparison to the introspective model, the reflective model is a more recent development. Its proponents contend that introspection, as a second-order experience, does not

⁶ On the distinction between intentional mode and content, see Recanati (2007).

⁷ See Moore (1903), Harman (1990) and Tye (1995, 2002).

mediate our judgment that we see or hear. Rather, the latter judgment is a direct reflection of our first-order perceptual experience. We can rationally move from seeing something as a flower directly to the judgment that we see a flower. At no point is our visual experience introspectively presented to us as a mental object.

The core idea underlying the reflective model is that we can answer a question about our own mental states (such as “Do you think there is going to be a third world war?”) by answering a more simple question about the world (such as “Will there be a third world war?”). As Evans famously put it, “I get myself in a position to answer the question whether I believe that *p* by putting into operation whatever procedure I have for answering the question whether *p*” (Evans 1982, 225). Introspection is no more needed to answer the metacognitive question than it is to answer the simpler, first-order question.⁸

Evans’s procedure is rather straightforward in the case of belief, but what about perceptual experience? Evans suggests that the same procedure can be used, with a crucial twist, to self-ascribe perceptual experiences:

[The subject] goes through exactly the same procedure as he would go through if he were trying to make a judgment about how it is at this place now, but excluding any knowledge he has of *an extraneous kind*. (That is, he seeks to determine what he would judge if he did not have such extraneous information.) (Evans 1982, 227-8)

Suppose that I judge that my neighbors are still on vacation by seeing their mailbox full of papers. My judgment is based on the content of my visual experience, but it also hinges on the extraneous information that my neighbors usually empty their mailbox when they return from vacation. By discarding this information, I can self-ascribe a visual experience with the right content, namely that this mailbox is full of papers.

The reflective model insists that our judgment that we see or hear can be justified (i.e., made for a reason) even though it is not based on introspective evidence or inference. On the one hand, there is no introspective experience with the content “I see or hear”. On the other hand, our judgment is not the conclusion of an ordinary inference. Its content is in no way entailed by the content of the first-order visual or auditory experience. Still, the transition is claimed to be rational, given an appropriate conceptual background.⁹

Obviously, the reflective model cannot be invoked as an adequate interpretation of Aristotle’s notion of metaperception, since it is not a genuine *perceptual* account of our knowledge that we see or hear. The relevant metaperceptual knowledge comes *too late*, i.e., only at the level of judgment. There are no metaperceptual experiences, conceived as pre-doxastic mental states. Moreover, reflection is hardly constitutive of first-order perceptual experience, so the reflective model cannot give a satisfactory interpretation of A4. Finally, from an Aristotelian point of view, the reflective model involves an intellectualist conception of our awareness of having perceptual experiences. For Aristotle appears to have held the following claim (see Gregoric 2007, 190-2):

(A5) Metaperception is available to non-human animals.

We can safely assume that at least some of the relevant species of animals cannot form judgments with sophisticated, metarepresentational contents like “I see or hear”, which require

⁸ See also Moran (2001), Shah & Velleman (2005), although the latter is more concerned with the question of whether to believe that *p* (in contrast to the question of whether I believe that *p*).

⁹ Here is how Peacocke (1999, 267) describes an instance of the relevant procedure: “When our thinker judges ‘I see the phone to be on the table’, his reason for making his judgment is the occurrence of his visual perception. That perception is a seeing that the phone is on the table; but that perception is not one which has the representational content that he is seeing the phone. An experience in a given modality does not normally have the representational content that the subject is having an experience in that modality”. Of course, as Peacocke observes (see 230-2), this makes sense only if the “spurious trilemma” of traditional epistemology, according to which a judgment is justified “by observation; by inference; or by nothing”, is rejected. See also Roessler (2013) for a thorough defense of the rationality of the relevant non-observational and non-inferential procedure.

possession of the concepts of seeing or hearing. Still, if Aristotle is right, they can enjoy metaperceptual experiences. It follows that metaperception cannot be fully explained at the level of judgments.

Independently of the correct interpretation of Aristotle's Claim, one might think that the reflective model is superior to any model that incorporates a robust notion of metaperception. However, Evans's procedure as applied to perceptual experience is not entirely straightforward. An immediate worry concerns the transparency claim introduced in the previous section. Proponents of the reflective model as applied to belief or judgment take transparency very seriously. Indeed, on this model, there is no need to posit an experiential awareness of modal properties of the first-order belief. In a sense, our awareness that we have a *belief* rather than a desire or a hope is fully explained by our awareness of the content of our belief as a fact within our worldview.

However, the case of perceptual experience is at least *prima facie* rather different. When we have a perceptual experience of a flower, how do we know that we *see* rather than *touch* the flower? Is this information somehow involved in the *content* of our perceptual experience? Byrne (2010) has suggested that we can move from the apparent visibility (or "touchability") of the perceived world to the judgment that we see (or touch) the flower.¹⁰ But it is not clear that a similar strategy can be successfully applied to all relevant properties of our experience. When I faintly see a horse, is the fact that my visual experience is faint already involved in what I see? In such a case, we seem to be aware of a genuine modal property of our experience, over and above its semantic or representational properties.¹¹

6. The reflexive model

On the reflexive model, any token perceptual experience has a *twofold* intentional structure: it involves one intentional relation directed outwards, to the perceived object, and another intentional relation directed inwards, to the experience itself. Let us use a standard terminology and call "primary intentionality" the first-order intentional relation to the external object and "secondary intentionality" the reflexive intentional relation.¹²

There is indeed textual evidence that Aristotle possibly held something like the reflexive model.¹³

It seems that knowing, perceiving, believing and thinking are always of something else, but of themselves on the side. (*Metaphysics*, 12.9, 1075a4-5)

However, even if Aristotle was independently attracted by the reflexive model, or even the same-order theory of consciousness, which is grounded on the reflexive model (see Caston 2002), some of his more specific claims about metaperception suggest that this is not the end of the story. There are three worries about attributing to him the reflexive model as his construal of the notion of metaperception.

To begin with, the reflexive model does not necessarily countenance metaperception. Its defender may not want to conceive secondary intentionality on the model of primary intentionality.

¹⁰ In this respect, Aristotle might have agreed: we can know that we see simply by reflecting on the fact that we perceive colors, or colored things. According to him, color is a proper sensible, and can only be perceived by sight. To my mind, the fact that Aristotle did not content himself with this version of the reflexive model is another indication that he had in mind a more substantial sense in which we know that we see or hear, which includes knowledge of *how* we see or hear; see below.

¹¹ For a more detailed discussion of whether what seem to be properties of perceptual experiences, such as blurriness, can reduce to properties of what is perceived, such as fuzziness, see Calabi (2012). To anticipate, even if no modal property over and above perceived properties of the scene can be introspected, our cognitive systems might still be sensitive to non-semantic properties of our perceptual experiences in a way that eventually surfaces at the phenomenological level.

¹² In Brentano's words, every conscious act "includes within it a consciousness of itself. Therefore, every [conscious] act, no matter how simple, has a double object, a primary and a secondary object. The simplest act, for example the act of hearing, has as its primary object the sound, and for its secondary object, itself, the mental phenomenon in which the sound is heard" (1874, 153-4).

¹³ See Caston (2002, 786). The famous regress argument in *De Anima* 425b15-17 has also been adduced as evidence that Aristotle acknowledged the reflexivity of perceptual experiences.

In other words, secondary intentionality need not be perceptual even if primary intentionality is perceptual. Secondary intentionality is not necessarily the same kind of intentionality as primary intentionality. Indeed, the objection raised above against the introspective model suggests that the reflexive model must acknowledge that secondary intentionality is not a way of being internally aware *of* our own visual experience of an external object. While primary intentionality can instantiate object awareness, secondary intentionality involves at most fact awareness: we are aware *that* we see by seeing the external object.¹⁴

Another worry concerns the full range of modal properties available in principle to be metaperceived. The best developed versions of the reflexive model (usually in the context of a defense of the same-order theory of consciousness) seem to acknowledge only *thin* secondary intentionality. For instance, the content of secondary intentionality is construed as having the form “This mental state is occurring”, or perhaps “I am in this mental state”, depending on whether the self is said to be explicitly represented (see Kriegel 2009, 177). According to the classification and terminology proposed above (in section 2) such a content is of type (i), and does not involve any modal property. As a consequence, metaperception cannot ground knowledge about the nature of our first-order experience, i.e., whether it is a case of perception, visual perception or perhaps faint visual perception. In order to do so, the content of secondary intentionality would have to thicker, i.e., belong to type (ii), (iii) or (iv).

A third worry has to do with the *dependence* of secondary intentionality on primary intentionality. On the reflexive model, it is only *by* seeing the flower that we are aware that we see the flower. Secondary intentionality is stepwise; it piggybacks on primary intentionality. The relevant dependence is apparent at the phenomenological level. Secondary intentionality is often pictured as “marginal”, but its marginality is *relative* to the focality of primary intentionality. Focal and marginal intentionality are two sides of the same coin.

Now some of the examples given by Aristotle himself suggest that he might not have fully endorsed the claim that metaperception is stepwise. In fact, as we shall see in the next section, there is reason to believe that he would have defended the following claim:

(A6) Metaperception can be autonomous relative to first-order perception.

There are two versions of A6, weak and strong. On the weak version, metaperception can operate independently of the content of the perceived first-order experience. On the strong version, metaperception can even operate in the absence of any first-order perceptual experience. In both cases, metaperception possesses a significant degree of autonomy relative to first-order perception.

7. The perception of darkness

The clearest indication that Aristotle might have construed metaperception as being relatively autonomous from first-order perception (claim A6 above) comes from his discussion of an intriguing case, namely the perception of *darkness*.¹⁵

It is clear therefore that “to perceive by sight” has more than one meaning; for even when we are not seeing, it is by sight that we discriminate darkness from light, though not in the same way as we distinguish one color from another. (*De Anima*, III.2, 425b20-23)

In this passage, Aristotle seems to claim that we can perceive something by sight without seeing anything. (This is not entailed by the claim that it is possible to perceive something by sight without seeing it.) For instance, we can perceive and thereby know that it is dark by sight although

¹⁴ The distinction between object and fact awareness comes from Dretske (1995). On his view, self-awareness of perceptual experience is a species of what he calls “displaced perception”: we perceive that we see a flower through the flower we are experiencing. There is no internal scanner or any phenomenology of introspection in addition to the phenomenology of the first-order perceptual experience. Note that if fact awareness is conceived as involving judgment or belief, as in Dretske’s view, the reflexive model seems to collapse into a version of the reflective model.

¹⁵ Aristotle offers analogous remarks about the auditory perception of *silence*.

we do not see at all. Darkness is invisible; it is not a primary intentional object of visual experience. Aristotle also refers to the possibility of perceiving light by sight without seeing. He presumably means excessive light, in a situation in which the subject is dazzled and cannot see any color or colored thing.

On Gregoric (2007)'s interpretation of this example, the common function of sight makes us aware of the *inactivity* of our visual sense. Gregoric can then infer the strong version of A6, namely that metaperception can operate in the absence of any first-order perceptual experience. In his own terms, "second-order perceptions do not always accompany first-order perceptions". On his view, this is the crucial difference between Aristotle's account and (what we call here) the reflexive model: "However, it does not make Aristotle a same-order perception theorist [...], since there is no constitutive relation between first- and second-order perceptions such that the latter could not occur without the former" (2007, 190).

Alternatively, one can argue that even when we perceive darkness and thus do not see anything, our visual sense is still somehow active. After all, we are at least *trying* to see or discern something, even if we do not succeed. Moreover, when our trying succeeds (our eyes have accommodated to the darkness of the room, or light is suddenly switched back), it changes into a genuine perceptual experience. (Our trying to see in the dark could thus be described as a "pre-perceptual" experience.) So perhaps metaperception cannot operate in the absence of *any* first-order experience or activity, although the latter may not be genuinely perceptual. Even in the darkness case, the content of our metaperceptual experience involves a reference to a particular experience, and might be of the form "This experience falls short of a visual experience". Note that this alternative account of our perception of darkness still justifies a strong reading of A6.

In a nutshell, Aristotle's remarks motivates a re-description of the perception of darkness as metaperception of not seeing anything.¹⁶ This is at odds with the reflexive model, insofar as the latter typically rejects A6 in either its weak or strong version. According to Aristotle, at least some exercises of metaperception do not constitutively depend on the operations of first-order perception.

8. Metaperceptual monitoring and control

Let us take stock. I have examined three models of self-awareness of perceptual experience, based respectively on introspection, intellectual reflection, and inherent reflexivity. I have suggested that neither of them fully captures Aristotle's notion of metaperception. As his discussion of the perception of darkness shows, he seems to have conceived of metaperception as a way of monitoring modal properties of our first-order perceptions, but also the absence of any first-order perception.¹⁷

At this point, it is worth looking at what present-day cognitive science has to say about metaperceptual and more generally metacognitive monitoring. It appears that humans and many species of non-human animals possess various kinds of self-monitoring abilities, which are relatively low-level in the sense that they do not require the possession of concepts of mental states and representations. Metacognition in this sense falls short of metarepresentation.¹⁸

For instance, research on uncertainty monitoring has shown that our cognitive systems are sensitive to the *quality* or *optimality* of our perceptual experience relative to a categorization task (Smith et al. 2003, Smith 2005). We may see (that is, visually categorize) something as a horse even

¹⁶ Compare Dokic & Martin (2013), who claim that what may seem to be perceptions of absences of worldly objects (as for instance when I expect to see my keys where there are not) are in fact metaperceptions of absences of expected first-order experiences.

¹⁷ This is controversial. As Mika Perala pointed out to me, one might argue that the kind of metaperception involved in the darkness case is different from the kind of metaperception involved in the perception that we see or hear. To my mind, though, a virtue of the model that will eventually be defended (namely the practical model) is that it provides a unified account of our metaperceptual skills.

¹⁸ See for instance Terrace & Metcalfe (2005), Beran et al. (2012), and Proust (2013). Levin (2004) focuses specifically on visual metacognition.

though our visual experience is not optimal; perhaps the horse is far away, or looks a bit like a cow from where we are. Monitoring mechanisms in us are sensitive to the fact that our visual experience is suboptimal, which typically inclines us to do something to improve the quality of our experience relative to the categorization task: moving our head from side to side or getting closer to what we see.

An empirically plausible hypothesis is that monitoring mechanisms evaluate the quality of our visual experience by being sensitive at least to the *fluency* of implicit visual processes. Fluent visual categorization processes will generally give rise to visual confidence.¹⁹ Psychologists define fluency as the “subjective ease with which a mental operation is performed” (Reber et al. 2004, Oppenheimer 2008). In this sense, fluency is a *non-semantic* property of perceptual or cognitive processes. Metacognitive abilities can monitor lower-level processes independently of the contents that the latter may in fact process (Koriat 2007).

Aristotle’s example of the perception of darkness can be seen as involving an extreme form of disfluency. Implicit visual processes are monitored even though they fail to generate any perceptual content at all. The fluency of some initial processes may be enough to generate the feeling that our eyes are in good order (we can at least move them and try to discern something), but later lack of fluency will produce very low or no visual confidence. Our overall experience of initial fluency and later disfluency can only make us confident that it is dark. Of course, in such a case, there is not much that we can do in order to improve the situation and restore some conscious experience: trying to focus hard on barely seen contours, perhaps, or screwing up our eyes.

An important question is whether metacognitive monitoring mechanisms can be conceived as realizing a form of *introspection* of first-order perceptual experiences. For instance, one might argue that monitoring perceptual uncertainty is a way of introspecting visual experiences and some of their modal properties, such as suboptimality. However, there are several reasons to resist the introspective interpretation of monitoring (see Dokic 2012). Here I shall emphasize only one of them. Monitoring mechanisms yield outputs that are not themselves conscious but are directly exploited by control mechanisms at the sub-personal level. Monitoring is entirely at the service of control, and does not cause personal-level introspection of one’s perceptual experiences. What surfaces at the personal level is our spontaneous trying to improve the quality of our experience. Our trying is spontaneous in the sense that it is not rationalized by prior intentions or beliefs. We may just feel inclined to engage in appropriate behavior in order to resolve perceptual ambiguity.²⁰

In a nutshell, metaperceptual activities are best conceived as instances of *practical knowledge*. We know how to improve the quality of our first-order perceptual experiences. Even in the darkness case, where we do not perceive anything, we exercise at least part of our metaperceptual practical knowledge; our control mechanisms are active and ready to deal with any object that could be visually discerned.

Although metaperceptual activities are spontaneous, they are intentional; they are done by ourselves as agents. It follows that we know what we are doing when we optimize our perceptual relationship to the world, or are ready to do so. According to an important trend in contemporary philosophy of action, initiated by Anscombe (1957), an agent’s knowledge of her own action is non-observational. Certainly we do not have to observe outwardly our behavior or inwardly our intentions to know what we are doing. However, *pace* Anscombe, this is compatible with the phenomenologically plausible claim that knowing what we are doing involves a specific kind of *experience*. Indeed, some philosophers posit a *sui generis* form of action-awareness, which is both representational and belief-independent (see Peacocke 2008, 246-9). In enjoying action-awareness,

¹⁹ Although fluency is an important metacognitive cue in many domains, visual confidence can be based on other types of cues as well; see Barthelmé & Mamassian (2010).

²⁰ Following Merleau-Ponty, Kelly (2010) argues that “perception has an essentially normative element” (149) in the sense that “it is part of my experience that it is improvable in a certain way (151). For instance, “[p]art of what it is to see that the object is clear and my vision of it is blurry just is to be motivated to get a better look at it” (155). From the perspective of this essay, Kelly correctly describes the phenomenology of our experience, but misattributes it to first-order perception. Rather, what may be called the “natural normativity” of our experience emerges at the level of metaperception.

it seems to us that we are doing something (and not merely that something is happening). Action-awareness in this sense can provide evidence for theoretical judgments, such as (in the case of metaperceptual practical knowledge) the judgment that we are trying to have a better view of some external object.²¹

9. The practical model

The practical nature of metaperception suggests a fourth model of our self-awareness of perceptual experience, additional to the introspective, reflective and reflexive models already presented. On what we may call “the practical model”, our awareness that we see or hear is grounded neither on introspection nor on first-order perception but is a case of action-awareness. Even though our metaperceptual abilities are in an important sense common to all of our sensory modalities, we know how to act in order to improve the quality or restore the optimality of our experiences in each sensory modality. Our practical knowledge may not be exclusive to the relevant sensory modality, but there are things we can do that are appropriate to seeing or hearing. For instance, having a look around an object might improve the quality of our visual experience with respect to the shape of the object, but might not improve the quality of our auditory experience. Particular exercises of our practical metaperceptual abilities involve belief-independent and probably non-conceptual seemings, which can justify and convert to knowledge specific metarepresentational judgments such as “I see (rather than hear) a tiger”.²²

The practical model can be compared to the so-called “enactivist” view of perception. On this view, our awareness that we see or hear derives from our practical knowledge of sensorimotor contingencies distinctive of the visual or auditory sense modality (O’Regan & Noë 2001, Noë 2004, O’Regan 2011). For instance, being aware that we see rather than touch a flower involves knowing, in a practical way, that closing our eyes would make the flower “disappear”, and visual stimulation become uniform.

However, there are at least two important differences between the practical model and the enactivist view. First, according to the enactivists, knowledge of sensorimotor contingencies is knowledge of the sensory consequences of our actions. In contrast, we may not know the *sensory* consequences of what we are doing to improve our seeing, but we may be aware that we see by engaging in characteristic control activities. In this respect, metaperceptual monitoring is not dependent on what is perceived or expected to be perceived in the way the standard enactivist formulation suggests.

Second, the target of the enactivists is first-order perception and only secondarily metaperception. As O’Regan & Noë (2001, 946) put it, “visual experience is a mode of activity involving practical knowledge about currently possible behaviors and associated sensory consequences. Visual experience rests on know-how, the possession of skills”. In contrast, the practical model is not committed to the claim that first-order perceptual experience itself is or rests on practical knowledge. The practical model is about metaperception, and specifically our awareness that we see or hear.

²¹ There is some evidence that Aristotle would have acknowledged the existence of action-awareness, as a special way of experiencing one’s own intentional action while or in acting. He explicitly claimed that a man who walks perceives that he walks (see the quotation from *Nicomachean Ethics* at the end of section 1 above). Thanks to Mika Perala for this point. Note also that the relevant action-awareness has better to be conceived as having non-conceptual content, on pain of denying it to animals lacking the concept of seeing. This is how Peacocke and presumably also Aristotle conceive it.

²² One might object that *looking* at an object, in the sense of visually keeping track of it, is already enough to make us aware that we see. Our visual tracking abilities can hardly be described as metaperceptual, though. Looking seems to be a case of first-order seeing. Two answers are available here. First, there are different levels of metaperceptual abilities, depending on the behavior that manifests them. Looking around an object to have a better perception of its overall shape is a more sophisticated behavior than merely looking at it. So perhaps looking can be considered as a limiting case of a metaperceptual ability, namely the ability to *maintain* a perceptual relation to the object. Second, it is not obvious that looking at an object makes us aware that we are *seeing* the object. Our tracking abilities may be crossmodal. We can perceptually track an object through several sensory modalities at once, or across time. To get a practical sense that we are seeing rather than hearing, we need genuine (or at least more substantial) metaperceptual abilities.

I would like to suggest that unlike the other three models of self-awareness of perceptual experience, the practical model can underpin the totality of Aristotle's claims about metaperception and bring them together in a philosophically coherent and plausible way.

First, claim A1 is vindicated to the extent that we enjoy genuine metaperceptual experiences. In contrast to the reflective model, metaperception already takes place at the pre-doxastic level. However, in contrast to the introspective model, metaperceptual experiences are not construed as inner perceptions of first-order experiences. As a consequence, the practical model is compatible with transparency; when we try to introspect our perceptual experience, we seem to be aware only of the perceived objects and properties themselves.

Second, in contrast to the reflexive model, metaperceptual awareness need not rely on awareness of the content of first-order perception. Our monitoring mechanisms can assess the quality of our first-order perceptual experience independently of what we perceive. Both claims A3 and A6 are taken into account with the important proviso (in the case of A3) that our awareness of modal properties is realized in specific action-awareness.

Third, given our cognitive architecture, it is plausible that perceptual experience is always, perhaps necessarily accompanied by some metaperceptual activity (claim A4). There is no first-order perception without some in-built ability to monitor and control the quality of our experience. As a consequence, it may be difficult to separate aspects of ordinary phenomenology that belong to first-order perception and aspects of it that result from metaperception.

Fourth, metaperception is available in principle to non-human animals (claim A5). There is evidence that some species of non-human animals have metaperceptual abilities influencing relatively complex decisions, even though they do not possess concepts of mental states or experiences.²³ It does not follow that all relevant species of animals have the same metaperceptual skills, or that they are on a par with respect to what they can cognitively extract from particular metaperceptual activities.

Finally, consider claim A2, according to which we perceive that we see or hear thanks to the common sense. Although metaperception does not count as an additional sense, it has perceptual powers on its own. However, there is also a sense in which metaperception partly constitutes the perceptual system, along with the five senses. Even though first-order perception and metaperception are strictly speaking distinct abilities, they are so intertwined in ordinary experience (see the third point above) that it is as if a single competence can be used to see but also to perceive that we see.

On the practical model, a metaperceptual experience and the first-order perceptual experience it is about are distinct mental episodes. This is compatible with the view that the latter is necessarily accompanied by the former; a necessary relation need not be an essential or constitutive relation. The claim that we perceive by sight that we see or hear could then be interpreted as follows. We perceive that we see (hear, etc.) by exercising control abilities appropriate to vision (audition, etc.). We are aware that we see thanks to meta-*visual* abilities. Indeed, our perception of darkness seems to require modality-sensitive metaperception (we may be aware that we do not see while being aware of hearing noises).²⁴

10. Conclusion

Aristotle's contention that we perceive that we see, hear, touch, etc., can be given a plausible interpretation, based on both conceptual and empirical grounds. First, we do possess metaperceptual abilities, which are different from higher-order introspective or merely cognitive abilities. Second, Aristotle's discussion of our perception of darkness strongly suggests that he was

²³ See especially Terrace & Metcalfe (2005) and Proust (2013).

²⁴ Note that with respect to other functions of the common sense, there may be no need to posit two mental episodes. For instance, when we see a blue balloon, a *single* act of perceptual awareness can be about color as a special sensible and shape as a common sensible. See Marmodoro (forthcoming, Ch. 5).

interested not only in our awareness that we see, but also in our awareness of *how* we see. In other words, our metaperceptual abilities are sensitive to thick properties of our perceptual experiences, and even to the activity of our senses when they fail to generate any perceptual content.

On the model eventually proposed, metaperceptual awareness is best conceived as a case of action-awareness, and thus as resting on practical knowledge. In particular, we know how to improve the quality of our first-order experiences in each sensory modality. From particular exercises of our metaperceptual abilities, we are able to extract explicit judgments to the effect that we see, hear, touch, etc., the world around us.

Of course, Aristotle might have been sympathetic to more than one model of our self-awareness of perceptual experience at once. Given his view of proper sensibles, the reflective model might correctly describe one way in which we can gain non-experiential knowledge that we see, namely by reflecting on the fact that we perceive colors or colored things. Similarly, he might have defended the reflexive model for thinner properties of experiences, such as the property of occurring, or occurring in oneself. In principle, different models might be invoked to deal with different types of property. However, two important conclusions can be derived from the foregoing discussion, which are relevant to both Aristotle's interpretation and contemporary philosophy of perception. First, the practical model is needed to deal at least with our awareness of thick modal properties. Second, our awareness of thinner properties can be derived from practical metaperception. Knowing how we perceive something can involve awareness that we see (hear, etc.), and even awareness that a perceptual experience is occurring (or is not occurring, as in the darkness case).

