

ARISTOTLE'S CASE FOR PERCEPTUAL KNOWLEDGE

by

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Abstract

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Sense experience, naïvely conceived, is a way of *knowing* perceptible properties: the colors, sounds, smells, flavors, and textures in our perceptual environment. So conceived, ordinary experience presents the perceiver with the essential nature of a property like Sky Blue or Middle C, such that how the property appears in experience is identical to how it essentially is. In antiquity, as today, it was controversial whether sense experience could meet the conditions for knowledge implicit in this naïve conception. Aristotle was a partisan in this debate, but his position is poorly understood. This dissertation examines how Aristotle's perceptual psychology responds to ancient challenges to the naïve conception, and so articulates his defense of perceptual knowledge.

Aristotle's defense relies on an ontology of "perceptual qualities"—a core class of perceptible properties—according to which those qualities, despite having a perceiver-independent essence rooted in the physics of causation and affection, nevertheless can be present in experience as they essentially are. Chapter 1 defends this realist and objectivist reading against competing interpretations, which overlook a crucial distinction between perceptual *qualities* and perceptual *objects*. Chapter 2 presents Aristotle's ontology as a physicalism that uncharacteristically *allows* for perceptual qualities to appear in experience as they essentially are.

This ontology informs Aristotle's account of the psychological conditions under which perceivers actually *are* presented with the essence of perceptual qualities. The locus of this account

is an obscure passage where Aristotle purports to show that the senses “discriminate” perceptual qualities because the senses are “mean states” (*An.* 2.11, 424^a5–7). Chapter 3 develops a comprehensive interpretation of the sensory mean state, which Chapter 4 uses to elucidate Aristotle’s argument for sensory discrimination. Sensory discrimination turns out to be a process in which the essence of a perceptual quality comes to be present in the affection it produces in a perceiver. For Aristotle, this shows that sense perception meets a condition for knowledge that his predecessors, including Plato, thought it could not meet. For in his view, but not in theirs, sense experience shares in both the truth and the essence of the qualities it perceives.

To the memory of my parents, and to Karen Hardy,
without whom especially not.

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Abbreviations of Aristotle's Works

<i>An.</i>	<i>De Anima</i>	<i>(On the Soul)</i>
<i>APo.</i>	<i>Analytica Posteriora</i>	<i>(Posterior Analytics)</i>
<i>APr.</i>	<i>Analytica Priora</i>	<i>(Prior Analytics)</i>
<i>Cat.</i>	<i>Categoriae</i>	<i>(Categories)</i>
<i>Div.</i>	<i>De Divinatione Per Somnum</i>	<i>(On Divination in Sleep)</i>
<i>EE</i>	<i>Ethica Eudemia</i>	<i>(Eudemian Ethics)</i>
<i>EN</i>	<i>Ethica Nicomachea</i>	<i>(Nicomachean Ethics)</i>
<i>Ins.</i>	<i>De Insomniis</i>	<i>(On Dreams)</i>
<i>GA</i>	<i>De Generatione Animalium</i>	<i>(On the Generation of Animals)</i>
<i>GC</i>	<i>De Generatione et Corruptione</i>	<i>(On Generation and Corruption)</i>
<i>HA</i>	<i>Historia Animalium</i>	<i>(History of Animals)</i>
<i>Long.</i>	<i>De Longitudine et Brevitate Vitae</i>	<i>(On the Length and Shortness of Life)</i>
<i>MA</i>	<i>De Motu Animalium</i>	<i>(On the Motion of Animals)</i>
<i>Mem.</i>	<i>De Memoria et Reminiscentia</i>	<i>(On Memory and Recollection)</i>
<i>Met.</i>	<i>Metaphysica</i>	<i>(Metaphysics)</i>
<i>Meteor.</i>	<i>Meteorologica</i>	<i>(Meteorology)</i>
<i>PA</i>	<i>De Partibus Animalium</i>	<i>(On the Parts of Animals)</i>
<i>Phys.</i>	<i>Physica</i>	<i>(Physics)</i>
<i>Pol.</i>	<i>Politica</i>	<i>(Politics)</i>
<i>Sens.</i>	<i>De Sensu and Sensibilibus</i>	<i>(On Perception and Perceptual Objects)</i>
<i>Top.</i>	<i>Topica</i>	<i>(Topics)</i>

Introduction

What would it be for sense perception to be a kind of knowledge? One approach to answering this question looks to the character of ordinary sense experience. When we perceive an object, we seem to be presented directly with certain of its properties. In vision we seem to be presented with its color, shape, size, movements, and perhaps other features; in hearing we seem to be presented with the sounds it makes, perhaps along with its location and other attributes.¹ One way for sense perception to be a kind of knowledge would be for this naïve conception of our sense experience to be partially vindicated. It would be for the colors, sounds, and other properties that seem directly presented to us in experience to *be* as they standardly appear, for there to be nothing to what these properties are that is not evident in standard experiences as of them. We would thereby have knowledge of these properties because, in a well-known metaphor, their essential natures would be *fully revealed* in the experience of them.²

Whether sense perception *is* a kind of knowledge for those who take this view depends on whether perceptible properties really are how they standardly appear in sense experience. Colors, for instance, *look* a certain way in visual experience. Consider an opaque body observed in daylight—a ripe banana, say. The yellow of its surface looks to be qualitative through-and-

¹For instance, we may also be presented in hearing with the meaning of linguistic utterances. In general, however, it is difficult to identify constraints on the types of properties we perceive, and the boundaries are quite possibly vague. Fortunately, my discussion will focus on what we may call “core cases” of perceptible properties—namely colors, sounds, smells, flavors, and tangible properties such as temperatures and moistures, which for Aristotle have a well-defined priority over other perceptible properties in relation to the special senses—so I shall put this question to one side. For a detailed discussion centered on the case of vision and defense of a rather permissive conception of the properties represented in perceptual experience, see Siegel 2011.

²The metaphor is due to Johnston 1992. Other metaphors employed in these discussions have it that such properties are “laid bare” (Johnston 1992), “displayed” (Hardin 1993, e.g. at 66), “disclosed” (Campbell 2005), or “made transparent” (Campbell 2005, cf. Campbell 1997) in the experience of them.

through, not the excitation of a disposition to appear a certain way or a configuration of the banana's micro-physical properties; moreover, it appears constant across different circumstances of viewing, not (as the appearance of a hologram superimposed over a driver's license) as an ephemeral feature shifting with our perspective; and it appears to be spread out over the banana itself, not (as an after-image) the occupant of a private visual field. Clearly, the essential nature of such a color is fully revealed in visual experience only if it really *is* the constant, qualitative attribute it appears to be. And what goes for color goes *mutatis mutandis* for other perceptible properties of the banana, for instance its size, shape, taste, and texture. The possibility of this sort of perceptual knowledge for *any* range of properties is principally a question of the *ontology* of those properties, of whether their essential nature *is* as it is presented to the subject in experience. So whereas theorists who claim that certain properties are knowable in this way must commit themselves to an ontology on which how those properties essentially are is how they standardly appear in experience, their opponents are committed to showing that how those properties essentially are is *not* exhausted by how they appear in experience.

This dialectical scheme is familiar from recent philosophical discussions of color.³ But it has its deepest roots in an ancient debate over the epistemic value of perception, a debate that centered on the question whether perceptual experience is a means by which the soul apprehends the being and essence—the *οὐσία* or *τί ἐστί*—of the perceptible qualities we experience things as having. Aristotle was an early partisan to this debate. Against theorists whom he took to deny that perceiving subjects are presented with the essence of a perceived quality—whether because the being and essence of the quality is not exhausted by how it is presented in experience or because it *lacks* being altogether—Aristotle defended an ontology according to which colors, sounds, smells, flavors, and tangible qualities like warmth and moisture are in their very nature identical to what the subject encounters in the experience of them. And against theorists whom he took to deny that perception alone is enough to grasp the being and essence of

³I have already mentioned a few of the major contributions to this literature, namely Campbell 1997, 2005, Johnston 1992. Others I'll have occasion to mention in this introduction include Allen 2011, Boghossian and Velleman 1989, Broackes 1992/1997, Gert 2008, McLaughlin 2003.

the qualities presented in sense experience, he argued that even the most basic modes of sense perception are states in which the being and essence of these qualities can be fully present to the perceiver. Aristotle's theory of basic sensory cognition—the psychophysical process whereby a perceiver becomes cognitively related to a quality uniquely accessible to a sense—is in many respects a response to arguments he took to threaten this naïve conception of sense experience as a state in which the perceiver is presented with the essential nature of perceived qualities. Yet crucial details of his response have not been understood by modern interpreters.

This dissertation articulates the defense of this naïve conception of sense experience embodied in Aristotle's theory of basic sensory cognition. Aristotle's defense may helpfully be interpreted in light of the dialectical scheme sketched above. My goal in this introduction is to lay out the general contours of Aristotle's defense in terms of this dialectical scheme. I'll begin by isolating a certain view of sense experience that is alive in contemporary philosophical discussions of color, what I'll call "Weak Revelationism". I'll argue that this view expresses a conception of how experience manifests the essential nature of perceptible properties that is both credible in itself and moreover captures what Aristotle takes to be at stake in the ancient debate. In particular, I'll argue that the teleological aspects of Aristotle's perceptual psychology reflect his commitment to the Weak Revelationist view of sense experience, and that his commitment to this view shapes his appraisal of rival theories of perceptual qualities.

Let me emphasize at the outset that the claims I make about the arguments of Aristotle's opponents are in the service of interpreting Aristotle's reception of their views. For all I'll have said, it may turn out that what I present as the arguments of these figures is inaccurate as interpretations of their historical views; all the same, there are good reasons to believe that they are nevertheless *Aristotle's* interpretations, and establishing this claim will be my primary concern.

Weak Revelationism

Weak Revelationism is characterized by the claim that subjects are *acquainted* in sense experience with the essential nature of a certain range of perceptible properties. For the purposes

of Weak Revelationism, a subject is *acquainted* with the essence of a perceptible property if, but perhaps not only if, it is presented to her directly, and not by means of some limited mode of presentation. So understood, Weak Revelationism expresses a version of a thesis that since Johnston (1992) has been discussed as an intuitive desideratum for a theory of color, what we can call the ‘revelation thesis’. According to Johnston, a maximally satisfactory theory of color will (as far as possible) support the thought that a standard experience as of a color, canary yellow for instance, fully reveals its “intrinsic nature”—or, as I prefer to say, the *essence* or *essential nature*⁴:

Revelation. The intrinsic nature of canary yellow is fully revealed by a standard visual experience as of a canary yellow thing. (Johnston 1992, 223)

The version of the revelation thesis expressed by Weak Revelationism is weak compared to a version that has been widely discussed in the philosophical literature on color. This view, which I’ll call Strong Revelationism, is characterized by the claim that sense experience gives us knowledge of *facts* about the essential nature of a certain range of perceptible properties. The intuitive appeal of Weak Revelationism comes into sharp relief against the background of this far stronger version, so I’ll begin by briefly rehearsing the arguments against it.

The formulation of Strong Revelationism that has been most discussed in the literature treats the revelation thesis as identical to the following biconditional:

p is in the nature of the colors iff, after careful reflection on color experience, it *seems* to be in the nature of the colors that *p*.⁵

⁴Cf. Gert 2008, 142n29. ‘Intrinsic nature’ is inapt in a formulation of the revelation thesis, at least insofar as we want to include facts like *canary yellow is more similar to scarlet than to sky blue* among what is revealed in sense experience, and insofar as the “intrinsic” nature of a color contrasts with its “extrinsic” nature. In opting for talk of essences and essential natures I do not presuppose any particular notion of essence. As I intend it, the essential nature of a property is *what it is to be* that property, where what it is to be that property includes, minimally, all that must be mentioned in the canonical definition of that property.

⁵Byrne and Hilbert 2007, cf. Byrne 2001. On this version of the revelation thesis, the same biconditional applies *mutatis mutandis* to other naturally related sets of perceptible properties. As Byrne and Hilbert note, “in the philosophy of perception, for the most part color just plays the role of an especially colorful example. The considerations that favor a particular view about color would be expected, *mutatis mutandis*, to apply to other perceptible properties such as sounds and tastes” (2007, 81). That is, while it may turn out that the ontological facts differ for different sets of naturally related properties (colors and sounds, say), considerations supporting a view of one set

Both directions of the biconditional have significant consequences. Look first at its left-to-right direction. It states that, if it is in the nature of the colors that p , then it seems on the basis of color experience that it is in the nature of the colors that p . This conditional has the striking consequence that scientific investigation can tell us nothing about the nature of the colors that we were not already in a position to know through careful reflection on color experience.⁶ Striking as it may be, however, this consequence is not obviously implausible. Perhaps it *is* the case that what we know about the nature of the colors can only be gleaned from our experience of them; perhaps we mistake for scientific inquiry into color the investigation of the causal *conditions* for color experience.⁷

The far more objectionable consequences of the biconditional follow from its right-to-left direction. In this direction, the biconditional states that color experience is an *infallible* guide to the nature of the colors, for if careful reflection on color experience suggests that p is in the nature of the colors, then it *is* in the nature of the colors that p . Though it has been suggested that this direction of the biconditional enjoys wide acceptance,⁸ the contentious history of scientific and philosophical theorizing about color and color experience seems to me to tell decisively against it.⁹ Take, for instance, the proposition that green is a “compound” hue, its shades appearing to various degrees both yellowish and blueish. Plausibly, if green is a phenomenal “compound” of yellow and blue, then it is in the nature of the colors that it is. Yet whether green is a compound or elemental hue—and indeed whether there exists a element-compound distinction among the

of perceptible properties should, to the extent that they apply, support the same view of another set of perceptible properties. As we’ll see in ch. 2, Aristotle has a general ontological framework for articulating the nature of perceptual qualities, so in his view the considerations that support a view of one range of perceptual qualities *must* be taken to support the same view of the others.

⁶See e.g. McLaughlin 2003, 98: “Revelation entails that there is nothing more that we can learn about the nature of our old acquaintances [sc. the colors] than what visual experience teaches us. While scientific investigation can uncover the underlying causal conditions for seeing such things as the redness of a ripe tomato, . . . such investigation will reveal nothing about the nature of these colour qualities themselves”.

⁷Cf. Broackes 1992/1997, 214–215. Compare with McLaughlin’s remarks in the previous footnote the following remarks from Locke: “These are two very different things, and carefully to be distinguished; it being one thing to perceive, and know the *Idea* of White or Black, and quite another to examine what kind of particles they must be, and how ranged in the Superficies, to make any Object appear White or Black” (*Essay* II. VIII. 2).

⁸See Byrne and Hilbert 2007, 79.

⁹Cf. Allen 2011, who deploys a similar argument against the left-to-right direction of the biconditional.

hues—has been a subject of controversy.¹⁰ Now, it is a consequence of this direction of the biconditional that if it is *not* in the nature of the colors that (say) green is a phenomenal compound of blue and yellow, then green does not *seem* after careful reflection on color experience to be a compound of blue and yellow. The problem of course is that, to a number of color theorists, green has seemed to be a compound of blue and yellow, and to be so in its nature. Assuming that there is a fact of the matter about whether green is a compound or elemental hue, and assuming that disagreement on this question is not a suitable basis for positing massive discrepancies in the phenomenal character of human visual experiences as of green, then we seem to be left with the conclusion that theorists to whom green seems to be a compound hue have simply failed to reflect carefully on their color experience. We are led to the same conclusion regarding other controversial theses about the nature of the colors. It is surely in the nature of the colors whether they are mind-dependent, or whether they are (or are sometimes) causes of experiences as of them; and we know that both sides of these questions have been vigorously defended over the history of philosophy. According to this direction of the biconditional, if it should turn out (for instance) that it is in the nature of the colors to be causally efficacious, then they will not *seem* to be inefficacious after careful reflection on color experience. Again the problem is that reflection on color experience has made it seem to some theorists that the colors are inefficacious;¹¹ and again we are left to conclude that one party to the debate has failed to reflect carefully on their own color experience.

If such diagnoses of controversies over the nature of the colors appear inadequate or uncharitable, it is because Strong Revelationism commits us to the wrong conception of how the essential nature of the colors are “revealed” in color experience. It just doesn’t seem plausible that, if you and I disagree over whether the colors are causally efficacious, or over whether green is phenomenally compound, it must be because one of us has failed to acknowledge some aspect of her color experience. So whether or not some version of the revelation thesis is true, the

¹⁰For detailed discussion see Allen 2011, 164–167.

¹¹Apparently including Berkeley; see Allen 2011, 160.

intuitive appeal that has led Johnston and others to treat it as a desideratum for a theory of color cannot lie with the idea that experience is sufficient (or even necessary) to give us knowledge of *facts* about the nature of the colors.

We get closer to what is intuitively appealing about the revelation thesis if we consider what color experience seems uncontroversially to give us, namely mastery of the color *vocabulary*.¹² Competence with color terms might imply the appreciation of a large body of facts about the colors, for instance facts about the higher-order similarity and difference relations that structure the familiar color solid. If so, then appreciation of these facts would plausibly ground the disposition of speakers possessed of color vision and a mastery of the color vocabulary to assent to a sentence like ‘canary yellow is more similar to scarlet than to sky blue’, but not to a sentence like ‘canary yellow is a shade of blue’. Yet competence with color terms need not *consist* in the grasp of these facts. For not only is explicit knowledge of these facts unnecessary for mastery of the color vocabulary, it is also logically independent of the knowledge in which mastery of the color vocabulary consists. Absent knowledge of the connection color terms have to visual experience, one could learn (for instance) all of the facts describing the structure of the color solid but yet fail to understand them as facts *about* the colors.¹³ What the connection to visual experience gives us, and what mastery of the color vocabulary consists in, is not knowledge of facts about the colors but of the colors themselves, a grasp of *which* properties we are talking about when we talk about the colors.

This is the perspective from which Weak Revelationism views the revelation thesis. On the Weak Revelationist version, the revelation thesis elaborates a central feature of the naïve conception of sense experience we mentioned earlier, according to which the visual experience as of a canary yellow object seems to present us *directly* with its canary yellowness. The Weak Revelationist version of the revelation thesis fleshes out this aspect of the naïve conception, adding that being directly presented with canary yellow is being presented with its *essential nature*, with

¹²See Campbell 2005 and Gert 2008, who develop this point in different ways.

¹³See Campbell 2005, 109–110 for a fuller statement of this argument.

what canary yellow essentially is. Our access to the nature of the property is direct in this experience because it is unmediated by grasp of a proposition describing some limited aspect or mode of presentation of it. And precisely because our experience is unmediated in this way, there can be nothing in what canary yellow is that is not present in the experience of it.

The Weak Revelationist version of the revelation thesis coheres with the passages Johnston initially adduced in support of the idea that it is an intuitive desideratum for a theory of color. Consider, for instance, this passage from Russell:

The particular shade of colour that I am seeing may have many things said about it But such statements, though they make me know *truths about the colour*, do not make me know *the colour itself* any better than I did before: so far as concerns knowledge of the colour itself, as opposed to knowledge of truths about it, I know the colour perfectly and completely when I see it, and no further knowledge of it itself is even theoretically possible.

(Russell 1912, 47; my emphasis)

In contrasting knowledge of truths about a color and knowledge of the color itself, Russell is claiming that the sort of knowledge corresponding to experience of the color is a kind of *acquaintance* with it, a total awareness of the color itself that does not depend on propositional knowledge of truths about it.¹⁴ That colors and other perceptually accessible properties are presented in sense experience in this way is the idea that Weak Revelationism takes to be captured by the revelation thesis. The Weak Revelationist's formulation of the thesis is weak in the sense that it does not entail that we acquire explicit *propositional* knowledge of the essential nature of the properties we seem directly to be presented with in experience, but only a direct awareness of, or *acquaintance* with, those properties. But for all its comparative weakness, this formulation of the revelation thesis is non-trivial. In particular, it is open to objection to the extent that it relies on the naïve conception of sense experience and the ontological assumptions implicit in that account.

¹⁴Cf. Russell 1912, 46. Russell's way of drawing the distinction receives support from the personal testimony of Knut Nordby, a vision scientist who happens also to be a complete achromat: "Although I have acquired a thorough theoretical knowledge of the physics of colours and the physiology of the colour receptor mechanisms, nothing of this can help me to understand the true nature of colours. From the history of art I have also learned about the meanings often attributed to colours and how colours have been used at different times, but this too does not give me an understanding of the essential character or quality of colours" (Nordby 1990, 305).

Incompatibility arguments against Weak Revelationism

To deny Weak Revelationism for a given range of perceptible properties is to insist on a discrepancy between how those properties essentially are and how they are manifest in sense experience. One way to argue for such a distinction is to suggest that verbs like ‘looks’ or ‘appears’ in reports of the form ‘ x looks/appears F ’¹⁵ introduce non-extensional contexts.¹⁶ In at least some cases, substitution of (logically or metaphysically) co-extensive expressions into the predicate position fails in looks/appears-reports of this form. In some cases, moreover, substitution fails when the name of a perceptible property is substituted with a description expressing what it is to be that property. For example, to be wet is to have one’s surface covered in a certain way by H_2O , yet it seems false to say in general that if x looks/appears wet then x looks/appears to have its surface covered in a certain way by H_2O . (Things presumably looked wet even before water was discovered to be H_2O .) If this example illustrates a general feature of looks/appears-reports of this form, and if expressions of this form may be used to report sense experiences, we should be able to ask of *any* perceptible property whether it looks/appears in sense experience in a way that would satisfy a description of what that property essentially is.

These considerations place an explanatory burden on proponents of Weak Revelationism. As we saw, Weak Revelationism holds that the properties with which experience seems to present us directly *are* presented to us directly, in the sense that our access to them is unmediated by any limited mode of presentation of those properties. However, the above considerations show that at least some of the properties we are presented with in experience are not presented to us directly in this way. They moreover show that it is possible to distinguish the essence of *any* property from the way it is manifest in experience, and to ask whether the two coincide. To retain the idea that we are acquainted with the essential nature of colors and other properties with

¹⁵Or, perhaps, ‘ x looks/appears F to subject S in circumstances C ’. For the sake of simplicity, I suppress the latter two variables in what follows.

¹⁶Cf. Cohen 2009, 164–166, 170–171, to whom I owe the example of wetness given below. The connection to opponents of the revelation thesis is also noted by Logue 2016b, 228n16.

which experience (on the naïve conception) seems to present us directly, it needs to be shown that these properties, unlike properties like wetness, are not manifest in experience under some limited mode of presentation. It needs to be shown, in other words, that how these properties are manifest in experience is how they essentially *are*.

According to opponents of Weak Revelationism, this is an explanatory burden that cannot be met. On their view, the ontological facts about the properties with which experience seems to present us directly do not cohere with their manifest appearance. The surface colors of solid bodies, for example, appear qualitative, constant, and as attributes of the colored bodies themselves. If it should turn out that the colors are not—or are not entirely—as they appear to be, then we would be committed to denying that colors are presented directly in experience in the way Weak Revelationism suggests. If, for instance, it turns out that the colors are in fact excitations of dispositions to appear a certain way (as on dispositionalist theories) or configurations of micro-physical properties (as on certain physicalist theories), then we would be committed to saying that at least some aspects of the essential nature of colors are not manifest in visual experience, and that, at best, the colors are presented in visual experience under some limited mode of presentation. Or if it turns out that colors as a rule are not attributes of the bodies that we experience as colored (as on eliminativist theories), then we would be committed to saying that aspects of our color experience are positively misleading and, to that extent, *illusory*. Each conclusion imports a very different conception of color experience, one according to which we must recognize a contrast between colors as they are manifest in experience and colors as they are in themselves, and another according to which we must regard color experience as to some extent systematically deceptive. But both entail the falsity of Weak Revelationism for the same reason, namely that the ontological facts concerning color are *incompatible* with the idea that experience gives us unmediated access to what the colors are.

We may state these incompatibility arguments against Weak Revelationism schematically as follows. Let the value of ‘BEING(Q_i)’ denote, roughly, the being (or essence, or nature) of a determinate perceptible quality Q_i . It is a constraint on Weak Revelationism about Q_i that there

Premise 1: Weak Revelationism is true for Q_i only if there are conditions under which:

- (a) o looks/appears Q_i , and
- (b) o looks/appears BEING(Q_i).

Premise 2: Under any experiential conditions: if (a) then not-(b).

Conclusion: Weak Revelationism is not true for Q_i .

Argument o.1 Incompatibility arguments against Weak Revelationism

exist conditions under which an experience satisfying a description like ‘ o looks/appears Q_i ’ (for arbitrary o) also satisfies a description like ‘ o looks/appears BEING(Q_i)’—intuitively, it requires that there exist conditions under which Q_i looks like what it essentially is. Incompatibility arguments purport to show on ontological grounds that this constraint cannot be met (see argument o.1). There are at least two versions of the argument. *Realist* versions claim that the constraint cannot be met because experiences as of Q_i only manifest *aspects* of BEING(Q_i). *Eliminativist* versions, by contrast, claim that the constraint cannot be met because experiences as of Q_i positively *obscure* aspects of BEING(Q_i), manifesting features which are not included in BEING(Q_i).

* * *

This dissertation argues that Aristotle’s theory of basic sensory cognition constitutes a defense of Weak Revelationism, and in particular the view that the subject of sense experience is presented with the being and essence of the qualities specially perceived by the senses: colors, sounds, odors, flavors, and tangible qualities such as temperatures and moistures. In constructing this theory, Aristotle takes himself to be responding to both types of incompatibility argument, which he takes to be implicit in the perceptual ontologies defended by certain of his predecessors. To appreciate this aspect of Aristotle’s theory of basic sensory cognition, it will be helpful to consider the arguments to which he is responding, and the threat he takes them to pose to a satisfactory account of sense perception.

Aristotle, Weak Revelationism, and the teleology of the senses

In contrast to its contemporary supporters, the considerations driving Aristotle's support for Weak Revelationism have to do, not with explaining our competence with terms for perceptual qualities, but with how perceivers come to grasp these qualities as genuine attributes of the objects to which they appear to belong. For Aristotle, to be an animal is to be a perceiver, and it is a central task of psychology to explain why different types of animal have been endowed with the specific perceptual capacities they have.¹⁷ The explanation he proposes is teleological, connecting the animal's possession of a given perceptual capacity to an end or set of ends whose achievement is necessary for the animal's survival or well-being:

Text o.1 Now, perception must belong to animals insofar as each is an animal, for it is by this that we distinguish what is an animal and what is not an animal. But with respect to each [class of animal]¹⁸ in particular, touch and taste are consequent upon all of necessity: touch for the reason we gave in our remarks on soul,¹⁹ and taste on account of food—for with it [the animal] discriminates between the pleasant and the painful in respect of food, so that it avoids the one and pursues the other—and generally [because] flavor is an affection of what nourishes [the animal]. But the distance senses, namely smell, hearing, and vision, [are consequent of necessity only] upon those among those that roam. They belong to all that have them for the sake of survival, so that they may pursue food and avoid what is bad and destructive by perceiving them in advance. But to those who also have intelligence [they belong] for the sake of well-being, for they report many differences, from which arises intelligence about the objects of thought and of practical activity.²⁰ (Sens. 1, 436^b10–437^a3)

The teleological role of the senses is to put the perceiving animal in touch with certain features of perceptible *bodies*. Most fundamentally, the contact senses—touch and taste—are needed

¹⁷See *An.* 413^b4–10, 414^b28–415^a6.

¹⁸Square '[]' brackets indicate that the enclosed text is my own insertion, added either to name the antecedent of a pronoun phrase or, as in this case, to clarify how I interpret ambiguous bits of the Greek.

¹⁹Namely, because “all bodies are tangible, and what is tangible is perceived by touch” (*An.* 434^b12–13); cf. 414^b7–14, 435^b4–19.

²⁰τοῖς δὲ ζώοις, ἧ μὲν ζῶον ἕκαστον, ἀνάγκη ὑπάρχειν αἰσθησιν· τούτω γὰρ τὸ ζῶον εἶναι καὶ μὴ ζῶον διορίζομεν. ἰδίᾳ δ' ἤδη καθ' ἕκαστον ἧ μὲν ἀφή καὶ γεῦσις ἀκολουθεῖ πᾶσι ἐξ ἀνάγκης, ἧ μὲν ἀφή διὰ τὴν εἰρημένην αἰτίαν ἐν τοῖς περὶ ψυχῆς, ἧ δὲ γεῦσις διὰ τὴν τροφήν· τὸ γὰρ ἡδὺ διακρίνει καὶ τὸ λυπηρὸν αὐτῇ περὶ τὴν τροφήν, ὥστε τὸ μὲν φεύγειν τὸ δὲ διώκειν, καὶ ὅλως ὁ χυμὸς ἐστὶ τοῦ θρεπτικοῦ πάθος. αἱ δὲ διὰ τῶν ἕξωθεν αἰσθήσεις τοῖς πορευτικοῖς αὐτῶν, οἶον ὄσφρησις καὶ ἀκοή καὶ ὄψις, πᾶσι μὲν τοῖς ἔχουσι σωτηρίας ἕνεκεν ὑπάρχουσιν, ὅπως διώκωσί τε προαισθανόμενα τὴν τροφήν καὶ τὰ φαῦλα καὶ τὰ φθαρτικὰ φεύγωσι, τοῖς δὲ καὶ φρονήσεως τυγχάνουσι τοῦ εἶ ἕνεκα· πολλὰς γὰρ εἰσαγγέλλουσι διαφοράς, ἐξ ὧν ἧ τε τῶν νοητῶν ἐγγίνεται φρόνησις καὶ ἧ τῶν πρακτῶν.

to put the animal in touch with tangible features vitally important to its survival, on the one hand features such as nutriment (*τροφή*) that nourish and grow the animal,²¹ and on the other features such as extreme heat and cold that destroy it.²² The distance senses—vision, hearing, and smell—do not directly perceive features of bodies that preserve and destroy the animal,²³ but nevertheless they contribute to their possessors' survival and flourishing by “reporting differences” among the bodies they perceive. Vision's contribution to practical animal intelligence (*φρόνησις*) serves as a model:

Text o.2 Among these [sc. the distance senses] vision in itself is the most authoritative in relation to [practical] necessities For the power of vision reports many and various differences, on account of the fact that all bodies partake of color, which is why the common [perceptual qualities] (by ‘common’ I mean [for instance] size, shape, motion, number) are mostly perceived through this [sensory power].²⁴
(*Sens.* 1, 437^a3–9)

The other distance senses likewise “report differences” among perceptible bodies, both within and beyond the range of qualities they uniquely or “specially” perceive.²⁵

On its own, this conception of the teleological role of the senses in promoting animals' survival and flourishing does not require accepting the Weak Revelationist conception of sense experience. To be sure, it could be that sense experience promotes nutrition, survival, and other practical goals by being a state in which the perceiver is presented with perceptual qualities as

²¹See *An.* 414^b6–9, 434^b18–19.

²²See *An.* 435^b13–19.

²³See *An.* 414^b9–11, 434^b19–21.

²⁴*αὐτῶν δὲ τούτων πρὸς μὲν τὰ ἀναγκαῖα κρείττων ἢ ὄψις καθ' αὐτήν διαφορὰς μὲν γὰρ πολλὰς καὶ παντοδαπὰς ἢ τῆς ὄψεως εἰσαγγέλλει δύναμις διὰ τὸ πάντα τὰ σώματα μετέχειν χρώματος, ὥστε καὶ τὰ κοινὰ διὰ ταύτης αἰσθάνεσθαι μάλιστα (λέγω δὲ κοινὰ μέγεθος, σχῆμα, κίνησις, ἀριθμὸν).*

²⁵In addition to special perceptual objects and the “commons” mentioned in text o.2, Aristotle recognizes a class of “incidental” (*κατὰ συμβεβηκότα*) perceptual objects. The special and common objects of perception are both said to be perceptible “as such” (*καθ' αὐτά*, *An.* 418^a8–20), and where at least special perceptual objects are perceived by producing perceptual affection in a perceiver—though see 435^a5–8 for evidence that the commons as such also affect the perceiver—the incidental objects as a class cannot affect the relevant perceptual power except incidentally (*An.* 418^a25). Incidental objects include the special objects of other senses, such as determinate shades of color and flavor, which as such can act on only one sense but which may be perceived incidentally by others; attributes such as being the son of Diaries, which as such are efficacious with respect to no perceptual power; and even universals such as *color* (cf. *Met.* 1087^a19–20). The interesting and controversial issues concerning the character of incidental perception and its role in Aristotle's psychology of perception are sadly beyond the scope of the present study, which will focus narrowly on the cognitive and epistemic aspects of episodes of special perception.

they essentially are, as Weak Revelationism states. This would be to claim that the teleological connection between animals' practical goals and sense perception is based in the latter's capacity to furnish the animal with an *accurate* representation of the world, one in which objects are presented to the animal as they are independent of observation. However, as Aristotle knew, even if one accepts that practical goals like nutrition and survival somehow *explain* why animals perceive in the ways they do, one may still deny that the means by which sense perception contributes to the achievement of these goals is anything like presentational accuracy. It might be that perception promotes the animal's practical goals by systematically *misrepresenting* its environment to render potential sources of food or danger more salient against the perceptual background, as some evolutionary models have been taken to suggest.²⁶ Or, to take an alternative with which Aristotle would have been familiar, it might be that perception promotes these goals simply by causing the animal to experience appetitive pleasure and pain, which would be sufficient for motivating pursuit and avoidance as appropriate but insufficient for giving the animal an accurate representation of its perceptual environment.²⁷

What signals Aristotle's commitment to Weak Revelationism in articulating this teleological picture is rather his additional claim that sense perception contributes to animals' practical goals because it is a *type of cognition* (*γνώσις τις*).²⁸ In one respect, this characterization emphasizes the distinctiveness of perception among the psychological capacities possessed by living things. Like all forms of organic life, that for which animals ultimately strive, and for whose sake they do everything they do by nature, is to reach reproductive maturity and generate offspring like themselves (*An.* 415^a26–b₂). But animals are distinctive in the means they employ in pursuit of this ultimate goal. For instance, whereas plants acquire the nourishment necessary for growth

²⁶It has in fact been argued that evolution *couldn't* have selected for perceptual accuracy, since survival under veridical perception strategies decreases to zero as the complexity of the strategy increases. For a summary of this research, see e.g. Hoffman, Singh, and Prakash 2015.

²⁷Cf. Plato's account of sensation in plants at *Tim.* 77B–C. The *Timaeus* (46E–47C) also attributes to vision a role in enabling philosophy and astronomy, but his account of visual perception seems conspicuously to disregard the question of its accuracy or truth. Cf. Cornford (1935/1997, 153n1), who notes that this account is compatible with the decidedly irrealist theory of vision from the *Theaetetus* (156D–E); for a recent critical discussion of these passages of the *Timaeus*, see Johansen 2008, ch. 8.

²⁸GA 731^a30–b₉; cf. *APo.* 99^b37–39, *An.* 427^a17–21, *Met.* 981^b10–13.

and sustenance simply by being rooted in the right kind of soil, animals must *select* food from their environment, which requires that they engage in such behaviors as hunting and foraging. In Aristotle's view, success at these endeavors imposes distinctively "cognitive" demands on the animal, for instance that it be able reliably to tell whether something is edible or potable, so that what the animal pursues is, at least in most cases, what in fact grows and sustains it.²⁹ Other demands arise from the animal's need to identify and, to the extent that it can, react to potential sources of bodily harm; and still others arise from the need of sexually reproductive animals to locate potential mates among conspecifics. In characterizing perception as a cognitive capacity, Aristotle is asserting that it is a means for animals to satisfy these cognitive demands.