An additional issue is the nature of consciousness. I have argued that strictly speaking, neither of the four models discussed here entails a theory of consciousness, although any of them can form the core of one such theory. Nowadays the dominant alternatives are higher-order and same-order theories of consciousness. If we take metacognition seriously, there is a third alternative. Perhaps what makes our first-order experience conscious is neither the fact that it is inherently reflexive nor the fact that it is the intentional object of another mental state, but the fact that it is monitored at the metacognitive level. However, the discussion of whether a non-introspective metacognitive theory of consciousness is a viable option must be left for another occasion.

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*Staunch vs. Faint-Hearted Hylomorphism:
Toward an Aristotelian Account of Composition*

Abstract

A *staunch* hylomorphism involves a commitment to a sparse theory of universals and a sparse theory of composite material objects, as well as to an ontology of fundamental causal powers. *Faint-hearted* hylomorphism, in contrast, lacks one or more of these elements. On the staunch version of HM, a substantial form is not merely some structural property of a set of elements – it is rather a power conferred on those elements by that structure, a power that is the cause of the generation (by fusion) and persistence of a composite whole through time. Bernard Williams discussed (and rejected) a faint-hearted version of HM in 1986, and faint-hearted HM has been defended more recently by Mark Johnston (2006), Michael Rea (2011), and Kathrin Koslicki (2008). I defend the superiority of the staunch version, in spite of its heavier ontological commitments, as a way of accounting for a real distinction between living organisms and heaps of matter, without recourse to dualism or vitalism, and as a way of combining a powers ontology with the possibility of gunk.

Paper

I. Hylomorphism as a third way

Aristotle clearly intends his theory of the soul as the ‘form’ of the living body to be an alternative to both materialism and to Pythagorean dualism or spiritism (of the sort ostensibly defended by Plato in the *Phaedo* or *Meno*). Thus, the contemporary defender of an Aristotelian hylomorphism faces two pairs of tasks: first, to distinguish an Aristotelian position from both materialism and dualism, and, then, to argue for the superiority of that position to both of its competitors. Obviously, the defensive tasks presuppose the success of the distinguishing tasks.

Many contemporary would-be defenders of hylomorphism fail to distinguish their position from contemporary materialism. I will label the resulting theories “faint-hearted hylomorphism.” In section II I will discuss several versions of faint-hearted hylomorphism, explaining both the distinctness and the superiority of a “stalwart” (i.e., a clearly anti-materialist) version of hylomorphism. I will discuss two contemporary versions of stalwart hylomorphism in section III and then turn, in section IV, to a discussion of the variety ways of distinguishing stalwart hylomorphism from substance dualism. In section V, I will develop and defend my preferred option, *parts as sustaining instruments*.

II. Faint-hearted hylomorphism

When Aristotle describes the soul as the form of the body (for example, in *De Anima* II.1, 412a19-21), he clearly means more than just an arrangement or relationship among the parts of the body. A *form* (*morphe*) of a body is not analogous to the harmonious relations among a set of strings (*De Anima* I.4, 407b).

Form is the first actualization of a living or organic body (*De Anima* II.1, 412a27). The acquisition of form involves a real change in the intrinsic natures of the body’s components; it is not merely a matter of their acquiring certain relations or beginning to cooperate autonomously in certain ways, as the strings of the lyre cooperate in producing harmony. In Aristotle’s terminology, when some material things acquire a new set of extrinsic relationships to each other, the result is an *accidental unity*, not a *substance*. It is this conception of form that distinguishes Aristotle’s theory from materialism.

At the same time, the form results in a substance that *is* the living body. Ultimately, it is the whole human being that thinks and feels, by virtue of having the right kind of form. The thinking and feeling is not carried out by some entity that is separate from the living body. In fact, there is no unified, material entity existing in separation from the soul, with which the soul could interact. In this way, Aristotle's view is distinguished from substance dualism.

Aristotle's third way requires several elements:

1. A sparse theory of fundamental entities. A soul is a substantial form, and only substances have substantial forms. Socrates is a substance, but sitting Socrates is only an accidental unity, and so there is no substantial form corresponding to *Socrates' sitting* as there is to *Socrates' living*.
2. A sparse theory of fundamental properties. Only substances have *essences* or *natures* in the strictest sense. An essence or nature is a fundamental property, which accounts for both the possibility and actuality of all other properties, acting as a 'principle' (*arche*) of motion (change) and rest.
3. A powers ontology. The natures of substances confer fundamental causal powers on those substances, and those powers (both active and passive) are the ultimate grounds for explaining all change and activity.

Ignoring any of these three elements results in a collapse of the substance/accidental unity distinction and, therefore, a collapse of Aristotle's hylomorphism into a form of mere materialism. Let's call such an erroneous version of Aristotle's theory 'faint-hearted hylomorphism'. Faint-hearted hylomorphists are typically guilty of the *statue fallacy*, that is, of taking Aristotle's statue analogy in *Physics* II.3 and *Metaphysics* V.2 as providing a literal example of material and formal causes. In these famous passages, Aristotle tells us that the shape of the statue is its form. If we take the statue's shape as a paradigm of form, we would have to think that it was a substantial form, like the soul. However, for Aristotle, artifacts like statues are not substances at all but are merely accidental unities (*Metaphysics* VIII.4, 1043b19-23). Hence, statues do not have substantial forms, and the 'form' of a statue is a form only *secundum quid*, i.e., in a loose manner of speaking.

Faint-hearted hylomorphism and similar forms of materialism give rise to an extreme ontological inflation, with large numbers of overlapping and coincident objects. This inflation in turn results in massive causal over-determination, of the kind discussed by Trenton Merricks (2001, 56-84). For example, when a baseball breaks a window, the causes of the breaking will be multiplied in proportion to the number of coincident objects and pluralities of objects associated with the material components of the baseball in motion. In addition, such versions of materialism are forced (when identifying a mind with its physical basis) to multiply coincident thinkers in a similar fashion.

Four Faint-Hearted Hylomorphisms

a. Bernard Williams

Bernard Williams (1986) offered two versions of Aristotelian hylomorphism, ultimately rejecting both of them. On the second version, an individual soul is a psychological *type* or *universal*, which is clearly a non-starter as an interpretation of Aristotle. On the first version, the soul is identified with a particularized property of a "Body" -- its "working" organically as constituting a living thing. Williams introduces the concept of *Body* to represent the material object that persists through generation

and corruption (thus, Kallias's body and Kallias's corpse are the same Body). Williams characterizes this view as nothing more than a "polite" version of contemporary non-reductive materialism.

Williams is missing the important features of Aristotle's theory. Williams's introduction of the kind *Body* ignores the substance/non-substance distinction. For the stalwart hylomorphist, the corpse is not a *thing* at all (in the strictest sense)—it is merely a *heap* or plurality of microscopic substances. Thus, it can't possibly be identical with either Kallias or Kallias's living body. Even if we grant that the corpse is a "thing" in a suitably weak sense, it certainly isn't either a substance or an integral part of a substance, and so it cannot exist in any sense prior to Kallias's death. Thus, there is in the stalwart hylomorphist's ontology no entity that corresponds to Williams's Body. Stalwart hylomorphists cannot suppose *human being* to be a mere phase sortal, marking out part of the career of a persistent *Body*, since substances like organisms are fundamental entities. The persistence of any material thing is parasitic on the more fundamental persistence of substances.

A Williams-style version of faint-hearted hylomorphism would involve a double proliferation of objects. First, any collection of material particles (at least, any collection occupying a connected region of space) would constitute one of Williams's Bodies. Second, any property of any Body would correspond to an accidental unity, just as Kallias corresponds to a certain Body's having the property of being alive. For example, if Socrates is sitting, then the "sittingness" of Socrates' body would (on Williams's faint-hearted account) correspond to an entity, *sitting Socrates*, that exists just so long as Socrates is sitting. Williams's account lacks the resources to distinguish substances like Kallias from accidental unities like sitting Socrates.

b. Kit Fine

Kit Fine (1999) introduced a theory of *rigid embodiments*. If R is a relation standing among objects a , b , c , etc. then there exists a rigid embodiment $[a, b, c, \dots/R]$, which exists when and only when these objects stand together in that relation. Fine calls R the rigid embodiment's *form*, and a , b , c , and so on its *matter*. Note again, Fine's theory includes no recognition of the substance/non-substance distinction, nor any limitation of form-matter compositionality to the case of material substances,

Fine also introduced *variable embodiments*, which are mereologically incontinent (i.e, capable of gaining or losing parts). For each variable embodiment, there is what Fine calls a *principle*, where each principle F has a unique manifestation at each time t . Manifestations are all rigid embodiments. Fine offers no restrictions as to what a principle might be like. Apparently, any rule or function that yields a unique rigid embodiment for each moment of time during some interval would count as a principle, grounding the existence of an appropriate variable embodiment.

Taken as a complete account of hylomorphism, Fine's theory would lead to a double proliferation of objects, an inflation of ontology far beyond even that of Williams's. First, any relation holding among any plurality of objects would correspond to a distinct rigid embodiment. Second, every function from times to rigid embodiments would correspond to a distinct variable embodiment. Thus, Fine's universe would be inhabited by a vast number of ontological monsters, many of which will share exactly the same material components at at least one point in time. Each relation that is realized gives rise to a distinct rigid embodiment, and every possible principle of diachronic identity, no matter how bizarre, would correspond to a distinct mereologically incontinent entity. For example, Eli Hirsch's exotic objects (Hirsch 1982), like the *incar*—an automobile that survives just as long as it remains in a garage—would be included as first-class members of Fine's ontology.

Alternatively, Fine's abstract theory could be interpreted so as to provide a framework of a *stalwart* version of hylomorphism. We could interpret Fine's "principles" as substantial forms, and we could

interpret the material elements of his rigid embodiments as parcels of matter. What, then, would his “forms” (the relations used to define rigid embodiments) be? We could take them to be what Aristotle calls ‘second actualizations’ of forms (*De Anima* II.1, 412a22). At any particular time, a person’s soul actualizes the potentialities of his body and of his mind in particular ways, ways that are consistent with the specific (first) actuality of the human soul as such. On the stalwart interpretation of Fine’s formal theory, each principle corresponds to the fact that some real substantial form (in reality) would sustain some substance in existence through time, with the principle’s value at each moment corresponding to the substance’s second actualization at that time.

Fine takes as a consequence of his view that “there will be an intensional or conceptual component to the identity of many material objects.” (Fine 1999, 73) This may well be true for non-substances, like artifacts and heaps. However, for stalwart hylomorphists, it will not be true for substances, since substantial forms are found in reality, and not merely in our representation of it. Consequently, stalwart hylomorphists won’t get an ontological inflation of substances.

c. Mark Johnston

Here is Johnston’s (Johnson 2006) basic schema for hylomorphic theories:

HS: what it is for X to exist is for y_1, y_2, \dots to stand together in relation R .

Like Williams and Fine, Johnston does not limit his hylomorphism to substances. Consequently, he countenances many cases of coincident objects, one corresponding to each relation R that is realized by any plurality of objects.

To his credit, Johnston rightly recognizes that hylomorphism is, at the very least, consistent with the metaphysical priority of some wholes over some of their parts (Johnston 2006, 678). He even suggests that it would be possible for a whole to be prior to *all* of its parts. However, it is not clear how this is consistent with HS. How can the relatedness of certain items be “the what it is” for the complex thing to exist, if the whole is ontologically prior to the relevant parts? If it is part of the essence of the parts to be parts of the whole, won’t HS force a problematic circularity upon us, making X ontologically prior to its own essence? It’s not clear what ‘ontologically prior’ could mean if HS doesn’t entail the ontological priority of whatever is prior to all of y_1, y_2, \dots over the complex X .

Setting this worry aside for a moment, can we adapt Johnston’s schema to a substance-only theory? Is Johnston’s schema compatible with a stalwart version of hylomorphism? Here’s an attempt:

HS₁: For any *substance* X , what it is for X to exist is for certain parcels of matter y_1, y_2, \dots to stand together in the relation R .

There are two problems with this suggestion.

First, the schema does not give us a particular substantial form for each substance. This would be better:

HS₂: For any substance X of species S , what it is for X to exist is for there to be a *trope* S_F of type S that modifies certain parcels of matter y_1, y_2, \dots

Johnston argues that such particularized forms or kind-tropes are unnecessary—that we can appeal instead to origins and original parts to distinguish one individual substance from another (Johnston 2006, 659-660). But what if those original parts are themselves substances of the same kind? An

infinite regress of individuation threatens, especially if we imagine a possible world that begins in a state of cosmic symmetry.

Second, Johnston (unlike Fine) faces the problem of material mereological incontinence. HS₂ implies that substance X necessarily has exactly the parcels y_1, y_2, \dots as components whenever it exists.

d. Kathrin Koslicki

In *The Structure of Objects*, Kathrin Koslicki (2008) defends a version of hylomorphism according to which every substance is literally composed of two parts, its form and its matter. The form is a relational property or arrangement, and the matter comprises of plurality of small objects that stand together in the arrangement. Such an account would, like the accounts of Williams, Fine, or Johnston, generate a plethora of 'substances', one for every arrangement realized by any plurality of objects. Koslicki explicitly rejects those elements of a stalwart hylomorphism that would bar such ontological proliferation: namely, the idea that form is a cause of the unity of the substance rather than literally a part of it, and the idea that the form unifies by imposing normative or teleological constraints on the arrangement of the material components of the substance.

The other oddity of Koslicki's account of hylomorphism is that substances are weird chimeras, composed of both concrete and abstract things. Koslicki insists that the form be a universal, since she finds the idea of an individualized form or haecceity "puzzling."

III. Stalwart hylomorphism

In order to differentiate hylomorphism from materialism, stalwart hylomorphists seek to identify a sparse collection of fundamental composite entities or substances, with enough sparseness so as to rule out coincident substances altogether. Given a powers account of causality, a sparse theory of fundamental things corresponds to a sparse theory of powers and power-bearers. The crucial question for stalwart hylomorphists is this: what is the relation between the powers of a whole substance and the powers of its proper parts?

One simple proposal would be this: the powers of any substantial whole are identical to the sum of the powers of its parts. In other words, all of the powers of the whole are wholly grounded in the powers of its parts, together with their extrinsic (spatial) relations to each other. Let's call this proposed principle the 'wholly grounded' conception of wholes. The wholly grounded conception of wholes has the consequence that no composite thing can have any fundamental powers. This is clearly in tension with the stalwart hylomorphist's commitment to the fundamentality of composite substances. Thus, stalwart hylomorphist should reject the wholly grounded conception of wholes and should instead embrace *emergent* powers of composite substances.

However, the thesis of emergent powers threatens to push the stalwart hylomorphist into the position of substance dualism. If the "whole" has emergent causal powers, in what sense can it be said to be wholly composed of its parts, as opposed to being a separate entity that interacts with those parts? Let's look at two recent proposals for resolving this dilemma.

a. Michael Rea

Michael Rea (2011) identifies several "controversial commitments" of traditional interpretations of hylomorphism (Rea 2011, 341-2):

1. The thesis that properties are "constituents" of the particulars they characterize.

2. The thesis that these properties are located “in” the particulars they characterize.

3. The belief that these relations of *constituent-of* and *in* cannot be understood in the ordinary way but must be taken to represent new, primitive relations.

I don’t see 1-3 in any way essential to hylomorphism, despite the popularity (beginning with Aristotle) of *talking* this way. I think properties are “in” particulars in the very straightforward sense of characterizing them. As we shall see, Aristotelian forms are not literally *parts* of the composite substances whose unity and being they ground. Thus, no additional primitive relation of parthood is required (at least, not for this purpose).

Rea complains that the technical vocabulary of *potentiality* and *actuality* finds no place in contemporary science (Rea 2011, 342). What is it, Rea asks, in the sodium chloride molecule, that “actualizes the potentiality of its matter to be a sodium chloride molecule?” Assuming that sodium chloride molecules are true substances (which I will grant, at least for *NaCl* molecules not incorporated into living things), the answer is that a certain emergent chemical form (expressed in a characteristic quantum function) has actualized the potentiality of a certain parcel of mass-energy and charge to be a *NaCl* molecule. That seems a promising way to go, and if modern scientists don’t talk that way, so much the worse for them!

Instead of form and matter, Rea prefers to speak in terms of ‘natures’ and ‘individuators’ of those natures. Rea proposes that natures *are* fundamental powers. In fact, for Rea, all properties are merely powers. Powers should play a central role in any hylomorphist theory, but we should not go so far as to suppose that all properties are simple powers and nothing more. Hawthorne, in his paper on “Causal Structuralism” (Hawthorne 2001), has shown that such a view has a real difficulty dealing with nomologically symmetrical worlds (the powers-analogue of the Max Black world).

Rea’s positive view is that the nature of a composite substance “unites” the powers of its parts. Here is his definition of what it is for one power (of the composite substance) to unify the powers of its proper parts (Rea 2011, 349):

A power p_0 of an object x *unites* distinct powers p_1, \dots, p_n =_{df}

(i) p_0 is intrinsic to x ,

(ii) each of p_1, \dots, p_n is a nature of at least one of x ’s parts,

(iii) p_0 is grounded in or identical to a certain sort of cooperative manifestation CM of p_1, \dots, p_n ,

(iv) every power intrinsic to x that is at least partly grounded in CM is identical with, reducible to, or at least partly grounded in p_0 , and

(v) there is no power intrinsic to x that is distinct from both p_0 and CM and that grounds p_0 .

Two of Rea’s claims don’t seem to cohere: on the one hand, the powers of substances are supposed to be fundamental, and yet, on the other hand, the powers of a composite substance are supposed to “unite” the powers of its parts, which entails that those united powers are *grounded in* the powers of the parts. It is better to have all (or at least some) of the powers of the parts “migrate” from those parts to the whole substance. One should at least insist that some powers had by the parts of substances are grounded in the nature of the whole and so not fundamental. This avoids

certain problems of potential causal redundancy noted by Merricks (in Merricks 2001, 147-155): if I stand on a scale, is it I (as a whole) or my parts (collectively) that cause the pointer to move? If the powers associated with weight have migrated from my proper parts to me, my weight can be the unique and non-redundant cause of the scale's response.

There is an important gap in Rea's account of substances: he hasn't shown that substances have *unique* natures, as he defines 'nature'. A single substance could have several independent powers, each of which unites some powers of its parts through separate cases of cooperative manifestation.

Like Fine and Johnston, Rea wants to apply the matter-form schema to all material objects, and not just to substances (Rea 2011, 352-353). However, non-substances must lack 'natures' in his sense, since they are merely derived entities.

b. Anna Marmodoro

Anna Marmodoro (2013), building on Theodore Scaltsas's interpretation of Aristotle's *Metaphysics* (Scaltsas 1994), rightly places the distinction between actuality and potentiality at the heart of a stalwart hylomorphism. The form is the *actualization* of the *potential* of the material parts to be merged into a whole (Marmodoro 2013, 18), as Aristotle explained in *Metaphysics* 1045b9-23. The proximate matter and the form are "one and the same," the proximate matter being potentially a single substance, and the form being the actualization of that potential.

As Marmodoro puts it, Aristotelian form is not literally a part of the composite substance, it is an "operation" (Marmodoro 2013, 17)—I would prefer a "process," with the material parts as participants, and the whole substance as the resultant. Marmodoro has explained (in private correspondence) that she takes the operation in question to be metaphysical one, since she takes form to be an abstract object. I would prefer an alternative, in which forms are concrete and the operation of the form are truly causal and diachronic. Formal and material causation are, on my view, both real, diachronic causal connections: the formal process, with its material participants, operating during each interval is the *cause* of the existence of the whole substance at the end of the interval.¹ A composite substance exists at time *t* because its material components participated in an appropriately formal process in some interval of time immediately prior to *t*. Marmodoro takes the form to be an abstract object embodied by these formational processes, rather than taking it (as I do) as the process itself.

In any case, thinking of form as an *operation* (whether metaphysical or causal) is fine, and a significant step forward for hylomorphism—but how does Marmodoro avoid the causal redundancy of the whole, or the exclusion of the whole's causal efficacy by that of its proper parts? Why isn't the whole merely epiphenomenal? The answer of Scaltsas and Marmodoro is this: the whole is not epiphenomenal because the whole's proper parts are existentially dependent on it. In other words, each proper part, no matter how small or elemental in character, is capable of existing only as a proper part of that whole or, perhaps, only as a proper part of some specifically similar whole. If this is so, then both the existence and the identity of each proper part are grounded in the nature of the whole substance. It would be natural to infer that the causal powers of the proper parts are also wholly grounded in the nature of the whole, securing the causal relevance of the whole.

Taken literally, this Scaltsas-Marmodoro thesis is quite radical in its implications. It would mean that whenever a new composite substance, such as an organism, is generated, the material components incorporated into it are literally annihilated and replaced by new elements, each of whose existence

¹ In thinking of the whole as diachronically emergent from its parts, I am following Timothy O'Connor's account of emergence (in O'Connor 2000).

and identity are dependent on the continued existence of the whole substance. We could, following Koslicki, refer to this thesis as that of Reverse Mereological Essentialism. There are two versions of such RME, one making the existence of each part dependent on the existence of a particular whole, and the other making its existence dependent on its being part of a whole of the right kind:

Reverse Mereological Essentialism (Particular). If x is a proper part of substance y , then, necessarily, if x exists, then y exists and x is a proper part of y .

Reverse Mereological Essentialism (Kind). If x is a proper part of a substance of kind K , then, necessarily, if x exists, then x is a proper part of some substance of kind K .

Of the two, the Kind version seems more reasonable, since it would be compatible with the possibility of organ transplants: a heart could continue to exist in a new host, even though separated from its original donor.²

At times, Marmodoro suggests an even more radical thesis: namely, that in the generation of a new substance, the substance's proper material parts exist "only potentially" (Marmodoro 2013, 15). This would mean that the original components are both annihilated and replaced, not by a number of counterpart entities existentially dependent on the new substance, but instead by an atomic whole, with no concurrent proper parts at all. On such a version of hylomorphism, there would in fact be no literally composite substances at all: all substances would lack actual parts, having at merely potential parts. We can call this radical thesis *Aristotelian Parts-Nihilism*.³

In thinking about Aristotelian Parts-Nihilism, we have to consider an issue that has come to the forefront in modern quantified modal logic: the issue of actualism vs. possibilism. Actualists, like Alvin Plantinga (1974, 131-163) and Robert M. Adams (1981), insist that the only things in the ultimate domain of quantification (the only possible values of singular terms or variables) are actual things, while possibilists take merely possible entities to be legitimate objects of reference and verifiers of existential generalization. Actualists affirm that absolutely everything exists in actuality, while possibilists maintain that some things are merely possibly existent. Actualists typically concede that it is possible that there exist things that don't actually exist, but they deny the validity of the converse Barcan formula: that is, they deny that from the possible existence of an F it should follow that *there is* something that is possibly F .

An actualist version of Aristotelian Parts-Nihilism entails that no substance has any proper part. We would have to deny that living organisms contain any organs, cells, molecules, or fundamental particles, although they might be capable of generating such things (through death, fission, expulsion, or excision). Singular terms referring to such apparent parts would have to be taken as simply empty or as referring to the whole substance under some specialized description. For example, 'the heart' might refer to the whole organism qua pumper of blood. All of the causal powers that we ordinarily attribute to the proper parts of an organism would have to be borne directly by the organism itself, which would involve a considerable complication to the nature of causal powers. We would have to relativize the causal powers of a substance to regions of space, so that we could distinguish the powers of the heart from those of the liver, or the powers of one internal electron from another. This would ultimately amount to treating regions of space as bearers or co-bearers of fundamental causal powers, an odd direction for a neo-Aristotelian to take.

² What should we say about the heart when it is in transit, between the donor and the recipient? I would suggest that it remains part of the body of the host, even when physically separated from it, until it has been successfully integrated into the functioning of the recipient's body. Up to that point, it seems reasonable to suppose that it is still supposed to be contributing to the functioning of the donor's body.

³ Alexander Pruss (2007) and in conversation has expressed some sympathy for Parts-Nihilism.

A possibilist version of Aristotelian Parts-Nihilism could instead take ‘the heart’ or an ‘internal electron’ (of a living organism) to refer to potentially existing material entities. This would make sense in the case of atoms and elementary particles and other entities that can exist outside a living body, but it will run into a serious problem with respect to those integral parts (like hands and organs), which, according to Aristotle’s Homonymy Principle, cannot exist except as part of the body. A severed hand or foot is not the same kind of thing as the intact hand or foot of a living organism—they are called ‘hands’ or ‘feet’ only “homonymously.” Since things cannot undergo a change of nature, the Homonymy principle would imply that such dependent parts cannot exist except as intact parts of the whole. If the heart does not exist as an *actual* part of the living organism, then it cannot be a merely *potential* entity either, since it (that very heart) cannot exist in isolation from the body, either (see *Metaphysics* 1035b24-25).

Marmodoro’s text suggests a third thesis, stronger than Reverse Mereological Essentialism but potentially weaker than Aristotelian Parts-Nihilism. She suggests that, when a new substance is generated, the material elements are “re-identified,” and “they have no distinctness in the substance (Marmodoro 2013, 15).” She proposes that the form “strips the elements of their distinctness (Marmodoro 2013, 17).” Once so stripped, the elements exist “holistically” in the substance and not “separately.” (Marmodoro 2013, 15) There are two ways of taking this third thesis. On the first way, it immediately entails Aristotelian Parts-Nihilism: to speak of something’s “losing its distinctness” from other things is merely to speak (in a somewhat figurative way) of that thing’s simply ceasing to exist. The second way of taking Marmodoro’s proposal is to interpret her as proposing that the material elements continue to exist after the generation of the substance but literally become one-- with each other and with the resulting whole. This would involve the denial of the eternity and necessity of distinctness, embracing the temporal relativity of identity. Such a theory would have to reject either Kripke’s argument for the necessity and eternity of identity (Kripke 1970, 143-4) or reject the symmetry of temporal or modal accessibility, corresponding to the axiom *B* (if *p*, then necessarily possibly *p*) and its temporal counterparts (if *p*, then it always will be the case that it was the case that *p*, and, if *p*, then it was always the case that it will be the case that *p*). In the end, even this interpretation leads back to a possibilist version of Aristotelian Parts-Nihilism: no substance could have any *proper* parts, since every substance would be literally identical to all of its concurrent parts.

Perhaps the most charitable interpretation of Marmodoro would be to take the talk of “losing distinctness” as not referring to the acquiring of strict, Leibnizian identity with other parts and with the whole. We could take these phrases as simply a vivid way of expressing Reverse Mereological Essentialism. What really happens (on this view) to material elements in the generation of a new substance is their annihilation and replacement by new, existentially dependent parts of the substance bearing some resemblance (whether qualitative or quantitative) to the pre-existing elements.

However, there is still a serious problem with Reverse Mereological Essentialism as an account of Aristotle’s hylomorphism. Aristotle introduced the notion of ‘matter’ (ὕλη) in *Physics* I,7 as the substrate of substantial change (i.e., the generation and destruction of material substances). Aristotle’s Substrate Principle demands that something, the substrate, exists both before every kind of change, including substantial change. Reverse Mereological Essentialism is inconsistent with the Substrate Principle, since RME entails that both the substance and all of its material parts begin to exist at the same moment. Just because the pre-existing elements and the new substance contain the same quantity of material stuff (e.g., mass, charge, and so on) is not sufficient, since what

Aristotle requires is some substrate that is numerically one and the same before and after substantial change.⁴

It is not enough for there to be (before and after a case of substantial change) things that are quantitatively and qualitatively similar to each other, even exactly similar. There must be some one thing that endures through the change as its ultimate subject. Why is this principle mandatory for Aristotelians? Suppose that there could be a change with no enduring subject. If such a thing could happen somewhere at some time, it could happen everywhere at all times. (This inference involves an appeal to David K. Lewis's Patchwork Principle, which every Aristotelian should endorse: what is possible in a given situation cannot depend on what actually happens in remote situations.) But a world in which there are never any enduring subjects of change is nothing more than a four-dimensional block of qualities, the sort of static block universe decried by McTaggart and endorsed by four-dimensionalists and Neo-Humeans. From an Aristotelian perspective, such a world would lack any real change or time at all. Hence, the very idea of substrateless change is incoherent.

A Parts-Nihilist might resist this argument by supposing that there are quantity tropes or particular accidents (e.g., tropes or accidents of mass, volume, or other physical quantities) that persist (with numerical identity) through substantial change, even though no material substance persists. This would require such tropes/accidents to be transferable from one substance to another, which is in some tension with the idea that an accident is merely a way that some particular substance is. Furthermore, since these enduring accidents would be the bearers of further qualities and powers, such a view would still entail that certain material entities persist.

We must, therefore, restrict the Homonymy Principle to the relatively proximate parts of the organism, like organs and cells, excepting fundamental parts, like elemental particles. Only then can we have material elements (the substance's independent parts) that literally endure through generation and destruction, without losing or gaining their mutual distinctness.

IV. The dilemma for stalwart hylomorphism

We must return to the drawing board and consider again how to deal with the fundamental dilemma of stalwart hylomorphism: that of ensuring the differentiation of hylomorphism from materialism by positing emergent powers without collapsing into a version of substance dualism. Is the whole something over and above its parts? Yes, if we are to avoid faint-hearted hylomorphism, a version of materialism. But if we answer Yes, then how can we ensure that the supposedly composite substance is truly *composed of* some smaller material elements, as opposed to being a wholly *separate* substance? In addition, an ideal solution would give us an account of parthood (as it pertains to composite substances and their elementary parts) that would validate most, if not all, of the axioms of standard formal mereology.

I'm not suggesting that we must find an answer to van Inwagen's General Composition Question: what, in general, is the essence of to-be-part-of? Parthood is unproblematic in those cases that satisfy either Mereological Essentialism or Reverse ME. If *A* is essentially a part of *B*, or *B* essentially includes *A* as a part, then either *A* or *B* (or *A* or *B* together with its essential nature) suffices as a truthmaker for the proposition that *A* is a proper part of *B*. However, in the case of living substances and their elemental parts, neither Mereological Essentialism nor Reverse Mereological Essentialism

⁴ By 'numerical sameness' I mean strict, Leibnizian identity. I don't mean to imply that the enduring things must be countable in the strict sense, as opposed to some stuff. (I have in mind the well-known distinction between count-nouns and mass-nouns.) Even uncountable masses come in particular 'parcels' or 'parcels' of stuff that are numerically the same at different points in time – see Laycock 1975.

holds, forcing upon us the question: what makes it the case that this is now a proper part of that? At the very least, we should welcome an informative answer to this question.

The solution to this dilemma is to tie the “whole” substance to its material “parts” by way of a double dependency of some kind. We want the whole to be dependent on its parts in such a way that it cannot be a separate substance, while also positing that the parts are dependent on the whole in such a way that it is rendered neither redundant nor epiphenomenal.

In developing such a solution, I propose to examine seven possible ways of accounting for the relation between emergent wholes and their material parts:

1. Aristotelian Parts-Nihilism. Emergent substances have no actual parts at all.
2. Reverse Mereological Essentialism. Parts of substances cannot exist except as parts of substances of the same kind.
3. Downward sustenance: the persistence and operation of the whole substance *cause* the persistence of its parts.
4. Upward sustenance: the persistence and cooperation of the substance’s parts *cause* the persistence of the whole.
5. Upward power migration: some (or all) causal powers *migrate* from parts to the whole.
6. Teleological subordination: the powers and activities of the parts are teleologically ordered to some end pertaining to the whole.
7. Parts as sustaining instruments: a combination of options 4, 5, and 6.

We have already seen reason to reject the first two options. Both Aristotelian Parts-Nihilism and Reverse Mereological Essentialism are inconsistent with Aristotle’s Substrate Principle.

There are additional problems with Parts-Nihilism. For example, there is the problem of internal locomotion, such as thought experiments involving spinning homogeneous disks. If substances have literally no parts, what sense can we make of internal locomotion (like the circulation of blood, for example)? Perhaps this can be explained in terms of tropes (particularized properties). For blood to circulate is for spatially located tropes (tropes of redness and liquidity, for example) to change their locations. But this just raises further questions, such as: what is it for a trope to have spatial location? Are there distinct bundles of tropes corresponding to the spatially disjoint sub-regions occupied by an extended substance? If so, wouldn’t these bundles simply be the proper parts of the substance, contrary to the assumption of Parts-Nihilism?

Let’s turn then to option 3, the downward sustenance account. On this view, parts of substances actually exist, but the fundamental ground of their persistence is the persistence and material powers of their encompassing substance. (I’ll use ‘encompasses’ as a convenient abbreviation for the converse of ‘is a part of’: x encompasses y iff y is a part of x). If a part persists from t_1 until t_2 , this is either because the substance persists throughout that period and sustains the existence of the part, or some material power of the substance is exercised at some point in the interval, resulting in the extrusion of the part, endowing upon the part its own, autonomous substantiality.

This option is similar to Reverse Mereological Essentialism, in that both seek to ground the continued existence of the parts in the existence of the whole, but Downward Sustenance involves understanding this dependency in terms of causation, rather than understanding it modally, in terms of the impossibility of the existence of the part in the absence of a whole. On Downward Sustenance, it is possible for the part to exist before or after the existence of the composite, but, while the part is a part of the whole substance, the whole is implicated in the causal explanation of the persistence (through time) of the part.

This account does a good job of explaining the diachronic dependency of the parts on the whole, but it provides no grounds for any dependency running in the opposite direction. Consequently, it can't differentiate hylomorphism from substance dualism. The whole is really separate from its parts.

Let's turn, then, to option 4: the Upward Sustenance account. On this view, the persistence of the whole is causally or metaphysically dependent (at each moment) on the cooperation of its parts.

Option 4 involves thinking of substantial forms as *processes*. The persistence of the whole substance through time is grounded in the cooperation of its parts in a formal or substance-forming process.⁵ For example, the persistence of a living organism is grounded in the cooperation of its part in the process of an organic life of the appropriate kind. In other words, the existence of the whole substance at any time *t* is a result of the cooperation of the parts in some formal process in an interval of time prior to and contiguous with *t*. One added advantage of the Upward Sustenance approach is that it is now no mystery how forms could be individual or particular, since processes are clearly concrete particulars.

Formal processes (to coin a term) have fundamental properties that are temporally extended--irreducible properties of motion and change. The instantaneous properties of the process and its participants are grounded in the temporally extended properties of the process. Thus, Upward Sustenance involves reversing the direction of grounding, when compared with the popular At-At theory of motion and change. The fact that motion is occurring is not grounded in the substance's being located at different places at different times: instead, the facts of the instantaneous locations of the substance are grounded in facts about the process of motion (e.g., its intrinsic velocity and the place and time of its origin).

If we adopt such a theory of forms as processes, then the principle of Reverse Mereological Essentialism will have a new domain of application: all of the parts of a formal process--its sub-processes and constituent events--will be essentially parts of that very process. No event or process that is numerically identical to one of these parts could exist in any world in which it is not a part of that very process. There is an upward dependency of part-identity upon the identity of the whole process. So, for example, the very chemical reactions that make up a process of an animal's digesting a meal could not exist except as part of that process of digestion, even if qualitatively and microscopically indistinguishable reactions could.

At the same time, the qualitative features of the formal process as a whole (e.g., the processes of an individual human life) will be grounded in the qualities of and relations among its sub-processes. There is a downward dependency of the qualities of the whole process upon the qualities and relations of the parts. The qualities of a particular case of digestion will depend on the qualities of and relations among the various chemical reactions and cellular changes that make it up.

⁵ Should the grounding be thought of as causal or metaphysical? The answer to this question depends on whether a composite substance (such as a living organism) could exist for merely an instant. If so, the dependency is merely causal; if not, it must be metaphysical. I am inclined to think that it is impossible for an organism to exist for only an instant, and so I lean toward the metaphysical dependency version of upward sustenance.

The Upward Sustenance account does a good job of anchoring the existence of the whole to the operation of the parts, dispelling worries about the whole's separateness from those parts. However, taken by itself, Upward Sustenance runs the danger of falling into a kind of non-reductive materialism, with the whole substance lacking causal efficacy. All of the causal work is done by the material parts, which possess all of the fundamental causal power (both active and passive).

Option 5, the Upward Power Migration account, addresses this problem of causal efficacy. On the Upward Power Migration account, proper parts of composite substances actually exist, but they lose many of their active and passive causal powers, making room for new powers that are acquired by the whole substance. Without this migration of powers, the whole would be either epiphenomal or causally redundant.

One major problem with option 5 is that it threatens to entail option 2, Reverse Mereological Essentialism. The nature of a material entity consists in a bundle of fundamental or primary causal powers. If a material part of a new substance were to lose any of its primary powers, it would undergo a change in nature, but this is impossible, given the Aristotelian's commitment to the Unchangeable Nature principle. What it is for any entity to exist is for it to instantiate a certain nature. Consequently, nothing can undergo a change or alteration in nature.

To avoid this entailment, the Power Migration account would have to suppose that the natures and primary powers of the material components do not change when the component is incorporated into or extruded by a composite substance. Instead, each elementary particle would have certain primary *material powers* (to coin another term), that is, powers that, when exercised in combination with suitable powers of other fundamental entities, result in the existence and persistence of a *composite* substance with certain causal powers. In addition, we would have to suppose that the active and passive causal powers of such elementary are all secondary powers, powers that result from the exercise of their primary powers in various circumstances. The elementary particle of type *E* would have one set of secondary powers corresponding to its existence as a separate substance, and distinct set of secondary powers corresponding to the status of being a proper part of a certain kind K_p in a composite substance of kind *K*, for every pair of kinds *K* and K_p , such that particles of type *E* can instantiate K_p in things of kind *K*.

For obvious reasons, we don't want Power Migration to leave the elementary parts of a composite substance powerless. We know by observation that parts of living organisms are capable of acting and being acted upon. In fact, we know on empirical grounds that the active and passive powers of the elementary parts of the body are generally very close to the powers of similar particles outside of any living body ("in the wild"). This similarity can be the result of a two-way transaction between the parts and the whole: the material powers of the parts ground the primary causal powers of the whole, which in turn grounds the secondary powers of the parts. The resulting secondary powers of the parts are similar (on the microscopic scale) to the secondary powers of similar particles in the wild but they are ontologically dependent on the primary powers of the whole. They are, consequently, *numerically* distinct from powers possessed by the same particles when no longer part of the organism.

Powers are individuated by the character of their exercise—that is, by the character of the outcomes they naturally produce. Difference in teleological properties corresponds to such a difference in outcomes. Hence, powers are individuated by their intrinsic teleological character: the very same power cannot be intrinsically ordered (on different occasions) to different ends.

This picture clearly differentiates hylomorphism from any version of materialism, since it implies that every material element has a fundamental nature that anticipates (so to speak) all of the possible kinds of composite substance in which element of that kind could be incorporated. For example, the powers of charge and mass would not be primary powers of the electron but only secondary ones, brought into being only when the electron's primary material powers are exercised in certain ways. The causal powers of the electron would be to comprise certain secondary powers when it is a separate substance, and a different set of secondary powers when it is incorporated as a proper part of a living organism of kind K. This opens up the possibility of a fundamental scientific explanation of the facts of material composition.

When elementary particles do compose a living organism, the organism will not be epiphenomenal or redundant, since it will possess primary active and passive causal powers of its own. The material parts will also possess active and passive causal powers, but these will be secondary powers, partly grounded in the powers of the whole. Similarly, any exercise of these secondary powers by the parts will be grounded in an exercise of some corresponding primary power by the whole. The parts will act, but only as *instruments* of the whole.

It is possible that some of the secondary powers of the elementary parts are not at all dependent on the primary powers of the whole organism. For example, suppose that some of the particles in the human body have certain powers of interacting with ambient neutrinos. Let's also suppose that the exercise of these powers has nothing to do with the organic process of human life. If so, it may be that the particles are disposed simply to retain these powers, without any bringing about any dependency of these powers on any power of the whole organism. On the other hand, many of the powers of the parts, such as the gravitational, electromagnetic, and nuclear powers, are clearly relevant to organic functional. Without the power to attract and be attracted by the earth gravitationally, I would be unable to perform many basic activities, such as walking or lying down to sleep.

One advantage of the Powers Migration is that it is consistent with the elemental parts' having active and passive powers that are indistinguishable (at a microscopic scale) from the active and passive powers that those same substances would have when existing in separation from the living body. Empirically, this seems to be generally the case. However, one might object that it is, to say the least, peculiar for the causal powers of the parts to be dependent on the whole, when they would have exactly similar powers on their own when "in the wild."⁶ Electrons outside the body have the power to repel each other with a certain force – surely they exercise the very same power when they repel each other as parts of a living body? Why suppose that their powers are dependent on the presence of the whole in the second case, when they clearly exist apart from the whole in the first case?

But do fundamental particles really do the very same things when part of the organism that they do in the wild? It is only because we suffer from a kind of microscopical myopia that we are inclined to think so. Consider the following analogy. I have the power to speak, a power that I can exercise in a Hobbesian state of nature. Now suppose that I am in fact part of a political community, which enables me to speak in specifically political settings, such as a jury or a town meeting. Clearly my power of speaking takes on new dimensions thanks to my incorporation into a larger whole. Similarly, electrons are enabled to do things by their inclusion that they couldn't have done in the wild.

Why should the defender of the Powers Migration account think that there is any loss of causal power on the part of the elementary material parts of the substance? Why not just suppose, as

⁶ Thanks to Brian Cutter for raising this objection.

some emergentists like Timothy O'Connor have done, that the composite substance acquires powers to act directly upon the substance's elementary particles, while the particles retain their full repertoire of powers? For example, we could suppose that the organism has the power to change the trajectories of certain electrons in the synapses of its brain, with the consequent alteration in macroscopic behavior being the result of a cascade of ordinary microphysical interactions.

The main difficulty with this proposal is that it misidentifies the fundamental powers of the organism. Animals, for example, have the power to act on a macroscopic scale, as guided by sensation and (possibly) rational deliberation. The basic powers of the animal include certain motions of their limbs and head, not the motions of synaptic electrons. If the organism is to be able to move its limbs, there must be some alteration in the powers of the constituent particles of those limbs, to prevent them from simply moving themselves. The Powers Migration account does not rule out the possibility that certain particles (when incorporated into the organism) may behave differently (even when judged empirically at the microscopic scale) than they would in an inorganic setting. However, it does not require such microscopic novelty in all cases of holistic action, and when it does occur, it is always a consequence of the exercise of some macroscopic causal power.

Here's another objection to Powers Migration (due to Brian Cutter). The account hypothesizes that the causal powers of the parts are grounded in the powers of the whole organism. However, the causal powers of whole organisms are quite coarse-grained: powers like the power to digest food, or to run, or to build a nest. The powers of the microscopic, elementary parts of organisms, in contrast, are quite fine-grained. The particles collectively have the power to digest particular molecules of food in very specific ways and very specific rates, to run through a very particular series of muscular and skeletal movements, or to build a nest from specific materials in a very specific arrangement. The latter powers cannot be grounded in the former, since grounding entails necessitation: if a set of powers S grounds a set S' , then the possession of set S must metaphysically necessitate the possession of set S' . A class of coarse-grained powers cannot necessitate a class of fine-grained ones.

However, it is far from obvious that the causal powers of a particular organism at a particular time are coarse-grained. It may be that the essence of the organism's species (or natural kind) entails only the possession of certain coarse-grained powers. However, the powers of a particular member of the species are produced jointly by the species-essence and the material powers of the member's actual elementary parts. The exercise of those material powers at each moment determine a set of fine-grained causal powers for the organism, which can in turn ground the secondary causal powers of the parts.

This version of the Powers Migration account does a good job of making the parts dependent on the whole, but it does a poor job of securing any dependency in the other direction. Consequently, the whole still threatens to be an entirely separate entity. A possible solution lies in combining options 4 and 5, resulting in dependency in both directions.

Option 6, teleological subordination, provides an alternative to option 5.⁷ On option 6, the parts are dependent on the whole only by virtue of a metaphysically primitive relation of teleological subordination: by being incorporated into a living organisms, the material parts acquire a teleological ordering to the natural ends or telos of the organism. On option 6, we don't need to talk about the migration of powers or the subsequent dependency of the powers of the parts on the powers of the whole. Instead, the elementary parts retain *all* of their native causal powers.

The obvious problem with option 6 is once again the threat of holistic epiphenomenalism. Can the whole act without its own, ontologically independent causal powers? Non-reductive materialists

⁷ Thanks to Brian Cutter for suggesting this option (without endorsing it).

might respond by urging that we don't need for the wholes to have *independent* causal powers: all that is needed is that they have powers of some kind, even if those powers are wholly grounded in the powers of the parts.

In addition, there is a further move that the teleological subordinationist can make here: we could suppose that the parts' incorporation into the organism and their teleological subordination to its end does produce new causal powers at the level of the elementary parts, even though these involve no loss of their physical and chemical powers. As I described in the political speech analogy above, the organic context provides particles with new kinds of causal powers: powers to contribute to the organism's functions. These powers are real and are grounded in the nature of the whole. Thus, the whole organism is causally relevant at the ontologically fundamental level, after all.

However, option 6 is merely a sophisticated version of epiphenomenalism. The teleological properties are mere embellishments or decorations of the non-biological facts, pulling no causal weight and making no difference to the physical domain. Given that teleological properties are metaphysically fundamental, there is no reason to suppose that they supervene, even weakly, on the non-teleological properties. A set of properties that do not supervene on the physical realm and that make no causal difference to the presence of physical properties is an inert and ultimately empty addition to reality. It is not necessary that the teleological properties make an empirical difference to the non-teleological realm, but they should have metaphysically fundamental powers with purely physical events among their causal consequences (as option 5 ensures).

The ultimate solution to the set of metaphysical constraints in play is to combine options 4, 5 and 6 into a single account, the Sustaining Instruments theory. On this account, the persistence of the whole is grounded in the ongoing cooperation of the parts, and the active and passive powers of the parts are grounded in corresponding primary powers of the whole. In addition, the whole acts through the parts, as teleologically subordinate instruments.

V. Parts as sustaining instruments

Option 7 ties the whole and parts together in such a way that whole is neither existentially separate from its parts nor able to act in a way that is separate from the actions of its parts. The stalwart hylomorphist must accomplish two things: (1) ensure that the persistence through time of the composite whole is grounded in the cooperation of its parts, and (2) ensure that the whole cannot act or be acted upon except, at least in part, doing so "through" the powers of its parts.⁸

The first requirement could be met by supposing that every composite substance at t is sustained in existence at t by the cooperation of its proper parts. Let's call this the 'Sustenance condition':

Sustenance: for any composite substance x with proper parts the yy 's and any moment t at which the substance exists, the existence of x at t is wholly grounded in the actual persistence of some process P in some interval of time beginning at some instant t_0 and ending at t , which process P is such that its participants from t_0 until and including t are exactly the yy 's (or exactly x itself and the yy 's).⁹

⁸ This limitation of active and passive powers is not supposed to exclude the whole organism's potentiality for engaging in internal activities that do not involve any part of the body. For example, Aristotle argues in *De Anima* III that the soul's purely intellectual activities do not require any corporeal organ. For Aristotle, causal powers are always transeunt, rather than immanent: they always involve both an agent and a disjoint patient. An organism can act on another substance and can be acted upon by another only through the instrumentation of its material parts.

⁹ This definition is consistent with the possibility of a rational soul's survival of the body's death—the human being's intellectual activity may be sufficient to sustain the persistence of the human substance, even in the absence of the organic

The second requirement could be met by supposing that for each causal power P (whether active or passive) of a composite substance, there is a power $P2$ of some proper part of the substance such that $P2$ is at least partly grounded in P . Let's call this the 'Instrumentation condition':

Instrumentation: for any composite substance x , any causal power P of x at any moment t , there is a proper part y of x at t , a power $P2$ of y at t , such that $P2$ is at least partly grounded in P , and the exercise of $P2$ at t would contribute to the natural end of x .

There is a sense in which the whole does interact with its parts. However, this can be distinguished from interactionist dualism because, on PASI theory, the whole acts upon a part only through another part. The whole acts because it has a part capable of acting in a certain way, and the part acts or is acted upon because it plays a certain role in the constitution of the whole.

The PASI account avoids the problem of circularity that afflicts some versions of emergence. There are two kinds of dependency relations: synchronic (occurring in a single instant), and diachronic (the dependency of something at one moment on a thing or things existing at earlier moments). The synchronic dependency is top-down, with the powers of parts grounded in the powers of the whole, while the diachronic dependency is bottom-up, with the later existence of the whole dependent on the earlier activity of the parts. Hence, there is no circularity: instead, the dependency diagram is a zig-zag path, running down at each moment and up as time advances.

Is there an alternative version of hylomorphism that also avoids circularity by reversing the two dependency relations, with synchronic dependency of wholes on parts and diachronic dependency of parts on wholes? This seems to be an unattractive alternative, for two reasons. First, if the elemental parts are dependent for their existence on the past operation of the whole, then it will be difficult to explain how the parts could exist before the whole's generation or after its destruction. There will have to be at least two different ways of causally explaining the existence of the same microphysical parts. Second, if the powers of the whole are synchronically grounded in the powers of the parts, then it seems that the whole cannot act on the parts, since this would involve some vicious causal circularity, on the plausible assumption that all transeunt action and reaction are instantaneous. The whole would have to act on other things without acting on or through its parts, which would entail that the whole is really separate from its parts.

Composite substances realize a hierarchical structure of functional parts. The secondary powers descend in a stepwise fashion, from top of the lattice structure (the whole organism) to the bottom (the elementary particles). Similarly, the material process by which the whole organism is sustained in existence (together with its accidental properties) rises from the bottom to the top through the same series of functional stages. The intermediate levels consist of dependent parts, to which the Homonymy principle applies, while the lowest level consists of independent parts, the enduring substrate of substantial change. We can define a substance as something that can exist at the top of such a structure:

Definition of substance: x is a substance iff it x is unencompassed (i.e., not a proper part of anything).

processes of biological life. While the human being is alive, the substance's persistence is sustained by the process of life in which the material parts participate, but this need not be true after death.

For Aristotelians, all fundamental causal powers reside with substances. Proper parts of substances have no independent synchronic powers. In contrast, materialists and most substance dualists identify the substances (in this sense) with the mereologically simple.¹⁰

The PASI Account and the Nature of Composition

The two conditions (Sustenance and Instrumentation) can be built into an answer to Peter van Inwagen's General Composition Question (van Inwagen 1995, 20).

Definition of 'instrument': x is an instrument of y at t iff, for every significant active or passive power P of x , there is some power P_2 of y such that P is partly grounded in P_2 , and the exercise of P at t would contribute to some natural end of y .

Definition of 'sustaining instrument': x is a sustaining instrument of y at t iff x is an instrument of y at t , and there is some process P and some interval of time t_0 to t such that: (i) x is a participant in P throughout the interval from t_0 to t , and at t itself, and (ii) the existence of y at t is wholly grounded in the persistence of P from t_0 to t .