In another respect, however, Aristotle's characterization of sense perception as a type of cognition emphasizes the connection between even the most basic sensory capacities and the sophisticated cognitive capacities distinctive of rational animals—capacities like intellect (*νοῦς*), the capacity responsible for cognitive states like scientific knowledge (*ἐπιστήμη*), in which rational subjects intellectually cognize the causes explanatory of necessary and universal truths (*APo.* 71^b9–12). For Aristotle, perception and intellect are both capacities whereby the soul engages in cognition (*An.* 427^a19–21), but what unites these capacities as types of cognition is not, as the previous paragraph might suggest, that there is a common teleological explanation for their presence in animals endowed with them. Rational animals, for instance, have the senses ultimately for the sake of nutrition and reproduction but theoretical intellect for the sake of theoretical contemplation (see e.g. *EN* 1177^b26–1178^a2); so we can appeal neither to nutrition and reproduction nor to contemplation to explain why perception and theoretical intellect are alike cognitive capacities.

What unites perception and intellect as cognitive capacities seems rather to be that there

²⁹Contrast Moss (2012, 34), who treats the ways in which plants and animals pursue food and other goods as the same in kind, different only in the degree of complexity manifest in animal modes of pursuit. That there is no botanical correlate to a cognitive function in Aristotle's psychology seems to me to tell strongly in favor of taking distinctively animal modes of pursuit and avoidance to be different in kind from the non-cognitive modes proper to plant life. In this respect Aristotle departs substantially from Plato, who seems to accord to plants the capacity to perceive, thereby allowing for the apparently intention-guided behavior of plants to be explained on the model of animal behavior; see note 27 above.

is a common *mechanism* whereby each contributes to the practical and theoretical ends that explains its presence in the animals endowed with it. The senses contribute to nutrition and reproduction in the same way that the intellect contributes to contemplation: namely, by *accurately* presenting the subject with the relevant range of cognitive objects. In order to judge only what is true and to avoid being persuaded of what is not the case (cf. *APo.* 72^a37–^b4), the subject inquiring in pursuit of scientific knowledge must have some means of grasping what explains the truth of scientifically knowable facts. Similarly, in order to have appetites for and pursue only what will in fact nourish and sustain it, the animal must have some means of telling which potential sources of food will nourish and not cause harm. In describing as *cognitive* the capacities that furnish the required means in both cases, Aristotle makes clear that the mechanisms by which these ends are realized are the same in kind. Intellect enables the inquirer to contemplate necessary and universal truths from a position of certainty because it gives rise to states, like scientific knowledge, that consist in a grasp of universal causes that the subject understands better than the truths they explain. Similarly, perception enables the animal to tell which objects are potential sources of food because it presents those objects to the animal as having the perceptual features they actually have, features which moreover make a difference to their nutritional value for the animal. In both cases the norm governing the relevant cognitive capacity's teleological contribution is *truth*—or, as we might put it, presentational accuracy—for which reason Aristotle regards both intellect and perception as “having authority over truth” (*κύρια ἀληθείας*, *EN/EE* 1139^a18).

Of course, Aristotle realizes that perceivers sometimes suffer perceptual illusions, in which the subject misperceives an object's qualities owing to illness, suboptimal perceptual conditions, or other circumstances distorting her perceptual connection to the perceived object.³⁰ He also recognizes an extensive range of quasi-perceptual phenomena, for instance after-images, hallucinations, dreams, and imaginings, in which the character of the subject's (quasi-) perceptual phenomenology is not determined by an occurrent perceptual connection to an external

³⁰See *Ins.* 428^b31–33, 459^b18–20 (cf. 460^b26–27), 460^b20–22; *An.* 422^b3–10 (cf. *Met.* 1010^b20–26), *Sens.* 439^b5–6.

object.³¹ But to the extent that *truth* is the norm governing perception's contribution to an animal's survival and flourishing, Aristotle is committed to regarding these cases as *deviations* from standard cases in which the perceiver is presented with the stable, qualitative attributes actually possessed by the perceived body. Thus even chronic inaccuracies or distortions in animals' sensory experiences cannot be attributed to a *formal* feature of the relevant sense, as if the animal had been endowed with a sensory power whose function is to present the relevant features of perceptible bodies inaccurately or imperfectly. They must rather be explained by reference to certain features of the *matter* of the sense organ, features that make it an imperfect instrument for realizing the sense's alethic function. For instance, chronic inaccuracies in vision are traceable to material defects in the eye: colored objects will appear darker or lighter than they are if the eye jelly is too dense (and hence too dark) or too sparse (and hence too light) (*GA* 779^b14–780^a13). Similarly, the inability of some animals to perceptually distinguish (*δαισθάνεσθαι*) qualitatively similar shades of color, sound, and flavor is caused by impurities in the relevant organ, such as wrinkles in the transparent membrane containing the eye jelly (780^a25–^b3, cf. 781^a14–20). In no case, however, will the animal be endowed with a sensory capacity whose function is not to present the perceiver with qualities as they actually *are*.

Aristotle on incompatibility arguments against Weak Revelationism

We've so far seen evidence for Aristotle's commitment to Weak Revelationism from his conception of the teleological role of perception, which I've suggested makes crucial use of the idea that the senses accurately present the perceiver with objects and their qualities. Aristotle's commitment to Weak Revelationism is also reflected in his reception of accounts of perceptual qualities that he takes to be *incompatible* with the truth of the senses. Aristotle's attitude toward these accounts is often harsh, but his harshness seems to be less the result of a hasty or uncharitable judgment of his opponent's views than a keen awareness of his own dialectical position. Aris-

³¹After-images: *Ins.* 459^b8–18; hallucinations: *Ins.* 460^b28–32; dreams: *Ins.*, esp. 460^b28–462^a7; imaginings: *An.* 427^b17–20, 428^b27–429^a2.

total *knows* that he cannot accept any account, realist or eliminativist, that divorces the nature of perceptual qualities from how they are presented to the perceiver in experience. For any account of this sort could serve as a basis for an incompatibility argument that would undermine the teleological connection he envisions between the senses and grasp of the qualities on which a perceiver's survival and flourishing ultimately depend.

Nowhere does Aristotle appear more sensitive to his dialectical position than in his appraisal of Democritus' atomist account of perceptual qualities. Democritus' account of perceptual qualities may be viewed as an instance of the ancient atomists' general strategy in natural science, namely to explain macroscopic phenomena in terms of the interaction of microscopic atoms.³² For example, Aristotle reports that according to Democritus things are colored "by turning" (GC 316^a1–2 [= Dmc128 Graham = 68A123 DK])—that is, by the rotary orientation of the atoms entering the visual organ (cf. *Met.* 985^b16–18). Such a view might plausibly be interpreted as a dispositional account of color, according to which colors are dispositions of objects (macroscopic aggregates of atoms) to appear visually a certain way (under certain circumstances and relative to certain types of perceiver).³³ Remarkably, however, Aristotle takes this account to show that Democritus in fact *denies* the existence of color.³⁴ What may have led Aristotle to this extreme appraisal of the atomist view of color is the recognition that it entails that macroscopic bodies *lack* the stable, qualitative attributes they are presented in sense experience as having. Far from having any share in truth, then, visual experience on the Democritean account is positively *misleading* about what macroscopic bodies are like, as Democritus implicitly acknowledges in his famous dictum: "by convention (*νόμῳ*) sweet, by convention bitter, by convention hot, by convention cold, by convention color, but in reality (*ἐτέρεῖ*) atoms and void" (7.135 [= Dmc136

³²Theophrastus, *Sens.* 49–78 (= Dmc131 Graham = 68A135 DK) gives a detailed overview of this account.

³³See Taylor 2010, 175–179 for a dispositionalist reading of Democritus; for a more cautious approach that makes room for the more extreme Peripatetic interpretation, see Lee 2005, esp. chs. 8–9, and Lee 2011. (There is an interesting parallel between this interpretive controversy and one between the traditional relationalist interpretation of Locke and one that reads him as an eliminativist about colors and other secondary qualities. For the latter view, see Boghossian and Velleman 1989, 95).

³⁴See GC 316^a1–2 and Theophrastus, *Sens.* 63.

Graham = 68B125 DK]).³⁵ To this extent Aristotle plausibly regards the atomist view of color and other perceptual qualities as grounds for an eliminativist incompatibility argument against Weak Revelationism. For, from the perspective of the view that colors must essentially be how they are presented in experience, adopting even a dispositionalist view of color is tantamount to denying that there are colors at all.³⁶

Aristotle's dissatisfaction with certain *realist* accounts of perceptual qualities seems likewise attributable to a sensitivity to his own dialectical position. Realist accounts hold that perceptual qualities for the most part are the stable attributes of perceptible bodies they are presented in experience as being. But, as we saw, even a realist theory can generate an incompatibility argument to the extent that it acknowledges essential features of a perceptual quality that are not manifest in the experience of it—in other words, to the extent that it posits a gap between how the quality is presented in experience and what the quality essentially is. Aristotle sees the threat any such gap would pose for the perceptual teleology he defends, and for this reason he unequivocally rejects the idea that aspects of a perceptual quality's essential nature are hidden from sense experience.

The realist incompatibility argument that would have been most salient for Aristotle appears in Plato's discussion of perception and knowledge in the first part of the *Theaetetus*:

SOCRATES. Hold on: won't it be through touch that [the soul] will perceive the hardness of what is hard, and in the same way the softness of what is soft?

THEAETETUS. Yes.

SOCRATES. But yet their being, and the fact that they are, and their opposition in relation to one another, and the being again of this opposition, [these] the soul itself tries to determine (*κρίνειν*) for us by rising up and comparing them with one another?

THEAETETUS. Certainly.

³⁵Cf. Diogenes Laertius, *Lives* 9.72 (= Dmc 141 Graham = 68B117 DK). By 'convention' Democritus probably does not mean to imply that observable objects appear sweet or colored by some sort of agreement or common consent, but rather, as some ancient interpreters suggest, that they so appear only "in relation to us" or "by means of our affections"; see Galen, *Med. Exp.* 15.7 (= Dmc 137 Graham = 68A49 DK), and Aetius, S. 1.50.24 (= Dmc 138 Graham = 67A32 DK).

³⁶Cf. Sextus, *M.* 7.136 (= Dmc 136 Graham = 68B9): we perceive "change in the disposition of the body as [atoms] enter and press against it"; *M.* 7.137 (= Dmc 136 Graham = 68B6): "one must know that the human being is cut off from reality by this standard (*κανών*)".

SOCRATES. So then, won't there be some things that humans and animals alike are naturally able to perceive as soon as they are born—namely those experiences [or: affections] that reach the soul through the body—but the calculations regarding their being and advantageousness come about, in those in whom they even do come about, with difficulty and time through a good deal of trouble and education? (*Tht.* 186B–C)³⁷

Socrates offers this argument in support of his conclusion (argued for at 184B–186E) that perception is not knowledge (*ἐπιστήμη*) because perception does not attain to either truth or being (*οὐσία*). The argument depends on a distinction agreed to earlier between the bodily “experiences” (or affections, *παθήματα*) made available by sense perception and the processes whereby the soul calculates and reasons about those experiences. The distinction leads Socrates and his interlocutor to agree that, while the soul gets hold of some things via the senses, namely perceptual qualities, it gets hold of what is common to these qualities, including importantly their being, sameness, and difference, all on its own. From this, and from the argument quoted above, Socrates' conclusion follows quickly: nothing that fails to get at being can get at truth, and nothing that fails to get at truth can have knowledge (186C); knowledge must therefore be, “not in the experiences, but in the process of reasoning about them” (186D).

It is controversial exactly what connection to being and truth Socrates is denying to the senses.³⁸ But any interpretation should have Socrates positing a gap between what is presented to the perceiver in experience—what is present “in the experiences”—and what is required for knowledge of what she perceives: grant that you feel the hardness of what is in fact hard and the softness of what is in fact soft; even so, these experiences do not put you in a position to know that the hard thing *is* hard or that the soft thing *is* soft.

Aristotle could certainly agree with the *letter* of Socrates' conclusion that perception is dis-

³⁷All translations from the *Theaetetus* follow Levett-Burnyeat, with at most minor modifications.

³⁸There seem to be two interpretive options. According to one, Socrates' claim is that when the soul is affected by the hardness of a rock or the softness of lambswool, it perceives only that the rock *feels* hard and the wool *feels* soft; what it does not perceive, and what can only be determined through a process of reasoning, is that is that the rock *is* hard or that the wool *is* soft (see Cooper 1970). According to the other, perceptual affection lacks the resources even to formulate the judgment that the stone is hard or that the wool is soft: experience of the rock may put us in touch with its hardness, and experience of the wool may put us in touch with its softness, but judgments such as that the stone *is* hard and that the wool *is* soft, and generally any predicative judgment of the form ‘*x is F*’ (for some perceptual predicate ‘*F*’), require the independent operation of the soul. (See Burnyeat 1976, Frede 1987, and Lorenz 2006, 74–94.) For an overview of the interpretive issues, see Burnyeat 1990, 52–61.

tinct from *ἐπιστήμη*—a term he reserves for scientific knowledge, a state he believes must be sharply distinguished from perception.³⁹ But he would have good reason to interpret it in *spirit* as a challenge to the thesis that sense experience puts the perceiver in contact with features of perceptible bodies. A clue to how he might have conceived of the challenge is found in Socrates' remark that the soul itself must *determine* (*κρίνειν*) the being of the hardness of the hard thing or the softness of the soft thing. In using this term Socrates is recalling a point he made in his earlier discussion of Protagoras' *homo mensura* doctrine, which famously holds that “of all things man is the measure: of things that are that they are, and of things of not that they are not” (152A [= Prt17 Graham = 74B1 DK]). As Socrates understands it, the doctrine amounts to the view that each person is a measure because she is the “decider” (*κριτής*) of what is and is not the case for her (160C).⁴⁰ Specifically, with respect to perceptible qualities like “white and heavy and light and all that kind of thing without exception”, it amounts to the claim that each person “has the criterion (*κριτήριον*) of these things within himself, so when he regards them to be as he experiences (*πάσχει*) them, he regards them as true and as what is *for him*” (178B).

The qualification “for him” may indicate that Socrates takes the Protagorean doctrine to be coherent only in the context of a relativist theory of truth, as well as an ontology according to which being and not-being—or rather, as Socrates insists, coming-to-be and coming-not-to-be—are thoroughly (perhaps completely) relative to the perceiver.⁴¹ Having already rejected these latter theories on independent grounds,⁴² Socrates turns in our passage to consider how Protagoras' doctrine fares in the context of an *objective* theory of being and truth. On this sort

³⁹See *APo.* 1.31. There is moreover evidence that Aristotle associates with Socrates a notion of *ἐπιστήμη* that departs from his own official conception. See esp. *EN/EE* 1147^b15–17, which contains a single tantalizing reference to *αἰσθητικὴ ἐπιστήμη*; cf. Gerson 2009, 67n9.

⁴⁰Cf. 170D: “Well, suppose you come to a decision (*κρίνας τι*) and then express a judgment about something to me. Let us assume with Protagoras that your judgment is true for *you*. But isn't it possible that the rest of us may criticize your verdict (*σῆς κρίσεως*). Do we always agree (*κρίνομεν*) that your judgment is true? Or does there rise up against you, every time, a vast army of persons who think the opposite, who hold that your decisions and your thoughts are false (*ἡγούμενοι ψευδῆ κρίνειν τε καὶ οἴεσθαι*)?”. Cf. also 179A.

⁴¹According to another interpretation, however, Socrates is only committed to the view that Protagoras' doctrine is *complemented* by a relativist theory of being and truth; for discussion, see Burnyeat 1990 and Lee 2005, esp. ch. 5.

⁴²See 177C–179D, 181C–183B; for discussion, see Burnyeat 1990, 39–52.

of theory, Socrates argues, it would no longer be plausible to maintain that perceivers as such have the criteria within themselves of qualities like hardness and softness. For, on this sort of theory, things do not come to be hard or soft only in relation to a perceiver; they *are* hard or soft, and their being such does not depend on their being *perceived* as such. However, for all that is presented to the perceiver in the tactile experience of a hard or soft thing, it may *not* be the case that the object is hard or soft in itself; it may yet be the case that the object is hard and soft only *for the perceiver*, as on the relativized ontology developed earlier in support of Protagoras' doctrine. For Socrates this shows that the being of these qualities is *not* present in the perceptual affections, but can be accessed (if at all) only by means of the soul itself, and even then only after careful, sustained reflection on the content of one's own experience.

On this interpretation, then, Socrates' denial that the senses "determine", or *κρίνειν*, the hardness of hard things and the softness of soft things relies precisely on the sort of realism Aristotle cannot accept. To the extent that tactile perception does not present hardness and softness as perceiver-independent attributes of hard and soft things, but at best as attributes that belong to things that are (or come to be) hard or soft *for the perceiver*, there is a gap between the being and essence of these qualities and how they are presented in experience—a gap that moreover prevents perception from having any share in truth or knowledge of them. This is a conclusion Aristotle rejects in no uncertain terms:

Text o.3 In relation to one another [hard and soft] are indeterminate in respect of more and less. But since we discriminate (*κρίνομεν*) all perceptual objects in relation to the [relevant] sense, it is clear that we determine what is hard and soft without qualification in relation to touch, since we use touch as a mean state. For this reason we call what exceeds it [sc. touch⁴³] hard and what falls short [of it] soft.⁴⁴
(*Meteor.* 4.4, 382^a16–21)

⁴³The antecedent of the *αὐτήν* at ^a20 could be either *μεσότης* or *ἀφή*, but we make much better sense of the passage's logical structure if we construe *ἀφή* as the antecedent: Aristotle's point is that we call what exceeds *touch* hard and what falls short of *touch* soft because we use it as a mean state, not that we call what exceeds the *mean state* hard and what falls short of the *mean state* soft because we use touch as one.

⁴⁴*πρὸς μὲν οὖν ἄλληλα ἀόριστά ἐστιν τῷ μᾶλλον καὶ ἥττον· ἐπεὶ δὲ πρὸς τὴν αἴσθησιν πάντα κρίνομεν τὰ αἰσθητά, δηλον ὅτι καὶ τὸ σκληρὸν καὶ τὸ μαλακὸν ἀπλῶς πρὸς τὴν ἀφήν ὠρίκαμεν, ὡς μεσότητι χρώμενοι τῇ ἀφῇ· διὸ τὸ μὲν ὑπερβάλλον αὐτὴν σκληρόν, τὸ δ' ἐλλείπον μαλακὸν εἶναί φαμεν.*

The point is not simply that *we* call those objects hard and soft without qualification which respectively exceed or fall short of the mean state occupied by touch. Nor is it that absolute hardness and softness are *defined* in terms of the tactile “mean state”.⁴⁵ It is that objects that appear hard or soft to touch *are* hard or soft, so that by perceiving the hardness of hard things and the softness of soft things we “discriminate”, or *κρίνειν*, their hardness and softness.

Aristotle’s remarks thus represent a decisive rejection of the gap Socrates posits between what is present in a perceiver’s experience of qualities like hard and soft and the being or essential nature of those qualities. But if these remarks are also meant to relate Aristotle’s *reasons* for rejecting the gap Socrates posits, they stand in need of clarification. I’ve suggested that the gap consists in a contrast between what is present in sense “experience”—the affections reaching the soul via one of the senses—and what is external to those experiences. Socrates argues that an ontology that treats hardness and softness as perceiver-independent attributes of perceptible bodies is an ontology on which the being and essence of these are *not* present in sense experience. Aristotle, I’ve suggested, is sympathetic to this sort of ontology. Does he then have a response to the Socratic argument? Does his theory of perception have the resources to show that the being and essential nature of attributes like hardness and softness can be *both* perceiver-independent *and* present in sense experience? Does it have the resources to specify the *experiential* conditions under which the perceiver is actually presented with the perceiver-independent nature of these qualities, the conditions under which the subject is in a position to *discriminate* the hardness and softness of things?

Discrimination and the conditions for perceptual knowledge

These questions pose a challenge to Aristotle’s theory of basic sensory cognition. On the one hand, we have seen that Aristotle’s support for the Weak Revelationist idea that the essential

⁴⁵*Meteor.* 382^a21–23. In this context Aristotle defines absolute hardness as the quality of having a surface that does not yield into itself, and absolute softness as the quality of having a surface that yields but not simply by displacement, as a liquid does (^a11–15).

natures of perceptual qualities are presented to the perceiver in sense experience is driven by a certain conception of the teleological role of sense perception. In his view, the norm governing the senses' contributions to animal survival and flourishing is *truth*, understood here as the norm of presenting the perceiving animal with perceptual qualities as they essentially *are*. On the other hand, we have also seen that there are substantial dialectical challenges to this conception of sense experience, challenges which fit the mold of incompatibility arguments against Weak Revelationism. Chief among these is a challenge Aristotle finds in the *Theaetetus*, according to which sense experience has *no* share in knowledge or truth because the soul by itself, and not by means of the senses, must determine (*κρίνειν*) the being of perceptual qualities.

Aristotle has a response to this challenge, and the task of the following chapters is to detail its most salient features. As I argue in Chapter 1, Aristotle's response is built on a distinctive conception of the nature of perceptual qualities. It is commonly assumed that Aristotle regards colors, sounds, and other perceptual qualities as essentially dependent on perceivers, so that a world without perceivers would also be a world in which nothing was colored, sounding, or flavored in the fullest sense. But this assumption wrongly conflates what it is to be a perceptual *quality* (e.g. a color) with what it is to be a perceptual *object* (e.g. an object of vision). In Aristotle's view perceptual qualities are *not* essentially perceptible, but objective features of the world whose nature and existence are wholly independent of the presence of perceivers.

In Chapter 2 I argue that Aristotle accepts a *physicalist* account of perceptual qualities, according to which the essential nature of a determinate quality (e.g. Sky Blue or Middle C) is identical to the attribute whereby objects produce sensory affections of that type—an attribute that Aristotle analyzes as a mixture of extreme contraries, as e.g. a color is a mixture of opaque and transparent, and a sound is a mixture of low and high pitch. But despite ascribing to perceptual qualities a perceiver-independent nature rooted in the physics of causation and affection, Aristotle nevertheless maintains that the nature of a perceptual quality can be fully present in the sensory affection it produces in a perceiver. For, unlike contemporary physicalist accounts, Aristotle's physicalism takes the quality as it inheres in an object to be identical in nature to

the quality as it inheres in the perceptual motion that affects a perceiver; the same quality, in Aristotle's view, is both "mixture and motion".

With this conception of perceptual qualities in place, all that Aristotle needs to respond to the incompatibility argument he finds in the *Theaetetus* is an account of the conditions under which the nature of a perceptual quality (so understood) is present to the perceiver in sense experience. In Chapters 3 and 4 I argue that Aristotle develops a general theory of discrimination within which he articulates these conditions. Commentators disagree over what it is, in Aristotle's view, for the senses to discriminate. Nevertheless, there is substantial evidence he takes that sensory discrimination to consist precisely in the sort of access to the essential nature of perceptual qualities that, according to Plato, is unavailable to the senses. The strongest evidence comes from a difficult passage in which Aristotle purports to show that the senses discriminate their special qualities (*An.* 2.11, 424^a4–7). His argument turns on the idea that each sense is a "mean state" (*μεσότης*) of the contrariety present in the qualities it perceives: vision is a mean state between opaque and transparent, hearing between low and high pitch, and so on. In Chapter 3 I argue that the senses' status as mean states reflects their *hylomorphic* status as the form of an organ that, *qua* organ, is compounded in a mean proportion of the same opposites that compose the qualities it perceives. (So, for instance, vision is the form of the eye, which *qua* organ of vision is compounded from a mean proportion of opaque and transparent stuff.) On the basis of this obscure detail of the physiology of perception, Aristotle concludes that each sense occupies a perspective from which the affection produced by a quality reflects how that quality is essentially.

As I show in Chapter 4, Aristotle's argument in this passage is illuminated by a parallel with his account of the character virtues. The ability of perceivers to discriminate perceptual qualities is analogous to the ability of virtuous agents to distinguish virtuous and vicious states of character. Just as it is only from the perspective of the courageous person that the rash person appears rash and the coward appears cowardly, it is only from the perspective of a sense occupying the visual mean state that contrary qualities like Sky Blue and Scarlet Red appear as they essentially are. This parallel is moreover of interest quite apart from the light it sheds on Aristo-

tle's understanding of sensory discrimination. For, as my account shows, it is wrong to say that Aristotle accepts a single Doctrine of the Mean; if any, he has at least *two*, one ethical and one discriminative.⁴⁶

As I also argue in Chapter 4,⁴⁷ a major implication of Aristotle's doctrine of the discriminative mean is that the senses turn out to *meet* the condition on knowledge the *Theaetetus* alleged they could not. *Pace* the Socrates of that dialogue, it is the senses themselves that discriminate (*κρίνειν*) and grasp the being and essential nature of the qualities they specially perceive, since cases of sensory discriminate are precisely cases in which the perceiver is presented with the being and essential nature of these qualities. While, as we've seen, this sort of acquaintance is on some contemporary views sufficient for knowledge of perceptual qualities, on the view Aristotle finds in the *Theaetetus* it expresses only a *necessary* condition for such knowledge. It belongs to a different study to consider whether the same is true for Aristotle himself, and so I conclude by sketching some prospects for further research recommended by the present interpretation.

⁴⁶See ch. 4.6.

⁴⁷See esp. chs. 4.5 and 4.7.

1

Perceptual Qualities, Perceptual Objects, and Aristotle's Realism

Aristotle is typically, and I think rightly, read as a *realist* about perceptual qualities. His is a world in which objects for the most part have the colors, sounds, odors, and flavors we experience them as having, and in which objects moreover have these qualities irrespective of whether they are experienced as having them.¹ This realist picture is typically, and again I think rightly, seen to underly central commitments of Aristotle's theory of perception. It seems implicit, for instance, in his view that perception of a quality like color is a process of *assimilation*, in which what perceives, which is *potentially* such as what it perceives, comes to be such as what it perceives is *actually*.² It is arguably also implicit in his views on perception's cognitive value, for instance in his claim that vision makes an important contribution to practical intelligence because "all bodies partake of color" (*Sens.* 437^a7, quoted in text o.2).

Yet the realist picture of perceptual qualities Aristotle endorses is typically held to be subject to an important restriction. Aristotle's intellectual milieu was dominated by *irrealist* conceptions of perceptual qualities, according to which objects do *not* have colors, sounds, odors, or flavors

¹See e.g. *An.* 418^a11–16, 428^b18–22 for remarks on the reliability of the senses with respect to these qualities. Aristotle takes the same view of the qualities specially perceived by touch, primarily temperature (hot and cold) and moisture (wet and dry); but since these qualities correspond to the fundamental elements of material bodies, there is less of a question concerning *their* perceiver-independent reality (cf. 423^b26–29).

²See *An.* 418^a3–6, 417^a17–21, 423^b31–424^a2.

in the absence of our experience of them. In an apparent concession to the irrealists, Aristotle admits that perceivers do in a way encounter features that objects would not have in the absence of such perceptual encounters. It is of course false to say *without qualification* that there is no color without vision or sound without hearing. But in his view the irrealists are right in thinking that there cannot be an *actual* object of vision without an *actual* observer, or an *actual* object of hearing without an *actual* auditor:

Text 1.1 But the earlier physical theorists who thought that nothing is white or black without vision, nor that there is flavor without taste, did not state this [matter] well. For they spoke in one way correctly but in another incorrectly, since the sense and its object (*αἰσθητόν*) are spoken of in two ways: some [are spoken of] as potential and some as actual, so that concerning the latter [sc. perceptual objects in actuality] what they said applies, but in the case of the former [sc. perceptual objects in potentiality] it does not apply. But those [theorists] spoke without qualification about what is spoken of not without qualification.³ (An. 3.2, 426^a20–27)

It is unclear how, if at all, these remarks curtail Aristotle's commitment to the perceiver-independence of perceptual qualities. Perhaps it demonstrates sympathy for a *subjectivist* view according to which colors, sounds, etc. are perceiver-independent features of objects, but in the absence of active perceivers they are not (or are not most fully) how we experience them. If so, however, this concession starts to look like an embarrassment for Aristotle.⁴ How much can we subtract from colors or sounds as we experience them before we are left with nothing but a bare disposition or causal tendency to affect perceivers in a certain way? And if a that *is* all that is left when we subtract the perceiver-dependent aspects of perceptual qualities, what remains of his view that perception is a matter of the perceiver being assimilated to what she perceives? What remains of the idea that perception of qualities such as color is a means of learning about the objective features of material bodies?

Some commentators have embraced a thoroughly dispositionalist interpretation of Aristo-

³ἀλλ' οἱ πρότερον φυσιολόγοι τοῦτο οὐ καλῶς ἔλεγον, οὐθὲν οἰόμενοι οὔτε λευκὸν οὔτε μέλαν εἶναι ἄνευ ὄψεως, οὐδὲ χυμὸν ἄνευ γεύσεως. τῇ μὲν γὰρ ἔλεγον ὀρθῶς, τῇ δ' οὐκ ὀρθῶς· διχῶς γὰρ λεγομένης τῆς αἰσθήσεως καὶ τοῦ αἰσθητοῦ, τῶν μὲν κατὰ δύναμιν τῶν δὲ κατ' ἐνέργειαν, περὶ μὲν οὖν τούτων συμβαίνει τὸ λεχθέν, ἐπὶ δὲ τῶν ἐτέρων οὐ συμβαίνει. ἀλλ' ἐκεῖνοι ἀπλῶς ἔλεγον περὶ τῶν λεγομένων οὐχ ἀπλῶς.

⁴See Irwin 1989, 313–14 and Taylor 1990, 137–141 for especially clear statements of this worry.

tle's realism.⁵ Others, however, have attempted to present Aristotle's concession as articulating only a very thin kind of subjectivism: while objects only *look* green or *taste* sweet in the context of actual vision or taste, they *are* green and sweet in all other important respects—including the respects relevant to perceptual assimilation and cognition.⁶ Still others have denied that Aristotle's realism is compatible with any form of subjectivism, arguing instead that his apparent concession to irrealism is the result of confusion, for instance an elision of the *disposition* to cause perception and the categorical *grounds* of that disposition.⁷ I propose a different approach to reconciling the objectivist tendencies of Aristotle's realism with this apparent concession to the irrealists. Aristotle *is* committed to the objective, perceiver-independent reality of perceptual qualities. Not only do colors, sounds, odors, and flavors belong to material bodies independently of our experiencing them as so belonging, they belong to material bodies *as we encounter them in experience*, and the admission that there are no objects of perception without actual perceivers does nothing to mitigate this commitment. To the extent that there appears to be a tension, it is because we have failed to distinguish two essentially distinct potentialities of material bodies, namely that which makes the body perceptually *qualified* (colored, or sounding, or flavored, etc.) and that which makes it *perceptible* (visible, or audible, or tasteable, etc.). The former potentiality characterizes a perceptually-accessible *quality* (ποιότης), an attribute whose presence in a perceptually qualified body does not depend on a perceiver's experience of it. By contrast, the latter potentiality characterizes a perceptual *object* (αἰσθητόν), and in Aristotle's view *this* potentiality may be actualized only in the presence of a perceiver.

Despite appearances to the contrary, Aristotle consistently maintains the distinction between perceptual qualities and perceptual objects. Passages in which he seems to treat the actuality of a perceptual quality as identical to actual perception—passages which have consequently led commentators to take the actuality of a perceptual quality to be *dependent* on the actuality of a perceiver—must be understood in light of the subtle distinction between the actuality that

⁵See Broadie 1993.

⁶See Silverman 1989 (endorsed by Lee 2005), Marmodoro 2014.

⁷See Broackes 1999, esp. 67–69; cf. Everson 1997, 29–30.

determines the essence of a perceptual *quality* and the actuality of the relevant type of perceptual *object*. Aristotle relies heavily on this distinction in *De Anima*, though it is not here that we find his most explicit statement of it. For that we have to look elsewhere, and especially to the accounts of perceptual qualities presented in the *Categories* and *De Sensu*. These passages, as we shall see, form the basis for *De Anima*'s discussion of colors, sounds, flavors and the rest as objects of sense perception.

1.1 Perceptual qualities as perceiver-independent attributes

In speaking of perceptual qualities I mean to pick out the range of attributes that are perceptually accessible within only one sense modality. This range of attributes coincides with what Aristotle in *De Anima* calls the “special perceptual objects” (ἴδια αἰσθητά), which are marked under this description by two features: each is a *per se* efficient cause of perception relative to just one sense, and that sense is immune to error concerning it (*An.* 418^a11–12). Aristotle's interest in these qualities in *De Anima* is for the most part limited to their role in causing perceptual affection and defining the senses specially perceptive of them (cf. 415^a14–22). Taken alone, then, the *De Anima* discussion may give the impression that Aristotle takes perceptual qualities to be essentially characterized in terms of their role as objects of perception, or even that being an object of perception is all there is to being a perceptual quality. But there is considerable evidence outside of *De Anima* that, in Aristotle's view, perceptual qualities may be understood quite independently of their role as special perceptual objects.

The first important piece of evidence comes from Aristotle's introductory remarks to the ontology of perceptual qualities he presents in *De Sensu* 3–5:

Text 1.2 Now, concerning the objects of each of the sense organs—I mean for instance color, sound, smell, flavor, and touch [i.e. the tangibles]—we stated in general in our remarks on soul what their function is and what being in actuality is [for them] in respect of each of the sense organs. But what we should say any one of them is—for instance what color is, or what sound is, or what odor or flavor are, and similarly in regard to touch—we should [now] examine, and first of all in regard to color.⁸ (*Sens.* 3, 439^a6–12)

⁸περὶ δὲ τῶν αἰσθητῶν τῶν καθ' ἕκαστον αἰσθητήριον, οἷον λέγω χρώματος καὶ ψόφου καὶ ὀσμῆς

Aristotle is asking us to distinguish perceptual qualities insofar as they are objects of perception and perceptual qualities as they are in themselves. As objects of perception, they should be understood in terms of their function (*ἔργον*) and actuality (*τὸ ἐνεργεῖν*) as *per se* causes of sensory affection. In themselves, however, they are not likewise to be understood strictly in terms of their role in sense perception. What colors, flavors, and odors are, according to the account Aristotle goes on to give, is not specified in terms of any causal or definitional relation to their special senses, but rather in terms of certain compositional facts about bodies possessing those qualities. Aristotle's account analyzes these qualities as values of a scale of attributes defined by a pair of opposites, the nature of each determinate quality fixed by a ratio (*λόγος*) of those opposites that simultaneously characterizes the "mixture and motion" specific to that quality.⁹ With this sort of account Aristotle claims to have identified perceptual qualities, not with their role in sense perception, but with what *enables* them to play that role—with, as he puts it, "what each of them is *being which* it will produce perception and actuality" (439^a16–17).