Definition of 'proper part': x is a proper part of y at t iff x is a sustaining instrument of y at t .

I will argue that all of the axioms of classical extensional mereology (with the exception of arbitrary sums) are validated by PASI theory. This is an important advantage of PASI theory over substance dualism.

Transitivity is easy and automatic, given the transitivity of grounding. The same is true for the asymmetry of proper parthood, since the grounding relation is also asymmetric.

Sustenance suggests that the PASI mereology will satisfy a strong condition of companionship:

Very Strong Companionship: if x is a proper part of y , then there is some z such that z is a proper part of y , z is not a part of x , and x is not a part of z .

It takes two or more mereologically independent components to sustain the existence of an emergent whole. Any elementary material entities is incapable of realizing, on its own, the sort of complex activity needed to sustain the existence of a living organism. There might be possible worlds where such a thing could happen, but it doesn't seem that the electrons, quarks, and photons of our world are capable of solo biological activity (unless something like string theory is actually true). However, even if a single elementary entity were capable of such complex activity, it wouldn't bring into existence a distinct living substance. The one material substrate would simply become a living thing, without undergoing any loss of secondary causal powers. A substance cannot be constituted by a single immediate proper part, since there would then be nothing to trigger that part's primary capacity to become the mere instrument of a distinct entity. We could call this the "Two to Tango" principle.

The structure of neo-Aristotelian mereology will be treelike, satisfying Mereological Linearity:

¹⁰ As a consequence, materialists have to deny the metaphysical possibility of mereological gunk (material entities with no simple parts), while Aristotelians must deny the possibility of "junk" (material entities with no unencompassed encompassers). For Aristotelians, the existence of composite substances, especially living organisms, breaks this tie. There are clear cases of composite substances, but no clear cases of encompassed substances

Mereological Linearity: either x is a part of y , y is a part of x , or x and y are disjoint (non-overlapping).

No entity could be capable of transferring all of its significant active and passive power simultaneously to two mutually independent entities. It is possible for this transfer to occur successively, up a single line of dependency, but nothing can be wholly an instrument of two distinct things, unless one of these is instrumentally subordinated to the other. We could call this the “No Two Masters” principle, after Jesus’ statement in Matthew 6:24, “No man can serve two masters.”

Linearity plus Very Strong Companionship entails Strong Supplementation.

Strong Supplementation: if y is not a part of x , then there is some part of y that does not overlap x .

Suppose y is not part of x . By Linearity, either (i) x is part of y or (ii) x and y are disjoint. In case (ii), y itself is the part of y that is disjoint from x . Consider case (i), and suppose x is part of y . Since parthood is transitive and antisymmetric, x is a proper part of y . By Very Strong Companionship, there is some z that is a proper part of y , z is not a part of x , and x is not a part of z . By Linearity, x and z are disjoint.

It is obvious that Strong Supplementation entails Weak Supplementation.

Weak Supplementation: if x is a proper part of y , then there is some z that is a proper part of y and that doesn’t overlap x .

In addition, Strong Supplementation plus the axioms of strict partial ordering (transitivity and asymmetry) entail the Extensionality principle:

Extensionality: if x and y have proper parts, then $x = y$ if and only if they have exactly the same proper parts.

Additional Advantages of PASI

(a) The brain damage problem

Substance dualists have great difficulty in explaining why brain damage can affect the higher mental functioning of a separate soul. On PASI theory, a composite substance does everything it does through material instruments. So, we can explain why brain damage damages mental capacities. We can also explain why the soul ceases to exist at death: death is always a causal consequence of the cessation of the relevant formal process (the soul).

(b) The pairing problem (Jaegwon Kim 1973)

Jaegwon Kim (1973) posed the pairing problem for substance dualism: what connects a particular body with a particular soul, in such a way that the body interacts only with that body, and the body only that soul? The counterpart of this problem for hylomorphism is solved by the conjunction of the sustenance and the instrumentation conditions. The organism acts through its parts because they are its instruments, and the parts sustain the whole because they participate in the relevant formal process.

(c) The interactive gap problem

How can something non-physical affect something physical? This objection is closely related to the pairing problem: in the case of mind/body interaction, what serves the role of spatial contiguity? How can the non-mental be spatially located?

On the PASI version of hylomorphism, the connection between the whole organism and the parts is one of grounding, rather than causation: the causal capacities of the material parts are grounded in the causal capacities of the whole, and the actions of each part are grounded in actions of the whole. This is not a causal connection.

A certain kind of causal interaction between a whole and one of its parts is possible, but the whole always acts upon one part through some other part (acting as its instrument). So, there is no spatial or categorial 'gap' between cause and effect.

(d) Fission and fusion survival puzzles

The persistence of an organism is always grounded in the persistence of a formal process (typically, a process of life). Each kind of formal process has a nature or essence that dictates a certain range of possible four-dimensional "shapes". In particular, forks and reverse forks are shapes that are excluded by these natures: one and the same process of life cannot survive a splitting into two, spatially separated sub-processes, nor can one process have existed in the past while constituted by two such separated sub-processes. Thus, there will always be, at the level of processes, a principled answer in the case of fission as to which one (if any) of the two fission products is identical to the original. Similarly, there will always be a principled answer in the case of fusion as to which one (if any) of the two original organisms survives their fusion.

(e) Limited vagueness of composition

If the grounding relation and the microphysical facts are determinate, so are the facts about the composition of composite substances. Composition introduces no further dimension of vagueness. If a composite substance is vague in respect of its parts, this must be owing to vagueness at the microphysical level or in the grounding relation.

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Anna Marmodoro

Aristotle on the problem of common sensibles

Abstract

Aristotle draws a distinction between qualities that are perceptible via a single sense only, the *special* sensibles, and qualities that are perceptible by more than one sense at once, the *common* sensibles. What are the ontology and the epistemology of the common sensibles, in light of Aristotle's assumption that each sense organ is sensitive to only its own special sensibles? Does the problem of common sensibles give us reasons for giving up a 'separatist' view of sense experiences? Or rather can it be solved by postulating extra perceptual powers for the senses? Are more 'parsimonious' options viable? In this paper I engage with these and related questions, which have attracted the interest of Aristotelian scholars (Gregoric 2007, Johansen 2012) and philosophers of the mind (Tye 2007) alike. I offer my own reading of Aristotle's account and examine its philosophical viability.

Paper

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Non sense-specific perception and the distinction between the senses

Abstract

It is beyond dispute that the senses interact. In this paper I will consider the way in which such interaction constrains thought about the senses, and in particular, thought about how they are distinguished from one another. I will consider two views of what it is to have a sense. On the first view, senses are systems. On the second, they are capacities. I will argue that on each view, the occurrence of different forms of multimodal perception rules out some views of how the senses are distinguished. The occurrence of perception not restricted to one sense does not, however, make it impossible to distinguish between the senses, either as systems or capacities. Neither does it make that distinction otiose. And whilst there is an explanatory penalty to be paid if one seeks to explain perception only one sense at a time, I will argue that given a plausible, defensible view of how to count perceptual experiences at a time, interaction between the senses does not show that it is illegitimate to talk of perceptual experiences belonging to one modality, at least whilst thinking of senses as capacities.

Paper

It is beyond dispute that the senses interact. There are many—and many kinds of —interactions between the senses. Some recent philosophical work on non sense-specific perception has focussed on categorising these kinds, and I will both rely on and add to that work here.¹ But what I want primarily to consider is the way in which such interaction should affect thinking about the senses, in particular thinking about the distinction between the senses. Non sense-specific perception might be thought to affect such thought in at least the following two ways.² First, it might threaten the distinction between the senses, either by making it impossible to distinguish the senses, or pointless to do so. Second, and relatedly, it might make it illegitimate to think about perception, as it were, ‘one sense at a time’. Most straightforwardly, if perception rarely or even never occurs in that way, one will have little or even nothing to talk about if one restricts one’s talk of perception to the modality-specific. Furthermore, as Casey O’Callaghan puts it, such interaction might threaten any view according to which the senses are ‘explanatorily independent’ (2011: 154), in which case one’s explanations, if one sticks to the sense-specific, will be not just partial but mistaken. In what follows I will try to capture these respects in which non sense-specific perception might be thought to affect thought about the senses and consider the extent to which thought ought to be thus affected.

Considering the effect of non sense-specific perception on thought about the senses is complicated by the involvement of other, related issues. There is no agreed-on view of just what it is to have, or indeed to lack, a sense. And even amongst those who share a broad conception of what a sense is, there is disagreement about what, if anything, is the defining difference between the senses. It is natural to think that we ought to settle on answers to these questions before we can begin even to determine which cases of perception are to count as non sense-specific. However, rather than offer any particular answer to these questions, I will try to consider how non sense-specific perception affects our thinking about the senses given some different answers to these questions. This is not at all regrettable: whilst it is plausible to think that we need to have in mind a view of the senses in order to determine which cases of perception are to count as non sense-specific, equally, some views of the senses and the distinction between them are, as we will see, made problematic by the occurrence of non sense-specific perception. So one shouldn’t want to take these issues neatly in order.

¹ See especially Macpherson 2011

² I use the clumsy ‘non sense-specific perception’ to mean perception that on at least one conception of what a sense is, and according to at least one answer to the question ‘how are the senses distinguished from one another’, is not specific to a sense.

Furthermore, it seems likely that the best response to at least some disagreement about what senses are and how they are distinguished is pluralist—there is, I will suppose, more than one thing one might have in mind in thinking about the senses, and more than one acceptable way of distinguishing between them.³ Given the supposition that ‘sense’ is polysemous, exploring how the occurrence of non sense-specific perception constrains thought about the senses *requires* one to consider how it constrains more than one way of thinking about the senses.

One limitation of what follows is that there are, inevitably, answers to these questions—what a sense is, how the senses are distinguished—that I’m not going to have space to consider.⁴ I will concentrate on two different views of what a sense is: first, a kind of *system* and second, a kind of *capacity*. One of the main claims of the paper will be that non sense-specific perception can affect thought about the senses considered in these two different ways, quite differently.

In Part I of the paper I will consider, relatively briefly, what effect non sense-specific perception should have on thought about the senses as systems. Whilst it doesn’t make distinguishing between the senses as systems impossible, it might, if it is very prevalent, make it otiose. Certainly, given the kind of explanation—that is, causal explanation—that is the natural home of thought about the senses as systems, there is little to be profitably explained ‘one sense at a time’ if multi-sensory integration is as common as some have suggested that it is.

In (the considerably longer) Part II, I consider what impact the occurrence and prevalence of non sense-specific perception should have on thought about the senses as capacities. Some kinds of non sense-specific perceptual experience make problematic some ways of thinking about the senses as capacities. But even if ubiquitous, cross-modal perceptual experience does not, I will argue, and despite first appearances, make the distinction between the senses impossible to make or otiose, nor does it make it illegitimate ever to think of and in certain ways explain perception one sense at a time. Crucial to seeing this, however, is avoiding certain assumptions about how modes of experience relate to one another and how to count the experiences one has at a time.

I

1. Senses as systems

To think about a sense as a system is think of it as a bit of equipment, or as a mechanism or kind of process or processing that, as it were, ‘runs on’ or is instantiated by the equipment or mechanism. Behind this sense of ‘sense’ lies the assumption that to categorise perceivings by sense is to indicate something about similarities and differences in how they are produced. So this sense of ‘sense’ sits well with both everyday and scientific talk of senses as bringing about or causing perceivings. Or to put it another way, the rationale of thought about the senses as systems is causal: to explain the occurrence of perceivings in terms of senses considered as systems is to explain the occurrence of those perceivings in terms of how they were produced.

Senses as systems are composed of (or ‘run on’ or are instantiated by) receptors that receive information of some kind, parts of the nervous system that take that information to the brain and also the areas of the brain to which that information is taken for further processing. How much of this further processing counts as properly perceptual, and thus internal to a sense, is a moot point, but one we can set aside here. There are many potential ways to distinguish between senses thus understood, perhaps via one of their ‘parts’, such as the receptor types or brain areas they involve

³ Mohan Matthen adopts a pluralist approach in Matthen forthcoming.

⁴ For instance, I don’t consider the second of the two views offered in Matthen forthcoming.

or, alternatively, by some external factor such as their function or evolutionary history, or maybe some combination of these.

In principle, one might distinguish between senses as systems via some prior typing of the perceivings they bring about.⁵ Thus, for instance, the visual system would be that which brings about or produces seeings or visual perceivings distinguished other than by the system that produced them, for instance, by their phenomenal character. Whilst this is a possible view, it is something of an outlier, in that it undermines the assumption, mentioned above, that I take to underpin this way of thinking about senses—that the rationale of thought about the senses is causal. For this reason, I will not consider it further.

2. *Multi-sensory integration*

Understood as systems, the senses, it is said, have commonly been thought of as *isolated* from one another, in that they produce perceptual experiences without being affected by one another. (Macpherson 2011: 429) One natural way to fill out the idea of the ‘isolation’ of senses as systems is in terms of the view that the senses thus understood are Fodorian modules. Modules, in Fodor’s sense, are ‘isolated’ in that they are domain specific: they are concerned with a restricted subject matter. Furthermore, they are inaccessible and encapsulated—as Jesse Prinz puts it, ‘they don’t let much information out and they don’t let much information in’. (2006: 8)

The occurrence of *multi-sensory integration* poses the greatest threat to the idea that the senses (as systems) are isolated in these ways. *Multi-sensory processing* occurs whenever information from two senses is combined in the brain in any way. (Macpherson 2011: 430) *Multi-sensory integration* is the form of multi-sensory processing which occurs when information from more than one sense, as system, is brought together in the production of a quite new product. (Macpherson 2011: 430; Stein *et al* 2010) This is often in the service of greater accuracy of representation. For example, the nervous system may, as Stein *et al* put it, come to combine visual and auditory information to ‘obtain a more precise estimate of the speed and direction of an object’s motion’. (2010: 1717) The resultant perception cannot be ‘readily deconstructed’ to reveal components for which audition and vision are each responsible. Thus, it is difficult to identify any perceiving produced by (for instance) just the sense of sight or the sense of hearing when multi-sensory integration occurs.

The occurrence of multi-sensory integration is often made apparent through the occurrence of cross-modal illusions. In such illusions, multi-sensory integration (that, as we have said, probably occurs most often in the service of greater accuracy of representation) leads to information from one sensory system bringing about an illusory perceptual experience of a kind not usually associated with that sensory system. (O’Callaghan 2012: 5) One well-known example is the ventriloquism effect. In this case, visual information received at the same time as some auditory information causes one to perceive a sound (say, of a voice or a beep) as coming not from where it is really coming, but from a location nearer to where that which one sees (say, a mouth moving or a flash) seems to be. On some views, the sound is perceived not just as coming from the location of that which is seen but also as produced by it. (Nudds 2001)

The occurrence of multimodal integration, in particular, suggests that senses as systems are not inaccessible and encapsulated with respect to the other senses as systems. Senses as systems are not, then, isolated in the ways that Fodorian modules are. Of what significance is this sort of non-isolation? To advocates of encapsulated early perception, none that is obvious. As Samuels puts it, what they are keen to reject is ‘a picture...on which early perceptual mechanisms have something approximating an unlimited access to one’s beliefs and desires in the course of their online

⁵ See Keeley 2002 for one thoroughly worked-out view of how to distinguish between senses as systems.

processing'. This is, he says, 'wholly compatible with many sorts of external cognitive influence on perception', amongst which, 'cross-talk between perceptual systems'. (2006: 52) So the occurrence of multi-sensory integration is, perhaps, of limited significance in the debate over the modularity of mind.

What's important for our purposes is what the occurrence of multi-sensory integration means for thinking about the senses. Of course, if one were to think that senses (as systems) just are Fodorian modules, and as such, encapsulated and inaccessible, then one would have to say: there are no senses. But to preserve non-empty thought about the senses as systems, there are a number of options available. There might be some perceptual systems that are, as it were, sub-components of the usually identified senses, and which are modules in the Fodorian sense—perhaps there is a visual edge-detection module, for example. Or, one might preserve the idea of senses as Fodorian modules by understanding Fodorian modularity less rigidly. Finally, and perhaps most plausibly, one might think of the senses as some non-modular kind of, and perhaps in part functionally specifiable, parts of cognitive architecture. Thus, whilst the occurrence of multi-sensory integration has as a consequence that the senses are not, in a certain way, isolated, there seems no reason to believe that its having this consequence constitutes a threat to thought about senses as systems. There are ways to say what a sense is, and to distinguish between them, consistent with their non-isolation.

The consequences of multi-sensory integration for thought about the senses 'one sense at a time,' however, are more serious, particularly if multi-sensory integration is very common. Recall that the occurrence of multi-sensory integration shows that *at least sometimes*, perceivings are produced by information from more than one sense being processed in such a way that the independent contribution of each is not available. For this reason, one cannot explain the occurrence of perception that is the result of multi-sensory integration in terms of the independent contributions of each of two or more senses, so attempting to explain perception one sense at a time will yield (for these cases) attempted explanations that are not merely partial, but mistaken. There is reason to believe that, as O'Callaghan puts it, 'inescapably multimodal processes are *pervasive* in perception.' (2012: 7, my italics) If multi-sensory integration is pervasive then there may be very few cases of perception that will be understandable one sense at a time, where senses are understood as systems. Furthermore, what one will be unable in such cases to provide are causal explanations, one sense at a time, of these perceivings (the ones that are the result of multi-sensory integration). The provision of causal explanations is, as we have said, the natural home of the concepts of senses as systems. So it is a matter of no small significance that sense-by-sense causal explanations of perception that make use of these concepts are precluded in the case of multi-sensory integration, particularly if multi-sensory integration is pervasive. On the assumption that it is pervasive we can safely say that the occurrence of this sort of non sense-specific perception simply rules out thinking of perception 'one sense at a time'.

As we have said, and as Mohan Matthen makes clear, this doesn't make it impossible to distinguish between the senses. Matthen builds the inescapable multimodality of perceptual processing into a definition of senses as systems. Such systems, he argues, necessarily form an overarching system within which other states of the subject are affected 'by content provided by *all* the information-gathering faculties in the group.' (Matthen forthcoming: 7) On Matthen's view, each sense, thus understood, is 'a collection of perceptual processes that begin from transducers specialized for information capture from a particular kind of energy.' (Matthen forthcoming: 17) Whilst Matthen's view preserves the possibility of distinguishing between the senses, it doesn't tell us why we would want to thus distinguish them. It doesn't follow that the distinction between the senses is otiose, of course. But if the senses necessarily form a system, as Matthen argues that they do, and if the occurrence of perceivings is to be explained, causally, in terms of the functioning of this overarching system, an alternative to distinguishing the senses looks quite appealing. This alternative is to

explain the occurrence of perceiving *just* in terms of the overarching system that takes inputs from all sorts of receptor types.

So, the occurrence of a particular kind of non sense-specific perception, multi-sensory integration, affects thought about the senses as systems in two related ways. First, if senses as systems have traditionally been thought of as producing perceptions without being affected by one another, then we must think of senses as systems in a way that is non-traditional. Second, this raises, and leaves open, the question: why, once thought of in this way, distinguish the senses at all?

In the next part of this paper, we move on to consider the impact of non sense-specific perception on thought about senses as capacities. Multi-sensory integration can affect such thought too, as we will see in section 4. But on a plausible view of how senses as capacities are distinguished it does not. With this view in mind, we will need to take into account other forms of non sense-specific perception.

II

3. Senses as capacities

To understand the senses as capacities, in the way I have in mind, is quite different to understanding them as sensory systems. Recently, John McDowell and Mark Kalderon have emphasised the significance, for theories of perception, of the fact that sight is a perceptual capacity.⁶ Understanding the senses, including sight, as perceptual capacities also has significance in philosophical theorising about the senses. A sense such as sight, understood as a capacity, is not that which brings about or produces seeings, but is instead the potential to see. (Kalderon forthcoming: 9) And thus to explain the occurrence of perceptual experience in terms of senses as capacities, is not to explain it in terms of how it is brought about, but as the exercise of a capacity or, equivalently, the actualisation of a potential.

Now of course, its being possible for one to see will depend, in part, on having the right equipment, which is to say, a sense or senses as system(s). So having a sense, as capacity, is not wholly unrelated to having senses understood as systems. Nevertheless, the two notions are not equivalent, as is made clearest by thinking about how capacities in general, and perceptual capacities specifically, are individuated.⁷

Having the capacity or potential to see doesn't require that one actually sees. One can, at least in principle, have that capacity and never exercise it if, for instance, one is blindfolded from birth. Nevertheless, what distinguishes the capacity, sight, from other perceptual capacities (and capacities more generally) is what it is a capacity for, namely, seeing. The use that philosophers such as McDowell and Kalderon have made of the notion of a perceptual capacity makes it important for them to emphasise that it is the *non-defective* exercise of a capacity that individuates it.⁸ 'Seeing', in this context, should be understood as the nominalization of a *success* verb—when one sees, one has achieved something, namely visual perceptual contact with some object in or aspect of one's environment.

⁶ Kalderon forthcoming; McDowell 2011; 2010.

⁷ I am indebted for this account of the relationship between capacities and their exercise to Kalderon forthcoming.

⁸ The dependence of capacities on their non-defective exercise also plays a role in Schellenberg (2013). Note, however, the capacities she has in mind may be more 'fine-grained' than senses, functioning to discriminate and single out just one kind of particular. As she suggests, they might be, for example, low-level cognitive capacities, or concepts.

I will assume, because I think that it's true, that seeing is also essentially a form of conscious awareness, and thus that seeing necessarily involves the occurrence of certain conscious episodes—visual perceptual experiences.⁹ So, if one has the capacity, sight, then, necessarily, one has the potential to have visual perceptual experiences. Likewise, hearing is the capacity to hear, which involves having those conscious auditory episodes one has when one hears, and so on. Thus it is plausible that in order to individuate senses as capacities, we need to distinguish between kinds or modalities of conscious perceptual episode, or perceptual experience. To distinguish the capacity 'sight' from 'hearing', 'smelling' and so on, we need to distinguish between the seeings, hearings, smellings (and so forth).

Now we can see that the way in which senses as capacities are distinguished from one another contrasts sharply with how senses are individuated when thought of as systems. When a sense is understood as a system, individuation proceeds most naturally 'inside out'—perceivings are typed, on this way of thinking, derivatively, in terms of the sense (as system) that produced them. When a sense is understood as a capacity, individuation proceeds the other way around, 'outside in', such that the capacity is identified and individuated derivatively, in terms of the conscious perceptual episodes that it is a capacity for having. This is not unrelated to the fact, already mentioned, that senses as capacities are not, unlike senses as systems, producers or bringers-about of perceivings. To use Kalderon's Aristotelian expression, we can see, instead, the capacity, sight, as a potential of which seeing is the actualisation.

If senses as capacities are individuated in terms of the perceptual episodes that constitute their successful exercise, then distinguishing the senses will depend upon distinguishing kinds or modes of perceptual experience. Grice's criteria for distinguishing the senses are a useful guide to how we might do so. (1962) I include below, and will consider here, just three of these criteria, which is to say, we might distinguish between the modes of experience in terms of:

- (1) What experiences in each mode are of or represent,
- (2) The phenomenal character of experiences in each mode,
- (3) The sensory system involved in bringing about the experiences in each mode.¹⁰

I set aside the fourth 'proximal stimuli' criterion on the basis that, as we have seen, it seems plausible that the sensory systems averred to in (3) (including senses considered as systems) will in turn be individuated on the basis of this criterion.

Application of the Gricean criteria, alone or in combination, alongside other assumptions, yields a variety of possible views of the senses as capacities, and how to distinguish between them. In what follows, we'll see that which such view one has in mind will contribute to the effect that non sense-specific perception has on thought about the senses as capacities. In part, this is because which such view one has in mind will also determine which perceivings count as non sense-specific. But only in part. How one takes senses as capacities to be distinguished from one another is orthogonal to whether a perceiving counts as specific to a sense considered as a system. It is orthogonal, for example, to whether a perceiving counts as being the result of multi-sensory integration. Nevertheless, some views of senses as capacities are such that thought about the senses, as understood in accordance with those views, is affected by the occurrence of multi-sensory integration. In the next section, I consider such views.

⁹ I do not mean to rule out that when one sees one also has a mental state nor that there is a relation which, when seeing, obtains between oneself and that which one sees. For discussion see Soteriou 2013.

¹⁰ Objections and counterexamples to these criteria of individuation can be found in the burgeoning literature on distinguishing the senses: it is not my aim to consider them here. See the papers collected in Macpherson 2011a for representative discussion.

4. Senses as capacities for uni-modal_{pure} or uni-modal_{sensory-system} perceptual experience

Call, after Macpherson, a uni-modal experience an experience that belongs to just one modality—by modality, I mean a mode or kind of perceptual experience. The, as Macpherson puts it, *purest* case of a uni-modal experience would be one that is ‘uni-modal according to all [three] criteria and the modality according to each is the same.’ (2011: 438) One possible view, then, of how to distinguish between the modalities, is that we should distinguish between them using all three criteria simultaneously. This yields a view according to which the senses are capacities to have kinds of uni-modal_{pure} perceptual experience, or equivalently, to perceive in uni-modal_{pure} ways.

On Macpherson’s helpful taxonomy, application of each of the Gricean criteria individually yields three further ways of categorising perceptual experiences as uni-modal. These, in turn, yield three possible views of how to distinguish the senses, as capacities. One of these views is that we should distinguish between the kinds, categories or modes of experience in terms *just* of the sensory system that was involved in bringing them about. The senses, on this view, are capacities to have kinds of uni-modal_{sensory-system} perceptual experience. Sight, the capacity for seeing, will be a capacity distinguished from other perceptual capacities in terms just of the sensory system involved in bringing seeings about.

These two views, on which senses are capacities to perceive in ways that are uni-modal_{pure} or capacities to perceive in ways that are uni-modal_{sensory-system} are profitably considered together. This is because on both these views, perception that is not specific to a sense considered as a system is not specific to a sense considered as a capacity either. Perception that is the result of multi-sensory integration is not specific to a sense considered as a system.¹¹ Thus, perceptual experience that is the result of multi-sensory integration is not uni-modal_{pure} experience and it is not uni-modal_{sensory-system} perceptual experience, in both cases because it does not belong to one particular modality by Gricean criterion (3). There is no one sense, as system, responsible for bringing such experience about.

To see the significance of this to thought about the senses considered as capacities individuated in these ways note first that perception that is the result of multi-sensory integration will be, on these views, not cross-modal, but *a-modal*. Call *cross-modal* any perceptual experience that is the exercise of more than one of our perceptual capacities.¹² If senses are understood as capacities for having some kind of uni-modal perceptual experience, then experience that is not uni-modal is not cross-modal either. For instance, if sight is the capacity to have a certain kind of uni-modal_{sensory-system} perceptual experience, an experience produced by both the visual and the auditory sensory systems will not be an exercise of that capacity. It will be an *a-modal* perceptual experience—an experience that is not the exercise of any of our senses, considered as capacities.

We saw, in part I, that it’s the potential *prevalence* of multi-sensory integration that threatens to make the idea of senses as systems otiose. Likewise, if multi-sensory integration is very common, the idea of senses as capacities for having uni-modal modes of experience individuated (partly or wholly) in terms of the systems that produce them comes under threat. For in that case, a very great deal of perceptual experience will be *a-modal*. As in part I, the threat posed here by perception that is produced by more than one sensory system is not that it makes it impossible to distinguish between

¹¹ Perception that is the result of multi-sensory processing more generally is not specific to a sense as system, but might, on occasion, be understandable in terms of components that are sense-specific in this way. For this reason, I focus on multi-sensory integration.

¹² Here again I stay quite close to Fiona Macpherson’s suggestion that we use ‘cross-modal experience’ ‘to refer to conscious perceptual experience produced by or associated with more than one sensory modality’ (2011: 430).

senses as capacities (here, for having uni-modal_{pure} or uni-modal_{sensory-system} perceptual experience). But it does threaten to undermine the point (whatever it might be) of the idea of such capacities, since it would be the idea of capacities to perceive in ways in which we rarely, if ever, perceive. This, in turn, makes appealing the idea of perception as instead the exercise of an overarching, or general-purpose perceptual capacity.

One might try to resist this conclusion by drawing attention to the fact that a capacity can give rise to *defective* instances of that which it is a capacity for, a feature of the notion of perceptual capacities that has been central to recent discussion in the philosophy of perception. The capacity sight can of course give rise to visual illusions and hallucinations—these are defective exercises of the capacity in that what sight is *for*, is veridical visual perception, or seeing. But perceptual experience that is the result of multi-sensory integration ought not, intuitively, be thought of as thereby, like visual illusion and hallucination, the defective exercise of a capacity. In fact, as we have seen, multi-sensory integration is plausibly thought of as most often occurring in the service of *accurate* representation. So this way of rescuing the idea of senses as capacities for having modes of uni-modal_{pure} perceptual experience or uni-modal_{sensory-system} perceptual experience from the threat of otiosity will not work.

And also as in part I, the threat posed to thought about the senses by the occurrence of multi-sensory integration is that of raising, and leaving open, a question: in this case, why bother with the notion of senses as capacities (to perceive in uni-modal_{pure} or uni-modal_{sensory-system} ways) rather than explaining its occurrence just as the exercise of an overarching capacity to perceive? There may be a convincing answer to this question. There is, however, reason not to bother pursuing such an answer and, instead, to move on to other ways of thinking about the senses. And that's that the view or views under consideration in this section sit rather uncomfortably with the idea of senses as capacities to perceive in certain ways. That's because, as we saw in section 3, explaining the occurrence of perceivings in terms of senses as capacities is unlike explaining it in terms of senses as systems in that the latter and not the former is crucially a matter of explaining perceivings in terms of how they are produced. If the ways of perceiving that senses are capacities for are distinguished from one another in terms of how perceivings are produced, as is the case on the views just considered, then this distinctiveness is lost. So looking to other criteria to distinguish ways of perceiving, appeals.

5. Senses as capacities for uni-modal_{phenomenal} and uni-modal_{representational} perceptual experience

Particularly appealing are Grice's first and second criteria. Recall that what a sense as capacity is, is a capacity to perceive in a certain way. Perceiving is a form of awareness: it involves having certain conscious episodes or perceptual experiences. Perceiving in a certain way involves having perceptual experiences of a certain mode or kind or category. On the face of it, it is plausible that what distinguishes a mode of experience (or modality) from another, has something to do with what it is like to have experiences in each modality: their phenomenal character. Furthermore, if we make the common assumption that phenomenal character is, in some way intimately related to representational content¹³ it is equally plausible that what distinguishes a modality from another, has something to do with what experiences in a modality are of or represent.

The plausibility of these suggestions lies, in part, in their being precedented. When philosophers are interested in categorising experiences in all sorts of ways other than by sense they often appeal to their representational content and/or phenomenal character. For example, A.D. Smith (2002) distinguishes between perceptual experiences and mere sensations in terms of their phenomenal

¹³ This is not to assume that what it's like to have an experience might not outstrip its (broadly speaking) representational features in, for example, its structural features. See Soteriou 2013.

character. Bertrand Russell (1921) distinguishes the category of experiential memories from that of perceptual experiences by appeal to the ‘pastness’ that he takes to characterise the phenomenal character of the former. And when it comes to counting individual experiences, representational content and/or phenomenal character are likely to be appealed to, also. According to the tripartite account adopted for some purposes by Tim Bayne, for instance, ‘experiences are to be individuated in terms of subjects of experience, times and phenomenal properties’. (2010: 24) And in contexts other than in discussions of distinguishing the senses, philosophers have sometimes appealed to differences between modalities of experience that are a matter of what the experiences represent or how they seem. For instance, Chalmers entertains the idea that amongst the impure representational properties of perceptual experience are such properties as ‘visually (or auditorily) representing the content in question’. (2004: 160)

The view I want to consider now, then, is the plausible, precedented view that senses are capacities to have kinds of uni-modal_{r-p} experience, which is to say, modes of experience that are uni-modal according to both the first and second Gricean criteria.¹⁴ I will not consider experiences that belong to one modality according to the phenomenal character criterion, and a different modality according to the representational criterion, not least because it’s not clear whether there are any such experiences. Our question is, how does the occurrence of non sense-specific perception impact upon thought about the senses as capacities, thus construed?

The first thing to note is that there is no obvious way in which the occurrence of multi-sensory processing impacts upon such thought, be it ever so prevalent. If senses are thought of as capacities to perceive in ways that are uni-modal_{r-p} then perception that is non sense-specific in this context will be perception that has non sense-specific phenomenal character and representational content. It is quite possible for perception that is produced by more than one sensory system to have uni-modal representational content and phenomenal character. So, before we can consider the impact of non sense-specific perception on thought about the senses as capacities individuated in this way we will need to consider whether there are any such perceivings. In the next section I consider what I take to be the most plausible candidate.

6. Experiencing cross-modal relations?

Casey O’Callaghan argues, in a paper of that name, that not all perceptual experience is modality specific. In particular, he maintains that there are perceptual experiences that have *phenomenal character* that is not modality specific. The thesis that all phenomenal character *is* modality specific, he notes, is not shown to be false merely by the fact that we experience ‘common sensibles’, even though he accepts that phenomenal character accrues in part, in virtue of what one’s experience is of (its representational content). It is quite plausible, he notes, ‘that any two token perceptual experiences of squareness *per se* may differ in phenomenal character when they belong to different modalities...perhaps [for instance] differing modality-specific modes of presentation generate a phenomenal difference.’ (forthcoming: 7). (Here he echoes the view that we saw earlier is also entertained by Chalmers.)¹⁵

What shows the ‘modality specificity thesis’ to be false, in O’Callaghan’s view, are cases in which ‘perceptible feature instances...are accessible only multimodally.’ (forthcoming: 21) Relevant feature instances are instances of *relational* features that hold between, and can be perceived to hold between, two objects perceived each in one modality. One such feature is, on O’Callaghan’s view, intermodal causality. Intermodal causality is something experienced in one modality causing

¹⁴ For ease, I’ll talk, in the rest of this paper, of the *representational content* of experience. However, nothing in what follows depends on believing the nature of perceptual experience to be representational.

¹⁵ C.f. Bayne 2010: 26.

something experienced in another modality, such as a flash causing a bang. Assuming, as we are currently doing, that what determines the modality to which an experience belongs is its having the right kind of phenomenal character and representational content, the experience of a flash causing a bang is not uni-modal_{r-p}. At first glance, such perceivings are what Macpherson calls cross-modal_{within r-p}. Which is to say, they have both the representational content and phenomenal character of more than one modality, and in such a way that according to each criterion the modalities to which the experiences belong are the same.

It is controversial whether causation can be perceived, and perhaps even whether causal goings-on such as pushes and scrapes are truly perceptible. It might be argued that application of some such causal concept, on some occasion, requires the perceiver to make a judgement, or to have some cognitive attitude such as belief. Rather than attempt to adjudicate that controversy, it is safer to turn to other relational features that might be thought not to be accessible uni-modally. Luckily, there are many such candidates. Take, for instance, cross-modal spatial relations. When I put my right hand on my coffee cup and turn my head to the left to look at the fruit bowl, I experience the coffee cup beneath my hand, with its felt smoothness and warmth, as being to the right of the apple, with its seen redness and shininess. If we perceive the cup's being to the right of the apple, then the experience we have in this case is not uni-modal_{r-p}. Again, on the face of it, it is cross-modal_{within r-p}.

If there are any perceptual experiences of cross-modal relations experiences of such cross-modal spatial relations must, I think, be amongst them. Let us suppose then, at least for the purposes of this paper, that there are such experiences, and focus, for now, on this example. Now we need to ask, how does the occurrence of this sort of non sense-specific perceptual experience impact upon thought about the senses as capacities, and, in particular, as capacities for perceiving in uni-modal_{r-p} ways? To answer this question, it helps to consider, first, the significance that O'Callaghan sees such experiences as having.

7. Near-universality and the preclusion of uni-modality

According to O'Callaghan, the occurrence of non uni-modal experiences, such as experiences of cross-modal relations, contradicts what he calls the 'composite snapshot conception'. (2006; 2008) On that conception, the stream of perceptual consciousness at a time (as we might put it) is made up of a conjunction of distinct, uni-modal experiences. Perceptual experiences of feature instances not perceptible uni-modally are, obviously, not uni-modal. So, minimally, the presumed occurrence of these experiences shows that the composite snapshot conception is false in that some of the components of the stream are not uni-modal.

Consistent with O'Callaghan's concern to contest the 'composite snapshot conception', experiences of cross-modal relations might be cross-modal, or a-modal. We have said above, that on the face of it, they are cross-modal and specifically, cross-modal_{within r-p}. However, since we are currently considering the view according to which senses are capacities to perceive in uni-modal_{r-p} ways, experiences that are not uni-modal_{r-p} cannot be considered cross-modal, which is to say, the exercise of more than one sense as capacity. Rather, they are a-modal: the exercise of none of our senses as capacities. So, in the context of the view of the senses under consideration, we can say that according to O'Callaghan, the occurrence of experiences of cross-modal relations shows that some components of the stream of perceptual conscious are a-modal. On its own, this conclusion need be of no particular significance to thought about the senses. It can, however, be developed so as to make it significant, taken in concert with other claims.

The occurrence of experiences of cross-modal relations shows that the stream of perceptual consciousness is not a conjunction of uni-modal_{r-p} experiences because experiences of cross-modal relations are not themselves understandable as conjunctions of uni-modal_{r-p} experiences. Recall my experience of the warm, smooth, coffee cup to the right of the red, shiny apple. Merely feeling the cup, at its location, and seeing the apple, at its location, is not yet, or not necessarily, perceiving the cup as being to the right of the apple. The experience of the cup to the right of the apple is *inherently* non sense-specific: it is not simply the conjunction of two uni-modal_{r-p} perceptual experiences. A natural way to develop this point is to say that experiences of cross-modal relations *preclude* the occurrence of uni-modal_{r-p} experiences of, in this case, the cup and the apple. When I experience the cup as to the right of the apple, I have *only* the non sense-specific (and as we have seen a-modal) perceptual experience of that cross-modal spatial relation between the two objects.

This has consequences for thought about the senses as capacities to perceive in uni-modal_{r-p} ways, once we note a further feature of perceptual experiences of cross-modal relations: their near-universality. If, as we are doing here, we accept that we have perceptual experiences of cross-modal relations, it seems that we should accept that we have such experiences at least most of the time: most of the objects we perceive are perceived as standing in some cross-modal relation. The a-modal experience of the cup being to the right of the apple is not rare. Far from it. And consider, even more tellingly, temporal relatedness: on reflection, it seems right to say that things always seem temporally related to things perceived in other modalities. At the very least, an event perceived in one modality (a pop, say) always seems to be either simultaneous or non-simultaneous with an event perceived in another modality (a flicker, for instance). And it is plausible that this is a perceptual seeming—what else, one might ask, could it be? Thus it is plausible that most if not all of the objects we perceive are perceived as standing in cross-modal *temporal* relations. So, we can say, perceptual experiences of cross-modal relations are near-universal.

If perceptual experiences of cross-modal relations are near-universal, and if they preclude the occurrence of uni-modal_{r-p} perceptual experiences, then we rarely, if ever, have perceptual experiences that are uni-modal_{r-p}. Since we are supposing that both antecedents of this conditional are true, we must conclude that uni-modal_{r-p} perceptual experience is rare. The consequences of this for thought about the senses as capacities to perceive uni-modally_{r-p} should be apparent, for we have encountered similar consequences already, in considering other views of the senses. That is, it raises and does not appear to help to answer the question of why we should bother with thought about the senses, in this case as capacities to perceive in ways that are uni-modal_{r-p}. If uni-modal_{r-p} experiences are rare then very few perceptual experiences count as the exercise of our senses. What would be the point of a notion of distinguishable senses if this were the case?

In section 2 we saw that if prevalent, the occurrence of multi-sensory integration threatens thought about the senses as systems with otiosity. Similarly, in section 4, it was argued that thought about the senses as capacities to perceive in ways partly or wholly individuated in terms of the sensory system that produced them, raises the question of why one should bother with such thought—and one might have independent reason for worrying about its purpose, given what is distinctive about the idea of senses as capacities. In the next section I will consider whether, if we drop an assumption that we have so far left unquestioned, we can avoid the same fate for thought about the senses as capacities to perceive in ways individuated in terms of the first two Gricean criteria. I will argue that whilst dropping this assumption, on its own, creates further difficulties, the rejection of an additional, independently problematic assumption does allow us to fend off the threat of otiosity. Thus, I will suggest, thought about the senses as capacities to perceive in ways distinguished by phenomenal character and representational content is not made otiose by the occurrence of non sense-specific perception.

8. Dropping the assumption of uni-modality

We have been assuming, so far, that the modes of perceptual experience that individuate senses (as capacities) are modes of uni-modal experience. Call this the assumption of uni-modality. As such, we have been thinking of the Gricean criteria as purporting to make what we might think of as an *exclusive* distinction between the modes of experience or modalities. Which is to say, a distinction between kinds such that nothing can belong to more than one kind. Such a criterion identifies features that all and only items belonging to each kind will have. Thus, supposing Grice's first and second criteria, the assumption is that all *and only* visual perceptual experiences will have the phenomenal character and representational content characteristic of seeing, in the sense that any experience with this character and content cannot also be auditory or olfactory, for instance.

Often, when we distinguish between kinds of thing in a domain, using some criterion, we do mean to make an exclusive distinction. But many distinctions, equally, are not like that. Take the domain *foods*. One amongst many criteria for distinguishing kinds of food is provided by the 'basic tastes', which are, let us suppose, salty, sweet, sour, bitter and umami. This criterion does not purport to make an exclusive distinction—plenty of things will belong to more than one kind: raspberries, for instance, and dark chocolate. The kinds of food, individuated in terms of the basic tastes, are kinds that overlap. The 'basic tastes' criterion for individuating kinds of food does not identify features that all *and only* items belonging to each kind will have. It identifies, rather, features that all items belonging to each kind will have. All the sweet things will be sweet. But *not only* the sweet things will be sweet, in that some of the sour things and the bitter things will be sweet, too.

If we drop the assumption of uni-modality, and the associated claim that the distinction between the modalities is exclusive, some of the difficulties facing thought about the senses as capacities to perceive in ways distinguished by phenomenal character and representational content are avoided. First, dropping the assumption of uni-modality has the happy consequence that experiences of cross-modal relations can be considered, as on the face of it they are, *cross-modal* rather than *a-modal*. Since we are no longer supposing that only uni-modal (and specifically uni-modal_{r-p}) experiences are the exercise of our senses, we can accommodate the idea of experiences that are the exercise of more than one sense, considered as capacity. So, for example, my experience of the cup to the right of the apple is tactile in that it has tactile representational content and phenomenal character, and it is also visual in that it has visual representational content and phenomenal character. It is a cross-modal experience, not an a-modal experience, and *thus it is an exercise of the senses*. This last point is, of course, of the greatest significance. With the assumption of uni-modality in play, experiences of cross-modal relations were a-modal, and thus not the exercise of our senses. This is what led to the concern that the idea of senses currently under consideration, might be otiose. Once we drop the assumption of uni-modality, experiences that are not uni-modal may be counted cross-modal and thus, still, the exercise of our senses.

So far, so good. We look to have ruled out a way of thinking of the modalities (as modes of uni-modal_{r-p} experience) but in so doing, we've ruled thought of the senses, as capacities, back in. This is, however, too quick. Bear in mind that given the assumed near-universality of experiences of cross-modal relations, and the assumption, also, that they preclude uni-modal_{r-p} perceptual experiences, it follows from the abandonment of the assumption of uni-modality that the majority if not all of our experiences are cross-modal and thus the exercise of more than one perceptual capacity. Unfortunately, this too threatens to undermine thought about the senses as capacities. How so?

Recall what we have already said about the rationale of thought about the senses as capacities. To explain the occurrence of perception in terms of senses as capacities is to explain it as the exercise of a capacity, which can be understood, as Kalderon argues, as the actualisation of a potential. And

in particular, the potential to have a certain kind of worldly success, to achieve something. The achievement in question is a kind of veridical perception: seeing or hearing for example. Now, it seems right to say that minimally, we operate with the notion of multiple perceptual capacities because we take the non-defective exercise of each (or the actualisation of each) to be a *different* achievement—a different kind of worldly success.¹⁶ Seeing the apple is a different achievement to feeling or tasting it, for example. It is a different way of being in perceptual contact with the apple. But if, by and large, and probably always, the non-defective exercise of one perceptual capacity just is, also, the non-defective exercise of another, there's a sense in which the non-defective exercise of each capacity does not amount to a different kind of worldly success. The idea of such distinctive kinds of success becomes redundant where there is always, or even nearly always, overlap between the purported kinds.

Now, I think there is more than one way to respond to this worry, and thus to argue that thought about the senses as capacities is not made otiose by the occurrence of non sense-specific perception. But in the remaining sections I consider just one such response.

9. Counting perceptual experiences

To resolve the difficulty in the way I want to discuss, we need to back up a bit. We said, in the last section, that according to O'Callaghan, a perceptual experience of a cross-modal relation cannot be understood as the conjunction of two or more uni-modal_{r-p} experiences. Call this *non-conjunction*. And, we said, a natural way to develop *non-conjunction* is to say that experiences of cross-modal perceptual relations preclude the occurrence of uni-modal_{r-p} experiences. Call this *preclusion*. *Preclusion* is, I think, the source of our remaining difficulties. It's the acceptance of *preclusion* that means that, once we drop the assumption of uni-modality, and accepting the near-universality of cross-modal experience, there are no perceivings that are, say, just visual or just auditory. That's what threatens the idea of distinctive perceptual achievements (seeing, hearing and so on) with redundancy. If we can avoid accepting *preclusion* then we can allow that though cross-modal experience is near-universal, in that we nearly always perceive objects as standing in cross-modal relations, still, we might perceive them uni-modally, at the same time, too.

Fortunately, we need not accept *preclusion*. The move from *non-conjunction* to *preclusion* is natural, but can be avoided by recognising that there are ways in which uni-modal_{r-p} experiences can co-exist with and be related to cross-modal_{within r-p} experiences, other than by conjunction. This shouldn't be controversial. As is well-known, there are many things that co-exist with their components whilst being related to them other than by conjunction. Take two quantities of clay. In the right hands, they become a sculpture. The two quantities of clay co-exist with the sculpture once the latter is made: the sculpture doesn't preclude them. But, of course, the relationship between the sculpture and the two pieces of clay is not mere conjunction. This is evident from the fact that before those hands go to work, the conjunction of the two pieces of clay already exists. But the sculpture does not. Or take eggs and sugar. In the right hands, they become a meringue. The sugar and the eggs co-exist with the meringue, as a vegan or diabetic will attest. But, of course, the relationship between the sugar and the eggs and the meringue is not mere conjunction. Before the meringue is made the conjunction of sugar and eggs already exists but the meringue does not.

More needs to be said to show that this is applicable to the case in hand, namely, the relationship between cross-modal_{r-p} experiences and the uni-modal_{r-p} experiences that are, in some sense, their components. More needs to be said, specifically, about how to count experiences. If *preclusion* is false, and uni-modal_{r-p} experiences can co-exist with the cross-modal_{r-p} experiences of which they are components other than by conjunction, then when I perceive the cup to the right of the apple I can

¹⁶ There is no doubt more to be said about why we distinguish between the senses. See Nudds 2004 for one suggestion.

be said to have three experiences. If preclusion is true, and non-conjunction rules out the co-existence of the cross-modal and uni-modal experiences then I have only one experience in this case. One option, which I will explore here, is the suggestion that there is more than one way to count experiences at a time. That there is only one way to count experiences at a time is the second assumption (alongside the assumption of uni-modality) that if rejected, allows us to preserve (non-otiose) thought about the senses as capacities. I'll argue first for the rejection of the assumption that there is only one way to count experiences at a time, and then, after that, we'll see how this helps.

That there is no single, privileged way to count experiences is an attractive claim, even at first glance. Consider my hearing someone drilling, over to my right, and someone hammering, over to my left. Do I have one experience of someone hammering to the left of someone drilling? Or two experiences, one each of the hammering and the drilling? One feels aggrieved, I think, at being made to answer: both, maybe? Tim Bayne, for one, is not convinced that we're wrong to feel thus aggrieved. Counting experiences, he says,

...is arguably more like counting the number of objects in a room or the number of events that occurred during a meeting than it is like counting the number of beans in a dish: one has some idea of how to go about one's business, but the idea that there is only one way in which to proceed is somewhat farcical (24).¹⁷

Consider, furthermore, counting experiences along the length of the stream of consciousness rather than, as currently, across its breadth. It has been argued that the length of experience that one picks out will partly determine what the experience can be said to be of, or to represent (and in turn, its phenomenal character). (Phillips forthcoming) This is particularly clear in the case of certain illusions. In the 'cutaneous rabbit' illusion, a series of taps (say, five) are given at the wrist, followed immediately by five further up the forearm and then five further up, still. The illusion, here, is that when one experiences all fifteen taps in succession, the taps seem to be distributed about evenly, up the forearm. Of course, if one were to stop the tapping after the five at the wrist and ask the subject what they had experienced, they would say, correctly, 'five taps at my wrist'.

Ian Phillips uses this example in an argument for the claim that we cannot identify what is true of a subject's experience at an instant, without taking into account the nature of their experience at subsequent times. (forthcoming: 18) This is because what on his view is 'metaphysically fundamental' are stretches (or 'lengths') of experience, rather than instants. Significantly, which stretch or length one picks out will make a difference to what one truly says about how things seem to the subject, at an instant. And furthermore, there seems no reason to think that one particular lengthwise stretch of experience is privileged when it comes to identifying what one perceives at a time. Take the time of the fifth tap. The instant at which the fifth tap ends is part of the stretch occupied just by the first five taps. But it is also part of the stretch occupied by all fifteen taps. Which stretch one chooses, which may be determined by a variety of concerns, will decide what it is right for one to say about how things seemed to the subject at the time of the fifth tap.

What's important for our purposes about this, is as follows. One can pick out different experiences had by a subject at a time in different ways, according to one's interests. Furthermore, according to what we have just said, there's a sense in which the stream of perceptual consciousness, over time, cannot be thought of as a conjunction of these different experiences, even though they co-exist at that time. Considered in the context of one interval, we can identify one experience had by the subject at a time. Considered in the context of another interval, we can identify a different experience had by the subject at a time. In a sense, then, there are two experiences that they have.

¹⁷ Although note that what Bayne has in mind here is the more specific idea that there is only one method or approach appropriate to individuating experiences.

Nevertheless, it is not the case that there is a portion of this subject's stream of (perceptual) consciousness, that can be thought of, in a single context, as the conjunction of these two experiences.