Another important piece of evidence comes from Aristotle's discussion of perceptual qualities in *Categories* 8, which in many ways complements the account from *De Sensu* 3–5 sketched above. Viewed from the comprehensive ontological perspective Aristotle adopts in the *Categories*, perceptual qualities are "affective qualities" (*παθητικαὶ ποιότητες*, *Cat.* 9^a29–31). They are *qualities* because they are attributes in virtue of which "the things that have received them are said to be qualified somehow" (*τὰ γὰρ δεδεγμένα ποιά λέγεται κατ' αὐτάς*, 34–35). The language of receiving recalls Aristotle's discussion of primary substances—objects such as Socrates and Bucephalus and a drop of honey—as the ultimate subjects of predication, the ultimate substrata receptive of and subject to change between opposites in non-substance categories.¹⁰ But here Aristotle's emphasis is on the *perfective* nature of an object's reception of a perceptual quality. Objects that are qualified in respect of (say) color or flavor *have* received

καὶ χυμοῦ καὶ ἀφῆς, καθόλου μὲν εἴρηται ἐν τοῖς περὶ ψυχῆς, τί τὸ ἔργον αὐτῶν καὶ τί τὸ ἐνεργεῖν καθ' ἕκαστον τῶν αἰσθητηρίων. τί δέ ποτε δεῖ λέγειν ὅτιοῦν αὐτῶν, οἷον τί χρώμα ἢ τί ψόφον ἢ τί ὄσμην ἢ χυμόν, ὁμοίως δὲ καὶ περὶ ἀφῆς, ἐπισκεπτέον, καὶ πρῶτον περὶ χρώματος.

⁹Cf. *Sens.* 442^a15, quoted in text 2.2. See ch. 2 for detailed discussion of this account.

¹⁰See *Cat.* 4^a28–34, ^b16–19.

these attributes, in the sense that their being colored or flavored as they are is not simply the result of some temporary affection from an external agent, as a trip to the beach might temporarily redden an otherwise pale complexion (cf. 9^b19–33 = text 1.13). Affective *qualities* (as opposed to temporary *affections*, *πάθη*) are characteristically stable (*παραμόνιμα*), both in the sense of being long-lasting and in the sense of being hard to change (*δυσκίνητα*). This is true even if the quality was initially received in a process of affection or alteration (a change in how a thing is qualified: 15^b11–12), so it must be kept in mind that perceptual qualities are called *affective* qualities only because they are *productive* of affections in other bodies:

Text 1.3 For instance, honey is called sweet because it has received sweetness, a body is white because it has received whiteness, and the same is true in the other cases. These are called *affective* qualities not because the things that have received the qualities have been somehow affected, for honey is not called sweet because it has been affected somehow, nor has any other such thing. In the same way as these both hotness and coldness are called affective qualities not because the things that have received them have been affected somehow. It is rather because each of the aforementioned qualities is productive of an affection of the senses that it is called an affective quality. For sweetness instills a kind of affection of taste, hotness of touch, and so on in the other cases.¹¹ (Cat. 8, 9^a33–^b9)

Note the high threshold this account places on the possession of a perceptual quality. In order to be perceptually qualified in some way, it is not enough merely to manifest the relevant quality. Turning red-faced from embarrassment or pale from fear is not enough to possess the *qualities* of redness or pallor. Nor is being placed over a stove-top flame enough to give a kettle the *quality* of heat. For soon the feeling of embarrassment or fear will subside, and the flame under the kettle will be extinguished; and at that point what was being affected will begin to lose the relevant attribute. Perceptual qualities, like all affective qualities, belong only to the objects that have received them, and so possess them in a way that is hard to change and long-lasting. These underlying ontological distinctions hold even if we attribute a quality like hotness to fire

¹¹οἶον τὸ μέλι τῷ γλυκύτητι δεδέχθαι λέγεται γλυκύ, καὶ τὸ σῶμα λευκὸν τῷ λευκότητι δεδέχθαι· ὡσαύτως δὲ καὶ ἐπὶ τῶν ἄλλων ἔχει. παθητικαὶ δὲ ποιότητες λέγονται οὐ τῷ αὐτὰ τὰ δεδεγμένα τὰς ποιότητος πεπονθέναι τι· οὔτε γὰρ τὸ μέλι τῷ πεπονθέναι τι λέγεται γλυκύ, οὔτε τῶν ἄλλων τῶν τοιούτων οὐδέν· ὁμοίως δὲ τούτοις καὶ ἡ θερμότης καὶ ἡ ψυχρότης παθητικαὶ ποιότητες λέγονται οὐ τῷ αὐτὰ τὰ δεδεγμένα πεπονθέναι τι, τῷ δὲ κατὰ τὰς αἰσθήσεις ἐκάστην τῶν εἰρημένων ποιότητων πάθος εἶναι ποιητικὴν παθητικὴν ποιότητα λέγονται· ἢ τε γὰρ γλυκύτης πάθος τι κατὰ τὴν γεῦσιν ἐμποιεῖ καὶ ἡ θερμότης κατὰ τὴν ἀφήν, ὁμοίως δὲ καὶ αἱ ἄλλαι.

on the same basis that we attribute the corresponding temporary affection to the heated kettle, namely because both produce tactile perceptions of hotness. The fact that we call both 'hot' shows that we have a common basis for *attributing* qualities and temporary affections, but it does not follow in Aristotle's view that things genuinely possess a given quality if, or even only if, they are observed to produce the relevant type of perceptual affection. Fire would be hot, snow would be white, and honey would be sweet even if there were no perceivers around to feel or see or taste them; and in general the possession of a perceptual quality is ontologically independent of the availability of perceivers suitably equipped to be so affected: "if the animal is destroyed *perception* (*αἴσθησις*) is destroyed, but there will still be the *perceptible* (*αἰσθητόν*), for instance body, heat, sweet, bitter, and everything else that is perceptible" (*Cat.* 8^a4–6).

1.2 A concession to irrealism?

When we look beyond *De Anima*, then, we find discussions of perceptual qualities that range far beyond their role as special objects of the senses. The ontology of *De Sensu* 3–5 and the account of affective qualities in *Categories* 8 in different ways commit Aristotle to the view that possession of a perceptual quality does not depend on the presence of perceivers, the first by distinguishing what perceptual qualities are from their role as perceptual objects, and the second by arguing directly for the ontological independence of perceptual qualities from perceivers. In light of these discussions, we may be tempted to interpret Aristotle's scolding of the irrealists, who according to text 1.1 "spoke without qualification about what is spoken of not without qualification", as an admonition to respect the distinction between perceptual qualities and perceptual objects. This interpretation has Aristotle agreeing with the irrealists that perceptual *objects* would not exist in the absence of perceivers, but denying the implication that perceptual *qualities* would therefore not exist in the absence of perceivers. To be a perceptual quality is not (or is not *only*) to be a perceptual object, so even if nothing would be *visible* in a world without observers, it does not follow that nothing would be *colored*.

But this interpretation does not get things quite right. In Aristotle's view, the irrealist's error

is not in conflating being visible and being colored, but in failing to recognize a certain sort of ontological complexity in attributes such as being visible and being sighted, and in general being an object of perception and being a perceiver. What the irrealist says is that is that nothing is white or black without vision. For Aristotle this is incorrect as it stands, since it fails to recognize the distinction between the *potentiality* and the *actuality* of a perceptual object. Like the sense (*αἴσθησις*) that perceives it, the object of perception (*αἰσθητόν*) may be spoken of in either of two ways, namely as potentially or as actually perceived. Applied to perceptual objects in potentiality, the irrealist's claim is false: objects are visible, tastable, and in general perceptible even if there is no one seeing, tasting, or in general perceiving them.¹² But applied to perceptual objects in actuality, it is true: without anyone seeing, tasting, or in general perceiving, nothing is ever actually seen, tasted, or in general perceived.

So Aristotle is not accusing the irrealist of conflating perceptual qualities and perceptual objects. But whether we take Aristotle's remarks in text 1.1 to weaken the commitment to realism he expresses in *De Sensu* 3–5 and *Categories* 8 depends on whether we take his argument to *presuppose* the distinction between perceptual qualities and perceptual objects. Given that Aristotle regards perceptual qualities as perceptual objects, his remarks may indicate that there are no perceptual *qualities* in actuality without perception in actuality. But given that he also distinguishes what perceptual qualities are from their role as objects of sense perception, his remarks may also indicate that there are no perceptual *objects* in actuality without perception in actuality, where this leaves it open whether perceptual qualities may be actualized without being perceived.

On the first reading, but not on the second, Aristotle would be committed to denying the perceiver-independence of perceptual qualities we saw defended in *Categories* 8. For on the first

¹²Would Aristotle also reject the version of the irrealist's claim according to which nothing is visible, tastable, and in general perceptible in a world without seers, tasters, and in general without suitably equipped perceivers—i.e. a version applied also to perceptual *subjects* in potentiality? Admittedly, the passage quoted at the end of sect. 1.1 (*Cat.* 8^a4–6) suggests he would, but elsewhere he refines his position: in the counterfactual scenario in which there are perceptible-in-the-actual-world bodies but no suitably equipped perceivers, nothing would be visible, tastable, etc., though there would yet be colors, flavors, etc., the underlying features by virtue of which bodies are perceptible-in-the-actual-world. See *Met.* 1010^b30–1011^a2 (= text 1.9) and, for discussion, sect. 1.5.

reading, but not on the second, to be an object of perception would be part of what it *is* to be a perceptual quality. Aristotle takes the essence of a potentiality to be determined by its actuality, by what it is a potentiality *for*. If, then, Aristotle's conclusion in text 1.1 is that there is no actuality of a perceptual quality without the actual perception of it, he is committed to the idea that part of what it is to be a perceptual quality is to be able to be perceived—to be, in other words, an object of perception. But if being an object of perception is part of what it is to be a perceptual quality, it follows that being a perceptual quality is, at least in part, just being able to produce a certain type of perceptual affection: “if the object of smell (*ὄσφραντόν*) is odor (*ὄσμή*), [then] if it produces anything, odor produces smelling” (*An.* 2.12, 424^b5–6). It becomes hard to resist the conclusion that perceptual qualities are essentially *dependent* on perception, for in that case we could not specify what a quality like color or flavor *is* without reference to its special sense. This would be a far more impoverished version of realism than we saw articulated in texts 1.2 and 1.3. For even if objects could be *potentially* colored, sounding, or flavored in the absence of perceivers, they could not *actually* be such in a world without seeings, hearings, or tastings.

However, Aristotle's discussion in *De Anima* gives us good reason to think he intends the second reading of text 1.1. This reading, unlike the first, does not commit him to the perceiver-dependence of perceptual qualities in actuality. What Aristotle concedes to the irrealists in text 1.1 is that perceptual objects are perceiver-dependent in actuality, but in doing so he does not concede much. True, nothing can be seen without someone seeing it. But in Aristotle's view being visible forms no part of the essence of color, so it does not follow that nothing can be actually *colored* in the absence of observers. As I shall presently argue, there is an actuality of color and other perceptual qualities that is independent of the actuality of the perceiver, and so independent of its role as an object of perception.

1.3 Dual actualities of sense and perceptual quality

The best evidence for a perceiver-independent actuality of perceptual qualities comes from Aristotle's account of the relation between perceptual subject and object in actuality in *De Anima* 3.2,

in a passage that is sometimes read as articulating the distinction between perceptual subject and object in actuality and potentiality we encountered in text 1.1:¹³

Text 1.4 So the actuality of that which produces sound is sound or sounding, and the [actuality] of that which hears is hearing or hearkening, since hearing is twofold and sound is twofold. The same account [applies] also in the case of the other senses and perceptual objects.¹⁴ (An. 3.2, 426^a6–9)

Using hearing as his example, Aristotle has been arguing for the thesis that the actuality of a perceptual object and its sense is “one and the same, though they differ in their being”:

Text 1.5 I mean for instance sound in actuality and hearing in actuality [are one and the same, though different in being]. For it is possible, while having [the sense of] hearing, not to hear, and that which has sound does not always sound. **But whenever that which is capable of hearing is active and that which is capable of sounding sounds, then hearing in actuality and sound in actuality come about at the same time, of which [pair] one should say the one is hearkening and the other is sounding.**¹⁵ (An. 3.2, 425^b25–426^a2)

Now, one might read text 1.4 as making explicit an underlying assumption of this passage, namely that both the perceptual subject and the perceptual object may be spoken of as potential or as actual. But in fact it seems to be making explicit a different assumption, namely that there are *two actualities* of both the sense and the quality it specially perceives. To see this, notice that in the bolded portion of text 1.5 Aristotle is careful not to say that every actual sounding is the same in number to an actual hearing. All he commits himself to is that *whenever* the auditor and the sounding object are both active, *then* their respective actualities are the same in number. From this it follows neither that every actual sounding is the same in number as an actual hearing, nor indeed that every actual hearing is the same in number as an actual sounding. Aristotle's view that a sounding object *produces* perception in the auditor may commit him to the claim that every actual hearing is identical to an actual sounding, but nothing rules out

¹³See Hicks 1907, note ad loc., and Ross 1961, note ad loc., who nevertheless acknowledges the passage's exegetical difficulty. Contrast Polansky 2007, 387–389.

¹⁴ἢ μὲν οὖν τοῦ ψοφητικοῦ ἐνέργειά ἐστι ψόφος ἢ ψόφησις, ἢ δὲ τοῦ ἀκουστικοῦ ἀκοὴ ἢ ἄκουσις· διττὸν γὰρ ἢ ἀκοή, καὶ διττὸν ὁ ψόφος. ὁ δ' αὐτὸς λόγος καὶ ἐπὶ τῶν ἄλλων αἰσθήσεων καὶ αἰσθητῶν.

¹⁵λέγω δ' οἷον ὁ ψόφος ὁ κατ' ἐνέργειαν καὶ ἢ ἀκοὴ ἢ κατ' ἐνέργειαν· ἔστι γὰρ ἀκοὴν ἔχοντα μὴ ἀκούειν, καὶ τὸ ἔχον ψόφον οὐκ αἰεὶ ψοφεῖ, ὅταν δ' ἐνεργῇ τὸ δυνάμενον ἀκούειν καὶ ψοφῇ τὸ δυνάμενον ψοφεῖν, τότε ἢ κατ' ἐνέργειαν ἀκοὴ ἅμα γίνεται καὶ ὁ κατ' ἐνέργειαν ψόφος, ὧν εἴπειεν ἂν τις τὸ μὲν εἶναι ἄκουσιν τὸ δὲ ψόφησιν.

that there may be an actual sounding that is not identical to an actual hearing. On the reading I am suggesting, the point of text 1.4 is to acknowledge this implication of his claim in the bolded portion of text 1.5.

Read in this way, text 1.4 states that there are two actualities of both that which sounds and that which hears. In both cases one actuality, what Aristotle calls 'sound' (*ψόφος*) and 'hearing' (*ἀκοή*) respectively, is homonymous with its corresponding potentiality, since we can say equally of what is only potentially hearing that it has hearing and of what is only potentially producing sound that it has sound. But in both cases there is another, "heteronymous" actuality, what Aristotle calls 'sounding' (*ψόφησις*) and 'hearkening' (*ἄκουσις*) respectively. In the bolded portion of text 1.5 he identifies the *heteronymous* actualities of that which sounds and that which hears as actualities of a single auditory perceptual episode. He then goes on to draw conclusions about their connections based on his general account of action and passion:¹⁶

Text 1.6 If indeed the motion and the acting and the affection are in what is affected, both the sound and the hearing in actuality must be in that which is in potentiality. For the actuality of what produces and sets in motion comes about in what is affected—hence it is not necessary for what moves to be itself moved.¹⁷ (An. 3.2, 426^a2–6)

Now, if there were just a single actuality of sound, Aristotle's remarks would entail that *each* actualization of sound must be present in a hearer, and hence that each actualization of sound is the same in number as a "hearkening". As if to guard against this misunderstanding, he follows up these remarks with text 1.4, which suffices to clarify that the above account applies only to the *heteronymous* actuality of sound—that is, to "soundings".

It is therefore no surprise that Aristotle arrives at the conclusion that the actuality of the *perceptible* (*αἰσθητόν*) and the *perceptive* (*αἰσθητικόν*) are located in the perceiver only after clarifying that it applies to just one of the perceived quality's actualities, namely the *heteronymous* actuality that arises simultaneously with and is the same in number as the actuality of the

¹⁶See *Phys.* 3.3 and, for specific application to affection in the category of quality, *GC* 323^a17–20.

¹⁷εἰ δὲ ἐστὶν ἡ κίνησις καὶ ἡ ποίησις καὶ τὸ πάθος ἐν τῷ κινουμένῳ, ἀνάγκη καὶ τὸν ψόφον καὶ τὴν ἀκοὴν τὴν κατ' ἐνέργειαν ἐν τῷ κατὰ δύνάμιν εἶναι· ἡ γὰρ τοῦ ποιητικοῦ καὶ κινητικοῦ ἐνέργεια ἐν τῷ πάσχοντι ἐγγίνεται· διὸ οὐκ ἀνάγκη τὸ κινῶν κινεῖσθαι.

relevant sense (*An.* 426^a9–11). Nor is it a surprise that Aristotle holds off discussion of the other, homonymous actuality of the perceived quality. His concern in this part of *De Anima* 3.2 is with the relation between the sense and its object in actuality, and this concern extends to perceptual qualities only insofar as they play the role of perceptual objects. As we saw above, and as Aristotle himself indicates in text 1.2, consideration of perceptual qualities in themselves is not a task for the psychology of perception, but rather for the sort of ontological inquiry we find in *De Sensu*. This is not to say, however, that Aristotle's more narrow focus on the role of perceptual qualities in *De Anima* does not provide important clues to the ontological assumptions underlying his psychology of perception.

1.4 Are perceptual qualities essentially perceptible?

Aristotle's account of the unity of perceptual subject and object in *De Anima* 3.2 leaves it open whether the actuality of a perceptual quality is independent of the actuality of a perceiver, since the account acknowledges an actuality of perceptual qualities that is neither simultaneous with nor the same in number as an actual perceiving. To show that Aristotle is in fact committed to the perceiver-independence of perceptual qualities in this respect, it needs additionally to be shown that the perceiver-independent actuality of a perceptual quality is in his view the one that determines what it essentially is. Aristotle does not address this question directly in *De Anima*, and according to a number of interpreters he is in fact committed to denying that perceptual qualities are essentially perceiver-independent. Nevertheless, as I'll argue in this section, the best interpretation of the relevant passages favors the radical *independence* of perceptual qualities. Once again, Aristotle's view depends on the distinction between perceptual objects and perceptual qualities. In his view, perceptual qualities *are* perceptual objects, but this status is neither essential nor even necessary to being a perceptual quality.

To see why, consider first the contrary hypothesis that the actuality that determines the nature of a perceptual quality is identical to the actuality of the relevant sort of perceptual object. Broadie (1993) has argued for such a view in detail, on the basis of a principle she calls the

“restricted efficacy of sensibilia”. The principle states that perceptual qualities (excepting the qualities specially perceived by touch) are productive of only one kind of effect: “the perception of them by animals” (Broadie 1993, 146). Viewed in this way, perceptual qualities just *are* potentialities for the production of a determinate kind of perceptual affection. To be colored, on this view, would be to possess the power to appear visually in a certain way, say as red. And color in general would be defined as the way in which an object is visible, as e.g.

COLOR AS OBJECT OF VISION

color := the potentiality to produce a color perception¹⁸

Applied generally, the restricted efficacy principle straightforwardly entails that the nature of a perceptual quality is exhausted by its being an object of the relevant sense. In the absence of suitably equipped perceivers, then, perceptual qualities could make no causal difference in the world; they would be, as Broadie puts it, “idle and as if dead” (*ibid.*).

What of the other, perceiver-independent actuality of a perceptual quality, which is not identical to an episode of actual hearing? Broadie does not deny that sound and the other qualities specially perceived by the senses can be active in the absence of perceivers, only that their actuality in the absence of perceivers makes any causal *difference* in the world: “[t]hough the breakers actually sound unheard on the shore, they make no more difference, in the absence of suitable perceivers, than would be made by a calm and only potentially sounding sea” (1993, 155).

One may wonder whether someone who accepts a view like Broadie’s is entitled to speak of a sound that is in actuality yet unheard: if sound is nothing but the power to produce an auditory perception, sound in actuality would just *be* its being heard. Moreover, as has become well-known from the considerable response Broadie’s interpretation has generated, there is good reason to deny that perceptual qualities should be defined in the way required by the restricted efficacy principle. In several passages Aristotle seems happy to characterize perceptual qualities

¹⁸Compare *Met.* 9.8, 1049^b13–16: “What is in the primary sense potential is potential because it is possible for it to become actual. For instance, I call ‘capable of building a house’ that which can build a house, ‘capable of seeing’ (*ὄρατόν*) that which can see, and ‘visible’ that which can be seen”.

without reference to the affections they produce in perceivers. Here, for instance, is how he characterizes color in *De Anima* 2.7:

Text 1.7 Now, every color is capable of setting in motion the actually transparent, and this is its [sc. color's] nature.¹⁹ (An. 2.7, 418^a31–b2)

The mention of color's "nature" (*φύσις*) suggests that the ability to set the actually transparent in motion is at least part of what it is to be a color. Similar, apparently definitional language appears later in the chapter, where Aristotle reminds us that

Text 1.8 Being for color is for it to be this, [i.e.] to be capable of setting in motion the actually transparent.²⁰ (An. 2.7, 419^a9–11)

Neither passage makes explicit reference to perception or the effect color has on a perceiver, but rather to a capacity to move that which is actually transparent. This suggests that, if we were to posit any definition on the basis of Aristotle's *De Anima* discussion of color, it would be something like this:²¹

COLOR AS MOVER OF TRANSPARENT

color := the power to set in motion what is actually transparent

This characterization of color is not equivalent to the one given in terms of its ability to cause color vision, for whereas the actuality of a power to be seen is actually *being seen*, the actuality of a power to move what is actually transparent is actually *moving* the actually transparent.

De Anima's discussions of the other sensory modalities also contain characterizations of perceptual qualities that make no explicit reference to their effect on a perceiver. Sound, for instance, is characterized as the motion of air that has been prevented from dispersing (420^a7–9), and as the motion produced by an object capable of bouncing off a smooth surface (421–23). Even qualities such as odor and flavor, which receive far less detailed treatment in *De Anima*,

¹⁹ πᾶν δὲ χρώμα κινητικόν ἐστὶ τοῦ κατ' ἐνέργειαν διαφανοῦς, καὶ τοῦτ' ἐστὶν αὐτοῦ ἡ φύσις.

²⁰ τοῦτο γὰρ ἦν αὐτῷ τὸ χρώματι εἶναι, τὸ κινητικῶ εἶναι τοῦ κατ' ἐνέργειαν διαφανοῦς.

²¹ Although, as I'll argue further in ch. 2, we actually get no definition of color or any other perceptual quality in *De Anima*.

are nevertheless described in terms of powers that extend beyond the production of a type of perceptual affection: the objects of taste, for instance, must be potentially or actually moist and easily soluble in order to cause the perception of flavor (422^a17–19).

These apparent violations of perceptual objects' restricted efficacy are only to be expected. As many commentators have pointed out, they are in fact *required* to make sense of the mechanics of perception, specifically the role of the medium.²² In Aristotle's view all causal contact between perceivers and perceptual qualities is carried out via some medium. This is most apparent in the case of the so-called distance senses: vision, hearing, and smell. Each of the distance senses is affected by perceptual qualities at a distance via some external medium. The medium of vision, for instance, is what Aristotle calls the "transparent" (*διαφανές*). When a transparent medium is illuminated it becomes actually transparent. A colored body immersed in an actually transparent (aerial or aqueous) medium produces a visual perception by setting in motion the air or water insofar as they are transparent, which then sets in motion the visual organ of a perceiver immersed in the same actually transparent medium (*An.* 419^a12–15). It is not the case, however, that the medium when set in motion thereby *sees* color. So the actuality by which color acts on the transparent cannot be the actuality specified in terms of the perceptual affection it causes in a perceiver. The same account applies to the respective media of hearing and smell, and indeed also to the media of the contact senses, touch and taste, which are not external but belong to the body of the perceiving animal (see e.g. 419^a25–^b3).

The distinction between perceptual qualities and perceptual objects offers a clear way to reconcile Broadie's restricted efficacy principle with Aristotle's evident support for the idea that the essence of perceptual qualities may be spelled out without reference to their effect on a suitably equipped perceiver. The restricted efficacy principle is an accurate characterization of special perceptual *objects* but it is an incorrect characterization of perceptual *qualities*. What it is to be a perceptual object is to have the power to produce a certain sort of perception. Perceptual qualities *have* the power to produce a certain sort of perception, but what it is to be a perceptual

²²Cf. Broackes 1999 and Marmodoro 2014.

quality does not consist in *having* this power. The objects of vision, for instance, have the power to produce certain sorts of visual perception. Colors have the power to produce certain sorts of visual perception, and to that extent they number among the objects of vision. The colors however neither exhaust the class of visual objects (*An.* 418^a26–29), nor does having the power to produce a certain sort of visual perception constitute what colors essentially are. Rather, colors are objects of vision *owing* to what they essentially are, namely what ground colored objects' powers to move the actually transparent.

In insisting on this distinction between perceptual qualities and perceptual objects, then, Aristotle is insisting that being a perceptual object forms no part of what it is to be a perceptual quality. To the extent that perceptual qualities are objects of the various senses, it is because they exist in a world of perceivers endowed with organs suitable for perceiving them. But it makes no difference at all to the existence or nature of these qualities whether there exist perceivers suitably equipped to perceive them. For this reason Aristotle argues elsewhere that the essential nature of perceptual qualities is modally more robust than their status as objects of perception. In a world without perceivers there would be no perceptual objects, but there would be color, sound, flavor, etc., the underlying qualities that would, in a world of perceivers, be productive of perceptual affections:²³

Text 1.9 So in general, if the objects of perception were all there were, there would be nothing if there were no ensouled things, since [in that case] there would be no perception. Now it is perhaps true that there would be no perceptual objects nor percepts, since this is an affection of what perceives. But it is impossible that what underlies, [i.e.] that which produces the perception, should also not exist without perception. For it is not the case that perception is of itself. Rather, there is also something else apart from the perception, which must be prior to the perception. For what moves is naturally prior to what is moved, and this no less if these are said in relation to one another.²⁴ (*Met.* 4.5, 1010^b30–1011^a2)

This passage refines Aristotle's account of the ontological independence of perceptual objects

²³Cf. Broadie 1993, 156–157 and Broackes 1999, 93.

²⁴ὅλως τ' εἴπερ ἔστι τὸ αἰσθητὸν μόνον, οὐθὲν ἂν εἴη μὴ ὄντων τῶν ἐμφύχων· αἴσθησις γὰρ οὐκ ἂν εἴη. τὸ μὲν οὖν μήτε τὰ αἰσθητὰ εἶναι μήτε τὰ αἰσθήματα ἴσως ἀληθές (τοῦ γὰρ αἰσθανομένου πάθος τοῦτό ἐστι), τὸ δὲ τὰ ὑποκείμενα μὴ εἶναι, ἃ ποιεῖ τὴν αἴσθησιν, καὶ ἄνευ αἰσθήσεως, ἀδύνατον. οὐ γὰρ δὴ ἢ γ' αἴσθησις αὐτῆ εαυτῆς ἐστίν, ἀλλ' ἔστι τι καὶ ἕτερον παρὰ τὴν αἴσθησιν, ὃ ἀνάγκη πρότερον εἶναι τῆς αἰσθήσεως· τὸ γὰρ κινῶν τοῦ κινουμένου φύσει πρότερον ἐστίν, κἂν εἰ λέγεται πρὸς ἄλληλα ταῦτα, οὐθὲν ἤττον.

PERCEPTUAL QUALITY	PERCEPTUAL OBJECT	SENSE IN ACTUALITY
potential sound		
actual sound	= potential object of hearing	
sounding	= actual object of hearing	= hearkening

Table 1.1 Relation of perceptual quality, perceptual object, and sense in actuality

from perceivers in the *Categories*. It retains the idea that perceptual qualities such as color, sound, and flavor would remain in a world without perceivers. But it also acknowledges that in such a world perceptual qualities would not be justly characterized as perceptual *objects*. What is presupposed in such an account, of course, is that a color can cease to be visible and a sound audible without thereby ceasing to be a color or a sound; that, in short, perceptual qualities needn't be *perceptible*.

1.5 Is there a second actuality of perceptual qualities?

I've argued that Aristotle accepts both the perceiver-independence of perceptual *qualities* and the perceiver-dependence of perceptual *objects*, but that there is no tension between these claims since perceptual qualities are not essentially perceptual objects. Rather, *given* that ours is a world of perceivers, i.e. that there exist subjects capable of being perceptually affected by colors, sounds, flavors, and the rest, these qualities are objects of their respective senses. The actuality that gives perceptual qualities their essence also, in a world of suitably equipped perceivers, makes them potential objects of perception. But since this actuality is contingent on there actually being suitably equipped perceivers, the actuality that consists in the actual perception of a given quality amounts to a *distinct* actuality additional to the one that defines its essence (see table 1.1).

Fundamental to the interpretation I am proposing is the claim that perceptual qualities are not perceptible *essentially*, but *in virtue of* what they are essentially. I therefore owe an account of how it is in virtue of what a perceptual quality is essentially that it is perceptible. That is,

I owe an account of the relation between the perceiver-dependent and perceiver-independent actualities of a perceptual quality. I will begin to sketch such an account in the next section. But before that, it will be helpful to consider a prominent family of interpretations this account rules out.

The thesis uniting this family of interpretations is that the perceiver-independent actuality of a perceptual quality stands to its perceiver-dependent actuality as *first* to *second* actuality.²⁵ Aristotle draws the distinction between what has come to be known as first and second actuality in *De Anima* 2.5, in an effort to clarify different ways in which animals may be said to be perceivers in actuality. On the one hand, animals may be said to actually perceive because they have the capacity to be affected in the appropriate way by perceptual objects; in Aristotle's view this first stage is achieved before birth, wrought by the agency of spermatic motions on the menses in gestation.²⁶ On the other hand, animals who are capable of but are not currently suffering affection by a perceptually qualified object are also *potential* perceivers, since they are not currently realizing their capacity to be so affected. Thus a second and fuller way of actually perceiving is to be *suffering* affection by a determinate perceptual quality.

Aristotle furthermore distinguishes the nature of the transition from potentiality that characterizes the process of coming into each stage of actuality. The transition to first actuality perception resembles an ordinary destructive change in which one contrary in a range of attributes is replaced with another. Akin to how the learner replaces ignorance with an item of knowledge, the perceiver transitioning into first actuality replaces "anesthesia", or the incapacity to be affected by perceptual qualities, with the capacity to be so affected. The perceiver's transition into second actuality does not likewise involve the replacement of one contrary with another. It is rather akin to the knower's transition from merely having to actually using an item of knowledge:

²⁵See e.g. Osborne 1983, 407, Kosman 1975, 513–514, Polansky 2007, 386–391, Marmodoro 2014, esp. ch. 3. The interpretation of Silverman 1989 is an interesting variant on this thesis; I discuss it below, at the end of this section.

²⁶See *An.* 417^b16–18; cf. *GA* 735^a12–25 with 743^b18–744^b27. For detailed discussion, see Johansen 2012, 137–145.

Text 1.10 Which is either not altering—for the progression is into itself and into its completion—or it is a different kind of alteration [sc. than that which characterizes a knower's transition from a state of ignorance]. This is why it is not well to say that the thinker, when he is engaged in thinking, alters [sc. in that respect], just as it is neither [well to say that] the house builder [alters in that respect] when he builds a house.²⁷ (An. 2.5, 417^b6–9)

The point that is important for present purposes is that the first and second actualities of a perceiver are *serial* actualities of a single potentiality, the first representing a stage on the way to the second and most complete actuality.²⁸ It is this final actuality that determines the essence of the common capacity, for at this stage, as Aristotle puts it in a parallel passage, “it is most of all in accordance with its nature (κατὰ φύσιν)” (Phys. 246^a14–15).²⁹

Although passages like text 1.4 admittedly suggest a parallel between the dual actualities of sense and object, Aristotle never explicitly appeals to a distinction between first and second actuality in the case of perceptual qualities. Nevertheless, commentators have found it illuminating for understanding the connection between the perceiver-dependent and perceiver-independent actualities of a perceptual quality. Marmodoro (2014) has recently extended the distinction to perceptual qualities on the grounds that the perceiver-dependent actuality of a perceptual quality parallels the second actuality of a sense, since both have further actualities whose realization does not require a change in the predicative subject to which it belongs:

What characterizes a *further* actuality as opposed to a new *first* actuality, according to Aristotle's distinction, is whether the actuality of the power *changes* the subject it belongs to or not. For instance, if a surface is painted green, it is subject to a change in color; if, after

²⁷ὅπερ ἢ οὐκ ἔστιν ἀλλοιοῦσθαι (εἰς αὐτὸ γὰρ ἢ ἐπίδοσις καὶ εἰς ἐντελέχειαν) ἢ ἕτερον γένος ἀλλοιώσεως. διὸ οὐ καλῶς ἔχει λέγειν τὸ φρονεῖν, ὅταν φρονῇ, ἀλλοιοῦσθαι, ὥσπερ οὐδὲ τὸν οἰκοδόμον ὅταν οἰκοδομῇ.

²⁸See sect. 3.3 for further discussion of this and related passages.

²⁹For a recent discussion of this passage see Coope 2011. Coope raises a worry whether Aristotle is making the same point in the two passages, observing that in the *Phys.* passage “Aristotle also wants to maintain that acquiring a defect is not an alteration. Acquiring a defect is certainly not a development into a thing's true self” (70). However, as Coope also notes, there is a parallel reason why defects as well as completions or perfections are not alterations: “. . . just as becoming excellent is manifesting a property that I already have, but to a greater degree, so becoming defective is manifesting a property I already have, but to a lesser degree” (71). In both passages, then, Aristotle want to distinguish processes in which a subject moves, as it were, *horizontally* between items on a scale of contrary attributes from processes in which the subject moves, as it were, *vertically* between more and less complete realizations of a single nature. And in both passages Aristotle wishes to reserve ‘alteration’ in its strictest sense for processes of the former variety; cf. An. 2.5, 417^b32–418^a3.

having been painted green, the surface is illuminated by bright clear light, its appearance is altered somewhat—the way in which it looks green is different—but its color has not changed. Similarly, being seen is a second actuality of the color of the green surface, not a change. (Marmodoro 2014, 133; her emphasis)

For Marmodoro a perceptual quality's perceiver-independent actuality (i.e. the illumination of the green surface), as well its perceiver-dependent actuality (i.e. its actually being seen), are stages in the realization of a single capacity (i.e. the one associated the affective quality given by the predicate 'green'). Of the two it is the perceiver-dependent actuality that marks the fullest realization of the quality: "[t]he color *we see*, or generally the qualities we perceive, 'reveal' what these qualities can be, and are, when perceived" (*ibid.*, her emphasis).

This ontology of perceptual qualities amounts to what Marmodoro calls a "subtle" realism on which perceptual qualities, while in some respect objective, perceiver-independent attributes of perceptually qualified bodies, nevertheless depend on perceivers for their fullest realization: "for Aristotle perceptible qualities are in the world such as we perceive them, but only while we perceive them, because they require a perceiver in order to reach their fullest actualization" (Marmodoro 2014, 102). However, in marking the perceiver-dependent actuality as the second and fullest actuality of a perceptual quality, this view treats perceptual qualities as essentially powers to produce perceptual affection. So although Marmodoro's view can accommodate perceiver-independent features of perceptual qualities (for instance, their ability to act on the medium) by appeal to their first or perceiver-independent actuality, it undermines their ontological independence. As we've seen, Aristotle is prepared to accept that a world without perceivers is a world without perceptual objects. Given that, on this view, the fullest expression of a perceptual quality is its being perceived, he should also be prepared to accept that a world without perceivers is a world without colors, sounds, odors, and flavors. Yet he does not, but instead asserts that these qualities, which in a world of perceivers would produce perception, would nevertheless exist. And he in no way indicates that their existence in such a world would be hobbled, alienated from the conditions that would enable the fullest expression of their nature—a nature that moreover would be intelligible in that world only by reference to a counterfactual state of affairs

in which there are suitably equipped perceivers. These considerations strike me as difficulties for Marmodoro's view, and indeed for any view that takes the perceiver-dependent actuality of a perceptual quality to determine any part of its essence.