Now, there are aspects of this case that are specific to counting the experiences of which the stream of perceptual consciousness is composed along its length, rather than its breadth. Nevertheless, this example helps us to see that in general, the perceptual experiences that 'make up' some portion of the stream of consciousness need not be related to one another by conjunction. This gives us a way of understanding how cross-modal_{r-p} experiences and the uni-modal_{r-p} experiences that are, in some sense, their 'ingredients' can co-exist, though the former is not the conjunction of the latter.

Return, once more, to our example of cross-modally perceiving the cup as being to the right of the apple. We can as legitimately pick out different experiences one has in this case, as in the temporal case just discussed. I tactually perceive a cup, having an experience that has the representational content and phenomenal character characteristic of touch. I visually perceive the apple, having an experience with the representational content and phenomenal character characteristic of sight. In the context created by thinking one sense at a time, explaining perception as the exercise of capacities to see and hear, I count two experiences. But we can also, as it were, concern ourselves with a broader portion of the stream of perceptual consciousness, and we'll need to do that if we want to accommodate the experience of the spatial relation between the cup and the apple. In that context, we can identify an experience that is the exercise of both capacities: the experience of the spatial relation between the cup and the apple. This is a cross-modal perceptual experience, having the representational content and phenomenal character characteristic of sight and touch, and it is not understandable as the conjunction of two uni-modal_{r-p} experiences. Nevertheless, I can be said to have all three experiences, since neither context is privileged in terms of identifying the experiences the perceiver really has.

I hope this goes some way to demonstrating, that for perceptual experience as for sculptures and meringues, *non-conjunction* does not entail *preclusion*. It follows that the near-universality of the experience of cross-modal relations does not, as we thought it might, threaten thought about the senses as capacities by undermining its rationale. It does not follow from the fact that one perceives, on some occasion, cross-modally (say, audio-visually), that one does not thereby see and hear, having those particular and distinct worldly successes. And thus the occurrence of cross-modal perception, and even its near-universality does not rule out explaining the occurrence of perceptual experience as the exercise of capacities to achieve these sorts of successes. O'Callaghan's point stands: one's perceptual experience at a time is not made up of just uni-modal experiences. The 'composite snapshot view' is false. And one cannot understand the senses *just* one sense at a time, for to do so will be to leave out cross-modal perceptual experience. But the consequences of this for thought about the senses as capacities is not devastating. There is still room for a role for such thought.

10. Uni-modal experiences again

I have suggested that though we shouldn't understand the Gricean criteria as purporting to make an exclusive distinction, still, there need to be experiences that are uni-modal, and thus the exercise of just one of our perceptual capacities, for thought about the senses as capacities to serve its minimal purpose. If modes of experience overlap entirely, the idea of distinctive kinds of perceptual success is in danger of being lost. The force of the argument of the previous section lay in its allowing us to accept that the near-universality of cross-modal perceptual experience is consistent with the occurrence of a great deal of uni-modal perceptual experience, too. I end with some brief remarks on the nature of this uni-modal experience.

O'Callaghan identifies two different conceptions of experience that is, as he puts it, 'restricted to a modality'. The first is that of a *pure* experience of a modality, or what we will call *pure* uni-modal experience. A pure uni-modal experience could be had by, say, a 'human born only with functioning vision'. (O'Callaghan forthcoming: 13) The second is that of a *mere* experience of a modality or what we will call *mere* uni-modal experience. A mere uni-modal experience could be had by someone with a full battery of senses that they have used normally but who is now restricted to using just one, perhaps after 'getting a disease that leaves vision intact but eliminates your capacity to experience auditorily, tactually, olfactorily and gustatorily.' (forthcoming: 19) Some mere uni-modal experiences might not be pure uni-modal experiences. For instance, if it's only in virtue of having previously had visual experiences (or at least, non auditory perceptual experiences) that one comes to have auditory experiences that represent direction and distance, then auditory experiences of direction and distance are mere uni-modal visual experiences, but not pure uni-modal visual experiences.

If these are the only options then there may be interesting consequences for our understanding of particular senses, as capacities, given the arguments of the preceding sections. Take, for example, the sense of smell. Arguably, odours seem to be external to us, when we perceive them, because we are aware of their having been brought into the nose by our sniffing or breathing. (Richardson 2013) If one accepts this, then, one might think that the role played by sniffing and breathing is this: when we breathe or sniff we are aware of the contact made between the air that carries the odour, and the inner surfaces of our nasal passages. In this way, the phenomenal exteroceptivity of olfactory experience is established. Suppose this is right. Now, if uni-modal experience is either the pure or the mere uni-modal olfactory experience I have when, say, sniffing a sample of perfume, *that* experience will not be phenomenally exteroceptive. Without the occurrence of simultaneous tactile (and bodily) perceptual experience, the odour will not, assuming the account just sketched is true, seem external to me. At best, the olfactory qualities experienced will seem qualities of my nose. It follows that the sense of smell is rather peculiar amongst our senses in that without the concurrent exercise of another of our perceptual capacities, it is not itself a perceptual capacity. Or at least, it is not, like the other five familiar senses, an exteroceptive perceptual capacity—a capacity for perceiving things beyond the bounds of our own bodies. If we understand 'smelling' as we usually understand it, that is, as perceiving odiferous things external to the body, then the capacity to perceive in that way is in fact a matter of the exercise of two capacities: the olfactory capacity and the tactile capacity. What to make of this? One might worry that it renders the distinction between touch and smell redundant—or at least, much more will have to be said to show that on this view, there is a role for the idea of a distinct olfactory perceptual capacity.

The view, however, will be compelling only if O'Callaghan's suggestions are exhaustive. There may be room, yet, for a third kind of uni-modality that is neither 'pure' nor 'mere'. That is, there may be a kind of uni-modality such that an experience could be uni-modal, and yet could not be had in the absence even of concurrent experience in some other modality. On this third conception of uni-modality we recognise that what Phillips argues is the case for lengthwise stretches of the stream of perceptual consciousness is true more generally. Which is to say, how things are at one, as it were, location in the stream of perceptual consciousness is affected by how things are over or along a more encompassing portion of the stream. A uni-modal experience need not be an experience that it is possible to have in isolation from experiences in other modalities. Applied to the case of olfaction, this will mean that olfactory experience of odours as external to the body, though not possible without concurrent tactile experience, is nevertheless uni-modal. We can understand Strawson as making use of this third conception of uni-modal experience when he suggests that 'where sense-experience is not only auditory in character...we can sometimes assign spatial predicates *on the strength of hearing alone*.' (1959:65 *my italics*) The implication of this way of putting things is that though, according to Strawson, auditory perception of spatial properties

requires concurrent, say, visual or tactile perceptual experience, still, one's auditory experience of spatial properties is, as it were, properly auditory. On this view, the dependence of smell on touch does not mean that all perceptual (and exteroceptive) olfactory experience is cross-modal, nor, thus, that it is the exercise of two capacities.

Conclusion

The brief, inconclusive discussion of the last section demonstrates what we have seen, in this paper, to be true more generally: that there is no very straightforward way of saying how the occurrence of non sense-specific perception should affect thought about the senses. I hope, nevertheless that in the preceding sections I have captured the most troublesome ways in which non sense-specific perception might be expected to affect such thought. As we have seen, any such effect is determined by a number of factors.

Whether one is thinking of senses as systems or as capacities can be of particular relevance, not least because these ways of thinking about the senses have distinctive rationales: they are involved in different ways of explaining the occurrence of perceptual experience. So, one should not be surprised if an effect non sense-specific perception has on our ability to explain perception in certain ways is in part determined by whether one is thinking of senses as systems or as capacities.

Other factors are relevant too. It's if multi-sensory integration is especially *prevalent* that thought about the senses as systems is threatened with otiosity, although, note, we have seen no particular reason to believe that this form of non sense-specific perception makes it impossible even to make the distinction between the senses. Likewise, if one thinks of senses as capacities to perceive distinguished wholly or partly in terms of how perceivings are produced, the prevalence (rather than merely the occurrence) of multi-sensory integration makes these capacities, though distinguishable, capacities that are very rarely exercised. It remains to be seen whether multi-sensory integration is prevalent enough to cause these difficulties.

Given the distinctive rationale of thought about the senses as capacities, the view that the modes of experience that they are capacities for are distinguished without any reference to senses as systems is, we have seen, appealing. We have considered one precedented, plausible, positive possibility: that they are distinguished in terms of phenomenal character and representational content. The occurrence of multi-sensory integration, and of multi-sensory processing more generally, has no direct affect on this way of thinking about the senses, no matter how common. Nevertheless, if, as we have supposed it is, the experience of cross-modal relations is common enough to be deemed near-universal, the threat of otiosity emerges again. However, we have argued that since modes of experience can overlap, and since there are ways to defend the claim that the near-universality of cross-modal experience is consistent with a great deal of uni-modality, this way of thinking about the senses is defensible. It is not *unaffected* by the occurrence of non sense-specific perception: if we accept that cross-modal relations are perceived then one cannot explain perception 'one sense at a time' but only in the relatively weak sense that doing so will leave some perceivings unexplained.

How does non sense-specific perception affect thought about the senses? Multiply, and in ways that are dependent on many factors that require further discussion, but not, or not that we have seen any reason to accept, disastrously.¹⁸

¹⁸ Versions of this paper were presented to the Mind and Reason group at the University of York, and at the conference 'Aristotelian and Contemporary Perspectives on the Mind' in Oxford. Many thanks to those present for helpful comments and questions.

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Modern Hylomorphism and the Reality and Causal Power of Structure: a sceptical investigation

Abstract

In recent years, a significant number of philosophers from an orthodox analytic background have begun to advocate theories of composite objects, which they say are strikingly similar to Aristotle's hylomorphism. These theories emphasize the importance of structure, or organization - which they say is closely connected to Aristotle's notion of form - in defining what it is for a composite to be a genuine object. The reality of these structures is closely connected with the fact that they are held to possess powers, again in what is held to be a broadly Aristotelian sense, and so to be genuinely efficacious. Naturally enough, they want to do all this without espousing the discredited aspects of Aristotelian science. It is the purpose of this essay to cast a sceptical eye on whether this objective can be achieved.

Paper

1. Different views of the purpose of structure.

In order to investigate whether modern hylomorphism is consistent with contemporary science, it is helpful to distinguish three positions.

(1) Complex structures figure in the explanations given by the special sciences but the (physical) world is closed under physics.

(2) Complex structures figure in the explanations of the physical sciences and the world is not closed under physics – laws are emergent, in the way they were believed to be by C. D. Broad and 'British emergentists', but the emergent laws are not teleological.

(3) The third option is like (2) in accepting emergence, but the emergent laws – eg of biology or psychology – are teleological.

In (1) the explanatory laws attached to complex structures may or may not be teleological, but all domains are closed under physics, which is not so for (2) or (3)ⁱ.

I think that it is clear that structure has real efficacy in (3). First, because there is no 'bottom up' explanation of the events that take place: that is, no bottom up explanation even of where the physical parts end up located. Does this mean that structure is efficacious in (2), for there is no bottom up explanation there either? Not necessarily, because one might hold that it was a property of the atoms that they react to each other differently when grouped together in certain ways. It is possible to believe (2) and still not ascribe efficacy to structure: it is just that the elements in the structure influence each other differently when placed in certain arrangements. It can be seen, in other words, as alterations in the mutual influence of the atoms depending on their arrangement. It could be argued that, if this is so, one need not hypostasize the structure as such, if one need not hypostasize it in (1). Whether (1) requires (or allows) the hypostasization of structure is the main topic of this paper, and the status of structure in (2) is not essential to that question.

But, whatever may be the case for (2), (3) has more than emergent efficient causation, namely the emergence of teleology. This is the second and crucial reason for thinking that structure (or 'form') has efficacy in (3): a teleological explanation requires that there be what one might term a perspective of the whole – an end in view that relates only to something with the appropriate organization. This is quite different from (2), for the emergence of such an end cannot be a form of bottom up complexity, as, possibly, could (2). So if (3) is true, this 'ontological reduction', as one might call it, is not possible, because there is no way of avoiding hypostasizing the 'whole', as defined by its nature or form, as something aiming at the *telos*, for the purpose will presumably relate the thing as a whole.

(3), which is traditionally attributed to Aristotle, is sufficient for attributing power to structures, but, excepting Tom Nagel in his recent book, *Mind and Cosmos* (2012), few modern philosophers want to

adopt it. Nor do they usually – with the possible exception of John McDowell (1994) and his enigmatic ‘second natures’ – want to adopt even (2). None of the philosophers I shall be discussing want their hylomorphism to depend on either (2) or (3): they are insistent that their position is consistent with closure under physics, that is, with (1). My concern in this paper is whether this can be true, whilst adopting a realist interpretation of hylomorphism. In order to pursue this we need to look more deeply at (1).

2. Two views of closure and complex structure.

(1) can be given what one might describe as a reductive, or, more accurately, a conceptualist interpretation, or a more robustly realist one. I shall claim that the hylomorphists need the realist reading, and I will be defending what I am calling the reductive or conceptualist one. But first, a brief indication of what I mean by the distinction between *conceptualist* and *realist* interpretations of the claim that form or structure exists.

Certain realists about properties and universals – for example D. M. Armstrong and probably Plato himself – adopt a *sparse realism*. That is to say that not every concept or predicate that can be successfully or truly applied to the world has a real property or universal corresponding to it: a statement of the form ‘that is *F*’ can be made true by the configuration of things in the world that do not involve postulating an instantiated *F-ness*. According to Armstrong, only the basic truth makers need to involve universals – the rest are just *predicates*. Only ‘basic physics’ involves universals, for this sparse ontology is enough to explain how all our predicates get a grip on reality. If we think of the predicate ‘is a table’, for example, this predicate can be satisfied by atoms, together with their typical properties, being arranged in a certain way: there does not need to be, in addition, ‘tablehood’ present in the world. Armstrong’s theory is explicitly about universals, but it naturally extends to objects: if ‘tablehood’ or ‘being a table’ is not instantiated in reality, neither will there be tables, in a fully realist sense, in addition to the atoms that make them up. You cannot combine a sparse approach to universals with a rich ontology of objects, for there is no clear sense to the claim that there really are tables over and above their constituents, but there is no real or realized universal of tablehood (assuming, of course, that one is a realist about universals at all). This will come up again in section 6, in the discussion of ‘blunt realism’.

Modern hylomorphism seeks to modify this sparse ontology by saying that form or structure counts amongst the things that are fundamentally real. The question is how one should decide on such an issue. First, some thoughts on the origins and motivations for this theory.

3. The origins of modern hylomorphism.

David Lewis (1986) famously propounded the doctrine of Unrestricted Composition: that is, any combination of things in the world constitutes a further thing. So my left foot and any arbitrary stone at the bottom of the sea constitutes an object, though an object of no descriptive or explanatory interest. In the opposite corner, Peter van Inwagen (1990) denied that there was any such thing as composition, at least for inanimate material objects.

Van Inwagen’s main argument is that necessary and sufficient (particularly sufficient) conditions cannot be given for the kind of cohesion of parts that is supposed to bind atoms into complexes. None of the standard candidates—contact, fastening, adhesion, fusion, nor any acceptable disjunction of them—will suffice. They all have counterexamples. So the notion cannot be well defined. The arguments are subtle and interesting. The question might be raised, however, whether van Inwagen gives sufficient consideration to the possibility of taking a line similar to that taken by Putnam on natural kinds. One fixes putative paradigm cases of non-living complexes, and says that the kind of cohesion required is whatever sort of bonding holds in those cases. It seems unlikely that there will not be a reasonably tidy, scientific account of how atoms bond. If there were not, there could not be a science of such bonding, as there clearly is. Nevertheless, van Inwagen’s mereological nihilism has a stopping point, namely that he believes that he, though a composite material object, really does exist. So organisms do exist.

Van Inwagen's unwillingness (unlike the early Unger (1975)) to apply the nihilism to himself, and others like him, prompted the thought in other philosophers that there may be a way of having a doctrine of Restricted Composition on the basis of being things of the right kind —namely having a structure of the right kind— and that this idea resembled Aristotle's notion of form and his doctrine of hylomorphism. Philosophers following this line of thought included Fine (1999, 2010), Johnston (2006), Lowe (2011), Koslicki (2008), Rea (2011) and Jaworski (2011, 2012).

4. What the moderns say.

It is difficult to provide a compact account of these philosophers' positions, as it can seem that all they have in common is a belief in some form of restricted composition and a sense that the Aristotelian label 'hylomorphism' helps to give their theories a pedigree. Even this seems sometimes to be very attenuated. In Johnston's case, for example, the concept of being in possession of a form seems to become very loose and detached from the individuation of distinct substances. Johnston's central account is as follows.

A statement of the genuine parts and principle of unity of an item...takes the following canonical form:

What it is for...(the item is specified here)...*to be is for...*(some parts are specified here)...*to have the property or stand in the relation...*(the principle of unity is specified here).

As in: *What it is for* this hydrochloric acid molecule *to be is for* this positive hydrogen ion and this negative chlorine ion *to be bonded together*. [two further examples follow, then] The idea that each complex item will have some such canonical statement true of it might be fairly called 'Hylomorphism'. For it is the idea that each complex item admits of a real definition, or statement of its essence, in terms of its matter, understood as parts or components, and its form, understood as a principle of unity. (2006; 658)

But Johnston's notion of a 'principle of unity' turns out to be so generous that his theory almost collapses into Lewis's.

Consider then all the myriad ways of constructing putative wholes from items gravitationally related to other items. Are they all genuine wholes? Given Hylomorphism, there does not seem to be any happy way to insist that they are not all *wholes* even though few of them will be material objects or stable physical systems...A whole consisting of your eyeglasses and Pluto is too far from [normal physical object] paradigms in respect of compactness and maximality to count as a genuine whole in the ordinary sense. But it is fully, completely and *genuinely* true that it is a whole. (2006; 697)

One might wonder whether such an apparatus preserves what one might want to save from a common-sense notion of composition, let alone the individuation of even neo-Aristotelian substances. This is emphasized by Johnston's strong defence of relative identity, against Wiggins's more orthodox Aristotelian view. (2006, 667-72)

Something closer to the traditional notion can be found in the way Jaworski deploys the concept of *structure*. Jaworski probably deploys this notion in the most straightforward way of all the modern hylomorphists. He and Rea both use the following illustration. If you compact a human being in a machine or waterproof bag, you retain the same matter, but lose the human being, because you have destroyed the structure. Structure is, therefore, a real and essential element in many or most complex objects. He explains his theory as follows.

Hylomorphism claims...[t]hat structure is a basic ontological and explanatory category. (2011; 169)

Structure is also a basic explanatory principle in that it explains why members of this or that kind are able to engage in the behaviors they do. It is because humans are organized as they are, for instance, that they are able to speak, to learn, to engage in the range of activities that distinguish them from other living things and from non-living ones. (2011; 172)

I think most, if not all, hylomorphists would agree with these statements, but the theory faces at least two worries. First, no-one would disagree with what is said about the crushed (ex)human

being, but does the fact that atoms need to be in certain spatio-temporal and causal relations to constitute a human being mean that structure (as opposed to spatio-temporal and causal relations, the reality and importance of which no-one denies) must be a fundamental category? We will return to this issue in section 5, when we discuss 'blunt realism'. The second worry concerns causal efficacy. The modern hylomorphists do not claim to be interpreting Aristotle, but to be inspired by his concept of form. This means that it is out of place simply to argue that they have not interpreted him in a scholarly fashion. Nevertheless, it is relevant to point it out if they have totally misunderstood his deployment of the concept of form, for if this is the case, it might suggest that they are pretending to a solution to the composition problem that they do not possess. Someone who was sceptical about their claim to a solution might start by pointing out that all the moderns reject the 'traditional' Aristotelian understanding of the idea that form has a role as an efficient cause, actually making a difference to the way that its matter behaves: that is, they reject (3). They deny this because they all want their theories to be consistent with the closure of the world under physics. At the same time, they seem to intend their composites to have full ontological weight, and to have causal efficacy.

Jaworski is particularly clear in emphasizing the causal efficacy of structures. He makes it clear that he is a **causal pluralist**, but does so in a way that may seem self-undermining:

Hylomorphists endorse **causal pluralism**. They claim that there are causal properties and relations that do not fit the mold set by physics...[this] view is compatible with all forces operating at a fundamental physical level [ie, none at other levels] and is therefore immune to the empirical objections raised against emergentism. (290-1)

Notice that the avowal of causal pluralism is immediately followed by the assertion that 'all *forces* are operating at a fundamental physical level' [*italics added*]. What one has, in fact, is an *explanatory* pluralism, with causation adopted into the domain of explanation; the wholly external, mind-free element is *force* and this is exclusively micro. So Jaworski is really only claiming that, once one realizes that most explanations are causal explanations, explanatory pluralism is pluralism enough to constitute or ground a full causal realism about all levels. On the one hand, one may wonder whether *explanatory* pluralism is enough to justify or constitute the real efficacy of the non-basic levels.

The importance of *explanations* at the level of complex structures is not disputed, but whether these represent just ways of *conceptualizing* a fundamental level which we cannot normally access, is another matterⁱⁱ. Johnston raises the question of whether the hylomorphic concepts we apply are to be taken realistically, but answers the question in what, for our purposes, is an unhelpful way. On the one hand, he thinks that psychological research has shown '[t]here are quasi-essentialist and quasi-hylomorphic elements in our conceptual scheme.' (662). But he worries that this may carry conceptualist, as opposed to realist, consequences.

To the extent that these empirical claims are true, it might seem that philosophical essentialism and Hylomorphism may be easily debunked. There are quasi-essentialist and quasi-hylomorphic elements in our conceptual scheme. These represent functional ways of coping with an environment that can be usefully modeled in essentialist and hylomorphic terms. But it is a philosophical error to project these aspects of our model of the environment onto the environment itself. (662)

His response is the following.

Maybe so; we shall have to see. For now, it is best to keep a lively sense that what is presented as philosophical Anti-essentialism is often the unwitting displacement of Essentialism onto a restricted domain. Perhaps the manifest kinds we find salient are merely nominal kinds...Perhaps tigers do not form such a real kind, but what of isotopes or electrons?

This response abandons any attempt to save the traditional Aristotelian substances and says that there must be some entities that are true natural kinds, but this is agreed by those who think that there are, and they are restricted to basic physics (as his examples of isotopes and electrons seems

to suggest might be the case, even in his opinion). We seem to have reached a position according to which, on the one hand, hylomorphism is a general feature of our conceptual system, and, as such, applies to most common objects, but, on the other hand, in reality, might apply only to a restricted group of objects. And certainly, for Johnston, explanations, though not subjective or psychological, are abstract entities, like propositions. (660-2). His view is, therefore, consistent with the conceptualist claim that, in so far as causation by complex structures belongs in the explanatory theories of the special sciences, it is not part of concrete reality, but of a certain mode of understanding it.

5. Modern hylomorphism's basic dilemma.

It seems that modern hylomorphism faces the following dilemma. The following argument has appeal.

(1) The concept of structure is essential to all or most natural sciences.

(2) If something is essential to a valid mode of explanation or understanding, then it should be conceived realistically.

therefore

(3) There are real structures in the world.

But the following also has appeal.

(4) It is sufficient for the concept of structure to be applicable that elements be appropriately related in the world, and these relations can be characterized without employing the notion of structure. This could be done by specifying the spatio-temporal location of the elements and their causal influence on each other.

If (4) is correct, it looks as if, though our structural concepts are well grounded in reality, structures are not part of the basic furniture of the world: by the causal criterion of concrete reality, they contribute nothing over and above the 'forces' of physics, and, as entities, they are nothing above their constituents and their spatiotemporal and causal relations.

There are two possible responses to this. The first is to borrow Johnston's distinction between *static* and *dynamic* forms and thereby to point out an ambiguity in (4). (2006, 663-4) Static forms are ones which do not change their constituent parts, dynamic forms are those which do. So an H₂O molecule is static because it always possesses the same hydrogen and oxygen atoms, but a living creature or its parts are dynamic because, though the structure remains the same, like Theseus's ship, the parts are constantly renewed. Using this distinction, one might claim that static structures are no more than their parts, but dynamic ones have an existence 'in their own right'. These are very much like what John Locke invoked to explain the unity of plants.

That being then one plant, which has such an organization of parts in one coherent body, *partaking of one common life*, it continues to be the same plant, as long as it *partakes of the same life*, though that life be communicated to new particles of matter vitally united to the living plant, in a like continued organization...For this organization being at any one instant in any collection of *matter*, is in that particular concrete distinguished from all other, and *is that individual life*, which existing constantly from that moment both forwards and backwards, in the same continuity of insensibly succeeding parts united to the living body of the plant, it has that identity, which makes it the same plant... (*Essay*, II, XXVII, 4: italics added, except '*matter*').

Given Locke's general conceptualism about macroscopic substances, his apparent commitment here to some objective feature called 'the same life', which is responsible for the identity of the plant, is remarkable. Locke may be a teleological emergentist about organic life, but, putting that possibility aside, there is a striking parallel between his conception of organization - usually designated as 'life' - in these cases and Johnston's notion of dynamic form. What could the existence of such an entity consist in, given physical closure? In a sense, this proposal still meets condition (4), as, at any given moment, a complex object consists in parts spatio-temporarily and causally related, but, against the spirit of (4), it might seem that, over time structure endures in its own right.

One might modify (4) and identify a dynamic structure with a four dimensional collection of spatiotemporally arranged interacting parts, and so accommodate the fact of change of parts, in this way saving the reductive import of (4). But this will not do, because it misses out the modal properties of dynamic structures: the same structure *could have* existed with at least some different parts from those that actually functioned as parts of it. So the central point is that dynamic structures have different identity conditions from anything defined in terms of the identity of its parts. This of itself, however, does not favour the realist view, for identity conditions, it might be thought, are principally things that reflect the content of concepts, rather than being things out in the world. The situation is, I think, as follows.