Silverman (1989) attempts to reconcile the second-actuality approach with the ontological independence of perceptual qualities, but this view seems to me to fare little better. Silverman illustrates the approach using the example of color, which is the focus of his discussion:

. . . Aristotle preserves the asymmetry [i.e. the priority of perceptual qualities to the senses perceptive of them] in the *De Anima* by adjusting his account of the relation between the first actuality of the sensible and its second actuality. Instead of defining the essence of red, for instance, in terms of its second actuality, being seen, he treats the second actuality as the realization of what in the *Posterior Analytics* and *Metaphysics* he calls a necessary accident: a property belonging to a subject in virtue of its essence but not found in an account of that essence That is, in virtue of what, for instance, red is, it is able to cause the perception of red. Since it is the realization of this necessary accident that is one and the same as the second actuality of the sense, the sense and sensible are related in a *καθ' αὐτό* [i.e. *per se* and necessary] fashion. (Silverman 1989, 272–273)

Silverman claims that ontological independence is preserved because the perceiver-dependent actuality of color is distinct from its essence but nevertheless a necessary consequence of it. Visibility isn't *essential* to color, but it is *necessary*, a consequence of what color essentially is. Thus, to generalize Silverman's view, the actuality in terms of which a perceptual quality is defined is not its "second", perceiver-dependent actuality but its "first", perceiver-dependent actuality. Hence the "adjustment" Silverman sees Aristotle making to the relation between first and second actuality is nothing short of denying that the second actuality of a capacity is the fullest realization of its nature: the complete realization of knowledge may be the contemplation of it, but the complete realization of a perceptual quality is not likewise the perception of it.

One may well object to Silverman's use of the labels 'first actuality' and 'second actuality', which Aristotle distinguishes precisely in order to identify the latter as the fullest realization of a potentiality such as those for knowing and perceiving.³⁰ Yet, perhaps surprisingly, Silverman insists that Aristotle "clearly holds" that the perceiver-dependent actuality is the second actu-

³⁰This, I take it, is the substance of Marmodoro's objection to Silverman's interpretation; see Marmodoro 2014, 129–130.

ality of perception (Silverman 1989, 280). The reason, I suspect, is that Silverman does not see Aristotle's terms for the objects of vision and his terms for the qualities that, in a world of visual perceivers, *are* objects of vision as tracking essentially different potentialities. That is, Silverman wants to hold on to the idea that visibility follows from the essence of color even though visibility cannot be admitted into an account of what it is to be colored. His solution is to say that the status of color as an object of vision is a "necessary (or essential) accident" of color, a property that is not the essence of color but which is true of it *in virtue of* its essence.

The problem with this suggestion is that it gets the *per se* connection between being a perceptual quality and being a perceptual object wrong. In saying that visibility is a "necessary accident" of color, Silverman is setting up a comparison between the *per se* connection between color and visibility and the *per se* connection between the terms in demonstrable propositions such as 'all triangles have interior angles equal to two right angles ($2R$)' and—Silverman's example of choice—'all humans can learn grammar'. These attributes are demonstrable because they belong to their respective subjects in virtue of what those subjects are. As a sign of this, notice that in each case the subject cannot be what it is without possessing the relevant attribute: take away the attribute given by the predicate 'has interior angles equal to $2R$ ' and the subject ceases to be a triangle; take away the attribute given by the predicate 'is (always or for the most part) able to learn grammar' and the subject ceases to be human. The same test fails, however, when we consider the proposition 'all colors (or all colored things) are visible': take away the attribute given by 'is an object of vision' and the subject does not cease to be a color (or colored). The reason, I suggest, is that visibility holds of color, not in virtue of what color is, but in virtue of what *visibility* is. On this view, to posit a *per se* connection between color and visibility is to set up a comparison with the terms in demonstrable propositions such as 'all broad-leafed plants are leaf-shedders', which in Aristotle's view holds in virtue of what the *attribute* is. Hence, on this view, *visibility* could not be what it is without its being an attribute of color. But this account of their *per se* connection also erases any temptation to treat visibility as a "second" actuality of color, since there is no suggestion that color could not be what it is if it were not visible.

Nevertheless, there is something importantly right about Silverman's view. The explanatory direction must run from the essence-giving, perceiver-independent actuality of a perceptual quality to its perceiver-dependent actuality. Our question, then, must be how it is that an attribute like color, understood as the quality by which an object is able to set in motion the actually transparent, makes colored objects visible in a world of perceivers.

1.6 Same cause, different effects

In the closing lines of *De Anima* 2.12 Aristotle raises and arguably answers a question that bears directly on the present discussion. He has just observed that imperceptive bodies are "affected in some way" (*παθών τι*) by perceptible qualities, as for instance air that has been affected by odor becomes, not smelling, but *smelly* (424^b16). The observation raises an important question: how does *perceptual* affection differ from the sort of effect perceptual qualities have on imperceptive bodies?

Text 1.11 What then is smelling apart from being in some way affected? Isn't it that smelling is perceiving, while air suddenly affected becomes perceptible?³¹ (*An.* 2.12, 424^b16–18)

The passage has been the subject of intense controversy and a notorious crux of the 20th century debate between materialist and so-called spiritualist interpretations of Aristotle's theory of perception.³² In recent years, however, something of a consensus has arisen that text 1.11 at the very least reflects Aristotle's commitment to something like the following principle:

KINETIC HOMOGENEITY

The motion produced in the sense organ by the actuality of a perceptual quality is of type *T* iff the motion it produces in the medium is of type *T*.³³

³¹τί οὖν ἐστι τὸ ὁσμᾶσθαι παρὰ τὸ πάσχειν τι; ἢ τὸ μὲν ὁσμᾶσθαι αἰσθάνεσθαι, ὁ δ' ἀῆρ παθῶν ταχέως αἰσθητὸς γίνεται; Following Kosman 1975 and many others, I omit καὶ at ^b17.

³²See e.g. Burnyeat 1992, criticized by Sorabji 1992, 219–220, criticized by Johansen 1997, 279n30, criticized by Caston 2002, 756n10.

³³See Burnyeat 2001, 133, Caston 2002, 755–756.

The grounds for attributing such a principle to Aristotle come from the prepositional phrase *παρὰ τὸ πάσχειν τι*, which I translated “apart from being in some way affected”. While in Aristotle’s usage an assertion of the form ‘*X* is something apart from (*παρά*) *Y*’ needn’t entail that *X* is *Y*,³⁴ it does entail that there is *Y as well as X*. It seems therefore to be an implication of text 1.11 that, whatever it is that distinguishes smelling from becoming smelly, it is over and above an affection that is common to both cases. This constrains how we account for the differential impact of a perceptual quality on the medium (which does not perceive) and the perceiver (who does): whatever accounts for the difference must be a component *external* to the common motion suffered by the medium and the perceiver at the hands of the perceptual quality.³⁵

The reason why KINETIC HOMOGENEITY is acceptable to all parties to the debate is that it carries no implications about the nature of perceptual affection. The principle states an equivalence relation, so all that is required of an interpretation according to which perceptual affection is a purely formal or “spiritual” change is that the motion in the medium also be a purely formal or “spiritual” change. Likewise an interpretation according to which perceptual affection is a material or “matter-involving” change must maintain that the motion in the medium is also a material or “matter-involving” change. What I intend to say about the relation between the perceiver-independent and perceiver-dependent actualities of a perceptual quality is also neutral on the nature of perceptual affection, though I think my proposal will remove some of the difficulties sometimes associated with materialist accounts of the perceiver’s transition to second actuality perceiving. My claim will be that what differentiates a perceptual quality’s perceiver-independent and the perceiver-dependent actuality in Aristotle’s view is just this: the latter is the same in number as a perception of the relevant quality, whereas the former is the same in number as a motion in the medium. In accordance with KINETIC HOMOGENEITY, the agency of the perceptual quality in both cases consists in the production of the same type of motion. Yet

³⁴See Johansen 1997, 279n30.

³⁵Cf. Caston 2002, 756: “[i]f perceiving is a special case of undergoing a change [=being in some way affected, *παθῶν τι*] . . . it can only be because of *what else* is true of the event, and not because it involves a distinct sense of ‘undergoing a change’” (his emphasis).

the same motion produces, and is moreover numerically identical to, different types of affection, and to mark this difference Aristotle calls them different actualities of the same perceptual quality.

How can the same motion produce distinct actualities? Starting with the medium, I'll argue that the difference consists wholly in the nature of the affected patient.

1.6.1 Affection of the medium

In the chain of causes linking a perceptually qualified body to a perceiver, the medium plays the role of a *moved mover*: the active quality produces a motion in the medium, which in turn moves the relevant sense organ and produces perception.³⁶ I've argued that the medium may be moved by a perceptual quality in this way even in the absence of a perceiver, and in such cases too its activity may be understood on the model of a moved mover. Take color, an attribute the possession of which enables an object to move an actually transparent medium. Transparency is a nature (*φύσις*) common to air and water, by virtue of which each is subject to a distinctive sort of affection at the hands of fiery bodies, namely *illumination*: actual transparency brought about by the presence of fire is light, and potential transparency brought about by its absence is darkness. So when a colored body comes to be present in an illuminated medium, its potentiality to move the actually transparent is activated.

It is not necessarily the case, however, that all parts of the medium are affected directly and immediately by the actualized quality. This is most evident in the case of the qualities specially perceived by the other distance senses, where it is evident that a perceiver closer to the source of a sound or an odor will perceive it before one more distant from it (cf. *Sens.* 446^a20–25). Indeed, in such cases the sound or the odor will often be more intense for the more proximal perceiver. What explains such phenomena in Aristotle's view is the fact that the medium is continuous, so that its motion is divisible into parts. The parts of the medium directly adjacent to the source of the sound or smell are moved first, and their motion produces further motion

³⁶See e.g. *An.* 2.7, 419^a13–15, ^a25–31; 3.12, 434^b29–435^a2.

in parts of the medium continuous with them. This outward propagation of the motion set up by the actuality of the perceptual quality presupposes relations of efficient-causal priority, first of the actualized quality to the parts of the medium directly adjacent to the qualified body, and then of these to more distal parts of the medium. The directly adjacent parts of the medium are set in motion only if the perceptually qualified body sets them in motion, and the more distal parts of the medium are set in motion only if the more proximal parts are in motion. In cases of local movement efficient-causal priority implies temporal priority, so Aristotle concludes it is reasonable that in the case of sound and odor too what is closer to the source will be affected first. These parts are also affected more intensely, since the force of an external motion in such cases tends to dissipate as it propagates outward from its source.³⁷

Color appears disanalogous to sound and odor in this respect. As Aristotle acknowledges, it is less obvious that there is a discernible difference in time or intensity in the visual experience of the observers at different distances but with equally clear perspectives on a colored object; it is obvious neither that the color reaches the closer observer first, nor that her experience of it is any more vibrant or intense. Aristotle attributes this apparent disanalogy to a difference in the kind of motion color produces in comparison with a quality like sound: sound in actuality seems to be a kind of local movement, whereas color in actuality, if any kind of motion at all, is an alteration of the medium (*Sens.* 446^b29–447^a1). It is not uniformly true of alterations that they propagate in the way local movements do, but neither is it impossible for alterations to unfold in that way:

Text 1.12 For it is possible [for what is altered] to be altered all at once, and not one half of it before [the rest]; e.g. [it is possible] for water to freeze simultaneously in every part. However, if what is heated or frozen is vast, what has it is affected by what has it, but the first part changes on account of itself having

³⁷This account conforms to the model Aristotle provides at *Phys.* 267^a2–10: “. . . what first produces motion is able to move the air or the water or something else which is of such a nature as to move and be moved. But its moving and being moved do not cease at the same time; rather, its being moved ceases at the same time as what moves it ceases moving it, though it is still moving. For this reason too it moves something else adjacent to it—and to this the same account [applies]. But [the moving] stops when power to produce motion (*ἡ δύναμις τοῦ κινεῖν*) comes to be in each case lesser in what is adjacent to it, and finally comes to a stop whenever the prior [mover] no longer imparts moving, but only being moved”.

been altered, and the whole thing need not be altered at the same time.³⁸ (*Sens.* 6, 447^a1–6)

There is moreover good reason to think the alteration set up by color propagates sequentially. As is the case for sound and smell, Aristotle acknowledges that there is a maximal distance beyond which the actually colored object is no longer visible (*Sens.* 449^a27–34). Explaining this sort of phenomenon would be difficult if the parts of the medium more directly adjacent to the colored body did not have some causal priority over the more distant parts. More generally, there is no reason to think that air or water operating as the medium for color is any less continuous or divisible than when it is operating as the medium for sound or odor. That the colors are not *observed* to propagate over time is therefore no evidence that they *don't*. (Aristotle may think that the distance it would have to propagate in order for the interval to be noticeable exceeds the maximal distance of visibility, or that the visible object would have to be massive on a conceivable scale and so visible at inconceivably vast distances.³⁹)

Even in the absence of perceivers, then, the medium operates as a moved mover.⁴⁰ This role of the medium is the key to understanding the sort of motion it suffers by the agency of a perceptual quality. As the moved mover in the chain of causes linking a perceiver to a perceptual quality, the medium acts as what we, on the basis of Aristotle's discussion of affective qualities in *Categories* 8, may call an "affective" affection. Recall from our discussion of that chapter that Aristotle distinguishes affective qualities from what he calls "affections" (πάθη). By 'affections'

³⁸ἐνδέχεται γὰρ ἀθρόον ἀλλοιοῦσθαι, καὶ μὴ τὸ ἥμισυ πρότερον, οἷον τὸ ὕδωρ ἅμα πᾶν πήγνυσθαι. οὐ μὴν ἀλλ' ἂν ἥ πολὺν τὸ θερμαινόμενον ἢ πηγνύμενον, τὸ ἐχόμενον ὑπὸ τοῦ ἐχομένου πάσχει, τὸ δὲ πρῶτον ὑπ' αὐτοῦ τοῦ ἀλλοιοῦντος μεταβάλλει καὶ οὐκ ἀνάγκη ἅμα ἀλλοιοῦσθαι καὶ ἀθρόον. Reading καὶ οὐκ ἀνάγκη at ^a6 with EM and most editors/translators, as is required by the sense of the text.

³⁹Aristotle does however insist that *light* does not travel, arguing that it is not a motion but a sort of presence of a fiery body; see *Sens.* 446^a27–28, cf. *An.* 418^b20–27. This observation occasions an extremely difficult passage in which Aristotle claims that the parts of a perceptual medium are not affected at the same time "except in the case of light for the aforementioned reason [sc. that light is not a motion but a presence], and for the same reason in the case of seeing, since light produces seeing" (447^a9–11). The remark may seem to contradict the interpretation I'm proposing. But note that Aristotle does *not* state explicitly that color affects the transparent as a whole. Moreover, Aristotle's remark that light produces vision is curious, since his official position is that *color* is the *per se* efficient cause of vision. Light is however a precondition for color vision, so Aristotle's point may be that the medium of vision is affected all at once insofar as it is illuminated, which is a cause of vision. It would not follow from this point, however, that the alteration of the medium produced by color does not propagate.

⁴⁰This can be true even of the last portion of the medium to be affected, which may be the terminus of the series only because the motion set up by the activated quality is by that point too weak to impart motive force; see note 37.

he means attributes like the temporary coloration of a face that has become red from embarrassment or white from fear, which in Aristotle's view may be mistaken for affective qualities but which nevertheless have a very different ontological basis in the object possessing the relevant attribute.⁴¹ We saw that the principal contrast between affections and affective qualities is not that the former are engendered through a process of affection (he notes that many objects can acquire qualities like color in that way, 9^b9–11). Nor is it that these attributes lack the power to produce an affection in something else (he observes that the same sort of coloration as that exhibited by the embarrassed or frightened person could come about naturally, 16–19). It is rather because, unlike affective qualities, which are uniformly stable, long-lasting, and hard to change, affections are unstable, ephemeral, and depart soon after the process of affection producing them subsides:

Text 1.13 Those attributes that have their source in certain hard to change and stable affections are called qualities. For if pallor or darkness should have come about in the thing's natural constitution they are called qualities, since in respect of them we are said to be qualified. Or if pallor or darkness should result from a lengthy illness or from a sunburn, and aren't easily gotten rid of or even remain for life, they are called qualities—for in the same way we are said to be qualified in respect of them. But those [attributes] that come about from what is easily gotten rid of and quickly restored are called affections. For no one is said to be qualified in respect of them. For one who has turned red from embarrassment is not called ruddy, nor is one who has turned pale from fear [called] pale, but rather they have been somehow affected. Thus such [attributes] are called affections, not qualities.⁴² (Cat. 8, 9^b19–33)

Aristotle is making a familiar point. We don't say of a Callias blushing from embarrassment that he has a ruddy complexion. We don't because we don't mistake the redness in Callias' face for his actual complexion. Rather than attributing the redness to Callias, it is much more natural to attribute it to his *embarrassment*. We say we can *see* the embarrassment on his face,

⁴¹See sect. 1.1 above.

⁴²ὅσα μὲν οὖν τῶν τοιούτων συμπτωμάτων ἀπὸ τινῶν παθῶν δυσκινήτων καὶ παραμονίμων τὴν ἀρχὴν εἴληφε ποιότητες λέγονται· εἴτε γὰρ ἐν τῇ κατὰ φύσιν συστάσει ὠχρότης ἢ μελανία γεγένηται, ποιότης λέγεται, ποιὸν γὰρ κατὰ ταύτας λεγόμεθα, εἴτε διὰ νόσον μακρὰν ἢ διὰ καῦμα συμβέβηκεν ὠχρότης ἢ μελανία, καὶ μὴ ῥαδίως ἀποκαθίστανται ἢ καὶ διὰ βίου παραμένουσι, ποιότητες καὶ αὐτὰ λέγονται, ὁμοίως γὰρ ποιὸν κατὰ ταύτας λεγόμεθα. ὅσα δὲ ἀπὸ ῥαδίως διαλυομένων καὶ ταχὺ ἀποκαθισταμένων γίγνεται πάθη λέγεται· οὐ γὰρ λέγονται ποιὸν τινες κατὰ ταῦτα· οὔτε γὰρ ὁ ἐρυθριῶν διὰ τὸ αἰσχυνηθῆναι ἐρυθρίας λέγεται, οὔτε ὁ ὠχριῶν διὰ τὸ φοβεῖσθαι ὠχρίας, ἀλλὰ μᾶλλον πεπονημένοι τι· ὥστε πάθη μὲν τὰ τοιαῦτα λέγεται, ποιότητες δὲ οὔ.

AFFECTIVE QUALITY	AFFECTIVE AFFECTION	AFFECTION
embarrassment	redness from embarrassment	perception of redness
perceptual quality	moved medium	affected sense organ

Table 1.2 Structural parallel between agency of the medium and “affective affections”

as if acknowledging that the source of the coloration is not Callias but his emotion. Yet it is nevertheless the case that Callias, as much as the person with a naturally ruddy complexion, *appears* red. Both are productive of a perception of redness, but only one does so by virtue of having the *quality* of redness.⁴³

There is a striking structural parallel between a medium set in motion by a perceptual quality and such “affective” affections (see table 1.2). First, like an affective quality, the medium is a moved mover, an actuality simultaneously dependent on a causally prior actuality and productive of further, causally posterior actualities. Second, the causal agency of the medium, like that of the sort of affective affections we’ve been considering, is dependent on the causal source of its actuality. Just as the ruddy appearance of a blushing Callias lasts only as long as embarrassment has a grip on him, the ability of the medium to produce further motions of the sort set up by the perceptual quality lasts only as long as the motive force set up by the relevant quality remains. Finally, and perhaps most importantly, the moved medium, like the subject of the affective affection, retains its natural character *even while suffering affection*. Just as a blushing Callias retains his complexion, the moved medium does not acquire the quality whose motion it helps to propagate. An actually transparent medium propagates the motion set up by a colored body, but in so doing it does not thereby cease to be transparent.

This proposal captures two important desiderata for an account of the medium’s causal role.

⁴³A slightly more technical way of putting the point would be to make use of Aristotle’s account of inherence in *Cat. 2*, according to which an attribute present *in* something as subject is one “which, being in something not as a part, cannot be separate from what it is present in” (1^a24–25). Aristotle’s point in distinguishing affective qualities from affections seems to me to clarify that while qualities are inherent in their possessors, affections are not. To this extent the proposition that Callias *is* red (or red-faced) is false on the truth conditions for in-predications, whereas an equivalent proposition predicating redness of someone with a ruddy complexion would be true.

First, it allows us to say that the impact of a perceptual quality on the medium is more than a “Cambridge” or relational change.⁴⁴ There are several reasons to resist such an interpretation. For starters, Aristotle uniformly and consistently describes a perceptual quality’s impact on the medium in terms of “motions” (*κινήσεις*), as for instance the actuality of color in the medium is a motion and sound itself is a kind of motion. Further, we’ve seen that Aristotle thinks the motions in the medium *propagate*, with one part of the continuous medium being affected prior to another. Such an account would be hardly intelligible if a perceptual quality had no non-relational effect on the medium. In contrast, by treating the motion set up by a perceptual quality in the medium as an affective affection, we can say that the effect a perceptual quality has on the medium is that of acting on it such that it becomes itself able to produce perceptual affection.

Second, the proposal allows us to say that effect produced in the medium by a perceptual quality is nonetheless that of a temporary affection. It would be too strong to claim that an affected part of the medium has thereby acquired the relevant perceptual quality. The transparent, for instance, is “receptive” (*δεκτικὸν*) of color precisely because it is colorless even in actuality, and the same sort of account applies to the other perceptual media:

Text 1.14 The colorless is receptive of color, the soundless of sound. Now, the transparent is colorless, as is the invisible or scarcely visible, as e.g. darkness seems to be. Such [sc. dark] is the transparent, but not when it is transparent in actuality, rather in potentiality. For this nature is sometimes darkness and sometimes light.⁴⁵ (*An.* 2.7, 418^a26–429^a1)

A medium in actuality that has been affected by the proper perceptual quality does not cease to be receptive of that sort of quality. The transparent, for instance, becomes “incidentally” or “indeterminately” colored.⁴⁶ Such descriptions signal that although the affected medium has acquired the potential to produce further affections of that sort, as though it had become e.g. colored or sounding or odorous, this potential is not due to its having actually *acquired* the rele-

⁴⁴Pace Alexander *apud* Burnyeat 1995, 424; for criticism, see Johansen 1997, 136–145.

⁴⁵ἔστι δὲ χρώματος μὲν δεκτικὸν τὸ ἄχρουν, ψόφου δὲ τὸ ἄψοφον. ἄχρουν δ' ἐστὶ τὸ διαφανὲς καὶ τὸ ἀόρατον ἢ τὸ μάλιστα ὀρώμενον, οἷον δοκεῖ τὸ σκοτεινόν. τοιοῦτον δὲ τὸ διαφανὲς μὲν, ἀλλ' οὐχ ὅταν ἢ ἐντελεχεία διαφανές, ἀλλ' ὅταν δυνάμει· ἢ γὰρ αὐτὴ φύσις ὅτε μὲν σκότος ὅτε δὲ φῶς ἐστὶν.

⁴⁶See *Sens.* 439^a18–19, ^b1–5.

vant quality. Rather, its potency is dependent on the activity of the perceptually qualified body. So the character, intensity, and duration of the motion produced in the medium is dependent on the character, intensity, and duration of the actuality of the relevant perceptual quality. The motion, in other words, is a temporary affection of the medium in actuality, an effect that instills the potency to produce further such affections. But it does so only given the sustained activity of the relevant perceptual quality, which remains the ultimate or “primary” (*πρῶτον*) cause of the resulting affection. Treating the perceptual quality’s movement of the medium as an affective affection provides a plausible model for understanding this type of motion or alteration.

The present proposal has some affinity to Marmodoro’s recent account of medial “disturbances”, according to which the medium is not “changed” by the activity of a perceptual quality, but “suffers only what is required to enable the perceptible form to be ‘commuted’ to the perceiver” (Marmodoro 2014, 149, cf. Scaltsas 1996). On my view too the medium is not changed, if what one means by “changed” is equivalent to becoming qualified in the same way as the perceptually qualified body. However, my view does not require the medium to suffer “only what is required to enable affection of the perceiver”, whatever that may turn out to be. Nothing in the present account rules out that the affection of the medium by a perceptual quality may bring about effects that do not bear on the affection of a perceiver. Further, in light of our above result that being perceptible is a non-essential feature of perceptual qualities, the restriction seems entirely arbitrary. Aristotle in fact explicitly recognizes the possibility of non-perceptual effects, at least in the case of odor: fumes from charcoal may cause asphyxiation in humans, and those of brimstone death in some animals (*Sens.* 5, 444^b30–445^a4). There thus seems to me to be no reason to limit the impact of a perceptual quality on the medium to what is necessary for perception; and if affective affections give a plausible model of the operation of the medium, nothing does so limit the impact of a perceptual quality.

1.6.2 Affection of the perceiver

I've argued that the actuality of a perceptual quality is a motion, either a local movement (as in the case of sound) or a distinctive kind of "alteration" (as in the case of color and likely smell and the objects of the contact senses). Applied to the medium, the motion or alteration set up by the quality is numerically identical to an affection of the medium whereby it acquires the potency to set up further motions without thereby acquiring the relevant quality. By KINETIC HOMOGENEITY it should follow that a sense organ continuous with a medium activated in this way suffers the same sort of affection. What is the evidence Aristotle saw this sort motion involved in the affection of a perceiver?

The best evidence comes from Aristotle's account of the composition of the sense organs. As we've seen, to be receptive of a perceptual quality a subject must lack qualification in the relevant dimension. In Aristotle's view this principle extends as much to the perceiver as it does to the medium. Part of what makes a sense organ receptive to a genus of perceptual quality is that it is composed of the same type of stuff as the medium proper to that genus of perceptual quality (*An.* 3.1, 424^b31–34). For example, the eye as the organ of vision must be made of transparent stuff, either air or water.⁴⁷ Likewise the ear as the organ of hearing is composed of confined, motionless air because air, when suitably confined, possesses in actuality the nature that mediates auditory perception, a nature subsequent commentators dubbed "the transonant" (*τὸ διηχέσ*).⁴⁸

One reason why Aristotle takes the sense organs to be receptive to perceptual qualities in the same way as the relevant medium is that perceptual qualities *affect* the sense organs in the same way as they do their respective media.⁴⁹ Thus Aristotle refers in an important set of passages to the transparent fluid in the eye being moved "qua transparent" by light and by visible objects,

⁴⁷See *Sens.* 438^a12–16: the eye happens to be composed of water because water is more easily confined and condensed than air.

⁴⁸See e.g. Themistius, *in De an.* 62.31, 70.15–21.

⁴⁹There are in fact *several* reasons why the sense organs must qua organs be composed in this way. See chs. 3.2 and 4.6.1 for detailed discussion.

and he associates certain visual pathologies (e.g. hypersensitivity to light) to the eye being inordinately moved “qua fluid” by light and visible objects (*GA* 779^b35–780^a3). Such inordinate motions are malfunctions of the eye, since vision just is a motion of the fluid in the eye qua transparent:

Text 1.15 But seeing *is* the motion of this part [sc. the eye] qua transparent, but not qua fluid.⁵⁰
(*GA* 5.1, 780^a4–5)

To generalize this pattern of explanation, we might say that what it is for a perceptual quality to cause perception is for it to move the perceiver’s relevant sense organ qua medium.

This preliminary account validates KINETIC HOMOGENEITY: the motion of the perceptual quality by which it moves a medium is the same in kind as the motion by which it causes perception in a perceiver. Like the medium, the motion set up in the sense organ by the perceptual quality is an affection in which it acquires the potency to set up further motions without thereby acquiring the relevant quality.⁵¹ It however remains to be shown how the same motion can cause two very different sorts of affection. Why does moving the medium qua medium cause it to become perceptible, while moving the sense organ qua medium cause perception?

The answer, I submit, does not concern *how* the perceptual quality causes affection in the two cases, but rather *what* is affected. In the case of the media, what is affected is something simple: air or water in the case of the external media, which possess natures which enable them to be affected by color, sound, and odor.⁵² These same natures are present in the sense organs, except that they are present, not as natures of simple bodies, but as a *part* of a compound organ

⁵⁰ἔστι δ' ἡ τούτου τοῦ μορίου κίνησις ὄρασις ἢ διαφανὲς ἀλλ' οὐχ ἢ ὑγρόν. Note the emphasis on the copula, which Aristotle places at the front of the sentence to highlight the contrast with the pathological case paraphrased above.

⁵¹This consequence is perhaps reflected in Aristotle’s assertion that what is engaged in seeing (τὸ ὁρῶν) is “as though it had been colored” (ὡς κεχρωμάτισται), so that the subject’s seeing comes to be in a way *visible* (*An.* 425^b17–24). On the interpretation I’m proposing, the implication would be that affection produced by the actuality of a color in the transparent sense organ (as well as the transparent medium) is akin to a process of coloration, since both acquire the potency to set up the sort of chromatic motions produced by the color in actuality. But the process is only *like* a process of coloration, since neither the medium nor the organ acquiring a different color quality.

⁵²See *An.* 424^b29–30. Matters are different in the case of flesh and the tongue, the bodily media of the contact senses, which seem to operate simultaneously as media and as peripheral organs; see *PA* 653^b19–27 and, for discussion, Johansen 1997, 201–212.

of perception. A sense organ such as the eye, in Aristotle's view, is an organic structure. That is, it is (like the living body of which it is a part) a material compound functionally organized for the realization of a psychological capacity possessed by the organism, namely vision. So unlike the motion qua medium of the simple aerial or aqueous stuff that mediates perceptual contact between a perceiver and a perceptually qualified body, the motion qua medium of a sense organ is the realization of an *end* for whose sake the organ is composed and structured as it is. To recall a passage quoted earlier, such a motion when present in the sense organ is a "progression into itself and into its completion" of the organ insofar as it functionally organized for the sake of being receptive to such a motion (see text 1.10 above).

In short, when Aristotle equates seeing with the movement of the fluid part of an eye qua transparent, he is speaking of an *ensouled* eye, an eye endowed with the power to see. An eye severed from a living body could be moved qua transparent by a color as long as it retains its inner moisture, but this motion would not constitute seeing. It is this fact—that the motion qua medium the quality produces in the sense organ is produced in an ensouled organ functionally organized for the sake of being so moved—that makes this actuality of a perceptual quality distinct. Unlike the motion produced in the medium, the motion it produces in the sense organ is the same in number as a *second* actuality, a fuller realization of the nature that is the form and essence of the embodied organ. Because the sense organ, unlike the medium, is functionally organized for the sake of being so affected by the relevant type of perceptual quality, the same activity on the part of the quality can bring about different types of affection, one that is and one that is not the second actuality of a capacity to suffer affection by qualities of that type.

One clear consequence of this interpretation is that Aristotle's notion of second actuality is thinner than it is often understood to be. Specifically, this interpretation distinguishes second actuality, understood as a transition into a fuller realization of a thing's nature, from what are sometimes called "non-destructive changes".⁵³ These are changes that do not involve the destruction of a contrary (as e.g. turning from red to green, where these are understood as af-

⁵³See ch. 3.3 for a fuller development of this view of non-destructive changes.

fective qualities) but rather preserve the potentiality of what is being affected. A non-destructive change may be the second actuality of some capacity, but it would not on this view be *because* it is a non-destructive change. As I've tried to illustrate in the case of affective affections, Aristotle's ontology contains many non-destructive changes that are not second actualities. Indeed, if I am right, the affection produced in the medium by a perceptual quality is a non-destructive change, but it is also not a second actuality—the air surrounding me is *not* there for the sake of mediating color vision. All second actualities however must be non-destructive changes, since it cannot be a fuller realization of one capacity to be replaced with one contrary to it. This is in line with what Aristotle says about second actuality in *De Anima* 2.5; recall from text 1.10 above that Aristotle adduces the status of active contemplation as a complete realization of knowledge as a premise to show that it is a non-destructive change. This is consistent with the idea that these are not both essential features of second actualities.

I claim this consequence as an advantage of the present interpretation. It has long been claimed, especially by spiritualists but also by materialists, that transitions into second actuality have something mysterious and “anti-physicalist” about them from the perspective of modern science. The idea that physical changes of the sort thought to be involved in sense perception can be accomplished without the underlying matter being altered has been held to suggest that the relevant sort of change is not material at all, that it is a purely formal or “spiritual” change with no material component; and it has been a challenge to materialist approaches to show just how a matter-involving change can be non-destructive in the required way. However, if I am right, non-destructive changes are much easier to come by than previously thought. A blushing Callias comes to appear red, but he does not do so by acquiring the quality of redness, since his underlying complexion has not changed. If, as I've suggested, this offers a plausible model for non-destructive changes in general, there should be no mystery at all concerning how such a change can be matter-involving. I emphasize that this does not show that Aristotle is a materialist about perceptual alteration, only that understanding how a non-destructive change can be matter-involving should pose no barrier to a materialist interpretation of his theory of

perception.

1.7 Objectivity and experience

On the interpretation I've presented in this chapter, Aristotle's claim in text 1.1 that there are no perceptual objects in actuality in the absence of perceivers, which has seemed to some as a concession to irrealism, is really no concession at all. The claim relies on an essential distinction between perceptual objects and perceptual qualities. To be a perceptual *object* is to be perceptible by a perceptual capacity, for instance vision or taste. For Aristotle colors, flavors, and other perceptual qualities are the paradigm cases of perceptual objects, the items most strictly perceived by the individual senses and to which they are in their essence related. But in Aristotle's view the status of perceptual qualities as objects of the senses is no part of what it is to *be* those qualities, but an attribute they acquire in virtue of what they essentially are, plus the additional fact that there exist perceivers suitably equipped to be affected by qualities of that sort. The last section sketched a way to discharge a burden of this account, namely the burden of showing how it is that perceptual qualities come to be perceived owing to what they are essentially. I argued that, from the point of view of the quality itself, the (perceiver-dependent) actuality of a perceptual quality relative to a perceiver is no different than its (perceiver-independent) actuality relative to the medium. The evident difference in the effect produced in the two cases, namely that the one becomes actually *perceptive* whereas the other becomes actually *perceptible*, is owing entirely to the nature of the affected subject: in one case, but not in the other, the actuality of the quality is numerically identical to the actual perception of that quality, the fullest realization of the subject's capacity to perceive qualities of that type. So even though it belongs to the essence of the latter to be related to and receptive of the former, it makes no ontological difference from the point of view of a perceptual quality whether it exists in a world of perceivers. We are perceptive so that we may perceive the world, but the world is not perceptually qualified so that we may perceive it.

In concluding, I would like to address a worry that might be raised for an interpretation like

the one I just sketched. The worry, in short, is that Aristotle's view as I've presented it leaves out the subjective and qualitative aspects of sense experience. What differentiates the affection produced by a perceptual quality in the medium and in a suitably equipped perceiver is more than the fact that the latter, but not the former, is the fulfillment of a nature whose fullest realization is to be affected by the relevant type of quality. The affection produced in the perceiver is also an episode of *perception*. It is, in other words, an *experience* of a perceiver, which implies that there is something it is like to be in the perceptual state, i.e. qualities that characterize, in one way or another, the phenomenal state of the active perceiver. It moreover implies that the perceiver in being affected by the perceptually qualified object adopts a *perspective* on that object, so that there is something *subjective* about the way the perceiver is affected. These are characteristics many would be hesitant to attribute to an affection produced in a lifeless medium. Aristotle would agree: he takes it as a distinguishing feature of alterations suffered by animate things that they are "not unaware of being affected" (*οὐ λανθάνει πάσχον*, *Phys.* 244^b15–245^a1). What then is it that imputes these additional experiential features to the affection produced in perceivers?

I think there are a couple of ways to respond to this question. One way is to construe it as a demand for an account of how a perceptual affection can be a *conscious* or phenomenal experience. Admittedly, I have said nothing to account for how the affection of a perceiver gives rise to these aspects of sense experience. Nor, in keeping with my focus on the nature of perceptual qualities, have I here essayed an interpretation of Aristotle's definition of sense (*αἴσθησις*) as "what is receptive of perceptual forms [i.e. bodies insofar as they are colored, flavored, sounding, etc.; cf. 424^a22–23] *without the matter*" (*An.* 423^b17–19), a claim that many have taken to be crucial to Aristotle's understanding of the experiential aspects of perceiving. Though a full defense of this claim will have to wait,⁵⁴ I believe what Aristotle means by this claim is fully consistent with the account of perceptual affection presented in this chapter. But note moreover that nothing I have said so far conflicts with any extant account of consciousness in Aristotelian psychology. For all I have said, the explanation may be that the matter of a living animal body

⁵⁴See ch. 3.3.

is “already pregnant with consciousness”, i.e. that consciousness is a *primitive* feature of matter functionally organized to be affected by a given type of perceptual quality, one that does not admit of a more fundamental analysis (Burnyeat 1992, cf. Burnyeat 2001, 149–150). Or, for all I’ve said, it may be that Aristotle holds a relational account of consciousness, according to which perceptual awareness is explained by the fact that token perceptual states are reflexively directed at themselves as well as at the external perceptual object (Caston 2002). In short, what I’ve said about the nature of perceptual qualities and how they operate on the perceiver is neutral on the important and extremely controversial question of Aristotle’s views on the conscious elements of perceptual experience.

There is, however, another way of construing the question that does bear on Aristotle’s conception of perceptual qualities. On this construal the demand is rather for an account of how perceptual qualities *appear* as they do in sense experience. Perception, we may assume, is an experiential state in which perceptual qualities phenomenally appear to the perceiver in a certain characteristic way. Given that there is a way that perceptual qualities are phenomenally manifest in sense experience, we may ask: what explains how perceptual affection by a particular flavor, or tone, or shade of color produces the phenomenal appearance it does?

This question seems to present a challenge for the sort of account I’ve attributed to Aristotle. I’ve argued that Aristotle accepts a thorough and demanding objectivism about perceptual qualities, according to which objects could be actually flavored, or sounding, or colored *in the fullest sense* even if nothing was suitably equipped to perceive them. These qualities can be fully actualized in the absence of suitably equipped perceivers because their actuality consists, not in being perceived, but in certain interactions—motions and alterations of bodies that serve as the media for perceptual affection—whose nature is fully describable in terms of the general physical principles governing motion and change. So described, however, the actualities of perceptual qualities do not seem to be what we are presented with when we encounter them in sense experience. Colors, in Aristotle’s view, are features of bodies whereby they produce motions in an illuminated medium; yet we would not be tempted to describe colors as they appear to us

in experience in the same way. To this extent the account I've attributed to Aristotle seems to commit him to a contrast between perceptual qualities as they are in themselves and perceptual qualities as they are manifest in experience. Hence, to the extent that the interpretation I've provided fails to spell out the connection between what a perceptual quality is and how it is phenomenally manifest in experience, it appears to fall short.

The challenge as I've presented it embodies an assumption implicit in many contemporary discussions of the nature of perceptible properties, especially contemporary discussions of color.⁵⁵ The thesis states that if the perceptible property in question is a physical property, a property whose nature can be spelled out in terms of the principles and concepts of physics, there is a difference between how properties of that sort are in themselves and how they are manifest in experiences as of them. As a result, the physicalist about perceptible properties is typically held to owe an account of the connection between, on the one hand, the physical property with which she identifies the relevant type of perceptible property and, on the other, the way the property is manifest in experience. For instance, a physicalist about color may hold that colors are identical to "ways of altering light", a description which may apply to a physical disposition of a colored body (or its microphysical grounds), but which would not obviously extend to the colors as they are presented to us in visual experience. The color physicalist therefore seems to owe us an account of the connection between the physical nature of the colors and how they are manifest in experience, an account that will more often than not take the form of the view that the limited access color vision affords us of the colors obscures their natures.

Aristotle's view, on the interpretation I proposed, has affinities to the color physicalist's. Colors and other perceptual qualities in his view are attributes of bodies whereby they produce certain types of physical effects; they are "ways of moving the medium". To this extent he seems likewise bound to give us an account of the contrast between the physical nature of perceptual qualities and how they are manifest in experience. Surprisingly, however, Aristotle does not

⁵⁵In particular, the thesis is implicitly accepted by theorists of color who suppose that if colors are identical to physical properties, then the nature of a color cannot be fully revealed in the experience of it; see e.g. Byrne 2001, Byrne and Hilbert 2007, Campbell 1997, 2005 and, for discussion, see Introduction, xii–xx.

share the assumption that physicalism commits one to a contrast between perceptual qualities as they are in themselves and as they are in experience. That is, Aristotle both accepts that the nature of a perceptual quality is a physical nature, a way of moving the relevant medium, and denies that an account of this nature is something that does not extend to the quality as it is manifest in experience. Understanding why he takes this view will require an examination of the nuanced ontology of perceptual qualities he develops in *De Sensu* 3–5. This examination will be the task of the next chapter.

2

“Mixture and Motion”:

Aristotle on the Nature of Perceptual Qualities

Some metaphysical approaches to perceptual qualities commit us to a distinction between the quality *as we experience it* and the quality *as it really is*. On these approaches, there is the yellow that we see, and then there is what yellow really is; there is the sweetness that we taste, and then there is what sweetness really is. One way of committing us to this distinction is to identify the perceptual quality with features of objects that are *not* manifest to us in experience, or at any rate are not manifest *in the same way*. Yellow and sweet appear to me a certain way in experience. If it turns out that yellow and sweet are identical to properties that do not appear to me in experience (or at any rate do not appear to me in the same way), then there must be a difference between yellow and sweet as they are presented in experience and as they really are in themselves. One metaphysical approach that pretty clearly commits us to this sort of distinction is *physicalism* about a type of perceptual quality. Physicalists about color, for instance, identify yellow with certain physical properties that are causally implicated in standard experiences as of yellow, like the disposition (or a disjunction of dispositions) to reflect, transmit, or emit light at certain wavelengths, or the microphysical properties that ground such dispositions.¹ On this

¹For a defense the first variety of color physicalism, see Byrne and Hilbert 2003; for the second, see McLaughlin 2003. Logue 2016a,b offers a helpful overview of the recent philosophical literature on color.

sort of view, it seems difficult to deny that there is a difference between yellow as we experience it and yellow as it really is, for it just doesn't seem true to say that the yellow I am presented with in experience appears to be a disposition to reflect light at certain wavelengths, much less the microphysical grounds of that disposition. Yellow, on this view, simply doesn't *look* like what it is.

Aristotle too is a physicalist about perceptual qualities. Understood as attributes of a perceptually qualified body, colors, flavors, and indeed each of the qualities specially perceived by a sense are identical to the (non-dispositional) causal ground of the body's ability to produce the relevant type of affection—in other words, to “what each of them is *being which* it will produce perception and actuality [sc. more generally]” (*Sens.* 439^a16–17). Aristotle's physicalism also commits us to a version of the distinction between the quality as we experience it and the quality as it really is. Understood as qualities manifest in perceptual experience, colors, flavors, etc. are (not attributes present in perceptually qualified bodies, but) motions and affections present in a *perceiver* (*An.* 446^a2–6, cf. *Phys.* 202^a13–17). Aristotle marks this ontological difference by distinguishing the quality in potentiality from the quality in actuality. But in recognizing this ontological difference between the perceptual quality itself and the quality as we encounter it in experience, Aristotle does *not* take himself to commit us to the view that colors, flavors, etc. don't *look* like what they really are. I argued in chapter 1 that Aristotle accepts a demanding form of realism, according to which the qualities we encounter in perception are perceiver-independent actualities of a perceptually qualified body. On this view, I suggested, sense perception presents these qualities as the fullest realization of their essential natures, although their achievement of this state of realization depends in no way on their being so perceived. A world without perceivers is in Aristotle's view “a play before empty benches”;² the performance is not canceled for lack of attendance.

The exegetical challenge posed by Aristotle's commitment to this view is to see how, for all their difference, the actuality of a perceptual quality, the quality as we encounter it in experience,

²Schrödinger 1956/2012, 94

is nevertheless the same as what it is potentially, namely the causal ground of an object's ability to produce that sort of perceptual affection. In this chapter I take up this exegetical challenge. I'll argue that in Aristotle's view the potentiality and actuality of a perceptual quality share a common essence. They share an essence in the way that two lemons from the same tree or canvases painted with the same pigment might share a shade of yellow. The phenomenal sameness in these cases is based in a sameness of being or essence: what it is for *this* lemon or *this* canvas to be a given shade of yellow is the same as what it is for *that* one to be the same shade of yellow. For Aristotle the same account applies to the potentiality and actuality of a perceptual quality: what makes a perceptually qualified body yellow (or more generally perceptually qualified in the ways it is) is the same as what makes the motion and affection it produces in a perceiving subject yellow (or more generally the perceptual quality it is). Aristotle describes the essence shared by the potentiality and actuality of a perceptual quality as a type of *ratio* (λόγος), which in different ways determines *both* the causally relevant features of the perceptually qualified body *and* the motions and affections produced by that body in actuality. The quality that we perceive, on this view, is essentially the same as the quality as it inheres in the perceived body. The same quality is both *mixture* and *motion*.

In *De Sensu* 3–5 Aristotle develops a powerful framework for articulating the nature of perceptual qualities in terms of these ratios. The framework draws from his more general account of the structure of quality genera and the nature of qualitative change, but the application of this framework to perceptual qualities presents special difficulties. Aristotle, I think, somewhat falters in his response to these difficulties, but the framework he develops presents a striking contrast to versions of physicalism familiar from contemporary philosophical discussions of color and other perceptual qualities.

2.1 Review: perceptual qualities in *De Anima* and in *De Sensu*

The discussion of colors, sounds and the rest in *De Anima* gives scant indication that they are to be thought of as ratios.³ This is because Aristotle's interest with perceptual qualities in that work is for the most part limited to showing that it belongs to their essence to be able to produce motions in bodies possessed of a special type of nature, for instance transparency or "transonance".⁴ Thus we also find him proposing, in seemingly definitional terms, such characterizations of perceptual qualities as the following:

COLOR AS MOVER OF TRANSPARENT

color := the power to set in motion what is actually transparent

SOUND AS MOVER OF THE "TRANSONANT"

sound := the power to set in motion appropriately compacted air or water

However, Aristotle makes clear in *De Sensu* 3 that such accounts are not to be confused with *definitions* of the relevant qualities (439^a6–17). Characterizing a perceptual quality in terms of its ability to set in motion bodies possessed of a certain nature does not state *what* it is but rather its "function" (ἔργον) and "activity with respect to the sense organs". The sort of account that answers a question like 'what is color?' will specify, not a power to produce a certain sort of motion, but a non-dispositional nature of a colored object "being which it will produce perception and actuality [sc. more generally]". The accounts provided in *De Anima* help to answer what colors, sounds, and other perceptual qualities are, namely by specifying what the relevant actuality is (e.g. moving the actually transparent), but they do not state what the nature *is* that produces such an actuality.

³The most explicit evidence occurs in *An.* 3.2, where Aristotle claims that since voice (a species of sound) is a kind of harmony (συμφωνία), so too must the hearing of voice must be a kind of harmony (426^a27–b7). See ch. 3.3 for detailed discussion of this passage.

⁴See ch. 1.6.2. A notable exception is *An.* 2.8, which contains a uncharacteristically detailed discussion of sound and voice (φωνή), which broadly coheres with the general framework presented in *Sens.* 3–5; see sect. 2.3. But at least part of this discussion may be a transposition from material originally commissioned for works like *Sens.*; cf. Burnyeat 2004.

What, then, are these natures? Aristotle begins spelling out a framework for articulating the nature of perceptual qualities in an extended discussion of color in *De Sensu* 3. The fascinating details of Aristotle's account in that chapter have been the subject of extensive scrutiny in recent literature.⁵ My aim is rather to expose the most general features of Aristotle's account, features which will be implicitly or explicitly applied to all perceptual qualities. With this aim in mind, let us turn to Aristotle's account of color in *De Sensu* 3.

2.2 The nature of color

In *De Sensu* 3 Aristotle's focus is on color *in potentiality*, the features of a colored body whereby it produces motion in the actually transparent. At 439^b11-12 he claims that color is "the limit of the transparent in a bounded body". The claim is based on a parallel with the actuality of the transparent itself. Transparency is a nature that belongs not only to simple bodies like the airy and aquatic media of color vision; it is present in some degree in *all* bodies (439^a21-25). When the body is unbounded, as in the case of the media, the actuality of the transparent is light, and the absence of light is darkness. In *De Anima* Aristotle compared light to the color of the medium (*An.* 418^b11), but in this connection he goes further. The actuality of the transparent in a bounded body, or more precisely in its surface, *is* color (*Sens.* 439^a26-31).

This conclusion sets up an analogy between light and color. Just as the condition of unbounded bodies as actually or potentially transparent is determined by the presence or absence of something, namely fire (or a fiery body), the coloration of the surface of bounded bodies is determined by presence and absence:

Text 2.1 Now, that which when present in air produces light may also be present in the transparent [sc. in the surface of bounded bodies]; it may also fail to be present, but [rather] there may be a privation [of it]. So as in the former case the one [sc. the presence] is light and the other [sc. the privation] is darkness, it is in this way that white and black come about in bodies.⁶ (*Sens.* 3, 439^b14-18)

⁵See most recently Kalderon 2015. Earlier studies worthy of mention include Sorabji 1972 and Broackes 1999.

⁶ἔστι μὲν οὖν ἐνεῖναι ἐν τῷ διαφανεῖ τοῦθ' ὅπερ καὶ ἐν τῷ ἀέρι ποιεῖ φῶς, ἔστι δὲ μή, ἀλλ' ἐστερηθῆσθαι. ὡσπερ οὖν ἐκεῖ τὸ μὲν φῶς τὸ δὲ σκότος, οὕτως ἐν τοῖς σώμασιν ἐγγίγνεται τὸ λευκὸν καὶ τὸ μέλαν.

The analogy is imperfect, however, since Aristotle does not want to identify the color black with the absence of *fire* in the surface of a colored body. The claim that color is the limit of the transparent in a bounded body suggests rather that black should be identified with the absence of *transparency*. On this reading, the analogy identifies extreme contrary degrees of transparency in the surface of a bounded body with extreme contrary colors: white turns out to be identical to the total or maximal presence of transparency in the surface of a bounded body, and black to its total or maximal absence.

The analogy suggests a straightforward interpretation of the claim that color is the limit of the transparent in the surface of a body. The genus of colors in potentiality includes all and only those attributes of which the following may be said:

COLOR AS DEGREE OF TRANSPARENCY IN SURFACE

color := degree of transparency in the surface of a bounded body

The determinate shades or species of color, on this account, correspond to the different degrees in which transparency may be present in a body's surface. Thus the nature of each of the determinate species of color will correspond to some determinate degree of transparency that may be present in a body's surface, and there will be as many species of color as there are degrees of transparency in surface.

What determines the degrees in which the transparent may be present in the surface of a body? Aristotle proposes to explain the proliferation of colors in terms of the interaction of the extreme contraries, black and white. He considers three models for their interaction: juxtaposition, superimposition, and mixture. On each model, the limit of transparency in surface corresponding to each determinate species of color is expressible in some way or other as a ratio (*λόγος*) of black to white. Some of these ratios will be numerically expressible by means of integers, but there may be others whose proportions may be expressible only in terms of the "excess" (*ὑπεροχή*) of one of the ingredients relative to the other. Evidently impressed by an analogy with harmonic theory, Aristotle suggests that, if so, the most pleasant colors will be those that are in numerically expressible ratios, just as the harmonic fifth and octave produce

pleasant tones.⁷

Hence another way of articulating the nature of color is in terms of a ratio of black to white:

COLOR AS RATIO OF EXTREME CONTRARIES

color := ratio of black to white in the surface of a bounded body

On this account what fixes the limit of transparency in surface corresponding to each determinate species of color is the ratio in which black and white are compounded, whether by juxtaposition, superimposition, or mixture.⁸ Aristotle dedicates considerable space to an exploratory discussion of these three models of the interaction of black and white. Ultimately, however, he adopts the model of mixture, arguing that on this model, unlike the others, we can explain the uniform appearance of surface color without appeal to physical minima or imperceptible magnitudes.⁹

Aristotle concludes that “there will be many colors owing to the many ratios in which the ingredients may be mixed with one another” (440^b18–21). But only a handful of these will be among the basic species of color mixed directly from the extremes. This class includes only five shades in addition to black and white: red, yellow, green, deep blue, and violet. Colors outside of this class are derivative, since they must be mixed from the basic species in addition to black and white (442^a20–25). In the course of discussing the three models of interaction Aristotle considers two possible ways of explaining the distinction between the basic and derivative species of color. One possibility is that the basic species correspond to numerically expressible concords, which are few. Alternatively, it may be that all colors are numerically expressible, but only some—the basic species—are ordered or regular (*τεταγμένως*); the derivative colors, on this hypothesis, would be irregular because they are “impure” ratios of ratios (439^b31–440^a6, cf. ^a12–15). Aristotle however is unsatisfied with either explanation, and he concludes his dis-

⁷Sorabji 1972 offers helpful discussion of Aristotle’s use of mathematics in this stretch of *Sens.* 3.

⁸The contrary extremes, black and white, will correspond respectively to the “pure” ratios 1 : 0 and 0 : 1. Construed as ratios, black and white must be distinguished from the black and white understood as terms of the ratio, as Aristotle acknowledges; see below, sect. 2.7.

⁹See *Sens.* 440^b1–17 and, for discussion, Kalderon 2015, ch. 6.

cussion of color on an aporetic note. The distinction between basic and derivative species is a problematic feature of Aristotle's account, and we shall return to it when we turn to the actuality of perceptual qualities.

2.3 Extending the model: presence, absence, and “agent natures”

In *De Sensu* 4 Aristotle turns his attention from color to other perceptual qualities, but he does not make a fresh start from the account he just presented. His strategy is rather to construct parallels with color to guide his discussion of other perceptual qualities, beginning with flavor:

Text 2.2 Just as the colors are [compounded] from a mixture of white and black, so too are the flavors [compounded] from sweet and bitter, and [just as in the case of color] each is [compounded] in a ratio or by the [numerically inexpressible] more and less; [they are also] either of a mixture and motion that accords with certain numerically expressible ratios, or [some are of a mixture and motion] also in an indeterminate way. And [in the latter case] the ones that when mixed produce pleasure are only those in numerically expressible ratios.¹⁰ (*Sens.* 4, 442^a12–17)

The passage recalls salient features of the account of color set out in the *De Sensu* 3. First, flavors are mixtures of a pair of contraries, namely sweet and bitter. As Aristotle argues at length in the lines leading up to text 2.2, sweet and bitter are also related as the presence and absence of a specific affection in the moistened dry (441^b19–21). The relevant affection is “nutritiousness” (*τροφιμότης*, cf. ^b24), the condition of being food for the perceiving animal. Sweetness corresponds to the total or maximal presence of this affection, whereas bitterness corresponds to its total or maximal absence. Next, the determinate species of flavor correspond to the different ratios in which bitter and sweet may be mixed. And finally, there remains the question of the determinacy in number of the flavors, which in terms of their basic species are equal in number to the colors (^a19–20); in this connection Aristotle once again raises the possibility that the basic species of flavor number among those mixed in numerically expressible ratios.

On the basis of these parallels we may propose the following definition of flavor:

¹⁰ ὡσπερ δὲ τὰ χρώματα ἐκ λευκοῦ καὶ μέλανος μίξεώς ἐστιν, οὕτως οἱ χυμοὶ ἐκ γλυκέος καὶ πικροῦ, καὶ κατὰ λόγον δ' ἢ τῷ μᾶλλον καὶ ἥττον ἕκαστοὶ εἰσιν, εἴτε κατ' ἀριθμούς τινας τῆς μίξεως καὶ κινήσεως, εἴτε καὶ ἀορίστως, οἱ δὲ τὴν ἡδονὴν ποιῶντες μειγνύμενοι, οὗτοι ἐν ἀριθμοῖς μόνον.

FLAVOR AS A RATIO OF EXTREME CONTRARIES

flavor := ratio of bitter to sweet in the moistened dry

Equivalently, but with reference to the affection whose presence or absence distinguishes the extremes of flavor, we may circumscribe the genus of flavor as all and only those attributes of which the following definition may be said:

FLAVOR AS DEGREE OF NUTRIMENT

flavor := degree of nutritiousness (for the perceiver) in the moistened dry

Together these accounts highlight three features that make up the general framework within which Aristotle articulates the nature of perceptual qualities. The first feature is a pair of *extreme contraries*. The contraries correspond respectively to the maximal presence and maximal absence of the second feature, an *agent nature* whose degree of relative presence or absence in the relevant sort of body determines the species of that quality genus. Third and finally is the idea that the presence or absence of the relevant agent nature, which in various degrees determine the distinct species of the quality genus, are produced through the *mixture* of the relevant extreme contraries in various ratios.

Each of these features is identified more or less explicitly in the other genera of perceptual quality. Aristotle is once again quite explicit in the case of odor. The kind of odor perceptible by all olfactory animals tracks the species of flavor, since the agent nature associated with it is the “flavored dry” (*Sens.* 443^a6–8; cf. 443^b18–26).¹¹ Thus the contrary extremes of odor coincide with those of flavor, but they are not identical. The extremes of flavor correspond respectively to the maximal presence and absence of an agent nature responsible for a body’s ability to act on the tongue. The extremes of odor, by contrast, correspond respectively to the maximal presence and absence of an agent nature responsible for a body’s capacity to act on a medium, which in this

¹¹Aristotle also recognizes a type of odor perceptible only by humans that is not tied to nutrition, what we might call *fragrance* (443^b26–444^b2). Whereas the pleasantness or unpleasantness of the former type of odors depends on the animal’s appetite, not to mention the food it can eat, fragrances are pleasant or unpleasant *per se*. Aristotle accords to fragrances a role in promoting the health of human beings, who depend on their warming properties to regulate the temperature of their atypically large brains. Aristotle does not go into detail about the nature of fragrances, so I propose to leave this subclass of perceptual quality to one side.

case is defined by its ability to rinse out the flavored dry (442^b29–443^a2). This is one reason why smell and taste are different senses, for though the animal is nourished by the sweet (443^a6–8, cf. ^b18–26), odor as such does not contribute to nutrition (445^a27–29).¹²

Aristotle is less systematic in isolating these features in the case of sound and the special objects of touch, which receive no dedicated treatment in the version of *De Sensu* that we have. Aristotle's discussion of sound is mostly confined to *De Anima*, a discussion whose considerable detail is anomalous relative both to Aristotle's interest in perceptual qualities in that work and to the amount of detailed discussion he devotes to the special objects of the other senses in *De Anima* 2.¹³ The most complete discussion of temperature and moisture is also found outside of *De Sensu*, split between Aristotle's treatise on the elements in *De Generatione et Corruptione* 2 and on chemistry in *Meteorology* 4; and neither text is explicitly concerning with perception.¹⁴ Nevertheless, all three features may be identified in the case of these qualities too. The contrary extremes of sound are sharp and flat in pitch, which reflect extremes in the speed of motion generated by percussion (*An.* 420^a26–^b4).¹⁵ The extreme contraries of temperature and moisture are, respectively, the hot and cold and the wet and dry, which are respectively identical to the presence or absence of elemental fire or water.¹⁶ Thus we arrive at an exhaustive framework for perceptual qualities based on the model provided by Aristotle's account of the nature of color (see Table 2.1).

¹²For discussion, see Johnstone 2012 and Johansen 1997, ch. 5.

¹³Which, again, may suggest that some of this material was originally intended for a work like *Sens.*; see note 4 above.

¹⁴Though see *Meteor.* 341^a13–14 for possible evidence that *Sens.* was meant to contain a discussion of tangible qualities like heat; for discussion, see Burnyeat 2004.

¹⁵Aristotle is clear that differences in the motion generated in the sonic medium reflect differences in the sounding objects, which would be a much better candidate for agent nature of sound. However it is very unclear, to me at any rate, what these differences are. For discussion of the location of sounds in Aristotle's theory, see Johnstone 2013.

¹⁶For cold as the absence of heat, see *Meteor.* 380^a7–8; for dry as the absence of moisture, 381^b29–32. For general discussion of the primary tangibles, see 378^b13–26 with GC 2.2

QUALITY	SPECIAL SENSE	AGENT NATURE	STATE	PRIVATION
COLOR	vision	light (actual transparency)	white	black
SOUND	hearing	$\frac{\text{speed of medial motion}}{\text{time}}$ (?)	sharp	flat
ODOR	smell	flavored dry	sweet	bitter or fetid
FLAVOR	taste	nutritiousness	sweet	bitter
TEMPERATURE	touch	elemental hot	hot	cold
MOISTURE		elemental wet	wet	dry

Table 2.1 An extension of the model of color to the other perceptual qualities

2.4 A “chemical analysis” model of perceptual qualities

If the interpretation so far is correct, then there is a common structure to the nature of the attributes falling under any genus of perceptual quality. The nature of each such attribute is expressible as a ratio of the extreme contraries proper to the genus: black and white, bitter and sweet, cold and hot, and so on. We’ve so far been considering perceptual qualities in potentiality, the features of perceptually qualified bodies whereby they produce the relevant sort of perceptual affection. Understood in this way, the ratio expressing the nature of a perceptual quality reflects certain compositional facts about perceptually qualified bodies, specifically, those that pertain to those bodies’ ability to cause perceptual affection. Considered in potentiality, then, a perceptual quality is a mixture of contrary extremes opposed as the presence and absence—or, as Aristotle sometimes puts it, as the “state” (ἔξις) and “privation” (στέρησις)—of some agent nature. The ratio of a quality’s “constitutive mixture” expresses its nature in the sense of fixing its criteria of identity: two qualities are homogeneous just in case they are mixed from the same ingredients, and they are the same in species just if the ingredients are also mixed in the same ratio. On this picture, determining the nature of a perceptual quality in potentiality is comparable to our modern notion of *chemical analysis*: just as a chemist can determine the identity of a solution by analyzing it into its elemental components, we can arrive at the nature of a perceptual quality

in potentiality by determining the relative proportions of the contrary ingredients present in its constitutive mixture.¹⁷

We may put this “chemical analytic” approach to perceptual qualities in potentiality more precisely by introducing three primitive notions. First, for an arbitrary quality Q_i , let Q^+ and Q^- be the extreme contraries of its genus, Q , such that

$Q^+ :=$ the “state extreme” of Q , and

$Q^- :=$ the “privative extreme” of Q .

Next, let Mix be a function from arbitrary items in the domain of Q -attributes to a ratio of Q^- to Q^+ . Thus we may define the state extreme (understood as an extreme value on a scale of Q -attributes) as the Q_i such that

$$Mix(Q_i) = 0 : 1,$$

and the privative extreme (likewise understood as an extreme value on a scale of Q -attributes) as the Q_i such that

$$Mix(Q_i) = 1 : 0.$$

These values define the limits of the quality scale. Mix assigns to Q -attributes proportions in between these extremes, i.e. in the range between $1 : (0 < x < 1)$ and $(1 > x > 0) : 1$.¹⁸

Note that there is no non-arbitrary limit to the number of ratios falling within this range.

¹⁷I do not intend it to be an implication of this analogy that Aristotle’s notion of chemical mixture is the same as the modern notion. For Aristotle mixture has occurred when contrary ingredients combine in such a way that the resulting mixture is (1) homeomerous and so (2) contains neither ingredient in actuality (but both potentially); see *GC* 1.10, esp. 327^b12–33. This account is indiscriminate between genuine chemical mixture and simple “blends”, e.g. of salt fully dissolved in a volume of water, which also satisfies (1) and (2) on Aristotle’s conception. The analogy I have in mind is rather between the Aristotelian idea that the identity of a perceptual quality is given by the ratio of its constitutive mixture and the modern idea that the identity of a chemical solution may be giving by specifying its constitutive ingredients.

¹⁸This notation is intended to capture how Aristotle applies his conception of mixture to the ontological analysis of perceptual qualities as ratios of contrary extremes, not to model the mathematical properties of that conception. For that, see e.g. Fine (1995), who models Aristotelian mixtures as ordered pairs of ratios; while mathematically more perspicuous, Fine’s model does not cleanly represent Aristotle’s talk of ratios in *Sens*.

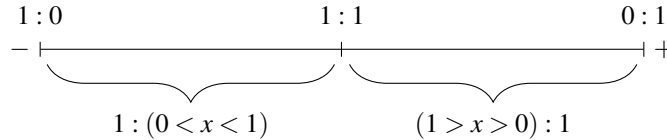


Figure 2.1 The structure of a perceptual quality scale

We would put this by saying that the range between the privative extreme and the state extreme is *dense*. Let ‘ \prec ’ be a binary relation between homogeneous qualities such that

$$Q_i \prec Q_k := Q^+ \text{ is more dominant in } Mix(Q_i) \text{ than in } Mix(Q_k).$$

We may then put this point by saying that, for every Q_i and Q_k such that $Q_i \prec Q_k$, there is a Q_j such that $Q_i \prec Q_j \prec Q_k$. For Aristotle this is to say that perceptual qualities are “continuous” (*συνεχές*), since it is distinctive of continua to be potentially infinitely divisible.¹⁹

Attributes in a perceptual quality genus are therefore best conceived as falling along a scale in which values continuously shade into one another (see Fig. 2.1). The scale may be divided into two broad regions delimited by three values. In each region the values of the scale are mixed predominantly from the extreme contrary directly adjacent to it. The common boundary between each is given by the ratio 1 : 1, the value mixed from equal portions of the state extreme and the privative extreme; call this the *mean* value of the relevant scale. It will be important to keep this picture of quality scales in mind, since Aristotle commonly refers to intermediate qualities of a perceptual quality scale metonymously through the dominant ingredient in their mixture, on the grounds that the character of an intermediate tends toward that of the extreme dominant in its mixture (cf. *Sens.* 448^a1–8).

¹⁹See e.g. *Phys.* 231^b15–18, 232^b20–26.

2.5 The nature of perceptual qualities: a preliminary account

The chemical analysis model of perceptual qualities enables us to state more precisely how the actuality and potentiality of a quality like color share a common essence, and how this connection compares with the intuitive way in which (e.g.) identical shades of color share a common essence. First, however, we must make a clarification. In thinking of the relation of the ratios generated by the *Mix* function and the essence of a perceptual quality, we must keep in mind that we are talking in the latter case about an essence that is an enmattered “natural” form, a form of something whose essential nature cannot be conceived of apart from the matter to which it belongs.²⁰ To the extent that a perceptual quality is inseparable from its matter, it cannot simply be *identified* with the ratio of its mixture, which (as Aristotle’s discussion in *De Sensu* makes clear) is separable in thought from matter. But neither can the form and essence of a perceptual quality simply be identified with the ratio *of its constitutive mixture*, since the actuality of that same quality is not a mixture but a *motion*. The account that best accommodates the evidence from *De Sensu* about the nature of perceptual qualities, I’ll suggest, is an account on which the ratios given by *Mix* rather characterize the essence of a quality that cannot be conceived of apart from the sort of matter to which it belongs, but that in different conditions may be enmattered in both a certain type of corporeal mixture and in a certain kind of motion. In other words, the chemical analysis model describes an enmattered form and essence that can be realized as *both* mixture *and* motion.

Evidence for the separability in thought of the ratios given by *Mix* comes from Aristotle’s notion of “coordinates” (*συστοιχα*), heterogeneous perceptual qualities that share a ratio. To get a grip on this notion, consider how the chemical analysis model handles relations of sameness between homogeneous qualities. Relations of sameness in genus and species may be stated in

²⁰On the distinction between natural and mathematical form, see *An.* 1.1, esp. 403^a3–^b15, and *Met.* 6.1, esp. 1025^b19–1026^a33. The term ‘natural form’ is due to Peramatzis 2011, 2015. The distinction as I intend it is neutral on the issue of whether natural forms are (as Charles 2008 puts it) essentially “matter-involving”. For criticism, see Caston 2008.

terms of the state extreme, the privative extreme, and *Mix*, for instance as follows:

SAMENESS IN GENUS

Q_i and U_i are the same in genus iff $Q^+ = U^+$.

SAMENESS IN SPECIES

Q_i and Q_j are the same in species iff: (a) Q_i, Q_j are the same in genus, and
(b) $Mix(Q_i) = Mix(Q_j)$.

These formulations reflect a certain interpretation of the *Mix* function. They treat *Mix* as a function from *Q*-attributes to an abstract *numerical* ratio—not, as it could also be interpreted, as a ratio of a mixture of contrary extremes. Aristotle’s notion of coordinatehood offers a compelling reason to prefer this interpretation. What this notion shows is that the two clauses in the above formulation of sameness in species are *independent*. On the one hand, two qualities may be the same in genus (in satisfaction of (a)) but return different values when inserted as argument into *Mix* (in violation of (b)); qualities satisfying these constraints would be homogeneous but *different in species*. But on the other hand, two qualities may be different in genus (in violation of (a)) but nevertheless be mixed in the same ratio of their respective extremes (in satisfaction of (b)); qualities satisfying these constraints are what Aristotle refers to as *coordinates*:²¹

COORDINATEHOOD

Q_i and U_i are the same in species iff: (a) $Q^+ \neq U^+$, and
(b) $Mix(Q_i) = Mix(U_i)$.

Coordinatehood is important because it tracks the way (*τρόπος*) in which the senses discriminate (*κρίνουν*) their special qualities, as for instance vision in Aristotle’s view discriminates white in the same way as taste discriminates sweet but opposite to the way taste discriminates bitter. This notion, and especially clause (b) of the above formulation, would however be unintelligible if the ratios given by *Mix* could not be thought of independently of the specific matter in which they are present.

²¹See *Sens.* 447^b30, 448^a13–18.