Identity or individuation conditions are not out there in the world, amongst the *concreta*, any more than are explanations. Things in the physical world can be said to have identity conditions, but they must exist in order to have them; a compound object does not consist of its parts, plus certain modal features, which latter endow it with an identity in its own right.

But surely there is something that underwrites the unity of an oak tree, beyond the features of our concepts. Not, I think, in addition to the causal cohesion of the parts, plus modal facts about what might possibly have occupied the role of those parts. This does not involve any facts beyond the basic physics. I think we can appreciate this better if we consider a case where the parts are themselves directly perceivable. If one considers a tornado or insects swarming, one would not think of these as anything other than phenomena consisting of the dynamic interaction of the parts. In these cases, the particulate nature of what is going on is manifest in a way that it is not for a living thing, but the difference is one of complexity and degree. It is no accident that Aristotle denied that a weather system was a genuine substance, precisely because the mechanical basis of its organizational structure was open to view. (...).

I said above that there were two possible responses to (4). The one I have just considered suggests that (4) conceals the hidden role of structure in accommodating the modal facts. The other is what I shall call 'blunt realism'. It involves accepting (4), in whatever form one wishes, and saying that it in no way contradicts realism about composite objects. Even if (4) gives a complete account of what constitutes an object, that does not impute the reality of the object so constituted. One might put it this way: an object does not need to be *something over and above* what constitutes it to be real; if its constituents are real, so *ipso facto* is it.

This line of argument is, in effect, trying to deny the distinction between the conceptualist account of composite objects, according to which such objects are well grounded conceptual interpretations of micro parts in spatiotemporal and causal relations; and the realist account, according to which composites are real, independently of any conceptual activity on our part. This distinction can be more clearly expressed as follows.

The question 'are there Fs?' can properly be interpreted in either of two ways, depending on the 'F' in question. One I call the conceptualist interpretation (CI), and it can be read roughly as follows:

(CI) We have the concept 'F'. Is the world so organized that it satisfies this concept in the way that is necessary for the utility of that concept?

If the answer to this is affirmative, then there are Fs, in the conceptualist sense.

The other interpretation is realist (RI), and goes roughly as follows.

(RI) Forget about us and our concepts. If there were no conceptualizers around (putting God or Divine minds aside) would there be Fs?

If the answer to this is affirmative, then there are Fs in the realist sense. So the issue is whether, in the absence of conceptualizers, there are composites out there in addition to the things that compose them. The 'blunt realist' denies any dependence on conceptualization. I think that I have already said enough to suggest that this is not the most illuminating philosophical perspective. First, if one is a sparse realist about universals, then one ought to accept the distinction between CI and RI. I have not discussed theory of universals, but I think a sparse realism is, on grounds of economy, the best theory. Second there is the question of the status of the modal properties required by our standard macro concepts. This issue does not arise for mereological theories, like Lewis's, because,

for them, different parts mean different objects, but for a motivated restricted composition theory, they are essential, and it is difficult to see what one can 'add to' the parts and their causal relations, in concrete reality, to give these modal features. But that they are built into concepts is obvious.

6. Aristotelian matter and physical closure.

Anna Marmodoro (2013) argues that the modern hylomorphists have misunderstood Aristotle in a radical fashion, in a way that is directly connected with their concern about the unity and hence reality of composites. She claims, with strong backing from the text, that form is not structure, because form is not a combination of parts, as a structure, by definition, is. The essence of form is its unity, and its unity depends essentially on the fact that the matter that comes to compose it loses its previous identity - just as a drop of water poured into bucket of water loses its individual identity when it mixes with the rest. By contrast, in any kind of structure of parts this identity is not lost; the parts are merely organized in a certain way. But is the water-drop analogy valid in a system closed under physics? Is it not more like the history of a brick, which retains its identity when incorporated in a building? Physical closure requires that basic physics applies to the basic constituents within complex structures as much as to them when more isolated. If it is to apply under those circumstances, the things to which it applies and of which it expresses the causal and behavioural properties must be deemed present. There is no science ranging over particular water drops – the kinds of things that lose their identity when merged – but there is over water molecules, which could, in principle, be followed individually on their path into the larger pool.

7. Sceptical conclusion.

My conclusion is that a realist hylomorphism, cannot be reconciled with closure under physics for at least three reasons.

(1) As Jaworski concedes, under such closure, all the *forces* operate at the bottom level. What one might characterize as higher level causes are simply parts of explanatory schemes within the special sciences or the 'common sense' world.

(2) Johnston might be right in saying that such explanations are not psychological or subjective entities, but that would be because they are Platonic entities, like propositions, and these are still not part of the world they explain. They are part of the (well grounded) conceptual structure we apply.

(3) The autonomy of structure or form that rests on the autonomy of their identity conditions points to a conceptualist interpretation of them. Identity conditions are external only if the objects to which they apply are external; they do not constitute or reify such entities.

One cannot preserve a realist and substantive form of hylomorphism while jettisoning the embarrassing feature of the Aristotelian system, namely its commitment to an irreducible teleology that is incompatible with physical closure.

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ⁱ It is important that I am not engaged at this point with the mind-body problem, so the issue is only whether all uncontroversially physical parts of the world are closed under physics.

ⁱⁱ See Robinson (2014) for further development of this.

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Hylomorphism and the Metaphysics of Structure

Abstract

Hylomorphism claims that structure is a basic ontological and explanatory principle; it accounts for what things are and what they can do. My goal is to articulate a metaphysic of hylomorphic structure different from those currently on offer. It is based on a substance-attribute ontology that takes properties to be powers and tropes. Hylomorphic structures emerge, on this account, as powers to configure the materials that compose individuals.

Paper

1. The hylomorphic notion of structure

Hylomorphism claims that structure (or organization, form, arrangement, order, or configuration) is a basic ontological and explanatory principle. Some individuals, paradigmatically living things, consist of materials that are structured or organized in various ways. You and I are not mere quantities of physical materials; we are quantities of physical materials with a certain organization or structure. That structure is responsible for us being and persisting as humans, and it is responsible for us having the particular developmental, metabolic, reproductive, perceptive, and cognitive capacities we have.

The hylomorphic notion of structure is not the same as others that have appeared in the literature.ⁱⁱⁱ It is not the same, for instance, as Ted Sider's (2012) notion. Sider uses the term 'structure' to refer to what grounds the distinction between things that are fundamental or perfectly natural in Lewis's (1983) sense, and things that are not. Hylomorphism provides one account of what structure in Sider's sense includes, but the specifically hylomorphic notion of structure is not the same as Sider's. Nor is it the same as David Chalmers's (2002, 258). For Chalmers, structural descriptions are abstract microphysical descriptions of a system's state at a time that are contrasted with microphysical dynamic descriptions of how a system's states change over time. For hylomorphists, by contrast, structure is not an abstract postulate, nor are descriptions of structures confined to microphysics.

One way of illustrating the hylomorphic notion of structure involves the many appeals to structure we find in the sciences, especially biology and biological subdisciplines such as neuroscience. Here is an example taken from a popular college-level biology textbook—note the references to organization, order, arrangement, and related things:

Life is highly organized into a hierarchy of structural levels, with each level building on the levels below it... Biological order exists at all levels... [A]toms... are ordered into complex biological molecules... the molecules of life are arranged into minute structures called organelles, which are in turn the components of cells. Cells are [in turn] subunits of organisms... The organism we recognize as an animal or plant is not a random collection of individual cells, but a multicellular cooperative... Identifying biological organization at its many levels is fundamental to the study of life... With each step upward in the hierarchy of biological order, novel properties emerge that were not present at the simpler levels of organization... A molecule such as a protein has attributes not exhibited by any of its component atoms, and a cell is certainly much more than a bag of molecules. If the intricate organization of the human brain is disrupted by a head injury, that organ will cease to function properly... And an organism is a living whole greater than the sum of its parts... [W]e cannot fully explain a higher level of order by breaking it down into its parts (Campbell 1996, 2–4).

This passage suggests that the way things are structured, organized, or arranged plays an important role in them being the kinds of things they are, and in explaining the kinds of things they can do. Consider likewise William Bechtel, a philosopher of neuroscience:

[T]he organization of... components typically integrates them into an entity that has an identity of its own... Organization itself is not something inherent in the parts... In virtue of being organized systems, mechanisms do things beyond what their components do... As a result, organized mechanisms become the focus of relatively autonomous disciplines... (2007, 174, 185–186).

According to Bechtel, a complex whole—what he calls a ‘mechanism’—consists of parts plus an organization that confers on it capacities not had by its parts taken in isolation. In addition, descriptions of structured wholes and explanations of their behavior are irreducible to descriptions and explanations of their unstructured parts. Bechtel goes on to argue that higher-level and lower-level empirical disciplines have different subject-matters on account of the ways things are organized or structured. Because of that they have different vocabularies and provide different kinds of explanations, and this makes higher-level disciplines autonomous—irreducible to lower-level disciplines in the traditional philosophical sense.

Often when people think of structure, they think of something static such as the relatively unchanging spatial relations among atoms in a crystal. But many structures, including those that distinguish living things from nonliving ones, are not static spatial relations, but dynamic patterns of environmental interaction. The neurophysiologist Jonathan Miller makes this point explicit:

[T]he physical universe tends towards a state of uniform disorder... In such a world the survival of form depends on... [either] the intrinsic stability of the materials from which the object is made, or the energetic replenishment and reorganisation of the material which is constantly flowing through it... The configuration of a fountain... is intrinsically unstable, and it can retain its shape only by endlessly renewing the material which constitutes it; that is, by organising and imposing structure on the unremitting flow of its own substance... The persistence of a living organism is an achievement of the same order as that of a fountain... it can maintain its configuration only by flowing through a system which is capable of reorganising and renewing the configuration from one moment to the next. But the engine which keeps a fountain aloft exists independently of the watery form for which it is responsible, whereas the engine which supports and maintains the form of a living organism is an inherent part of its characteristic structure (Miller 1978, 140–1).

Miller brings out a further point as well. The dynamic structure that qualifies something as a living thing is also what enables that thing to persist through time. It is one and the same organism that persists through the constant influx and efflux of matter and energy because of its structure and its dynamic ability to impose that structure on incoming matter and energy.

A final idea about structure is introduced by John Dewey (1958, 253–8). He suggests that mental phenomena can be understood as species of structural phenomena in general. If structure is uncontroversially part of the natural world, and mental phenomena are just species of structural phenomena, then they must be uncontroversially part of the natural world as well. The resulting view thus appears to be naturalistic. Moreover, because structural descriptions and explanations are irreducible to descriptions and explanations that appeal to unstructured physical materials, the account also appears to be antireductive. And if structure is a basic ingredient of the natural world, then it is unmysterious on this account how mental phenomena could be both natural and irreducible.

The foregoing authors gesture toward a view of structure in the natural world. According to it, structure serves as a principle of unity, persistence, and power. It is responsible for setting something apart as a discrete individual distinct from the rest of the physical universe, and it explains why such an individual can exist one and the same over time. It also explains why that individual can do many of the things it does: why it has many of the powers it has, including the powers that classify it as a living being or a mental one. Finally, an individual's structure explains the autonomy of various empirical disciplines that would look to describe and explain its behavior. We can express the foregoing theoretical roles that structure plays on this view with some slogans:

Structure matters: it operates as an irreducible ontological principle, one that accounts at least in part for what things essentially are.

Structure counts: it explains the unity of composite individuals, including the persistence of one and the same living individual through the dynamic influx and efflux of matter and energy that characterize many of its interactions with the wider world.

Structure makes a difference: it operates as an irreducible explanatory principle, one that accounts at least in part for what individuals can do, the powers they have.

Structure minds: it provides us with resources for understanding the place of mental phenomena within the natural world.

Elsewhere I have argued in favor of taking hylomorphic structure as a basic ontological and explanatory principle, and have argued that an account of mental phenomena based on hylomorphic structure implies attractive solutions to mind-body problems, including the problem of emergence and the problem of downward causation (Jaworski 2011, 2012). In what follows I plan to say more about the metaphysics of hylomorphic structure. I will articulate an account of hylomorphic structure based on a substance-attribute ontology which takes properties to be powers and tropes.

2. Sparse properties, tropes, and powers

A substance-attribute ontology claims that substances or *individuals*, as I'll call them, and attributes or *properties*, are fundamental entities. There are in addition *states of affairs* or *events* (some philosophers call them 'facts'): individuals having properties or standing in relations at times. An event exists exactly if an individual has a property at a time or several individuals stand in a relation at a time (Kim 1976). Event e is identical to event e^* exactly if e and e^* have the same individuals, properties, and times. If, for instance, event e is identical to a 's having property P at time t , and event e^* is identical to b 's having property Q at time t^* , then $e = e^*$ exactly if $a = b$, $P = Q$, and $t = t^*$.

The principal agents in this ontology are individuals. They can both act on other individuals and be acted on by them; they have, in other words, they have both *active* and *passive powers*—both powers to affect things and powers to be affected by them. Individuals enter into causal relations by exercising their powers, and they are empowered in the ways they are by their properties.

The properties I have in mind are *natural* properties, not mathematical or logical ones. For our purposes we can put properties of the latter sorts to one side. Natural properties play several theoretical roles in this ontology. First, they are causal-enablers; they confer the powers that make causal interactions among individuals possible. Second, because they confer powers, properties are also causal-explainers; they explain why individuals act or are acted on in the ways they are. Third, properties ground the objective similarities and differences among individuals. Individuals are always

similar or dissimilar in certain respects. These respects are properties (Martin 1996a, 71–73; 1997; 2007, 42–43). Moreover, since properties are possessed by individuals independent of any descriptive or explanatory interests we happen to have, the similarities and differences they ground are objective.

The view I've described takes properties to be *sparse* not *abundant* (Lewis 1983). A sparse account of properties has several noteworthy features. First, a sparse account sharply distinguishes properties from predicates. Predicates can be identified with sentence-frames (Strawson's 1974, 37–8; Armstrong 1978a, 2–3), linguistic expressions such as '___ is red' and '___ is taller than ___' that form sentences when the blanks are filled in by terms. (For convenience I'll omit the blanks when talking about predicates in the future.) Properties are supposed to be the non-linguistic correlates of at least some predicates. Some accounts that take properties to be abundant claim that every predicate expresses a property, and that different predicates express different properties. A sparse account of properties denies these things.

According to a sparse account, it is possible for different predicates to express the same property ('weighs 453.59 grams', 'weighs 1 pound'), and for different properties to be expressed by the same predicate in different contexts ('The team is good', 'The wine is good') (Armstrong 1978b, 9–14; Campbell 1990, 25; Molnar 2003, 26). Likewise, not every predicate expresses a property. For one thing, there might be unknown properties to which no actual predicates correspond (Armstrong 1978b, 12–14; Molnar 2003, 25). In addition, some predicates are self-referentially incoherent such as the predicate 'is a property to which no predicate corresponds' which generates a version of Russell's paradox. These predicates do not (and indeed cannot) correspond to any property (Molnar 2003, 26). It is also possible to invent predicates, but it is not possible to invent properties. When we invent predicates, moreover, we can do so by iterating formal operations ad infinitum, yet it is implausible to suppose that the number of properties could be infinite (Ellis and Lierse 1994a, 9; Molnar 2003, 26). Similarly, we can invent a non-denumerably infinite number of predicates to describe physical entities such as subatomic particles provided we take seriously the use of real numbers in physics. But it is extremely implausible to suppose that those physical entities should have non-denumerably infinite properties (Bradley 1979, 12–13; Molnar 2003, 26).

For the foregoing reasons, sparse properties are distinct from predicates. What, then, determines which predicates express properties, and whether two or more predicates express the same property or different ones? The answer, on a sparse account, is that this is largely an empirical matter. We take our best empirical descriptions, explanations, methods, and techniques, and countenance all the properties needed to make the descriptions and explanations true and the methods and techniques effective (Ellis 2002, 44–45; Molnar 2003, 27; Armstrong 2010, 19).

There are many debates about properties in the literature. A very old one concerns whether properties are universals or particulars. Realists like Armstrong (1978a–b; 1983; 1989; 1997; 2005; 2010) claim that they are universals—"repeatable" entities (Loux 2006). Numerically one and the same universal can be instantiated by and thereby be wholly present in diverse individuals. Nominalists, by contrast, claim there are only particulars. Extreme nominalists posit only individuals, but moderate nominalists posit other particulars besides. These latter are called 'abstract particulars' to distinguish them from individuals, which are the concrete particulars. Abstract particulars include classes and tropes.

Tropes are particularized properties, also called 'unit properties', 'property instances', 'individual accidents', and 'modes', among other things (Stout 1923; Williams 1953, 1986; Campbell 1981, 1990; Martin 1996a–b, 1997, 2007; Molnar 2003; Heil 2003, 2005). To understand the concept of a trope, it is helpful to contrast it with the concept of a universal. Consider two apples, *a* and *b*, which are qualitatively indistinguishable. The redness of *a* is completely indistinguishable from the redness of *b*. Realists explain this similarity by claiming that there is a universal, redness, that is instantiated by both *a* and *b*. Trope theorists deny this. There is not a single entity, the universal redness, which is instantiated by both *a* and *b*; rather, *a*'s redness is a property that is numerically different from *b*'s redness. *a*'s redness and *b*'s redness nevertheless exactly resemble each other,

and because of this exact resemblance it can seem as though there is an entity, a universal, which the two literally have in common. But according to trope theorists, this is not the case. Saying that *a* and *b* have the same color is analogous to saying that a boy and his father have the same nose, or that two embarrassed celebrities arrived wearing the same dress. Statements like this do not posit a single nose or a single dress, but two exactly resembling ones. Realists insist that all similarities must be grounded in numerically identical universals, but trope theorists deny this. They take similarities as ground-level facts that stand in need of no further explanation.

Many trope theorists have been attracted to bundle theories of substance (Stout 1923; Williams 1953; Campbell 1981; 1990), but I follow those trope theorists who remain committed to a substance-attribute ontology. They include Martin (1980, 1996a–b, 1997, 2007), Molnar (2003), Heil (2003, 2005), and trope theorists of the past such as Aquinas, Ockham, and perhaps even Aristotle.

One advantage of trope theory is that it enables us to avoid positing states of affairs or events as a separate ontological category (Campbell 1981, 354–5; Williams 1986, 4; Armstrong 1989, 117–119). The reason is that the relation between a trope and its individual bearer is not contingent but necessary, something that trope theorists have termed ‘nontransferability’ (Heil 2003, 141–2; Molnar 2003, 43–46). Martin explains:

Properties are nontransferable. The redness or sphericity of this tomato cannot migrate to another tomato. This is a consequence of the idea that properties are particular ways things are. The identity of a property—its being the property it is—is bound up with the identity of its possessor (Martin 2007, 44).

Apple *a*’s redness cannot belong to something other than *a*, any more than Eleanor’s smile can belong to someone other than Eleanor. Consequently, there is no need to posit something in addition to individuals and properties, namely states of affairs or events, that tie individuals and properties to one another. For a property to exist on this account is for it to be the property of some individual.

Another debate about properties concerns what it means to say that properties confer powers. The view I favor is a version of the one defended by C. B. Martin (1990, 1993, 1996a–b, 1997, 2007), John Heil (2003, 2005), and Martin and Heil (1998, 1999). Heil calls it the ‘identity theory’. I will adopt his terminology, and call it the *identity theory of powers*. It claims that each property is essentially dispositional. In this sense it is similar to pure dispositionalist views (Shoemaker 1980; Mumford 2004; Bird 2007). Each property essentially empowers its individual possessor to interact with other individuals in various kinds of ways. A diamond’s hardness empowers the diamond to do a variety of things—to scratch glass, for instance. It is essential to the hardness that it empowers the diamond to do these things; it plays this power-conferring role in every possible world in which it exists. We describe this role in a variety of ways. We say that the diamond is able (or has the power or potential or capacity) to scratch glass, or that the diamond would scratch that mirror if raked across its surface. But the diamond’s hardness plays other roles which we describe in different terms. We say, for instance, that the diamond has a tetrahedral arrangement of carbon atoms. According to the identity theory of powers, these descriptions are of numerically one and the same property. The diamond’s hardness = the diamond’s power to scratch glass = the diamond’s having a tetrahedral arrangement of carbon atoms. These descriptions simply bring out different theoretical roles that the one property plays. Dispositional descriptions such as ‘The diamond would scratch that mirror if raked across its surface’ bring out the roles it plays as a power. Nondispositional descriptions such as ‘The diamond has a tetrahedral arrangement of carbon atoms’ bring out its role as a stable manifestation—an actualization, we might call it—of a power possessed by the carbon atoms, namely the power to be arranged tetrahedrally. The one property is thus simultaneously both a stable manifestation of a power and a power itself, both an actuality and a potentiality.

Martin and Heil mention the identity theory's Lockean pedigree, but to my mind the more obvious historical antecedent is Aristotle. Almost everything on Aristotle's view is both an actuality of some potentiality and a potentiality for some further actuality. The only exceptions are prime matter and God. The former is pure potentiality, on Aristotle's view, and the latter pure actuality, but both are limit cases on a continuum in which otherwise every actuality is a potentiality and every potentiality an actuality.^{iv} Numerically one and the same property thus plays different theoretical roles.

It is worth noting one difference between the way Martin and Heil develop the identity theory of powers and the way I do. The discussion of powers in metaphysics has typically been framed as a debate about whether properties are fundamentally categorical or fundamentally dispositional. Martin (1996a) eschews talk of categorical properties on the grounds that calling properties 'categorical' covertly begs the question against the identity theory. His preferred term is 'qualitative', and Heil (2003, 2005) follows his lead. I agree with Martin and Heil that the term 'categorical' is prejudicial, but I think the term 'qualitative' is overcommitted as well. The notion of a quality has a narrower scope than the notion of a property. Qualities are linked to our experiences of things.^v Molnar (2003, 178) argues, however, that some properties, such as those postulated by quantum theory, are not qualitative. If he is right, then the notion of a property outstrips the notion of a quality. Consequently, I think identity theorists do well to avoid the term 'qualitative'. I've suggested that they say instead simply that there are different vocabularies, some dispositional others nondispositional, for describing the different theoretical roles that properties play.

The identity theory of powers has several noteworthy features. First, it claims that powers are essentially directed toward their manifestations. This directedness has led some philosophers to draw analogies between dispositionality and intentionality (Martin and Pfeifer 1986, Place 1996a–b, Molnar 2003). Intentional mental states are said to be directed at things. My desire is essentially a desire *for* something, my fear is essentially a fear *of* something. Something analogous is true of powers; they are essentially powers *for* various exercises or manifestations. Likewise, just as my desire can remain unfulfilled and my fear unrealized, so too a power can remain unmanifested. A quantity of table salt has the power to dissolve in water, yet that power might never actually be exercised. It is possible that the salt might remain forever undissolved. Martin (1996a) defends this idea with an example: it seems possible that there might be fundamental physical particles in the universe that have the power to interact in various ways with particles around here, and yet that are so far away that they reside outside the light cone of the particles around here. The two groups of particles never actually interact, yet it seems obvious that the distant particles still have the power to interact with the local ones.

Another feature of the identity theory is that powers are manifested or exercised only in specific circumstances and typically only in conjunction with individuals that have reciprocal powers—what Martin calls 'reciprocal disposition partners'. I mentioned earlier that powers come in both active and passive varieties: there are powers to affect things and also powers to be affected by them. Powers are typically exercised only when individuals with reciprocal active and passive powers are conjoined in the right circumstances. Water, for instance, can exercise its power to dissolve things only in conjunction with things that have the power to be dissolved by it. Harré and Madden's (1975) examples of radioactive decay and ammonium tri-iodide seem initially to provide counterexamples to the general rule that powers are manifested or exercised in pairs, or triples, or.... But even here it might be possible to understand the cases in a way that conforms to the general reciprocity model. At the very least the environment surrounding the radioactive nuclei or the ammonium tri-iodide cannot include any agents that inhibit the exercise of their powers to decay or explode, respectively. Environments that are free of inhibitory factors might then be viewed as reciprocal disposition partners for the decaying nuclei and the explosive compound.

In addition, the exercise of some powers can inhibit or excite, impair or enhance, strengthen or weaken the exercise of others. An antidote has the power to inhibit the power of a poison, and there might be other things which have the power to enhance or strengthen it. These observations

reflect a more general point: the same power can manifest itself differently in conjunction with different disposition partners. To use Heil's example: a ball will roll on a hard surface on account of its roundness, and it will make a concave depression in a soft surface on account of that same roundness. The same property, the ball's roundness, manifests itself in different ways in conjunction with different disposition partners.

3. Individual-making structures

The ontology I've just described provides a basis for understanding the hylomorphic notion of structure. The kinds of structures I'll focus on are the ones that make individuals what they are—individual-making structures. According to hylomorphists activities also have structures, but a discussion of activity-making structures would take us beyond the confines of this paper.

The theoretical roles we expect these structures to play (the role of conferring powers, for instance) are characteristic of properties in the foregoing ontology. If structures are properties, then they have all the characteristics of properties described earlier. First, they must be powers—powers in particular to configure (or organize, order, or arrange) materials. Each structured individual organizes or configures the materials that compose it. I configure the materials that compose me, and you configure the materials that compose you. Describing the way each of us configures our respective materials is something that hylomorphists say is an empirical undertaking—in our cases, an undertaking left largely to biology, biochemistry, neuroscience, and other biological subdisciplines. Collectively, these disciplines are likely to deliver long, complicated descriptions of cells, tissues, and organ systems, along with their characteristic activities, capacities, and interrelations. It will be convenient to have a term to stand in for these descriptions. Let us say that you and I configure materials *humanwise*, where 'humanwise' is a placeholder for the longer descriptions that it is the collective job of biologists, neuroscientists, and others to supply.