A different but equally compelling reason not to interpret the ratio given by *Mix* as a ratio of a mixture is that it is not only intended to characterize the corporeal mixtures with which Aristotle identifies the perceptual quality in potentiality. Rather, as Aristotle puts it in text 2.2, it is intended to characterize “a mixture and a motion” (μίξις καὶ κίνησις), namely the medial motion with which Aristotle identifies the perceptual quality in actuality. So far we’ve seen how the chemical analysis model applies to perceptual qualities in potentiality. Each quality is a mixture of the state extreme and privative extreme that define the scale to which it belongs, its value and position on that scale fixed by the ratio of its constitutive mixture determined by *Mix*. Since Aristotle’s theory also calls for extending the chemical analysis model to perceptual qualities in actuality, we would need to model to extend, not only to mixtures present in perceptually qualified bodies, but to motions present in what is affected by these bodies insofar as they are perceptually qualified.

Taken together, these considerations call for a conception of the ratios given by *Mix* as both numerical and descriptive of a natural form and essence that may be realized in both a mixture and a motion. This demand can be met if we adopt the following picture. The sort of ratios generated by the *Mix* function represent mathematical forms, numerical items that may be understood independently of any conception of the sort of matter to which they belong. Applied to perceptual qualities, however, they characterize a natural form that in different conditions must be realized alternatively as corporeal mixtures and as motions present in a certain type of medium. So, applied to perceptual qualities, these ratios characterize a form and essence that, while not conceptually or ontologically separable from matter, is nevertheless not fully determinate in the sort of matter in which it must be present. It is a form that in different conditions is both mixture and motion.

On this picture, the potentiality and actuality of a perceptual quality are the same in essence in much the same way as numerically different objects may have the specifically same color—namely, in Aristotle’s view, because both instantiate the same ratio of the same contrary extremes. In this way, for instance, the actuality of a single perceptually qualified object may consist in the

production of several perceptual motions in several numerically different perceivers:

Text 2.3 Isn't it that everyone perceives numerically one and the same thing, [i.e.] that which first produced the motion (e.g. the bell, or frankincense, or fire), though of course the peculiar thing [perceived by each] is different in number but same in species, which is why many [perceivers] simultaneously see and smell and hear [sc. the same thing]? And these [latter] are not bodies, but an affection and a sort of motion—otherwise this [phenomenon] would not occur—but nor are they without body.²² (*Sens.* 6, 446^b21–26)

But the actuality of a perceptual quality must be more than just the same in species as the potentiality of that quality; it must be the actuality *of* that potential. The fact that you and I are looking at the same object cannot be explained simply by noting that the chromatic motion affecting you is the same in species as the chromatic motion affecting me. (It could be that you and I are looking at visually indistinguishable objects that, though some sort of mirror trickery, seem to each of us to be located in the same place.) What explains the fact that we are viewing the same object is that the (numerically different) motions affecting you and me are both realizations of a single chromatic potentiality in the object. Both motions are the fulfillment of a potential of the object that was actualized when the relevant conditions for actualization obtained—namely, contact with an illuminated medium. And to the extent that the motions are also the same in species, this is to be explained by reference to the fact that they are actualizations of the same potential.

It is this picture that I want to capture with the idea that the potentiality and actuality of a perceptual quality share a common essence, one that is both mixture and motion. As I shall argue in what follows, the chemical analysis model accommodates both aspects of perceptual qualities. The same ratio that describes the constitutive mixture of qualities in potentiality also describes the character of the motions each produces in actuality. Aristotle details the principles governing the actualization of perceptual qualities near the end of *De Sensu*. Before that, however, he has to address a problem. The problem, in short, is that the chemical analysis model seems to *overgenerate* qualities. Perceptual quality scales are continua, which means that there

²²ἢ τοῦ μὲν κινήσαντος πρώτου, οἷον τῆς κώδωνος ἢ λιβανωτοῦ ἢ πυρός, τοῦ αὐτοῦ καὶ ἐνὸς ἀριθμῶ αἰσθάνονται πάντες, τοῦ δὲ δὴ ἰδίου ἑτέρου ἀριθμῶ, εἶδει δὲ τοῦ αὐτοῦ, διὸ ἅμα πολλοὶ ὁρῶσι καὶ ὁσμῶνται καὶ ἀκούουσιν; ἔστι δ' οὔτε σώματα ταῦτα, ἀλλὰ πάθος καὶ κίνησίς τις (οὐ γὰρ ἂν τοῦτο συνέβαιεν), οὔτ' ἄνευ σώματος. Cf. Ps.-Aristotle, *MXG* 981^b9–17.

is a dense infinity of values falling between the privative extreme and the state extreme. There thus seems to be no a priori limit to the number of species in a perceptual quality genus, since there are infinite numerical values *Mix* can assign to distinct species. In Aristotle's view, however, the actual quality species we encounter in experience are "determinate and not unlimited" (*Sens.* 440^b24). If, as the above account of perceptual qualities in potentiality suggests, there is a dense infinity of qualities on any given scale, why don't we perceive an infinity of colors, flavors, odors, etc.? Why, in other words, is our perceptual experience so circumscribed?

As I understand it, this is a problem with extending to the actuality of perceptual qualities the model that has so far only been applied to those qualities in potentiality. It has not always been understood in this way, however. Showing that this is Aristotle's concern will provide considerable support for the interpretation I'm urging, so I propose to look at the problem (and Aristotle's rather disappointing solution) in some detail.

2.6 A problem concerning the actuality of perceptual qualities

When, in *De Sensu* 6, Aristotle returns to this question of why perceptual quality species are determinate, it becomes clear that the answer has to do with the distinction between the potentiality and actuality of a perceptual quality. Perceptual quality scales *are* continuous in potentiality, but in actuality they are limited in their species:

Text 2.4 Everything of which there are extremes must be limited in what is between them. Contraries are extremes, and every perceptual object admits of contrariety. For instance, in color there is white and black, in flavor sweet and bitter, and in all the others the contraries are extremes. Now, whereas what is continuous may be cut into an unlimited number of unequal [parts] or a limited number of equal [parts], what is continuous but not *per se* [may be cut] into a limited number of species. So, since the affections [sc. produced by perceptual qualities] are spoken of in terms of species, while in every case continuity is present in these [perceptual qualities], it remains that the [perceptual quality] is different in potentiality and in actuality.²³ (*Sens.* 6, 445^b23–31)

²³ ὦν μὲν γὰρ ἐστὶν ἔσχατα, ἀνάγκη πεπεράνθαι τὰ ἐντός· τὰ δ' ἐναντία ἔσχατα, πᾶν δὲ τὸ αἰσθητὸν ἔχει ἐναντίωσιν, οἶον ἐν χρώματι τὸ λευκὸν καὶ τὸ μέλαν, ἐν χυμῶ γλυκὴ καὶ πικρὸν· καὶ ἐν τοῖς ἄλλοις δὴ πᾶσιν ἐστὶν ἔσχατα τὰ ἐναντία. τὸ μὲν οὖν συνεχὲς εἰς ἄπειρα τέμνεται ἄνισα, εἰς δ' ἴσα πεπερασμένα· τὸ δὲ μὴ καθ' αὐτὸ συνεχὲς εἰς πεπερασμένα εἶδη. ἐπεὶ οὖν τὰ μὲν πάθη ὡς εἶδη λεκτέον, ὑπάρχει δὲ συνέχεια αἰεὶ ἐν τούτοις, ληπτέον ὅτι τὸ δυνάμει καὶ τὸ ἐνεργείᾳ ἕτερον.

In actuality, perceptual qualities are affections produced by a perceptually qualified object, and in this condition they are spoken of in terms of determinate species. However, even in this condition continuity belongs to each of them, presumably in potentiality, as compounds of extremes present in perceptible bodies. Considered in actuality, then, perceptual qualities are only *incidentally* continuous, insofar as they are affections produced by qualities that lie on a continuous scale.

This much of the position is clear, but its details are difficult to understand. One point at issue is how the determinacy in number of perceptual qualities in actuality can be reconciled with a dense infinity of perceptual qualities in potentiality. This point concerns the proper interpretation of Aristotle's crucial distinction between *per se* and incidental continuity. Still more crucial is the proper interpretation of the premise that generates the difficulty in the first place, namely that "everything of which there are extremes must be limited in what is between them". What motivate this premise are not, as some commentators have supposed, observations about the nature of our experience of perceptual qualities, for instance that we perceive only a limited number of colors or sounds.²⁴ Instead, it is a general conception of alteration within genera that exhibit contrariety of the sort exhibited by perceptual qualities. In employing the model of mixture, Aristotle treats perceptual qualities as a special instance of a type of genus in which species are ranged in between extreme contraries. Aristotle's primary interest in developing this general account is to make sense of a certain features of change, and in particular qualitative change, between extremes in such genera. Before offering an interpretation of text 2.4, then, we need briefly to introduce this account, which serves as necessary background for the discussion to follow.

²⁴See Kalderon 2015, 129; Sorabji and Kretzmann 1976, 80; G. R. T. Ross 1906 and W. D. Ross 1955, notes ad loc.

2.7 Interlude: a compositional approach to intermediacy

For Aristotle all qualitative change, or alteration, is between contrary attributes. One type of alteration, which occurs between contradictory attributes, is *binary*. The transition between ignorance and knowledge is an example of this sort of alteration: to assert that a subject has acquired knowledge of grammar is to assert that she has ceased to be ignorant of it; and if a subject somehow loses grammatical knowledge we say she has come once again to be ignorant of it. Other types of alteration are not binary but, as we might put it, *gradual*. A log placed on a campfire undergoes an alteration in temperature; it comes to be hot. This is a change between contraries related as state and privation, in this case hot and cold, but the removal of one attribute does not entail the possession of the other. Before the log becomes hot, it must first become tepid, then lukewarm, and so on. These qualities, which the log must serially acquire and lose before it reaches the contrary extreme, Aristotle calls *intermediates* (τὰ μεταξύ), and he proposes a general account of intermediacy in genera that exhibit such gradual change.

In Aristotle's account there are two features distinctive of intermediates (*Met.* 1057^a18–30). First, they fall *between* extreme contraries, in the sense that changes from one contrary to the other must proceed through them. Second, they are *homogeneous* with the extremes they fall between. He proposes a common explanation for these features:

Text 2.5 Since among contraries it is possible for there to be something intermediate, and [since] of some there *is* [an intermediate], **it is necessary for the intermediates to be from the contraries.** For every intermediate is in the same genus and in between the things of which they are intermediate. For we call those things intermediate into which something changing must change into first. For instance, if one were to pass from the highest to the lowest [string] in the shortest time, one will reach the intermediate strings first; and if among colors [one should pass] from white to black, one will sooner reach crimson and gray than black; and so on in the other cases. But it is not possible to change from one genus into another, for instance from color into figure, except incidentally. Therefore it is necessary that the intermediates be in the same genus both as one another and as the things they are intermediate between.²⁵

(*Met.* 10.7, 1057^a18–30)

²⁵ ἐπεὶ δὲ τῶν ἐναντίων ἐνδέχεται εἶναι τι μεταξὺ καὶ ἐνίων ἔστιν, ἀνάγκη ἐκ τῶν ἐναντίων εἶναι τὰ μεταξύ. πάντα γὰρ τὰ μεταξὺ ἐν τῷ αὐτῷ γένει ἐστὶ καὶ ὧν ἐστὶ μεταξύ. μεταξὺ μὲν γὰρ ταῦτα λέγομεν εἰς ὅσα μεταβάλλειν ἀνάγκη πρότερον τὸ μεταβάλλον (οἶον ἀπὸ τῆς ὑπάτης ἐπὶ τὴν νήτην εἰ μεταβαίνοι τῷ ὀλιγίστῳ, ἥξει πρότερον εἰς τοὺς μεταξὺ φθόγγους, καὶ ἐν χρώμασι εἰ ἐκ τοῦ λευκοῦ εἰς τὸ μέλαν, πρότερον ἥξει εἰς τὸ φοινικοῦν καὶ φαιδὸν ἢ εἰς τὸ μέλαν· ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων).

Aristotle goes on to make clear that this compositional account of the intermediates requires that we distinguish two sorts of extremes. On the one hand, there are the extremes that *delimit* the continuum of qualities falling under the genus; on the other hand, there are the extremes that act as the uncompounded *principles* of the genus:

Text 2.6 So the contraries are uncompounded from each other; therefore they are principles [sc. of the genus]. But the intermediates [are compounded], either all or none of them. Now something comes about from the contraries, so that a change will be into this before it is into them [sc. the extremes], since it [sc. what comes about from the contraries] will be both less and more than each of them. Therefore it will be also intermediate between the contraries. Therefore the other intermediates will also be compounds. For what is more than one thing and less than another is in a way compounded from the things of which it is said to be respectively more and less. And since nothing else of the same genus is prior besides the contraries, all of the intermediates would be from the contraries, so that everything lower [sc. than these contraries], both the contraries and the intermediates, will be from the primary contraries.²⁶

(*Met.* 10.7, 1057^b22–32)

Thus, to take up our previous example, absolute hot and cold, understood as extreme contraries of the temperature scale, will designate *both* the limits of the temperature scale *and* the principles composing the qualities falling along it. Intermediate temperatures, each of which is to varying degrees hotter than absolute cold and colder than absolute hot, are compounds of these extremes, so that the differences each manifests in the degree of heat or cold is traceable back to differences in their composition.

It should be clear how Aristotle's framework for articulating the nature of perceptual qualities draws on this compositional account of intermediacy. As the chemical analysis model shows, the identity of a genus of perceptual quality is determined by a pair of primary contraries, what I have been calling the state extreme and the privative extreme. And the values of the scale of attributes falling under the genus are composed of the primary contraries: the extreme values

μεταβάλλειν δ' ἐξ ἄλλου γένους εἰς ἄλλο γένος οὐκ ἔστιν ἀλλ' ἢ κατὰ συμβεβηκός, οἷον ἐκ χρώματος εἰς σχῆμα. ἀνάγκη ἄρα τὰ μεταξὺ καὶ αὐτοῖς καὶ ὧν μεταξὺ εἰσιν ἐν τῷ αὐτῷ γένει εἶναι.

²⁶τὰ μὲν οὖν ἐναντία ἀσύνθετα ἐξ ἀλλήλων, ὥστε ἀρχαί· τὰ δὲ μεταξὺ ἢ πάντα ἢ οὐθέν. ἐκ δὲ τῶν ἐναντίων γίγνεται τι, ὥστ' ἔσται μεταβολὴ εἰς τοῦτο πρὶν ἢ εἰς αὐτά· ἐκατέρου γὰρ καὶ ἦττον ἔσται καὶ μᾶλλον. μεταξὺ ἄρα ἔσται καὶ τοῦτο τῶν ἐναντίων. καὶ τᾶλλα ἄρα πάντα σύνθετα τὰ μεταξὺ· τὸ γὰρ τοῦ μὲν μᾶλλον τοῦ δ' ἦττον σύνθετόν πως ἐξ ἐκείνων ὧν λέγεται εἶναι τοῦ μὲν μᾶλλον τοῦ δ' ἦττον. ἐπεὶ δ' οὐκ ἔστιν ἕτερα πρότερα ὁμογενῆ τῶν ἐναντίων, ἅπαντ' ἂν ἐκ τῶν ἐναντίων εἴη τὰ μεταξὺ, ὥστε καὶ τὰ κάτω πάντα, καὶ τὰναντία καὶ τὰ μεταξὺ, ἐκ τῶν πρώτων ἐναντίων ἔσονται.

of the scale are composed solely of one or the other primary contrary, whereas the intermediate values of the scale contain portions of each.

The principles Aristotle takes to govern mixture generally validate this account of the relation of the intermediates to the primary contraries. First, mixture can occur only between items that are homogeneous and so admit of contrariety (*GC* 328^a32–36). This condition appropriately confines intermediates and their contrary ingredients to the same genus. Second, the character of the resulting compound is a function of the relative portions of the initial contrary ingredients, according to which “each [ingredient] changes from its own nature into that of the stronger, not however becoming the other but intermediate and common [to both]” (328^a29–31). Thus the character of the resulting compound comes to resemble one ingredient or another according to the degree to which it dominates over the other in the mixture. This condition nicely accounts for the behavior of changes from one extreme to its contrary on a scale of qualities of the sort we’ve been considering. Finally, on Aristotle’s theory the initial ingredients are not destroyed in the process of mixture; rather, they are preserved “in potentiality”, such that they are in principle entirely recoverable (327^b22–26). This allows for the characterization of mixtures in terms of their constitutive ratio, the relative portions of initial ingredients forming the resulting compound.²⁷

2.8 The determinacy of perceptual quality species

Viewed against the background of this account of intermediacy, it is clear why what comes in between contrary extremes must be finite. The intermediates represent stages in an alteration between extreme contraries. If the intermediates were unlimited, the change would have to proceed in an unlimited number of stages, which could not be carried out in a limited amount of time. How, then, do we introduce appropriate constraints on the number of intermediates on a perceptual quality scale?

²⁷See Fine 1995 for detailed discussion of the role of this compositional account of intermediacy in Aristotle’s theory of mixture.

One might try to introduce the necessary constraints in a way analogous to how Aristotle responds to one of Zeno's paradoxes of motion (*Phys.* 233^a21–31). One could, for instance, say that the "quality space" traversed in such a change, though potentially infinitely divisible, may be parceled into a finite number of stages. Kalderon has recently defended an interpretation of this sort, according to which "perceptual discrimination imposes a discontinuous chunking on a sensible continuity . . . but a continuity always subsists in these since there are infinitely many potential discriminations to be made, perhaps in other, more fortuitous, potential circumstances of perception" (Kalderon 2015, 129). This however appears to be precisely the solution Aristotle wishes to *rule out* by denying that perceptual qualities in actuality are continuous *per se*. Aristotle is no doubt alive to the possibility that the character of a perceptual experience depends on external conditions. Violet, for instance, appears differently against white and dark backgrounds, and the appearance of a colored object shifts with differing conditions of illumination (*Meteor.* 375^a23–28). He also acknowledges that different species of animal may differ in the range of differentiae they can discriminate within a genus of perceptual quality (*GA* 780^b13 ff.). Perceivers differing either in the conditions of perception or in the range of discriminable species will discriminate only a finite number of species in a given genus of perceptual quality. Yet Aristotle resists identifying the *species* of a perceptual quality genus with the differentiae discriminable by an arbitrary species of perceiver in arbitrary perceptual conditions. Part of what makes perceptual qualities in actuality incidentally continuous is that they are divisible into a limited number of *determinate* species, but on this interpretation it appears arbitrary how perceptual quality scales are to be divided.

I suspect Aristotle's commitment to the determinacy in species of a perceptual quality in actuality has less to do with the putative discreteness of a perceiver's *experience* of perceptual qualities than with the theoretical *role* of the basic species. For Aristotle it is not arbitrary that the extremes of the color scale generate five intermediate species of color, and that the extremes of flavor likewise generate five intermediate species of flavor. He posits that the interaction of the state extreme and the privative extreme alone generates only a finite number of basic species,

and in turn gives a role to the basic species in the generation of the derivative species, precisely *because* this framework provides a principled way to distinguish a finite number of intermediates.

Aristotle may be also relying on empirical support for the distinction, which is once again extrapolated from the case of color to cover all perceptual qualities. Consider the rainbow. In Aristotle's color vocabulary there are three colors in a rainbow, red (*φοινικοῦν*), green (*πράσινον*), and violet (*άλουργόν*), although yellow (*ξανθόν*) sometimes appears between red and green (*Meteor.* 371^b33–372^a10). Aristotle seems to have understood that rainbows are caused by the reflection of the sun,²⁸ and he proposes to account for the appearance of the rainbow's colors in terms of an alteration brought about by the reflection's progressive weakening of the visual motion:

Text 2.7 For it happens that when a cloud is near the sun it does not appear colored but white to one looking at it, whereas to one observing the same [cloud] in water it appears in a way to have the color of the rainbow. Therefore it is clear that, on account of its weakness, reflected sight makes black appear blacker, as it also [makes] white [appear] less white, and pushes it toward black. Now, stronger sight changes color to red, then to green, and still weaker sight changes [the color] to violet. Nothing further appears apart from these three, and just as in most other cases, the completion [of the series] is with these—change into the rest is imperceptible. For this reason too the rainbow appears tricolored . . .²⁹
(*Meteor.* 3.5, 374^b24–375^a1)

Translated into an intromission theory of vision,³⁰ the rainbow seems to display simultaneously the serial stages of the process by which an initially white visual motion weakens to that of a

²⁸See Wilson 2013, ch. 6 for a recent critical evaluation.

²⁹συμβαίνει γὰρ ὅταν ἦ τοῦ ἡλίου νέφος πλησίον, εἰς μὲν αὐτὸ βλέποντι μηδὲν φαίνεσθαι κεχρωματισμένον ἀλλ' εἶναι λευκόν, ἐν δὲ τῷ ὕδατι αὐτὸ τοῦτο θεωροῦντι χρώμα τι ἔχειν τῆς ἱριδος. δῆλον τοίνυν ὅτι ἡ ὄψις ὥσπερ καὶ τὸ μέλαν κλωμένη δι' ἀσθένειαν μελάντερον ποιεῖ φαίνεσθαι, καὶ τὸ λευκὸν ἦττον λευκόν, καὶ προσάγει πρὸς τὸ μέλαν. ἡ μὲν οὖν ἰσχυροτέρα ὄψις εἰς φοινικοῦν χρώμα μετέβαλεν, ἡ δ' ἐχομένη εἰς τὸ πράσινον, ἡ δὲ ἔτι ἀσθενεστέρα εἰς τὸ άλουργόν. ἐπὶ δὲ τὸ πλέον οὐκέτι φαίνεται, ἀλλ' ἐν τοῖς τρισίν, ὥσπερ καὶ τῶν ἄλλων τὰ πλείιστα, καὶ τούτων ἔσχεν τέλος· τῶν δ' ἄλλων ἀναίσθητος ἡ μεταβολή. διὸ καὶ ἡ ἱρις τρίχρως φαίνεται . . .

³⁰The account as stated presupposes an extramission theory of vision. What suffers alteration through refraction is not a visual motion from the sun but a visual ray (*ὄψις*) emitted from the eye. This sort of theory contradicts the intromissive account Aristotle develops in *De Anima*, which is also presupposed throughout *De Sensu* and the rest of *Parva Naturalia*. However, the context surrounding text 2.7 makes clear that the account on offer is meant to be agnostic both about the scientific facts concerning vision and about the location of the change, whether the alteration is of the subject's vision or of the seen object; see 374^b15–18, 22–24.

darker color. What is remarkable about the process is that it seems to occur in discrete stages: red, green, violet, and ultimately, as the visual motion gives out, black (cf. 374^b13–15). Though there are colors in between these primary species, the change into them is “imperceptible”, which is why they don’t appear in the rainbow.

It is no coincidence that in *De Sensu* Aristotle reckons red, green, violet, and yellow (which, recall, sometimes does appear in the series) among the basic species of color. Rather, these colors are basic *because* they are the observable intermediates in changes between the extremes of black and white. (The remaining basic color is deep blue (*κυανοῦν*), which does not appear in the rainbow but seems also to be a perceptible stage in the series from white to black; this, for instance, is a color one experiences when looking into a deep chasm into which little light reaches: cf. *Meteor.* 342^b14–16.) In this light Aristotle’s appeal to the distinction between the potentiality and actuality of colors and other perceptual qualities in text 2.4 looks to be an attempt to reconcile the scientific account he has been developing, according to which the nature of a perceptual quality locates it on a continuous scale, with a particular conception of qualitative change as discrete and noncontinuous, a conception that also coheres with certain facts about our experience of perceptual qualities. As is often the case, Aristotle’s solution is to say that these seemingly conflicting reports are not really in conflict, since they pertain to different aspects of perceptual qualities. Continuity is a feature of perceptual qualities understood as attributes of perceptually qualified bodies, whereas discreteness is a feature of perceptual qualities understood as affections or motions in the medium or in a perceiver.

Of course, the challenge faced by this approach is to explain how a continuous alteration could produce such a discontinuous series. One proposal, due to Sorabji and Kretzmann (1976, 80), draws a comparison with the movement of a stopper along a vibrating string: “as the stopper moves along the vibrating string, we hear the sound all the time, but we do not hear a change of pitch, until the stopper has moved the distance that corresponds to a quarter tone”. Similarly, though the continuously weakening visual motion does not at any point cease alteration, no change in color is visible until it has been weakened to the point at which it reaches the next

basic color in the series. Of course, it is not that there are *no* qualities intermediate between the basic species. There are, it is just that in alterations of the type we are considering they are present only *potentially*. The semitone is present as the stopper moves to the distance at which it reaches the quarter tone, but it escapes notice (*Sens.* 446^a1–6). Similarly, we might say that orange is present as the visual motion changes from red to yellow, but it goes unnoticed. The imperceptibility of these derivative qualities is not attributable to a failure of the perceiver to *discern* them, but to their being only potentially present in the series. There *is* a position in the series corresponding to the ratio definitive of the derivative quality. But unlike the basic species, it is never actualized in alterations along the scale, so it never produces a motion that could affect the medium or a perceiver. In order to be so actualized, the qualities must first be separated out by mixture.

Other empirical observations may have led Aristotle to the conclusion that the derivative species of color require separation via mixture. For example, he reports that painters can obtain almost all of the colors by mixing (*κραννύναι*) except red, green, and violet—the colors of the rainbow (*Meteor.* 372^a5–8); this lends support to the idea that these colors are somehow more *basic*, and perhaps that the colors that can be obtained by mixing are somehow dependent on them. And anyway it is true that some colors, like brown, never appear in spectra produced by refracted light; if one were like Aristotle committed to a scalar conception of perceptual qualities, this might lend support to the idea that such colors must be merely potentially present on the scale. In general, however, it must be conceded that conclusive evidence for this picture is lacking. Aristotle is wrong to think that perceptual qualities in actuality are discontinuous. The rainbow is not tricolored but a prismatic spectrum. Nor indeed does the rainbow provide a satisfactory mapping of color space: the familiar color solid differentiates the shades along three dimensions, whereas Aristotle's scalar theory only captures one, the dimension of lightness.

These inadequacies are not simply the result of careless observation, however. They stem from commitments much more central to Aristotle's theory. Perceptual qualities are conceived as two-dimensional scales not only on the basis of phenomena such as the rainbow, but because

Aristotle conceives of perceptual qualities in potentiality as attributes of perceptually qualified bodies and therefore as subject to analysis in terms of his general account of qualitative change. Similarly, Aristotle adopts the model of mixture not only because it better handles phenomena such as color constancy at various distances, but because the more general principles governing mixture allow him to trace qualitative differences in the affections produced by specifically different perceptual qualities to quantitative differences in their constitutive mixtures. This is the most substantial upshot of Aristotle's chemical analysis model, and I will devote the remainder of this chapter to exploring it. The lesson of text 2.4 is not that Aristotle's theory of color and other perceptual qualities were arrived at on the basis of careful (or careless) empirical observation. The lesson is that, however the theory was arrived at, Aristotle held it as a condition of adequacy that it respect the observed phenomena.

2.9 Perceptual motions on the chemical analysis model

In defending the determinacy of the species of a perceptual qualities in actuality Aristotle is not denying that perceptual quality scales are continuous.³¹ Rather, he is acknowledging a datum he thinks must be accommodated by any credible account of the nature of perceptual qualities. He remains committed to the chemical analysis model he used to describe perceptual qualities in potentiality, and to the dense (potential) infinity of qualities it generates. And having dealt to his satisfaction with the problem this model poses for the evident determinacy of perceptual quality species, he turns in *De Sensu* 7 to applying this model to the actuality of perceptual qualities. As with the corporeal mixtures with which he identifies the qualities in potentiality, Aristotle argues that the *qualitative* differences among the motions they generate in actuality are determined by *quantitative* differences in the ratios of extreme contraries that characterize the motions. With the important exception of the mean, it turns out that each of the potentially infinite values of a perceptual quality scale has its own actuality; each, in other words, is productive of a distinctive

³¹Contrast G. R. T. Ross 1906, note *ad* 445^b24, and, perhaps, W. D. Ross 1955, note *ad* 445^b27–29.

type of motion. This section elaborates the principles governing this extension of the chemical analysis model.

Let's first get clear on the *explananda*. Recall from section 2.4 that a perceptual quality scale divides into two regions bordered by three limits, the state extreme, the privative extreme, and the mean. As we observed, Aristotle is in the practice of referring to qualities in terms of the extreme that dominates in their constitutive mixture; thus, for instance, gray and deep blue are dark colors, red and yellow light. This suggests that the values of a perceptual quality scale can be divided into three types: where Q_i is a value on an ordered perceptual quality scale $Q_1 \dots Q_n$, exactly one of the following will be true of $Mix(Q_i)$:

- (1) $Mix(Q_i) = (0 < x < 1) : 1$, so that Q_i belongs to the "stative" region of $Q_1 \dots Q_n$,
- (2) $Mix(Q_i) = 1 : (0 < x < 1)$, so that Q_i belongs to the privative region of $Q_1 \dots Q_n$, or
- (3) $Mix(Q_i) = 1 : 1$ so that Q_i is the mean value of $Q_1 \dots Q_n$.

Intuitively, the values of the color scale that satisfy (1) are the dark colors, and the values that satisfy (2) are the light colors. (Which quality, if any, satisfies (3) will be considered separately, in sect. 2.9.3.) Moreover, the values in which one extreme dominates to a greater extent over the other, and so lie closer to the dominant extreme on the scale, are intuitively qualitatively more similar to the relevant extreme: colors that contain more black appear darker, whereas colors that contain more white appear lighter. To validate these intuitions, Aristotle introduces three principles that together explain how the manifest qualitative differences among perceptual qualities in actuality depend on underlying quantitative difference in the ratios of their constitutive mixtures.

Although the context in which Aristotle articulates these principles is highly aporetic, it can nevertheless be shown that Aristotle accepts each principle *in propria persona*. For not only does he appeal to them outside of *De Sensu* 7, but each is based in the same theory of mixture he adduces to spell out the nature of perceptual qualities in potentiality. In fact, the relation between perceptual qualities in potentiality and in actuality entailed by these principles is such

that, all things being equal, the ratio that determines the character of the quality in potentiality also determines its character in actuality.

2.9.1 *Principle 1: contraries produce contrary motions*

Perceptual quality scales have the same structure. Each is delimited by two extreme contraries opposed as the state and privation of some nature. This nature, which I have been calling the *agent* nature of the relevant quality scale, may be present in various degrees in perceptually qualified bodies, and the degree to which it is present or absent in a perceptually qualified body is determined by the ratio in which the extremes of state and privation are mixed. So one role of the agent nature is to differentiate the values of a quality scale in terms of its degree of presence. But the agent nature also has a role in the *production* of perceptual affections. Consider again the analogy between light and white (text 2.1 above). In an unbounded transparent medium the presence of fire causes illumination, the state of actual transparency. In the transparent determinately located in the surface of a solid body, by contrast, the presence of fire causes *coloration*, the actuality of the object's potential to *move* an illuminated transparent. Thus it is “illumination” or actual transparency in the object's surface that brings it to actuality and enables it to produce a motion in an actually transparent medium.

Generally, then, the degree of presence of the agent nature in the perceptually qualified body is responsible for the motion it produces in the medium. This explains the efficacy of the state extreme for each genus of perceptual quality. But what of the efficacy of the privative extreme, which corresponds to the total *absence* of the agent nature but is nevertheless a perceptual quality? Bodies that approximate the privative extreme *lack* the nature that would enable them to cause the relevant sort of perceptual affection. To this extent they are imperceptible, but Aristotle denies that they are thereby *inaccessible* to the relevant sense:

Text 2.8 Now just as vision is of the visible and the invisible (for darkness is invisible, but sight discriminates this as well), and furthermore of the excessively bright (for this too is invisible, but in a different way than darkness); and [just as] hearing is of sound and silence, of which the former is audible and the latter not audible, and of great sounds as sight is of bright [colors] (for just as a small sound is inaudible, in a way [so too are] great and violent [sounds])—and though invisible is in general said in the same way as

impossible in other cases, it is also said, if something should not have or have weakly what it is by nature such as to have, in the same way as footless or pipless³²—so too, then, is taste of the tasteable and the un-tasteable, i.e. what has a minute or weak flavor or what is destructive of the taste.³³ (*An.* 2.10, 422^a20–31)

A precursor to this position appears in Aristotle's discussion of the rainbow in *Meteorology*, where he describes black as a sort of denial (*ἀπόφασις*) and a extinguishing (*ἔκλειψις*) of sight (374^b12–14). Aristotle's considered view in *De Anima* and *De Sensu* conforms to this characterization, with one important difference: the perception of black, no less than the perception of white, is an affection of an active perceiver. To capture this point, it is better to describe the privative extreme, not simply as an absence or privation, but as a distinctive motion of the relevant medium caused by the absence of the appropriate agent nature. So the way Aristotle prefers to put it in *De Sensu* 7 is that the state extreme and the privative extreme correlate with contrary motions in the medium; that is:

CONTRARIETY

The motions of contraries are contraries. (448^a1–2)

2.9.2 Principles 2 and 3: the interaction of contrary motions

The principle of CONTRARIETY provides the basis of the remaining two principles. Given the chemical analysis model, we need to know what effect the admixture of the primary contraries has on the motion produced by the resulting quality. The last two principles are designed to relate the qualitative character of the motions produced by such quality mixtures back to quantitative facts concerning the ratio in which they're composed.

The principles are highly intuitive, but they also have an ontological basis in the metaphysics of mixture. In *De Sensu* 7 Aristotle introduces them as a special case of a familiar phenomenon

³²Accepting Ross's conjecture of τὸ δ' ἐὰν πεφυκὸς μὴ ἔχη ἢ φαύλως at 422^a28; cf. *Met.* 1022^b27–28

³³ὥσπερ δὲ καὶ ἡ ὄψις ἐστὶ τοῦ τε ὀρατοῦ καὶ τοῦ ἀοράτου (τὸ γὰρ σκότος ἀόρατον, κρίνει δὲ καὶ τοῦτο ἡ ὄψις), ἔτι τε τοῦ λίαν λαμπροῦ (καὶ γὰρ τοῦτο ἀόρατον, ἄλλον δὲ τρόπον τοῦ σκότους), ὁμοίως δὲ καὶ ἡ ἀκοή ψόφου τε καὶ σιγῆς, ὧν τὸ μὲν ἀκουστόν τὸ δ' οὐκ ἀκουστόν, καὶ μεγάλου ψόφου καθάπερ ἡ ὄψις τοῦ λαμπροῦ (ὥσπερ γὰρ ὁ μικρὸς ψόφος ἀνήκουστος, τρόπον τινα καὶ ὁ μέγας τε καὶ ὁ βίαιος), ἀόρατον δὲ τὸ μὲν ὄλως λέγεται, ὥσπερ καὶ ἐπ' ἄλλων τὸ ἀδύνατον, τὸ δ' ἐὰν πεφυκὸς μὴ ἔχη ἢ φαύλως, ὥσπερ τὸ ἄπουν καὶ τὸ ἀπύρηνον – οὕτω δὲ καὶ ἡ γεῦσις τοῦ γευστοῦ τε καὶ ἀγεύστου, τοῦτο δὲ τὸ μικρὸν ἢ φαῦλον ἔχον χυμὸν ἢ φθαρτικὸν τῆς γεύσεως.

(447^a14–20). We all know what it is like to be so immersed in some mental activity, whether it is in thought, passion, or with some captivating perceptual stimulus, that we fail to notice even what is right before our eyes. In Aristotle's view the visual affection's inability to capture our attention in such cases is attributable to the fact that its motion is drowned out or repelled by the competing intellectual, emotional, or perceptual affection currently consuming us. And if the overwhelmed visual motion should turn out to get our attention, the force of the resulting affection will necessarily be diminished by that of rival affections. It is just like, when honey is added to water, it becomes more difficult to see either the honey or the water distinctly: to the extent that we can still see the honey, its appearance is "watered-down", less vivid than it would have appeared on its own.

Similarly, when we encounter a color mixed from white and black, the resulting affection is unlike either seeing white or seeing black. It is rather something different from both, an affection whose character reflects the degree to which the white or black in the color compound dominates over its contrary. These observations suggest that the resulting motion respects the following constraints:

MAGNITUDE

The greater motion cancels out the lesser. (447^a14–15)

PURITY

Everything is more perceptible unalloyed than mixed (*κεκραμένος*). (447^a17–18)

There is no question that Aristotle accepts these principles *in propria persona*. We find appeals to MAGNITUDE elsewhere in *Parva Naturalia* (e.g. at *Div.* 464^b5) as well as in Aristotle's comparative anatomy of the eye, which explicitly draws on the results of his psychological investigation of perception (*GA* 5.1 780^a8–9). Further, both principles parallel certain of the features of Aristotle's theory of mixture that also recommend it as a model for the composition of intermediate perceptual qualities.³⁴ One such feature was that in compounds each of the contrary ingredients

³⁴See sect. 2.7. Cf. *GC* 327^b22–26, 334^b9–15, *Meteor.* 381^b29–382^a8.

changes from its own nature, so that the compound comes more to resemble the character of the stronger ingredient. This reciprocal alteration on the part of the ingredients coheres with MAGNITUDE and PURITY, for the compound will (by MAGNITUDE) come to resemble the stronger ingredient, but only to the extent that its effect has not (by PURITY) been diluted by the weaker ingredient.

Taken together, MAGNITUDE and PURITY explain the differences in how distinct quality mixtures impact the medium as well as perceivers. Because, by PURITY, the extreme contrary ingredients obscure (literally ‘make unapparent’, ἀφανίζει) one another, the motion produced by a mixed quality will be determined by the degree to which the dominant ingredient exceeds, in the way specified by MAGNITUDE:

Text 2.9 This [result] is produced in the [motions] from which some one thing is generated. If indeed it is the case that the greater motion obscures the lesser [= MAGNITUDE], it is necessary, when they occur simultaneously, that it [sc. the greater motion] be less perceptible than if it were on its own. For the lesser [motion] with which it is mixed diminishes it to some degree, if indeed everything is more perceptible in its pure form [= PURITY].³⁵ (Sens. 7, 447^a20–24)

Since, according to Aristotle’s theory of mixture, the ingredients of a mixture remain present potentially in the resulting compound, the motion produced by a mixed quality can be conceived as the simultaneous actuality of contrary motions. When the state extreme and the privative extreme constituting the quality compound act simultaneously, the resulting “compound” motion is the product of neither on its own but of both together. Like honey mixed in water, the affection will be a “watered-down” version of the dominant motion. What vividness the dominant motion retains in the resulting affection will depend on the degree to which it is obscured by its contrary: as the magnitude of the dominant motion relative to its contrary increases the resulting affection comes to resemble the product of the dominant motion in its “pure” or unalloyed form.

³⁵τοῦτο δὲ ποιεῖ ἐξ ὧν ἔν τι γίγνεται. εἰ δὴ ἡ μείζων τὴν ἐλάττω κίνησιν ἐκκρούει, ἀνάγκη, ἂν ἅμα ὦσι, καὶ αὐτὴν ἥττον αἰσθητὴν εἶναι ἢ εἰ μόνη ἦν· ἀφαιρεῖται γάρ τι ἡ ἐλάττων μειγνυμένη, εἴπερ ἅπαντα τὰ ἀπλᾶ μᾶλλον αἰσθητὰ ἔστιν. See LSJ, § III s.v. ἀπλός, for the translation of ἀπλᾶ as ‘pure’ in this context.

2.9.3 *The mean*

Thus PURITY and MAGNITUDE validate our intuitions concerning at least two of the three cases mentioned above. Suppose, for instance, that Q_i is a value of the color scale. If Q_i satisfies condition (1), such that white dominates over black in its mixture, MAGNITUDE tells us that Q_i is a bright color. By PURITY, moreover, Q_i 's impact on a perceiver will resemble that of pure white to the extent that the portion of white exceeds that of black, as indicated in Q_i 's ratio. By contrast, if Q_i satisfies (2), such that black dominates over white in its mixture, MAGNITUDE requires that Q_i be a dark color, one whose darkness (by PURITY) corresponds to the degree to which black exceeds white in the mixture. There remains one further case, namely (3) that $Mix(Q_i) = 1 : 1$, so that Q_i is what I earlier called the *mean* of the relevant quality scale. How do we understand the impact of qualities that fall into this category?

If neither extreme dominates in a quality mixture, MAGNITUDE gives no indication of which, if either, of the contrary motions affects the perceiver. Nor does PURITY tell us the extent to which the efficacious motion (whichever it is) impacts the perceiver, since each motion obscures and is obscured reciprocally. Aristotle too is vexed by this question, as the following lines from *De Sensu* 7 attest:

Text 2.10 So if there should be distinct [motions] that are equal, there will be perception of neither. For each obscures the other to the same extent, and it is impossible to perceive [either] in its pure form. Therefore there will either be no perception, or there will be a different [perception] compounded from both. This in fact is precisely what seems to happen in the case of things blended together in whatever they are mixed.³⁶ (Sens. 7, 447^a25–29)

Two options are considered: either the simultaneous equal motions produce no perception, or, as in cases in which one of the motions exceeds its contrary, there will be some singular perception produced in both, one whose character is presumably determined by a third principle specific to equal perceptual motions. However, it is unclear what such a principle might be,

³⁶ἐὰν ἄρα ἴσαι ὄσιν ἕτεραι οὐσαι, οὐδετέρας ἔσται αἴσθησις· ἀφανιεῖ γὰρ ἢ ἕτερα ὁμοίως τὴν ἕτεραν, ἀπλῆς δ' οὐκ ἔστιν αἰσθάνεσθαι. ὥστε ἢ οὐδεμία ἔσται αἴσθησις, ἢ ἄλλη ἐξ ἀμφοῖν· ὅπερ καὶ γίγνεσθαι δοκεῖ ἐπὶ τῶν κεραννυμένων ἐν ᾧ ἂν μειχθῶσιν.

and Aristotle seems to accept the former option, according to which simultaneous contrary perceptual motions which are equal in magnitude produce no perception in the perceiver.³⁷

This is a reasonable conclusion, since (given CONTRARIETY) the state extreme and the privative extreme are productive of mutually exclusive motions, and since the only other alternative, namely that the patient is simultaneously affected by incompatible motions, seems impossible.³⁸ The conclusion however carries some surprising and counterintuitive implications, chief among which is that the mean value of a perceptual quality scale seems *not* to be a perceptual quality. A perceptual quality is an *affective* quality. As such, it is in potentiality the non-dispositional causal base for a perceptually qualified body's ability to produce the motions in which the quality consists in actuality. There is however no motion in which the mean value of a perceptual quality scale consists in actuality, so bodies that instantiate the mean value in that respect *lack* the ability to produce the type of motion characteristic of that genus of quality. So it would be more apt to say that bodies that instantiate the mean value of a perceptual quality scale *lack* qualification in the relevant scale; what is meanly colored is in fact *colorless*, and what is meanly flavored is in fact *flavorless*.

This may seem paradoxical. I've argued that Aristotle *defines*, for instance, color as the degree of transparency in the surface of a body or, equivalently, as a ratio of black to white. On either formulation the mean of the color scale appears to be a color: 1 : 1 is after all a ratio of black to white, and a 1 : 1 mixture of black and white does determine *some* degree of transparency in surface. If this is right, then, in apparent contradiction of Aristotle's conclusion in text 2.10, we seem committed to treating meanly colored items as somehow *colored*. However, it would be wrong to think that this conception of the mean is a flaw in Aristotle's view. To the contrary, it is a feature of central importance, and one that Aristotle exploits in arguing for the conclusion

³⁷See e.g. 447^b4–6; cf. Alexander, in *De sens.* 136.22–137.15.

³⁸This indeed is the substance of the problem Aristotle is discussing in *De Sensu* 7. To the arguable extent that Aristotle allows for the simultaneous perception of contrary homogeneous qualities, it is by distinguishing different subjects for the relevant affections. See Gregorić 2007, 145–162 for one recent interpretation that attempts to make room for a perceptual “field” in Aristotle's theory. Though I cannot substantiate my suspicions here, I myself am dubious whether Aristotle does allow for simultaneous affection by homogeneous qualities, as he clearly does for the case of heterogenous qualities.

that the senses both perceive and discriminate the qualities they specially perceive. Over the course of the next two chapters, we shall explore this aspect of Aristotle's ontology of perceptual qualities in considerable detail. For the moment, let me just summarize how I think Aristotle avoids contradiction in claiming, for instance, that meanly colored objects are colorless. Meanly colored objects are of course not colorless in the sense that they do not instantiate some ratio of black to white; to that extent, they have *generic* color. But because mean objects are incapable of producing perceptual affection, there is no determinate *species* of perceptual affection associated with the quality it instantiates. In other words, the mean is a value of the color scale, and as such it is a color *in genus*, but it corresponds to no color *in species*.³⁹ This condition moreover characterizes the illuminated transparent medium, which Aristotle describes variously as “colorless”, as having color “incidentally”, as “colored” and as visible “through a borrowed color”, as well as the condition of the visual organ in first actuality.⁴⁰ And the same account applies to the mean value of the other perceptual quality scales. The mean, though clearly a special case, poses no special problem for chemical analytic approach I am attributing to Aristotle.

2.10 Physicalism and the nature of phenomenal qualities

Once we arrive at an adequate understanding of the puzzles Aristotle raises concerning the actuality of perceptual qualities, we can appreciate the unity of the account he offers in *De Sensu*. To summarize, the account contains two basic components. First, it contains a common framework for articulating the nature of perceptual qualities in potentiality, what I have called the chemical analysis model. Second, it contains a set of principles that relate the qualitative character of the motion produced in the actuality of a perceptual quality to the ratio of the mixture that characterizes it in potentiality: CONTRARIETY, MAGNITUDE, and PURITY. Together, these components

³⁹Compare Aristotle's views on mules, which he thinks belong neither to the species horse nor the species donkey, but rather to their (anonymous) common genus: *Met.* 1033^b33–34. Perhaps like mules, the mean value of a perceptual quality scale is on this view a member of the genus, but not by virtue of being any one of its species. For further discussion, see ch. 3.2.3.

⁴⁰See ch. 1.6.1.

imply that there is a single nature and essence common to the potentiality and actuality of a quality, a nature and essence Aristotle conceives of as kind of ratio of contrary qualities that may be variously realized in corporeal mixtures and medial motions. Applied to corporeal mixtures, the ratio characterizes a perceptual quality in potentiality. Applied to medial motions, it applies to the actualization of those potentialities, an actualization whose character is determined by the degree to which one or the other contrary ingredient dominates in the quality's constitutive mixture.

An appealing way to put this point would be to say that this ratio, which may be realized either in a perceiver or in the perceived object, and which may take the form of a mixture or a motion, defines what it is to *be* the relevant species of perceptual quality.⁴¹ Such a perspective on Aristotle's account would moreover allow us to see what is distinctive about his physicalist approach to perceptual qualities. In general, physicalism about a given range of perceptual properties is the view that properties within that range, which manifest in distinctive ways in sense experience, are identical to certain "physical" properties. What is usually meant by "physical properties" are properties that may be described using the canonical vocabulary of physics, without the need to advert to irreducibly qualitative notions proper to that range of qualities, such as those figuring in "purely chromatic" propositions ('pink is desaturated red') or "purely sonic" propositions ('middle C is consonant with G₄ but not with C[#]₄'). Physicalism about a given range of perceptual qualities typically entails a distinction between the *phenomenal* qualities manifest in sense experience and the *physical* properties they are in themselves. One reason they may be held to do so is precisely the existence of such irreducibly qualitative notions. The truth of propositions like 'pink is desaturated red' and 'middle C is consonant with G₄ but not with C[#]₄' are evident to experience: anyone with grasp of pink and red and the notion of saturation should be able to understand and appreciate the fact that pink is desaturated red simply

⁴¹This interpretation moreover has the exegetical advantage of justifying Aristotle's uncharacteristic preoccupation with mathematics and ratios in *De Sensu*; see Sorabji 1972. As we shall see in the following chapters, the idea of ratios that may be instantiated in different types of matter has further application in Aristotle's theory of special perceptual discrimination.

on the basis of her experience of those colors. If a proposition like this cannot be translated into the canonical vocabulary of physics—a proposition that moreover seems to be essential to our experience of red and pink if any is—then we seem to be committed to a contrast between the nature of the phenomenal property, which evidently has such qualitative features, and the physical property, which evidently doesn't. But even if such qualitative features as saturation and consonance could be reduced to the vocabulary of physics, we would still be compelled to distinguish the phenomenal quality and the physical quality. For there are a number of *non-qualitative* features of the physical qualities that are not manifest in experiences as of them. As noted at the outset, colors just don't *look* like dispositions to reflect, transmit, or emit certain wavelengths of light, or the microphysical grounds of such dispositions. So phenomenal colors, colors as they are presented to us in sense experience, are not obviously the same as physical colors, the physical properties that characterize what the colors essentially are.⁴²

The physicalist strategy in response to these arguments has typically been to diffuse the worrying implications of this apparent contingency of the identity between the phenomenal quality and the physical quality. The apparent contingency of their identity is due to the fact that sense experience *imperfectly* presents the world as it actually is. Perhaps we are presented in experience with qualitative properties that *could have* but *do not actually* belong to the objects we perceive.⁴³ Or perhaps we are presented only with *certain* aspects of the physical nature of the qualities, such that it cannot be discerned on the basis of experience alone what these qualities are like in themselves.⁴⁴ But in either case the worrying implications of the physicalist's contrast between the phenomenal quality and the physical quality dissolve if we simply let go of the assumption that sense experience acquaints us with the nature of the relevant range of qualities.

I've argued that Aristotle is a physicalist about perceptual qualities in the same way. On his view the essential nature and behavior of perceptual qualities at different levels of actualiza-

⁴²The parallels between this dialectic and the mainline 20th century debate about the psychoneural identity theory of mind should be clear; see esp. Levine 1993 and Kripke 1980, 144–155; and for in depth discussion of the parallels, see Byrne 2006.

⁴³Cf. Chalmers 2006.

⁴⁴Cf. Byrne and Hilbert 2007.

tion may be explained completely in terms of the general physical principles he takes to govern mixture, motion, and change. Yet Aristotle feels no need to resort to strategies like the one described above in order to account for the identity between perceptual qualities as they are presented to us in experience and as features of perceptually qualified bodies. This is because neither of the above arguments for a contrast between the phenomenal and the physical quality apply in Aristotle's framework. In his view qualitative descriptions of perceptual qualities—for instance, the chromatic difference between different shades of red or the consonance and dissonance of different tones—are fully accounted for by quantitative differences in the ratios of the relevant qualities.⁴⁵ And there are moreover no “non-qualitative” features present in the nature of a perceptual quality that might fail to be manifest in the experience of it, since the essence of the perceptual quality insofar as it is present in a corporeal mixture is the same as its essence insofar as it is present in a medial motion. For this reason Aristotle is happy to treat the qualitative sameness manifest between a quality in potentiality and in actuality on the model of the sameness manifest for instance in identically colored objects. Though the sameness in the former case (though not in the latter) is explained by the fact that the quality in actuality is an actualization of that potential, in neither case is there an essential difference to be discerned between the compared qualities.

In this chapter I've argued that Aristotle's ontology of perceptual qualities leaves no room for a contingent connection between perceptual qualities as they are in themselves and as they are manifest in experience. This conclusion, however, leaves room for the claim that perceptual experience *imperfectly* presents us with phenomenal qualities that are nevertheless the same in nature as the relevant features of perceived bodies. Grant that perception presents you with a quality whose nature corresponds to a physical attribute of the perceived body; nothing in this picture guarantees that you have been thereby become acquainted with the nature of that quality. This is an objection of which Aristotle was keenly aware.⁴⁶ His response to this worry is

⁴⁵On harmony and disharmony among quality-ratios, both within and without the genus of sound, see *Sens.* 439^b25–440^a6.

⁴⁶See Plato, *Tht.* 186B–C. For discussion, see Introduction, xxviii–xxxii.

not however based in the ontology of perceptual qualities, but rather in a psychological theory according to which the senses “discriminate” (κρίνειν) the qualities they specially perceive. Starting in the next chapter, I’ll show how Aristotle’s employs the ontological framework of *De Sensu* 3–5 in formulating an account of perceptual discrimination. We begin with Aristotle’s obscure claim that the senses are “mean states” (μεσότητες) of the contrariety present in their special objects, a claim that relies on central features of this framework.

3

The Sensory Mean State

Aristotle uses two seemingly incongruous models to describe the special senses. The first is that of the *soul*. The animate sense organ is a microcosm of the living animal; the material organ is its body, and the sense is its soul. This model presents the sense as a principle of the animate organ, the form and final cause for whose sake the sense organ is instrumentally structured in the way that it is. The second is that of a *ratio* of its organ, akin to the tuning of strings on a lyre. This model presents the sense as structurally analogous to the qualities it specially perceives, which in Aristotle's analysis are also items whose nature is given by a ratio of contrary extremes. Each model considered independently of the other is revealing, highlighting characteristics of the special senses that are essential to understanding their function within the animal soul. The model of the soul highlights the formal and final causal priority of sense over its organ, whereas the model of a ratio highlights its essential relation to the objects it specially perceives, objects which are in turn causally prior to it.¹ But taking them together exposes a tension. Viewed as a miniature soul, the sense could not be like a ratio of its organ, for if it were, it would not be prior to but actually *dependent on* its organ. Conversely, viewed as a ratio, it could not operate as the form and final cause that explains the instrumental organization of its organ.² How, then,

¹Cf. *An.* 418^a24–25, cf. 415^a15–22. On the ontological priority of perceptual qualities to their senses, see ch. 1. On the objects of psychological capacities as formal causes, see Johansen 2012, 93–115.

²Aristotle's use of both models in the case of the senses appears all the more puzzling if we recall that Plato in the *Phaedo* (85E–87B) had already noticed this tension in harmonic theories of soul, and that (as we'll see) Aristotle himself rejects harmony accounts for similar reasons (*An.* 407^b33–408^a18).

are we to reconcile these models to yield a coherent account of the special senses?

My aim in this chapter is to sketch an account of the senses as both miniature souls and ratios of their respective organs by developing Aristotle's related, but poorly understood, notion that the sense is a *mean state* ($\mu\epsilon\sigma\acute{o}\tau\eta\varsigma$) of the contraries present in its special objects. Properly understood, the sensory mean state (as I shall call it) combines the essential elements of both models, yielding a conception of sense as, on the one hand, the principle of the animate organ and, on the other, a capacity whose actuality consists in its ability to track and regulate the affections of its bodily organ. This conception moreover sheds light on the condition of the animate sense organ in a state of second actuality, a question that has been hotly debated by recent interpreters. While I shall not claim to have settled the question of the nature of perceptual affection, I believe that a proper understanding of the sensory mean state provides substantial support for an alternative account of perceptual affection that deserves serious consideration.

I shall proceed as follows: section 3.1 sets up the tension between the incongruous models of sense, as soul and as ratio; section 3.2 argues for a conception of the sensory mean state that would resolve this tension, first by defending an interpretation of a puzzle Aristotle raises concerning the organ of touch, and second by extending the resulting account to the other senses; finally, in section 3.3, I consider at length the implications of this interpretation for the nature of perceptual affection.

3.1 Two models of sense

Aristotle views the relation of a sense to its organ on the model of the relation of a soul to its body, that is to say *hylomorphically*. If the eye were an animal, vision would be its soul (*An.* 412^b18–19). This is because vision stands to the eye as form to matter, the substance of the eye in accordance with its definition (^b19–20). Here we must apply all of the qualifications Aristotle builds into his hylomorphic conception living bodies. First, by 'eye' we must understand an *animate* eye, one already endowed with vision, for in the absence of such a power it is an eye only in name, as though it were made of stone or drawn in pigment (cf. *PA* 641^a17–21). Second, by 'vision' we

must understand the *capacity* to see, a power that is brought to actuality by the agency of a visible object (such as a color), but one that the eye possesses in first actuality even in the absence of visual affection, as a knower possesses knowledge even in the absence of contemplating it (cf. 412^a21–26). Finally, we must understand that, on such a hylomorphic conception, the sense and its organ are the same in number. So there should be as little wonder whether the sense is one with its organ as there is whether the shape is one with the wax in which it is impressed, or generally whether the matter of a thing is one with the thing of which it is the matter (^b6–9).

But unlike the living animal to which it belongs, the eye is just one part of a functionally integrated whole—the living animal—a part whose presence must therefore be explained by its contribution to the survival and flourishing of the whole, for instance by its enabling the animal to find food, avoid predators, or acquire some degree of practical or theoretical intelligence.³ For these reasons the sense is better thought of as the substantial form of its bodily organ qua organ, that aspect of the organic whole that is instrumental for the exercise of the relevant sensory power:

Text 3.1 Generally concerning each sense one must grasp that the sense is that which is receptive of perceptual forms without the matter And [the] primary sense organ is that in which such a capacity [is present]. Now, they are the same, but their being is different. For that which perceives is a certain magnitude, yet neither what it is to perceive nor the sense is a magnitude, but a certain *logos* and capacity of that [sc. magnitude].⁴ (An. 2.12, 424^a17–28)

I shall postpone (until sect. 3.3.2) discussion of the account of sense as what is receptive of perceptual forms or species without the matter and the famous wax analogy (^a19–14, elided in this quotation). But notice for the moment how the sense and its organ are each characterized by reference to the other. Aristotle first identifies the sense as the capacity to receive perceptual

³See An. 434^b23–29, 435^b19–24, Sens. 436^a18–437^a9. I assume it is possible to account for both the animal as a whole and the activities that make up its form of life without reference to their contribution to anything more comprehensive, such as its species, its ecosystem, or the cosmos, even if in Aristotle's view they do provide such benefits.

⁴καθόλου δὲ περὶ πάσης αἰσθήσεως δεῖ λαβεῖν ὅτι ἡ μὲν αἴσθησις ἐστὶ τὸ δεκτικὸν τῶν αἰσθητῶν εἰδῶν ἄνευ τῆς ὕλης αἰσθητήριον δὲ πρῶτον ἐν ᾧ ἡ τοιαύτη δύναμις. ἔστι μὲν οὖν ταυτόν, τὸ δ' εἶναι ἕτερον· μέγεθος μὲν γὰρ ἄν τι εἴη τὸ αἰσθανόμενον, οὐ μὴν τό γε αἰσθητικῶ εἶναι οὐδ' ἡ αἴσθησις μέγεθος ἐστίν, ἀλλὰ λόγος τις καὶ δύναμις ἐκείνου.

forms without the matter, and then proceeds to identify its “primary organ” as the type of body in which such a capacity is present.⁵ However, Aristotle wants to avoid giving the impression that the sense is present in its organ merely as an attribute, as something without which the organ can go on being what it is. To ward off this misunderstanding, he immediately reminds us of their underlying unity: the sense and its primary organ are the same in number, though they differ in being. This underlying unity is more apparent in Aristotle’s *second* description of the sense as a certain *logos* and capacity of that magnitude which is its organ. By describing the sense in this way, Aristotle makes clear that the capacity definitive of a sensory power is a capacity of a certain magnitude, namely the animate organ of sense.

One way of understanding the sense as a *logos* and capacity of a certain magnitude reinforces the parallel with soul. With this characterization of sense, Aristotle partially delivers on an account of perception promised in the opening chapter of *De Anima*. Perception, as with most of the operations and affections of soul, is an “enmattered *logos*” (*An.* 403^a5–10, 24–28). As such, it is an attribute that belongs to an organism not simply because it possesses a certain type of form or soul, in the way the surface area of a bronze sphere is equal to the product of the square of its radius and 4π , not because it is a *bronze* sphere, but simply because it is a sphere. Rather, perception belongs to the organisms that possess it because they possess a soul *enmattered in a certain type of body*. In this way it is analogous to how a bronze sphere makes contact with a linear surface at a single point because it is a sphere *composed of solid matter*.⁶ In this respect the *logos* Aristotle identifies with sense parallels the soul itself, which in Aristotle’s view is also

⁵See sect. 3.2.1 below. Aristotle’s point in calling it the “primary” (*πρῶτον*) organ is to isolate those respects of the organ by virtue of which the sense is present in it as subject, or in short, what makes the organ an organ of that sense; cf. *Met.* 1022^a29–31 and Polansky 2007, 331–332. Aristotle’s point may also be to distinguish the unified organ of sense, or central *sensorium*, from peripheral organs such as the flesh, tongue, eyes, ears, and nose. As he will soon go on to argue at length (*An.* 426^b8–29; cf. *Sens.* 449^a5–20), the various senses must belong to a unified perceptual faculty in which, though different from each other in being, they are the same in number and therefore also one in matter. So Aristotle may be thinking here of the heart, insofar as it is receptive to a given type of perceptual form, though the identification of the organ is not strictly germane to the present psychological inquiry. See e.g. *Juv.* 469^a10–22 (cf. 467^b14–468^a3), *PA* 2.10, esp. 656^a27–^b6 (cf. *Somn.* 456^a4–6 for a possible referent of the remarks ἐν τοῖς περὶ αἰσθήσεως). Detailed discussion of the unity of the perceptual faculty of soul is given in two recent monographs by Gregorić (2007) and Marmodoro (2014).

⁶Cf. *An.* 403^a11–16: for Aristotle contact requires matter.

an enmattered *logos*, a feature of the living organism that belongs not only in virtue of what it is, but also because of the sort of matter it has (*An.* 414^a14–28, cf. *Met.* 1036^b24–30). Thus sense, no less than soul, cannot be understood or defined independently of the sort of matter to which it belongs. Understood in this way, the sense is a *logos* because it is the *definition* of the enmattered organ, just as the animal soul corresponds to the definition of the living animal.

But Aristotle also conceives of the sense as a *logos* of its organ in another way, namely as the *ratio* of the organ's composition. Here the parallels with soul appear to cease. Aristotle has already argued at length against the view that the soul is a *harmonia*, or, roughly, the proper attunement of the material elements composing the body (*An.* 407^b33–408^a29). Among the theories he criticizes under this heading is one that takes the soul to be the “ratio of the mixture” (ὁ λόγος τῆς μίξεως) of these elements (408^a13–18). Aristotle's complaint with “harmonic” conceptions of soul is not that appeals to mathematical ratio and proportion are out of place in the life sciences. To the contrary, he believes life depends on the maintenance of a proper proportion of the body's elemental constituents (cf. *Long.* 466^a18–23; *Meteor.* 379^a2–11); and he even defines some parts of the body in terms of the ratio of their mixture, for instance flesh, bone, and other “homoeomerous” stuffs. But he thinks it is untenable to regard any such ratio as a *soul*. This is partly because there would then be several souls in a single organism, one for flesh, another for bone, and so on. But his more fundamental reason for rejecting the harmonic conception is that it renders the soul *ephiphenomenal* and so unable to originate change in the body (407^b34–408^a35). Consequently the harmony theory of soul cannot account for the operations and affections that in Aristotle's view evidently belong to it.

Given these deep parallels with soul, it would seem incongruous for Aristotle to endorse a harmonic conception of the senses, that is, to construe them as harmonic ratios whose persistence depends on the proper attunement of their respective organs. But this is just what he appears to do. For example, he infers as an obvious corollary of the idea that the sense is a *logos* of its organ that, like a lyre strummed too violently, extreme perceptual qualities impair the organ and “loosen” its sensory *logos*:

Text 3.2 It is clear from these [considerations, sc. that the sense is a kind of *logos* and capacity of its organ] also why the excesses among the perceptual objects destroy the sense organs. For if the motion of the sense organ should be too strong [sc. for the organ], its ratio—and this is the sense—is loosened, just as the concord and tension [of a lyre] are loosened when its chords are strummed too hard.⁷
(*De Anima* 2.12, 424^a28–32)

Clearly, ‘*logos*’ here cannot simply mean definition, and the musical analogy comparing the sense to the concord (*συμφωνία*) of a well-tuned lyre strongly suggests that the relevant meaning is ratio. Has Aristotle stumbled upon a contrast with the soul that would allow for a harmonic conception of the senses? Unlikely, since his reasons for rejecting a harmonic theory of *soul* would also apply to a harmonic conception of the basic *faculties* of soul. Aristotle’s fundamental complaint about the harmony theory is that it supposes that the actions and affections living things engage in qua living can be given a complete material explanation, one which makes no ineliminable reference to psychological functions.⁸ For this reason he would find it equally absurd to conceive of the faculties of soul on the model of homoeomerous stuffs, that is, as essentially reducible to a composition of elements, or to a ratio thereof: “of what [part] are we to suppose intellect—or even the perceptive or desiderative faculty—is the composition, and [compounded] how?” (408^a12–13).

I believe there is another way to conceive of the sense as a ratio, one that compromises neither the hylomorphic relation in which the sense stands to its organ nor the parallels between sense and soul. This approach takes its point of departure from the causal and explanatory priority of the soul in relation to the body, for in this respect too the animate organ is a microcosm of the living animal to which it belongs. One way in which the soul is a cause and principle of the living body as a whole is as a final cause (*An.* 415^b15–21). Living things possess the (first actuality) psychological functions they do for the sake of their (second actuality) exercise: as Aristotle summarizes the point elsewhere, “animals do not see so that they may have vision,

⁷φανερὸν δ' ἐκ τούτων καὶ διὰ τί ποτε τῶν αἰσθητῶν αἱ ὑπερβολαὶ φθείρουσι τὰ αἰσθητήρια. ἐὰν γὰρ ᾗ ἰσχυροτέρα τοῦ αἰσθητηρίου ἡ κίνησις, λύεται ὁ λόγος – τοῦτο δ' ἦν ἡ αἴσθησις – ὥσπερ καὶ ἡ συμφωνία καὶ ὁ τόνος κρουομένων σφόδρα τῶν χορδῶν. On the translation of τόνος, see Hicks 1907, note ad 424^a32.

⁸See Caston 1997 for a defense of this reading.

they have vision so that they may see” (*Met.* 1050^a10–11). The sort of body that living things naturally possess is likewise for the sake of the realization of its psychological functions. We’ve seen that the body is an instrument of the soul, a composite of functionally integrated matter organized for the sake of realizing the soul’s characteristic functions. The same is true of the modular *parts* of the body. As the animal has sight in order to see, it has eyes in order to have *vision*.⁹ So even though neither the sense nor its organ can be defined independently of the other, the sense is causally and explanatorily prior to its organ. For it is *because* the sense organ is an instrument for the exercise of its sense that it is functionally organized as it is, whereas the converse explanatory relation does not hold.

On the reading I’m suggesting, Aristotle introduces the idea that the sense is the ratio of its organ to *spell out* the way in which the sense is the final causal of the animate organ, hylomorphically conceived. Here, as elsewhere in *De Anima*, Aristotle’s claims about the nature of the senses must be understood against the background of the account of perceptual qualities given in *De Sensu*. On that account, a perceptual quality is an item on a scale of attributes defined by a pair of extreme contraries: black and white in the case of color, bitter and sweet in the case of flavor, and so on. The determinate qualities populating the scale are analyzed as mixtures of those extremes, the qualitative differences between them ultimately attributable to differences in the ratio of their constitutive mixtures.¹⁰ For reasons we shall soon consider, it is hypothetically necessary for the sense to be perceptive of a scale of such qualities that its organ instantiate a certain ratio of the contraries defining that quality scale. Specifically, the organ must instantiate a 1 : 1 ratio of the relevant extremes, since this is the ratio that determines the mean of the quality scale(s) it specially perceives.

In short, what it is to be the organ of that sense is to instantiate the mean of the relevant quality scale. But because the sense is the form and substance in accordance with definition of such an organ, it too in a way *is* the mean of that scale. So understood, however, the sense is

⁹And, of course, thereby to see; cf. *Met.* 1050^a15–16.

¹⁰See ch. 2 for detailed discussion of this account.

not simply reducible to this ratio, as on the harmonic conception Aristotle rejects. As the final cause of the animate organ, the sense is also what (by hypothetical necessity) *makes* the organ composed in such a way that it instantiates the relevant mean; it is that for whose sake the organ is composed as it is. The sense therefore stands as the explanatory principle (*ἀρχή*) or nature that structures and determines the behavior of its organ.

As I shall argue in the next section, Aristotle captures this aspect of the hylomorphism of sense and sense organ by comparing the sense to a *mean state* (*μεσότης*) of the contrariety present in the qualities it specially perceives. This approach contrasts sharply with how recent commentators have tended to interpret Aristotle's talk of the sensory mean state. By abandoning their tendency, we stand to gain fresh insight into the explanatory use to which Aristotle puts the sensory mean, as well as a better understanding of the hylomorphic conception of sense and sense organ he endorses.

3.2 Sense as a mean state

In several passages Aristotle compares the senses to mean states, specifically to mean states of the contrariety present in their perceptual objects (*τῆς ἐν τοῖς αἰσθητοῖς ἐναντιώσεως*: *An.* 424^a4–5; cf. ^b1, 431^a11, 435^a21–25, *Meteor.* 382^a19–20). There are at least two ways of interpreting this comparison. Most contemporary commentators take the comparison simply to call attention to the fact that the sense is imperceptive of qualities already instantiated by its organ.¹¹ The sense appears as a mean state relative to the qualities it can perceive because the latter must exceed or fall short of the “mean” condition of the sense organ in order to produce perceptual affection. I call this the *wandering* conception of the sensory mean state because, for all we are told by Aristotle's description of the sensory mean state on this interpretation, the sense organ's position on the relevant quality scale is arbitrary.

One could however take the condition of the sense organ relevant to the sense's status as a

¹¹For a representative sample, see Barker 1981, 248; Burnyeat 1992, 20–21; Bradshaw 1997, 146; (perhaps) Corcilius 2014, 40–43; (perhaps) Everson 1997, 81–82; Johansen 1997, 216–217 (cf. Johansen 2002); Polansky 2007, 333.

mean state to be fixed, or *stationary*.¹² Here too the qualities perceptible by the sense are excesses in either direction of the relevant quality scale, but the condition of the organ is not arbitrary. This reading, which I'll presently defend, takes the condition of the organ to be precisely the one necessary for it to be instrumental for the exercise of its sense—namely, the condition of being composed of equal portions, or a 1 : 1 ratio, of the relevant extremes. Thus only if the sensory mean state is interpreted as stationary does the sense's status as a ratio of its organ explicate its role as principle and final cause of the animate organ.

The key passage for arbitrating between the wandering and stationary conceptions is Aristotle's discussion of the primary organ of touch. Appropriately enough, this discussion appears just before Aristotle turns to consider the relation of sense to sense organ in general. His immediate concern is to explain an apparent anomaly in tactile perception, a phenomenon that has come to be known as the tactile "blind spot". The phenomenon points out an exception in the organ of touch that distinguishes it from the organs of the other senses, but it turns out to be an exception that clarifies the rule.