Second, structures are particulars. To say that you and I configure materials humanwise does not imply that there is a universal, configures humanwise, that you and I have in common. If properties are tropes, then my configuring and your configuring are numerically different properties, though they resemble each other rather closely—more closely than, say, either resembles Fido's configuring the materials that compose him or the oak tree's configuring the materials that compose it. My configuring and yours are also nontransferable: my configuring cannot belong to anything other than me, nor can your configuring belong to anything other than you.

Third, structures have the same directedness that all powers do. The structures of living things in particular appear to be directed toward developing and maintaining the organism's mature state, as well as the powers that characterize that state and their manifestations (Mayr 1997, 22). Like many of the powers we have considered, an organism's structure manifests itself in many different ways—in, for instance, the organism's various developmental stages, as well as in the variety of self-regulating processes that maintain the cells, tissues, and organs that living things develop such as photosynthesis, glycolysis, protein synthesis, and so on.

Fourth, structures confer whatever powers they do necessarily. It is metaphysically impossible for my structure not to confer on me the power to grow lungs, skin, and bones. Critics might object that we can easily conceive of situations in which I fail to develop normally, and end up without lungs, or skin, or bones. There are at least two ways hylomorphists can respond to this kind of objection. Either they can deny that worlds in which I lack the power to develop lungs, skin, and bones are genuinely conceivable, or else they can deny that the kind of conceivability we achieve in these cases is a reliable guide to possibility. Consider an example of the first strategy. Hylomorphists can claim that when we take ourselves to be conceiving of me lacking the power to develop lungs, skin, or bones we are really conceiving of me in circumstances in which something is inhibiting my power to develop normally. Powers, recall, can inhibit or enhance the manifestation of other powers; that includes the powers of living things. It is possible for outside influences to interfere

with the ways my structure is manifested—teratogenic agents that could prevent me from developing lungs, skin, or bones. If critics insist that they are conceiving of me failing to develop lungs, skin, or bones in the absence of outside influences, hylomorphists have the option of shifting to the second strategy: they can accept that the critics are in some sense conceiving what they say, but deny that conceiving in this sense is any guide to what is possible. Perhaps critics are tacitly employing an epistemic notion of conceivability (Shoemaker 1980, 231), and when they say that they are conceiving of me failing to meet various developmental milestones in the absence of any noxious outside influences, they are merely saying that such a circumstance is not inconsistent with everything they know about human development. This kind of conceivability is clearly not an infallible indicator of possibility, for among other things, critics might not know very much about human development. It is possible that if they knew more, they might no longer be able to conceive what they currently do.

With these points in mind consider again the theoretical roles attributed to structures in Section 1. It should be apparent how structure makes a difference on the hylomorphic view. Structures are powers. Consequently, if something has a structure, it has powers that it would not otherwise have. Structure thus makes a difference. Structure also matters. Structured individuals have their configuring properties essentially; each is essentially an organizer/configurer of materials. For a structured individual to cease configuring some materials or other is for that individual to cease to exist. Structures are thus essential properties of structured individuals. In addition, unlike many of the powers we have considered, structures cannot go unmanifested. Crystals of table salt can sit idly; their power to dissolve in water can remain forever unmanifested. But there is no sitting idle when it comes to my power to configure the materials that compose me. If I am not manifesting that power, if I am not configuring those materials, then I do not exist, and if I do not exist, then there is no individual to do my configuring. Structures, then, are not just essential powers of structured individuals; they are powers of structured individuals that are essentially manifested, that cannot exist unmanifested.

Structure also counts; it explains the unity and persistence of composite individuals, and in the case of living things that means explaining their unity and persistence through the dynamic influx and efflux of matter and energy that characterizes their interactions with the surrounding world. To understand how structure plays this role it is helpful to consider the hylomorphic view of composition.

4. *Hylomorphic composition*

The hylomorphic view of composition is similar in its outlines to Peter van Inwagen's (1990). Van Inwagen presents his view as an answer to the Special Composition Question (SCQ): Under what conditions do multiple things compose one thing? Extreme answers to the SCQ are offered by mereological universalists, on the one hand, who claim that composition happens under any conditions, and mereological nihilists, on the other, who claim that composition happens under no conditions. Moderate answers to the SCQ claim that composition happens under some conditions but not under all. Van Inwagen's own moderate answer claims that composition happens exactly if the activities of some fundamental physical particles constitute a life. By 'a life' van Inwagen takes himself to mean what biologists do: "the individual life of a concrete biological organism... [the] sense according to which 'Russell's life' denotes a purely biological event" (van Inwagen 1990, 83). Van Inwagen's descriptions of lives stay largely at the level of metaphor and analogy. The reason is that providing the literal details of what lives are and what characteristics they have is, he thinks, an empirical undertaking (1990, 84).

Van Inwagen's answer to the SCQ implies that x is a proper part of y if and only if y is an organism and x is caught up in the life of y (1990, 94). The expression "caught up in a life" is one that van Inwagen borrows from the biologist J. Z. Young (1971). Van Inwagen explains with an example:

Alice drinks a cup of tea in which a lump of sugar has been dissolved. A certain carbon atom... is carried along with the rest of the sugar by Alice's digestive system to the intestine. It passes through the intestinal wall and into the bloodstream, whence it is carried to the biceps muscle of Alice's left arm. There it is oxidized in several indirect stages (yielding in the process energy... for muscular contraction) and is finally carried by Alice's circulatory system to her lungs and there breathed out as a part of a carbon dioxide molecule... Here we have a case in which a thing, the carbon atom, was... caught up in the life of an organism, Alice. It is... a case in which a thing became however briefly, a *part* of a larger thing when it was a part of nothing before or after... (1990, 94-5).

According to van Inwagen, then, composition does not happen apart from lives; composite beings are all living things. There are, then, two kinds of material beings on van Inwagen's view: mereological simples (material beings with no proper parts) and living things. Moreover, the only living things, according to van Inwagen, are single cells and multicellular organisms.

Van Inwagen's view has several noteworthy implications. First, it implies what he calls 'the Denial', the claim that many objects belonging to a commonsense ontology do not exist. Examples include artifacts such as tables and chairs, and also natural bodies such as rocks, mountains, stars, and planets. Since the only material beings on van Inwagen's view are living things and mereological simples, and tables, chairs, mountains, and so on are neither simples nor living things, van Inwagen's view implies that these things do not exist (he calls them 'virtual objects'). Although this seems counterintuitive, van Inwagen argues that his view can accommodate our pedestrian intuitions. The reason is that it is possible to paraphrase statements that are apparently about artifacts and natural bodies in ways that mention only mereological simples. When we say that there is a chair in the corner, for instance, we are really saying that certain mereological simples are arranged in the corner chairwise. This strategy allows van Inwagen to countenance ordinary talk of artifacts, mountains, and stars without compromising his answer to the SCQ.

The Denial enables van Inwagen to solve a variety of philosophical problems in an elegant way. Consider two examples. The first is a biological analogue of the Ship of Theseus. Organisms are constantly exchanging the materials that compose them for new materials. Suppose, then, that I am an organism composed by the x s at time t_1 . Gradually the x s come to be replaced entirely by the y s at time t_2 . Suppose, moreover, that at that time the x s themselves get reassembled into an exact replica of the organism composed by the y s. Which organism, if either, am I: the one composed of the y s, or the replica composed of the reassembled x s? Van Inwagen's answer is that I am the organism composed of the y s since organisms can survive gradual part replacement. The reason is that they persist on account of their lives (van Inwagen 1990, 148–9). So long as the life constituted by the activity of the x s at t_1 persists, I persist. Since the life constituted by the activity of the x s at t_1 is the same as the life constituted by the y s at t_2 , it follows that I am the organism composed of the y s at t_2 .

The second problem is a biological analogue of the statue-lump puzzle. I share all the same parts with the mass of matter that composes me at exactly the same time. But two things cannot share all the same parts at the exactly the same time, so I must be identical to the mass of matter. But the mass and I cannot be identical since we have different properties. The mass of matter existed (scattered throughout the biosphere) before I did, and unlike me it can survive being squashed. Since the mass and I have different properties, it follows from Leibniz's law that we must be distinct. There is thus good reason to think both that the mass and I are identical and that the mass and I are distinct. Van Inwagen's (1990, 144) solution is to deny that there are masses of matter (or lumps, chunks, or hunks of matter). The particles that occupy my location compose nothing other than me, and in that case, there is nothing—no mass of matter—located exactly where I am in addition to I myself, so there can be no question whether I am identical to a mass of matter.

Why does van Inwagen stop with organisms? Why not deny that all composites exist? Van Inwagen's most compelling answer is that organisms have non-redundant causal powers that other alleged composites lack. The activities attributed to artifacts and natural bodies can be understood as disguised cooperative activities performed by simples. The chair, the mountain, and the planet don't do anything that cannot be exhaustively described and explained by appeal to the activities of mereological simples, but according to van Inwagen, not all activities are like this. Organisms are capable of doing things that cannot be done by simples alone but only by composite individuals. We are thus forced to grant existence that they exist as distinctive individuals since they engage in activities (such as thinking) which, van Inwagen argues, cannot be performed by simples alone (1990, 118, 122). There are thus good reasons, van Inwagen thinks, for accepting that organisms exist while yet denying that artifacts and natural bodies do. Importantly, then, van Inwagen's view implies a kind of property pluralism. Living things have properties, such as thinking, which are different from any of the properties had by simples. As a result, those properties cannot be understood as cooperative activities performed by simples; they must be understood as properties unique to living wholes.

Let the foregoing remarks suffice for an overview of van Inwagen's account of composition. Importantly, van Inwagen's lives play precisely the kinds of theoretical roles that hylomorphic structures are supposed to play. *Lives matter* on van Inwagen's view; they are ontological principles: whether the xs constitute a life makes a difference to whether or not some composite individual exists. Likewise, *lives make a difference*; they are explanatory principles: living things are capable of doing things that cannot be exhaustively described and explained using the conceptual resources used to describe and explain the materials that compose them (1990, 122, 180). Finally, *lives count*; they operate as principles of unity (121) and persistence (145, 148): what binds the simples that compose me into a single being is that their activity constitutes a life, and what enables me to persist through changes in those simples is the persistence of that life. Because van Inwagen's lives play these roles it is easy to use his view of composition as a basis for developing the hylomorphic view.

Like van Inwagen's view, the hylomorphic view of composition provides a moderate answer to the SCQ. Configuring materials and being composed of materials are co-foundational concepts on the hylomorphic view, just as having a life and being composed of simples are co-foundational concepts on van Inwagen's. Likewise, just as van Inwagen restricts composition to living things, hylomorphists restrict it to structured individuals in general. According to hylomorphists, composition occurs when and only when an individual configures materials; there is a *y* such that the *xs* compose *y* if and only if *y* is an individual that configures the *xs*. I will call individuals that configure the materials composing them *structured individuals*.

Structured individuals are *emergent* individuals on the hylomorphic view. There are empirically-describable conditions that are sufficient to bring into existence new structured individuals where previously no such individuals existed. Once a structured individual comes into existence it is essentially and continuously engaged in configuring materials. The materials it configures are precisely those that compose it. When it comes to characterizing the configuring activity of structured individuals, hylomorphists can adopt most of what van Inwagen says about lives, at least when it comes to the configuring activities of living things, the paradigmatic structured individuals. My life is identical to my configuring various fundamental physical materials at various times—an event that has the characteristics van Inwagen attributes to lives, and that has many other characteristics it is business of the biological sciences to describe. An individual living thing does not configure exactly the same materials for very long since those materials are in constant flux, yet despite this, the individual maintains itself one and the same through all the changes on account of its ongoing configuring activity. That activity is what unifies various materials into a single individual, both synchronically and diachronically, just as lives do on van Inwagen's account.

The hylomorphic view has many of the same implications as van Inwagen's. It rejects the existence of artifacts, and masses (or chunks, hunks, or lumps) of matter, and can therefore solve philosophical puzzles about composition in the same way van Inwagen does. It is also committed to

property pluralism. It implies that structured individuals have properties of at least two sorts: properties due to their structures (or their integration into individuals with structures), and properties due to their materials alone independent of the ways they are structured. Subatomic particles, atoms, and molecules have physical properties such as mass irrespective of their surroundings. Under the right conditions, however, they can contribute to the activities of living things. Nucleic acids, hormones, and neural transmitters are examples. They are genes, growth factors, and metabolic and behavioral regulators. Each admits of two types of descriptions. They can be described in terms of the contributions they make to a structured system, but they are also independently describable in non-contribution-oriented terms. Descriptions of the former sort express the properties characteristic of structured individuals such as organisms and their parts. Descriptions of the latter sort express the properties they possess independent of their integration into structured wholes. A strand of DNA might always have various atomic or fundamental physical properties regardless of its environment, but it acquires new properties when it is integrated into a cell and begins making contributions to the cell's activities. It becomes a gene, a part of the cell that plays a role in, say, protein synthesis. Some philosophers and biologists call the "new" properties acquired by structured systems *emergent properties*.

There are nevertheless three noteworthy differences between the hylomorphic view and van Inwagen's. First, van Inwagen is a committed atomist; he claims that fundamental physical materials are particulate. Hylomorphists are not committed to this. They assume that fundamental physical entities are capable of composing structured wholes, but they do not take a further stand on the natures of those entities. They instead leave it to the relevant empirical disciplines to tell us what their natures are. In order to express this neutrality about the nature of fundamental physical entities, I've used the term 'materials' to refer to them since the term 'materials' can be applied both to discrete individuals and to continuous stuffs ('building materials', for instance, can be applied both to individual timbers and nails, and to stuffs such as glue, metal, and wood).

Second, van Inwagen limits composition to living things. According to hylomorphists, living things are the paradigmatic structured individuals, but hylomorphists do not rule out *a priori* the possibility that there might be structured individuals of other sorts. Consider atoms and molecules. Van Inwagen claims that they do not exist; they are virtual objects which are virtually composed of mereological simples. Hylomorphists are free to take the same stance as van Inwagen, but two more options are available to them. They can claim that atoms and molecules are structured wholes in their own right distinct from living things and their parts, or they can claim that atoms and molecules are parts of living things and the atom- and molecule-wise arrangements of fundamental physical materials we find outside organisms are virtual objects in van Inwagen's sense. Which stance they take depends on broadly empirical considerations. If atoms and molecules are discovered to have powers distinct from those that can be exhaustively described and explained by appeal to fundamental physical materials alone, then there are grounds for claiming that they are not mere aggregates of fundamental physical materials, but distinctive individuals in their own right. Hylomorphists thus countenance a larger ontology than van Inwagen's. His ontology includes mereological simples and organisms. Hylomorphism's includes fundamental physical materials, structured individuals (which might include individuals other than living things), and their parts.

Third, the hylomorphic view of parts is less revisionary than van Inwagen's. Van Inwagen (1981; 1990) denies that there are organic parts such as eyes, hearts, and kidneys; the only proper parts are fundamental physical particles and individual cells. Hylomorphists, by contrast, accept that there are parts such as eyes, hearts, and kidneys. Their reasons for doing so are again broadly empirical: our best descriptions and explanations of human behavior postulate parts like these, and this gives us good reason to think such parts exist. It is worth considering the argument for this claim in greater detail.

There are multiple ways of dividing things into parts. A hammer can be exhaustively decomposed into functional parts such as the head, the claw, and the handle—parts that contribute to the hammer's overall operation. It can also be exhaustively decomposed into spatial parts such as

the top third, the middle third, and the bottom third, or into the spatial parts obtained by dividing the hammer along the lines of a three-dimensional coordinate grid with metric units. Different principles of part identity and individuation yield different inventories of parts, all of which may be consistent with principles of formal mereology such as the transitivity and asymmetry of proper parthood. Because there are many different principles for part identity and individuation, whenever we want to consider the parts that a particular individual has we need to determine which principle is (or which principles are) best suited to our descriptive and explanatory interests. If we accept a broad naturalism in matters of ontology, then empirical adequacy is an important criterion for making that determination. A broad ontological naturalism implies that when it comes to determining what exists, empirical investigation—paradigmatically science—is our best guide. Consequently, when it comes to choosing principles of part identity and individuation for various individuals, we should choose principles that reflect our best empirical descriptions and explanations of their behavior. Roughly, if principle *P* does a better job enabling us to describe and explain the behavior of *Ks* than principle *P**, then we have good reason to accept that *Ks* have parts that are identified and individuated by *P* instead of *P**.

Consider now living things such as human organisms. Like the hammer, a human can be divided along purely spatial lines into thirds, or fifths, or along the lines of a three-dimensional coordinate grid with metric units. But biologists, neuroscientists, and psychologists are more interested in dividing humans and other organisms along functional rather than purely spatial lines (Bechtel 2007; 2008; Craver 2007).^{vi} Perhaps the best example of how the biological sciences divide organisms into hierarchically-ordered functional parts is provided by the method *functional analysis* (other names include ‘mechanical decomposition’ or ‘functional decomposition’).^{vii}

Functional analysis is a method that biologists, cognitive scientists, engineers, and others frequently employ to understand how complex systems operate. It involves analyzing the activities of those systems into simpler subactivities performed by simpler subsystems (Fodor 1968; Cummins 1975; Lycan 1987, Chapter 4; Bechtel and Richardson 1993; Glennan 2002; Bechtel 2007; 2008; Craver 2007).^{viii} Consider a complex human activity such as running. Functional analysis reveals that running involves a circulatory subsystem that is responsible for supplying oxygenated blood to the muscles. Analysis of that subsystem reveals that it has a component responsible for pumping the blood—a heart. Analysis of the heart’s pumping activity shows that it is composed of muscle tissues that undergo frequent contraction and relaxation. These activities can be analyzed into the subactivities of various cells, and these in turn can be analyzed into the operations of various organelles. This analytic process continues until something is discovered to have a property or to engage in an activity not on account of the activities of some lower-level subsystems but as an unanalyzable matter of fact. At that point, functional analysis comes to an end.

Functional analysis is important because it provides a basis for understanding the kinds of parts postulated by descriptions and explanations in the biological sciences. Those parts are subsystems or components, things that contribute in empirically-specifiable ways to the activities of the wholes to which they belong. Saying that *x* is a part of *y* implies that *y* engages in some activity, that there is a functional analysis of that activity into subactivities, and that *x* performs one of those subactivities. Saying that my heart is part of me is saying that my activities can be given an analysis into subactivities (or those into further sub-subactivities, and so on), and that one of those subactivities (or sub-subactivities or sub-sub-...subactivities) is performed by the heart. What distinguish different parts of me from each other, moreover, are the different ways they contribute to my activities: different parts contribute in different ways.

Because hylomorphism endorses this account of parthood, its inventory of parts that exist is less revisionary than van Inwagen’s. It is able to countenance the functional parts postulated by the biological sciences, and in many cases these will include parts that are postulated by common sense, such as eyes and hearts.

5. Functional parts and the body-minus problem

I want to close by considering an objection to the claim that there are functional parts. Van Inwagen (1981) argues that there is no principled reason for choosing to divide an organism into the kinds of functional parts we recognize in our pedestrian dealings as opposed to, say, parts on a metric grid. Functional divisions do not reflect anything deep in reality, only our peculiar descriptive interests. We can easily imagine a race of beings with descriptive interests different from ours who would divide humans into parts in a way different from the way we customarily do. Consequently, says, van Inwagen hands, eyes, hearts, and other functional parts are arbitrary; there is no principled reason for choosing to postulate them instead of parts of various other sorts. But arbitrary parts do not exist, for their existence would generate body-minus problems (Wiggins 1968; Burke 1994). Consider an example. It focuses on the brainstem. Why the brainstem? Eric Olson (1996) has argued that there is good empirical reason to suppose that the brainstem is the functional part with which at the barest minimum a human can survive: a human survives if and only if his or her brainstem does. Call this the 'brainstem survival thesis', and suppose that Olson is right about it. We can now formulate a body-minus problem:

(1) Descartes exists before t , and (2) a proper part of him, namely his brainstem, B , exists before t . Due to some catastrophe, however, every proper part of Descartes except B and its proper parts is destroyed at time t . (3) If B is the bare minimum functional part with which a human animal can survive, then Descartes survives the catastrophe. So Descartes exists after t . But (4) B also survives the catastrophe, so it too exists after t . Now, it seems that after t Descartes must be identical to B since (5) after t Descartes and B have the same size, shape, position, orientation, attitude, mass, velocity, and color, but (6) two objects cannot have the same size, shape, position, orientation, attitude, mass, velocity, and color. Hence, Descartes and B must be one, yet the identity of Descartes and B would violate Leibniz's law since Descartes used to have arms and legs, but B did not. There are thus good reasons to think both that Descartes and B are identical, and that they are distinct.

Van Inwagen's solution to the problem is to deny claim (2). If there is no such thing as Descartes's brainstem, then the body-minus problem never gets off the ground. Hylomorphists, however, endorse the existence of functional parts, so they cannot reject claim (2). They look instead to reject claim (4). According to them ' B ' designates a proper part of Descartes that immediately prior to t was composed of objects f_1, f_2, \dots, f_n (the cells, organelles, molecules, and so forth that would be revealed through functional analyses of B 's activities before t). After time t , however, f_1, f_2, \dots, f_n no longer compose a proper part of Descartes; they compose only Descartes himself. What had been a proper part of Descartes, his brainstem, no longer exists even though Descartes does.

This solution implies that the brainstem survival thesis is false, but since there are empirical reasons to think the thesis is true, hylomorphists should try to find a way of accommodating something very much like it. Here is one suggestion: Suppose that Descartes will continue to exist as long as f_1, f_2, \dots, f_n continue to contribute to his overall operation as they have done hitherto, but that if any of them is damaged or destroyed, and is thus incapable of performing its contributing subactivity at a time, then Descartes will cease to exist at that time. Collectively, then, f_1, f_2, \dots, f_n constitute a core of functional components that Descartes needs to exist, and that are sufficient to enable him to exist. They are in this sense the barest minimum functional parts with which Descartes can survive. Objects f_1, f_2, \dots, f_n composed Descartes's brainstem prior to t , and as a result, someone might be tempted to say that Descartes's brainstem is the bare minimum Descartes needs to survive, but strictly speaking this is false. What is true instead is that f_1, f_2, \dots, f_n are the bare minimum that Descartes needs to survive, and f_1, f_2, \dots, f_n needn't compose a brainstem. Descartes thus

survives the catastrophe along with the proper parts which used to compose his brainstem but which now compose only him.

Critics might complain that it is implausible to suppose that Descartes's brainstem would disappear even though all the parts that previously composed it remain where they are. There are at least two things hylomorphists can say in response. First, the objection appears to be tacitly committed to the idea that the intrinsic properties and the spatial arrangement of f_1, f_2, \dots, f_n are sufficient for those things to compose a brainstem. But the functional account of composition suggests otherwise. For f_1, f_2, \dots, f_n to compose something, they must contribute to the activities of the whole they compose. Suppose, then, that brainstems are essentially things that coordinate the activities of diverse organ systems.^{ix} When Descartes is whittled down to f_1, f_2, \dots, f_n , he no longer has any diverse organ systems to coordinate. In that case, however, it is not implausible to claim that he does not have a brainstem among his proper parts.

Second, hylomorphists can argue that even if it is implausible to suppose that Descartes's brainstem ceases to exist when he is whittled down, it is nevertheless no more implausible than the alternatives. It is no more implausible, for instance, than claiming that Descartes's brainstem never existed at all. But if this solution to the body-minus problem is no more implausible than the alternatives, then the charge of implausibility loses its force.

There is clearly a great deal more to be said about the hylomorphic notion of structure. I nevertheless hope that what I've said here provides a serviceable introduction to an account of hylomorphic structure different from those currently on offer.

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ⁱⁱⁱ Other accounts of hylomorphic structure that have appeared in the literature include Mark Johnston's (2006), David Oderberg's (2007), and Kathrin Koslicki's (2008). The account of hylomorphic structured I'll be developing here differs from theirs in ways that I trust will become evident as I proceed.

^{iv} Martin calls his view the 'Limit View' for analogous reasons. If there is a difference between him and Aristotle on this point, it is that Aristotle takes the limit cases to be real, whereas Martin (1996a: 74–75; 1997: 215) takes them to be merely abstract postulates.

^v It is because of this experience-linkage that Heil argues that rejecting the identification of powers with qualities veers toward idealism: "If minds have qualities but no material thing has qualities, then minds are not material things" (2005, 351).

^{vi} Carl Craver (2007: Chapter 5) calls purely spatial parts 'pieces' and parts in the functional sense 'components'. John Heil (2003: 100) also suggests something like the distinction between merely spatial parts and parts of other sorts, which he calls 'substantial parts'.

^{vii} The term 'functional analysis' is due to Cummins (1975). Bechtel (2008) calls it 'mechanistic decomposition' or 'functional decomposition'. Craver (2007) subsumes it under the heading of 'mechanistic explanation'. He takes Cummins's notion of functional analysis to be the exemplar of what he calls the 'systems tradition', but argues that Cummins fails to provide an adequate account of mechanistic explanation. He thus distances himself from the term 'functional analysis'.

^{viii} Elsewhere I've discussed functional analysis in greater detail. I've argued among other things that it does not correspond to the notion of function that is operative in discussions of functionalism in the philosophy of mind (including teleological functionalism), and that it does not imply a commitment to reductionism (Jaworski 2011, 2012).

^{ix} Van Inwagen (1990: 177–8) himself appears to endorse a principle like this.