3.2.1 Aristotle on the tactile "blind spot"

Dip your hand in water. If the water happens to be the same temperature as your hand, you will, arguably, not feel the water's temperature. Putative experiences like this are evidence for a tactile "blind spot", and as Theophrastus reports they played a role in early Greek theorizing about perception:

Some suppose that perception comes about in a process of alteration, i.e. that like is unaffected by like but that what is unlike is susceptible to affection, and they cede their opinion to this [sc. the idea that perception is by contraries]. And they think that what happens concerning touch bears witness, for what is equally hot or cold as flesh (*ὁμοίως τῇ σαρκὶ θερμὸν ἢ ψυχρὸν*) does not cause perception. (*De Sensu* 2.1–4)

Aristotle agrees that perception compares with alteration in that, prior to perceptual affection, what perceives is unlike what is perceived: "it seems," as he judiciously puts it, "to be alteration

¹²This minority view is held e.g. by Murphy 2005, 328–330, Sorabji 1992, 214–16, and Tracy 1969, 208–209.

of a sort (*ἀλλοίωσίς τις*)” (*An.* 2.5, 416^b34–35). However, in evident concession to other predecessors who maintained that perception is “by likes” (416^b35–417^a2), he also thinks that when what perceives has been affected it comes to be like what affects it. Perception, in other words, is a process of *assimilation*, or “likening” (*ὁμοίωσις*), in which what perceives comes to be such as the perceived object insofar as it is perceived. For Aristotle this means that what perceives must not only be *actually* unlike, or contrary to, what it perceives, it must also be *potentially* like it. These points are summarized in the final lines of *De Anima* 2.5, Aristotle’s most extensive discussion of perceptual affection:

Text 3.3 What perceives (*τὸ αἰσθητικόν*) is potentially such as the perceptual object is already in actuality, as has already been said. Not being like [sc. the perceptual object] it suffers affection. Having suffered affection, it has been likened and is such as it.¹³ (418^a3–6, tr. following Lorenz 2007)

In the course of that chapter Aristotle clarifies that the sort of affection and alteration that occurs when the perceiver is assimilated to the perceptual object is not the ordinary sort of affection and alteration (417^b28–418^a3). But his point here is that, in whatever respect that which perceives is assimilated to the perceived object, it must be potentially but not actually such as the perceptual object actually is.

This condition on the possibility of perceptual assimilation provides the theoretical backdrop for Aristotle’s own discussion of the tactile blind spot. In Aristotle’s discussion, however, what (according to Theophrastus) early theorists presented as a manifest perceptual phenomenon appears more as a conceptual difficulty. The special senses are supposed to be sensitive to the full range of their special perceptual qualities. In order to meet this demand—in order, that is, for what sees to be sensitive to the full range of colors, what hears to the full range of sounds, and so on—what perceives in the relevant modality must be *potentially all* but *actually none* of those qualities. Thus, Aristotle asserts, “what is colorless is receptive of color, what is soundless of sound” (*An.* 2.7, 418^b26–27). Now, what is receptive of color is in one way vision, but in another way it is the *eye*, or more generally the animate organ of sense, which is also said to receive the

¹³τὸ δ' αἰσθητικὸν δυνάμει ἔστιν οἷον τὸ αἰσθητὸν ἤδη ἐντελεχείᾳ, καθάπερ εἴρηται. πάσχει μὲν οὖν οὐχ ὅμοιον ὄν, πεπονθὸς δ' ὁμοίωται καὶ ἔστιν οἷον ἐκείνο.

form without the matter.¹⁴ We shall consider in a moment how the other sense organs achieve such non-qualification in the relevant genus of quality. For now, notice that this condition, applied to the organ of touch, presents an apparent difficulty. The qualities specially perceived by touch are no ordinary qualities. They are the fundamental elements of Aristotle's cosmos, the basic components of all material bodies. This is a problem because the organ of touch is itself a body, so it can hardly *lack* tangible qualities altogether. It must instantiate *some* tangible qualities, to which it will inevitably be imperceptive, but which ones? This is the question that prompts Aristotle's discussion of the tactile blind spot.

Aristotle offers a complicated argument in support of his preferred answer to this question. It is worth considering in detail:

Text 3.4

[1] The organ of touch—the sense organ of these [qualities, sc. hot, cold, wet, and dry] and that in which the so-called sense of touch is present primarily—is the part that is in potentiality such [as these qualities are in actually]. For perceiving is a type of being affected; hence that which acts makes that [part], which is potentially [such as it is], actually such as it is.

[2] For this reason we do not perceive anything that is equally hot and cold or [equally] hard and soft, but rather the excesses, given that the sense is like a kind of mean state of the contrariety present in perceptual objects.

[3] That is also why [the sense] discriminates the objects it perceives. For it is the mean which is capable of discrimination, since in relation to each extreme it comes to be the other extreme.

[4] And just as that which is to perceive white and black must be neither of these in actuality, but both in potentiality, and so on in the other cases, in the case of touch too [that which is to perceive hot and cold must be] neither hot nor cold.¹⁵ (An. 2.11, 423^b29–424^a10)

¹⁴An. 3.2, 425^b23–24: τὸ γὰρ αἰσθητήριον δεκτικὸν τοῦ αἰσθητοῦ ἄνευ τῆς ὕλης ἕκαστον. Pace Johnstone 2012, 152n28, who supposes Aristotle must be using αἰσθητήριον to refer to the *composite* of sense and sense organ, contrary to his ordinary practice of referring to the perceptual composite as τὸ αἰσθητικόν. The fact that here Aristotle is evidently comfortable saying that the perceptual composite qua material receives perceptual form without the matter seems to me an important *constraint* on how we understand the reception of perceptual form without matter, rather than an unlikely shift in terminology. In particular, it indicates that material affection is intrinsically involved in the reception of perceptual form, while at the same time suggesting that the material affection is not ordinary “destructive” alteration; see below, sect. 3.3, for discussion.

¹⁵τὸ δὲ αἰσθητήριον αὐτῶν τὸ ἀπτικόν, καὶ ἐν ᾧ ἡ καλουμένη ἀφή ὑπάρχει αἴσθησις πρώτη, τὸ δυνάμει τοιοῦτόν ἐστι μόριον· τὸ γὰρ αἰσθάνεσθαι πάσχειν τι ἐστίν· ὥστε τὸ ποιοῦν, οἷον αὐτὸ ἐνεργεία, τοιοῦτον ἐκείνο ποιεῖ, δυνάμει ὄν. διὸ τοῦ ὁμοίως θερμοῦ καὶ ψυχροῦ, ἢ σκληροῦ καὶ μαλακοῦ, οὐκ αἰσθανόμεθα, ἀλλὰ τῶν ὑπερβολῶν, ὡς τῆς αἰσθήσεως οἷον μεσότητός τινος οὔσης τῆς ἐν τοῖς αἰσθητοῖς ἐναντιώσεως. καὶ διὰ τοῦτο κρίνει τὰ αἰσθητά. τὸ γὰρ μέσον κριτικόν· γίνεται γὰρ πρὸς ἑκάτερον αὐτῶν θάτερον τῶν ἄκρων· καὶ δεῖ ὥσπερ τὸ μέλλον αἰσθήσεσθαι λευκοῦ καὶ μέλανος μηδέτερον αὐτῶν εἶναι ἐνεργεία, δυνάμει δ' ἄμφω (οὔτω δὲ καὶ ἐπὶ τῶν ἄλλων), καὶ ἐπὶ τῆς

Proponents of the wandering conception will take Aristotle to be discussing the same tactile blind spot that was evoked by supporters of the view that perception is by contraries. So read, the passage would indeed support a wandering tactile mean state. Touch would be insensitive to objects possessing the same tangible qualities as its fleshy organ, whatever they happen to be; it would perceive only objects possessing “excesses” of these, for instance what is hotter or colder, harder or softer, than whatever its fleshy organ happens to be. But the blind spot Aristotle is pointing out cannot be the one that interested his predecessors.¹⁶ Note first that the blind spot with which Aristotle is concerned is presented in text 3.4.1 as an *implication* of the assimilation condition, not, as in Theophrastus’ presentation, a phenomenon simply evident to experience. Second, that tactile blind spot concerns objects whose temperature is the same as the perceiver’s *flesh*, but in text 3.4.1 Aristotle makes clear that his concern is with the primary organ of touch, which is not flesh but something *internal* to the perceiver.¹⁷ Finally and most importantly, Theophrastus’ formulation of the phenomenon discusses objects which are as hot or as cold *as the perceiver’s flesh*, but there is no such comparandum in Aristotle’s formulation in text 3.4.2.¹⁸ Thus Aristotle’s concern here seems not to be with what is as hot or cold as the perceiver’s primary organ of touch—as if ordinary perceivers were in a position to sense the temperature of their primary organ of touch as opposed to their flesh—but with what is equally hot *and* cold, and with what is equally hard *and* soft.¹⁹ The tactile blind spot with which *Aristotle* is concerned is not to whatever happens to be the same temperature as the tactile organ, but rather to what has a temperature that coincides with the *determinate* temperature that charac-

ἀφῆς μήτε θερμὸν μήτε ψυχρόν.

¹⁶Pace Burnyeat 1992, 21n3.

¹⁷See esp. *An.* 422^b19–23, 34–423^a1, ^b1–8; cf. 426^b15–17. See also note 5 above; cf. Sorabji 1974.

¹⁸This detail has regrettably been suppressed by several translators, who have taken it upon themselves to supply a comparandum; see Barbotin and Jannone 1966, Hicks 1907, the paraphrasis of Ross 1961, and Shields 2016; Hamlyn 1993 is an exception.

¹⁹Siwek (1965) reports several variations in the text I’ve printed as τοῦ ὁμοίως θερμοῦ καὶ ψυχροῦ, ἢ σκληροῦ καὶ μαλακοῦ (424^a2–3), most of which flip or omit one or more of the conjunctions. Most of the variations seem to me to produce nonsense, and none seem to me to support the alternative reading I’m criticizing. Note that hard and soft are in Aristotle’s view derivative tangible properties that supervene on bodies’ primary tangible qualities; see *Meteor.* 383^b21–23.

terizes the organ's mean condition.

If this is correct, text 3.4 strongly suggests that the tactile mean state must be *stationary*. We've seen that the question motivating this discussion concerns which qualities the organ of touch must possess qua body and so be insensitive to qua organ of touch. The answer Aristotle wants to give is that the relevant qualities are those corresponding to the mean of the quality scale, for instance, on the temperature scale, the quality characterized by equal portions (or a 1 : 1 ratio) of the extreme contraries cold and hot. However, all that he is entitled to conclude from the considerations adduced in text 3.4.1 is that touch's bodily organ must possess, and so be insensitive to, *some* value or other of each tangible quality scale. In order to establish that the organ instantiates the *mean* value of each scale, Aristotle needs another premise. The required premise, introduced in the last clause of text 3.4.2, is that the sense, in this case touch, is "like a kind of mean state of the contrariety present in the objects it perceives", in this case the contraries determining the quality scales specially perceived by touch.²⁰ Thus, as Aristotle states in text 3.4.2, the bodies to which touch is insensitive are in fact those that instantiate the relevant mean, for instance, by being equally hot and cold or equally hard and soft, *because* touch is a kind of mean state of the relevant contrariety.

3.2.2 Why must the organ of touch instantiate the mean?

Read in this way, texts 3.4.1–2 neatly exhibit the pattern of explanation sketched at the end of the last section. The organ of touch is composed as it is—namely, in such a way that it is insensitive to what is (for instance) equally hot and cold but perceptive to what contains an excess of hot

²⁰Note the grammatical construction, a genitive absolute clause introduced by a causal *ὡς* (see Smyth §§ 2240, 3000). That the clause is so clearly intended to explain the inference introduced by *διό* at the beginning of the sentence presents a problem for the proponent of the wandering sensory mean state. The clause may be taken to modify either the whole previous sentence or just the second clause (*ἀλλὰ τῶν ὑπερβολῶν*), but on their reading of the passage neither clause is helpfully elucidated by the consideration that the sense is a mean state. On their view the first claim made in text 3.4.2 is that what is (e.g.) as hot or cold as the organ (whatever its temperature happens to be) will not be perceptible to it, which follows unproblematically from the assimilation condition. So too does the second claim, namely that the qualities of which it is perceptive are those that exceed it with respect to heat or coldness. On the wandering conception, then, the lemma that the sense is a mean state would be an idle wheel in the argument. That Aristotle evidently does not agree further supports my claim that the sensory mean state is not wandering.

or cold—*because* its sense is such as to be a mean state of these contraries. These passages also allow us to see how touch may be understood as a ratio of its organ without collapsing into a harmonic conception. For, although the status of touch as a mean state reflects the mean condition of its primary organ, the organ instantiates the mean *because* and *in order that* it may be an instrument for tactile perception. So, far from making the sense an epiphenomenon of the composition of its organ, identifying the sense with the ratio of its organ actually reflects the former's final-causal *priority* over its organ.

Still, it may appear obscure why Aristotle should insist that what makes the organ of touch a suitable instrument for tactile perception is that it instantiates the mean of each scale of tangible qualities. Nothing in *De Anima's* discussion of perception and the special senses prior to text 3.4 has led us to expect that the sense organ should instantiate the mean of the quality scale(s) specially perceived by its sense, or even that instantiating the mean is a matter of possessing equal portions of contrary extremes.²¹ Nor have we been given the principles necessary for understanding what it would be for the senses to be mean states, much less to grasp the implications for the composition of the sense organs qua organ. In discussing the tactile blind spot, Aristotle only hints at the central importance of meanness in his theory of perception.

Because Aristotle's primary concern is with the nature of the organ of touch, his remarks on the discriminative power of the senses are necessarily brief. Nevertheless, they suffice to illustrate the connection between meanness and the discriminating power of perception on which his argument turns. We learn from several passages late in *De Anima* that perception is a discriminative capacity of soul (*An.* 432^a15–16, 427^a19–21, 428^a1–5; cf. *APo.* 99^b34–35). As with the other discriminative capacities and states of soul—including *nous*, scientific knowledge, belief, and arguably *phantasia*—it is the job or function (*ἔργον*: 432^a16) of the perceptual capacity as a whole to discriminate and facilitate the animal's cognition (*γνώσις*) of something external to

²¹Save perhaps 422^b10–13, which seems to anticipate elements of the perceptual ontology of *Sens.* 3–5: τὰ δ' εἶδη τῶν χυμῶν, ὥσπερ καὶ ἐπὶ τῶν χρωμάτων, ἀπλᾶ μὲν τάναντία, τὸ γλυκὸν καὶ τὸ πικρὸν, ἐχόμενα δὲ τοῦ μὲν τὸ λιπαρὸν, τοῦ δὲ τὸ ἀλμυρὸν· μεταξύ δὲ τούτων τό τε δριμύ καὶ τὸ αὐστηρὸν καὶ στρυφνὸν καὶ ὄξύ· σχεδὸν γὰρ αὐταὶ δοκοῦσιν εἶναι διαφοραὶ χυμῶν.

itself (*An.* 427^a17–21, cf. *APo.* 99^b28–35). In special perception, discrimination facilitates cognition of the perceived object insofar as it acts on the activated sense. As Aristotle argues in text 3.4.3, what gives an individual sense the power to discriminate its special objects is its status as a mean state between the contrariety present in these objects. Touch too must be a mean state of this sort; and since being a mean state of this sort requires that its organ instantiate the relevant mean(s), we may conclude that the organ of touch is composed in the requisite mean way.

In the next chapter I give a detailed account of the connection between meanness and discrimination articulated in text 3.4.3. What is most important for present purposes is to take note of the explanatory roles of the sensory mean state in *De Anima*'s discussion of perception. We've already noted one such role, namely explaining the senses' power to discriminate their special objects, and we've seen Aristotle conclude on that basis that the organ of touch must qua organ instantiate the mean of each of the tangible quality scales. But another, arguably more fundamental role of the sensory mean state is to explain, not just how the senses discriminate their special objects, but how affection by a perceptually qualified object amounts to *perception* of it. Consider plants. Plants, in Aristotle's view, have soul and are subject to affection by perceptually qualified objects—they are, for instance, heated and cooled. But for all that, they do not *perceive* these qualities, but are rather affected by them *with* the matter (*An.* 424^b2–3). One possible explanation for plants' insensitivity to these sorts of affection is that they are composed primarily of earth, and so do not have organs that instantiate the mean qualities necessary for the presence of a sensory mean state (cf. *An.* 435^a20–b3). But this would get the direction of explanation precisely backwards. Even if plant bodies were composed in such a way that they instantiated the necessary mean qualities, plants would still not *perceive* the temperature of the hot and cold objects that respectively heat and cool them. For even if a plant's body were composed of equal portions of cold and hot, its body qua mean in this way would still not be an *organ* of touch. In Aristotle's view being composed in the right way is not enough for a body part to be a sense organ. If it were, then so long as an eye or piece of flesh retained the requisite mean composition, it could be an organ of sense even after death or being severed from a living

body. In Aristotle's view, however, they would not (cf. *GA* 735^a5–9). To be an organ of sense, and more generally to be an instrument for the realization of some psychological function, the body must be structured as it is *for the sake of* realizing the relevant function. Thus even even plants mixed in equal portions of cold and hot would lack the organs necessary to perceive temperatures, since they still lack “a mean state and such a principle as to receive the forms of perceptual objects” (424^b1–2)—that is, a sensory power possession of which *requires* that sort of functional organization. Plants do not lack perception because their bodies are ill suited to be organs of sense; plant bodies are ill suited to be organs of sense because plants lack perception.²²

Here again Aristotle repudiates the harmonic conception of the senses. Whether an organism possesses a sense like touch is not merely a question of whether its body is composed in the right way, namely by having parts mixed in the right ratio(s) of contrary qualities. It is rather a question of whether it possesses a certain kind of principle, a principle responsible both for the organism's ability to receive perceptual form without the matter and for its possession of sensory *organs* composed in the right way *for the sake of* receiving perceptual form without the matter. I've argued that the sort of principle Aristotle has in mind is the sensory mean state, and I've argued that the sense of touch exemplifies Aristotle's conception of the sensory mean state. Yet this conclusion raises a difficulty. In the closing lines of his discussion of the tactile blind spot, Aristotle observes that what goes for touch is what goes for the other senses: the same condition that requires what is to perceive hot and cold to be potentially both but actually neither applies equally to what is to perceive black and white, sharp and flat, and sweet and bitter (see text 3.4.4). But unlike touch, whose organ instantiates some determinate mean value of the quality scales it specially perceives, Aristotle thinks that the non-tactile senses meet this condition by lacking qualification altogether: it is the *colorless* that is receptive of color, and the

²²It is possible to read the passage as stating two distinct criteria for tactile perception—having a mean state and having a principle so as to receive perceptual form without matter—both of which plants fail to meet. But it would be obscure just what would so distinguish them. Both descriptions pick out the sense of touch, one as a mean state and another as a capacity for receiving perceptual (tangible) form without the matter, so at best they are different descriptions of the same psychological capacity. In my view, however, they are more closely connected, since it is precisely insofar as it is a mean state that touch, or any other perceptual capacity, is receptive of perceptual form without the matter. Cf. Murphy 2005, 299, who also reads this passage as articulating a single criterion.

soundless that is receptive of sound. This contrast would appear to strain the analogy we are trying to draw between the tactile mean state and those belonging to the other senses, at least insofar as the non-tactile sense organ *lack* qualification within the relevant scales. The tension is however only apparent.

3.2.3 *The non-tactile senses as mean states*

Aristotle conceives of perception as a type of assimilation, in which what perceives moves from being potentially to being actually such as what it perceives. This conception places two constraints on how we understand the composition of the non-tactile sense organs. First, since each is sensitive to the full range of the quality type it specially perceives, it must wholly *lack* qualification within that scale. In this respect the non-tactile sense organs differ from the organ of touch, which qua body must actually possess *some* value of the tangible quality scales that differentiate bodies as such. However, in Aristotle's view it is not possible for something to be affected by a quality such as color or sound if agent and patient are entirely *unlike*. In order to be potentially and not actually such as the agent quality, the patient must, second, be unlike the agent in species but like it in genus: "body is naturally affected by body, flavor by flavor, color by color, and generally what is alike in genus by what is alike in genus" (GC 323^b33–324^a1). This general thesis about alteration, or qualitative change, has clear implications for the composition of the sense organs, which must therefore be the same in genus with the perceptual qualities to which they are receptive. So, just as with the organ of touch, the non-tactile sense organs must also be the same in genus with the perceptual qualities of which they are receptive (cf. PA 647^a2–9, 14–23).

But how can the non-tactile senses *both* be the same in genus as the qualities they can receive *and* lack qualification within that genus? If this question seems perplexing, it is because we tend to think that membership in a genus entails—and is entailed by—membership in one of its species. Just as an animal earns its membership in the genus mammal by being a specific type of mammal—as, for instance, you and I are mammals because we are humans—so an individual

quality earns its membership in a genus like color by being a specific type of color, for instance crimson or sea blue. There is however a further complication in the case of perceptual qualities. In Aristotle's view, perceptual qualities are *affective* qualities, qualities defined partially by their ability to produce a determinate type of affection. Of course, there may be other conditions sufficient for membership in an affective quality genus, such as being analyzable as a composition of a certain pair of extreme contraries. But a member of an affective quality genus cannot be considered a *specific* quality of that type unless it is productive of a *specific* type of affection. If it is possible to meet this membership condition without falling under some species or other of the genus, then genera of affective qualities may contain members that are not species of that genus.

The ontology of perceptual qualities Aristotle develops in *De Sensu* 3–5 explicitly makes room for such “generic” membership in a perceptual quality genus. On this approach, the nature of a perceptual quality is determined by its “chemical analysis”, that is, by the proportion of extreme contraries in its constitutive mixture. In most cases the chemical analysis of a perceptual quality also determines the type of affection it produces in other bodies, since the character of the affection it produces is simply a function of which extreme dominates in the quality mixture and to what degree it dominates over its contrary. However, as we observed at the end of the last chapter, this account breaks down when applied to the mean value of the scale: because the mean value is mixed from *equal* portions of the extremes, the activity of the extremes relative to another body cancel each other out, resulting in *no* affection at all.²³ I noted in that discussion that this result—namely the inefficacy of the mean value of a perceptual quality scale—should be regarded as a crucial feature of Aristotle's view. We are at last in a position to see why: by instantiating the mean value of the perceptual quality scale it specially perceives, the non-tactile sense organs can be at once the same in genus as the qualities they can receive and totally without specific qualification within that genus.

²³See *Sens.* 447^a25–29 (= text 2.10); for discussion, see ch. 2.9.3. The following interpretation amounts to a textual defense of an interpretation initially proposed by Johansen 2002, 181 and endorsed by Corcilius 2014, 41n27.

Take the color scale. In *De Anima* 2.7 Aristotle says it is in the nature of every color to be capable of moving the actual, or illuminated, transparent (418^a31–^b2, 419^a9–11). As I argued in the last chapter, this characterization falls short of a definition of color, since in Aristotle's view color is not a dispositional property but an attribute of colored bodies *whereby* they are productive of the relevant type of affection. But since colors are *affective* qualities, specifically qualities capable of producing change in the genus color, nothing can be colored which is not productive of this sort of affection. Thus bodies that instantiate the mean of the color scale—bodies whose surface contains equal portions of transparent and opaque stuff—are not, in this strict sense, colored. They are not however colorless by virtue of not being the sort of thing that *can* be colored, since they are bounded bodies, and their respective surfaces contain both transparent and opaque stuff.²⁴ They are rather colorless by virtue of having a mixture of transparent and opaque stuff that cannot effect change in the genus of color. Thus, rather than speaking of meanly-colored bodies simply as colorless, as though they lacked a determinate surface like the transparent medium, it is better to speak of them as *generically* but *not specifically* colored.

This account of meanly colored bodies fits with how Aristotle describes the composition of the eye jelly, that part of the animate eye that is instrumentally composed for realizing vision. Like the unbounded airy or watery media through which colors act on it, the watery eye jelly must be actually transparent to facilitate vision (*Sens.* 438^b5–16, 439^b6–10). But since the eye jelly is confined by a membrane to a bounded, determinate region of the eye, it is not transparent in the same way that the unbounded medium is transparent (*GA* 780^a27–36).²⁵ Instead, Aristotle thinks the eye jelly's transparency is a function of the *density* of the water composing it, variations in which account for variations in eye color. Blue or otherwise lightly colored eyes are due to a deficiency of fluid, whereas darkly colored or “non-see-through” (*μη̄ εὐδίοπτα*) eyes are due to an excess of fluid.²⁶ Eye colors intermediate between these extremes differ by degree (779^b26–34), but in Aristotle's view the eye best suited for vision is one that contains neither

²⁴Aristotle thinks *all* bodies contain some transparent stuff in their surface; see *Sens.* 439^a21–25.

²⁵Cf. *Sens.* 438^a12–16 and, for discussion, Johansen 1997, 95–100.

²⁶See ch. 1.6.2 for remarks on the visual pathologies Aristotle associates with dark and light colored eyes.

too much nor too little fluid, but is exactly “proportionate” (σύμμετρον, 779^b28) and “the mean between too much and too little fluid” (ἡ . . . μέση τοῦ πολλοῦ καὶ τοῦ ὀλίγου ὑγροῦ, 780^a23). While, admittedly, even meanly dense eyes will exhibit color in the iris, Aristotle likens such an appearance to the blue appearance of “see-through” sea water (779^b30–33). In this regard the transparent eye jelly is similar to the unbounded transparent media, which also exhibit color, though the color is neither determinate nor their own (see *Sens.* 439^b1–6, *An.* 418^b4–6).

A clear implication of this account is that the most suitable organ for vision is the one composed so that it instantiates the mean between the extremes of the color scale, namely black and white or, equivalently, opaque and transparent. Aristotle’s (far briefer) discussions of the other non-tactile senses indicate a similar commitment to identifying the organ’s composition with the relevant mean. He argues, for instance, that the organ of hearing, which consists of air compressed in the inner ear, maintains its own proper motion (οἰκείαν τινὰ κίνησιν, *An.* 420^a16) that is disturbed by incoming motions that produce sounds different in pitch—a condition in which the organ nevertheless qualifies as soundless. Similarly, Aristotle describes the moistened tongue, the peripheral organ of taste, as having no differentia of flavor (*Sens.* 449^a8–9, 20–21); though falling short of an explicit identification with the mean of the flavor scale, this description of the organ locates it precisely in the gap between genus membership and species membership in which the mean value of the flavor scale would fall.

All of this strongly suggests that Aristotle thinks of the other senses as mean states and ratios of their respective organs along the model of touch. Such a conclusion would cohere with Aristotle’s explicit goal of giving a fully general account of the senses as discriminative capacities, one that attributes to each sense organ a role in explaining the sense’s power to discriminate its special objects:

Text 3.5 So then, each sense, by being present in its sense organ qua sense organ, is of its underlying perceptual object and discriminates the differences of that underlying perceptual object. For instance, vision [discriminates] white and black, taste [discriminates] sweet and bitter, and so on in the other cases.²⁷ (*An.* 3.2, 426^b8–12)

²⁷ἐκάστη μὲν οὖν αἴσθησις τοῦ ὑποκειμένου αἰσθητοῦ ἐστίν, ὑπάρχουσα ἐν τῷ αἰσθητηρίῳ ἥ

On this interpretation, the contrast implied by the tactile blind spot would not be between the composition of the organ of touch and that of the non-tactile sense organs. Rather, each qua organ of sense would instantiate the mean of the quality scale(s) specially perceived by its sense. The contrast would instead lie with the distinctive nature of the tangible qualities, which qua tangible are affective (and so necessarily productive of a distinctive sort of perceptual affection), but qua differentiae of bodies as such are not. Furthermore, the contrast so understood would not undermine the general account of special perceptual discrimination Aristotle offers in his discussion of touch (see text 3.4.3 above). Thus we could look there, to Aristotle's argument connecting a sense's power to discriminate its special objects to its status as a mean state of the contrariety present in those objects, for a general account of special perceptual discrimination.

Such, at any rate, is the interpretation suggested by the passages we have considered so far. These were passages that concerned the relationship between sense and sense organ, as well as the material conditions necessary for actual perceiving and discriminating. The next section will focus on the sense as a ratio in active perceiving. As we'll see, there are powerful objections to what are sometimes taken to be the implications of the sort of interpretation we are considering. My goal will be to show that these objections are misdirected, and that there is an attractive conception of the sense as a ratio in actual perceiving that does not require us to give up the present account of the sensory mean state.

3.3 Sense as ratio in actual perceiving

We have been considering an interpretation according to which the individual senses are ratios because each is the form and final cause of an organ that must, qua organ, be composed in certain ratio of extreme contraries. Prior to affection by a perceptual quality—when, in other words, the sense is considered as the first actuality of the animate organ—the sense organ instantiates the mean value of the scale defined by these extremes, so that it can (as far as possible) be potentially

αἰσθητήριον, καὶ κρίνει τὰς τοῦ ὑποκειμένου αἰσθητοῦ διαφορὰς, οἷον λευκὸν μὲν καὶ μέλαν ὄψις, γλυκὺ δὲ καὶ πικρὸν γεῦσις· ὁμοίως δ' ἔχει τοῦτο καὶ ἐπὶ τῶν ἄλλων.

all but actually none of the determinate species of quality within the scale. Aristotle's likening of the sense to a mean state of that contrariety reflects this conception of its organ's condition prior to perceptual affection. Thus the sense is a mean state because, as the form and final cause of the animate organ, it both *determines* and *reflects* the condition of its organ, in those respects in which the latter is an instrument for the realization of the sense's perceptual and discriminative functions.

Aristotle also applies the model of a ratio to describe the sense in second actuality. This is the state in which the (hylomorphically conceived) animate organ is actually perceiving: the sense is exercising its potential to receive the form of a perceptually qualified object without the matter; and its organ is suffering affection by the object insofar as it is so qualified.²⁸ However, contrary to what the present interpretation may lead us to expect, Aristotle does not explicitly identify the ratio of the sense in second actuality with the composition of its organ in a state of being affected; he rather identifies *this* ratio with that of the perceptual *quality* whose form it is receiving without the matter:²⁹

Text 3.6

[1] If, then, some voice is a concord [i.e. voice in actuality],³⁰ and voice and hearing are in a sense one—though they are in [another] sense not one or not the same—and [if] concord is a *logos*, it is necessary that hearing is also a kind of *logos*.

²⁸Cf. *An.* 419^a17–18: *πάσχωτος γάρ τι τοῦ αἰσθητικοῦ γίνεται τὸ ὄρᾶν*. Note that for Aristotle the affection of the organ by a perceptually qualified object must be via some medium. Since I do not see any difference between how the causally relevant perceptual quality acts on the medium and how it acts on the sense organ (see ch. 1.6), I shall ignore this complication in what follows.

²⁹The passage is difficult both textually and exegetically; I include with the translation in the main text several interpretive glosses (indicated by square brackets). The interpretation I favor is largely consonant with that of Polansky 2007, 391–393 and Hamlyn 1993, 125–126; cf. Shields 2016, 270–272. Contrasting views include Ross 1961, 277–278 and, especially, Barker 1981 and Hicks 1907, 441.

³⁰The most natural reading of the text given by most MSS has Aristotle making a much weaker claim than his argument requires. What he needs to say is that voice, or at any rate voice in actuality, is a kind of concord, but the Greek phrase *εἰ δὲ συμφωνία φωνή τις ἔστω* is most naturally read as claiming that concord is a type of voice. Two solutions have been proposed for getting the required premise. (1) Barbotin (1966, 71) keeps the MSS reading but translates *φωνή τις* as the subject of *ἔστω*: “*si donc telle voix est une harmonie*”. (2) On the basis of readings gleaned from Priscian of Lydia (in his epitome of Theophrastus' *De Sensu*) and the Byzantine commentator Sophonias, Ross (1961, 277) emends 426^a27 so that it reads *εἰ δ' ἡ φωνή συμφωνία τις ἔστω* (cf. Hamlyn 1993, Shields 2016). (1) has the advantage of preserving the majority MSS reading, though I have found no parallel passages in Aristotle's corpus in which an ‘*X τις*’ expression serves as the grammatical subject of a predicative *ἔστω*. (2) is less conservative, but it yields a much more natural statement of the required premise. My slight

[2] Indeed, this is also why each extreme, both the sharp and the flat, destroys hearing; [why the extremes present] in flavors destroy taste; and [why] in colors the very bright or dark and, in the case of smell, strong odor, both sweet and pungent, [destroy the sense]: namely [on account of the fact] that the sense is a certain of *logos*.

[3] For this reason too [the extremes] are pleasant, whenever they, being [initially] pure and unmixed, are brought into the *logos*—[extremes] such as the sharp or sweet or salty;³¹ for then [such extremes] are pleasant. But in general what is mixed, [namely] a concord, is more [pleasant] than the sharp or flat, and, for touch, that which can be heated or cooled [is more pleasant than either extreme]. And the sense is the *logos*, but the extremes either pain it or destroy it.³² (An. 3.2, 426^a27–^b8)

Read in the way I am suggesting, Aristotle's point in text 3.6.1 is that the hearing of vocal sounds exemplifies a general feature of special perception, namely that the sense in second actuality is identical to the ratio or *logos* that formally characterizes the actualized quality it is perceiving. Actual voice seems to be exemplary in this regard, since it is so obviously a ratio; it is at any rate a concord, and a concord is a numerical ratio of sharp and flat pitch (APo. 90^a18–19).³³ In any case, the lesson of the example is clear. Aristotle has just argued that when actual voice occurs with the actual hearing of voice the two are the same in number—though different in being—and are both located in the perceiver.³⁴ Voice in actuality is a concord, that is, a ratio of flat and sharp pitches, so the actual hearing with which it is identical must also be a ratio. The point generalizes because, as Aristotle makes clear in texts 3.6.2–3, qualities in other perceptual modalities are likewise composed of extreme contraries in a numerical ratio. Thus in these lines Aristotle is able to derive general corollaries about the primary or “unmixed” extremes of

preference for (1) stems from the comparatively weak ancient authority for Ross' emendation, but the reader who finds the (admittedly unnatural) translation of the MSS text unbearable may adopt solution (2), which is equally compatible with the present interpretation.

³¹For saltiness as the privative extreme of the flavor scale, akin to bitterness, see *Sens.* 442^a25–27, though cf. *An.* 422^b10–14, quoted in note 21 above.

³²εἰ δὲ συμφωνία φωνή τις ἐστίν, ἢ δὲ φωνή καὶ ἡ ἀκοὴ ἐστίν ὡς ἐν ἐστὶ καὶ ἐστίν ὡς οὐχ ἐν ἢ οὐ τὸ αὐτό, λόγος δ' ἡ συμφωνία, ἀνάγκη καὶ τὴν ἀκοὴν λόγον τινὰ εἶναι. καὶ διὰ τοῦτο καὶ φθείρει ἕκαστον ὑπερβάλλον, καὶ τὸ ὄξύ καὶ τὸ βαρὺ, τὴν ἀκοὴν· ὁμοίως δὲ καὶ ἐν χυμοῖς τὴν γεῦσιν, καὶ ἐν χρώμασι τὴν ὄψιν τὸ σφόδρα λαμπρὸν ἢ ζοφερόν, καὶ ἐν ὀσφρήσει ἢ ἰσχυρὰ ὀσμὴ, καὶ γλυκεῖα καὶ πικρά, ὡς λόγου τινὸς ὄντος τῆς αἰσθήσεως. διὸ καὶ ἡδέα μὲν, ὅταν εἰλικρινῆ καὶ ἄμικτα ὄντα ἄγεται εἰς τὸν λόγον, οἷον τὸ ὄξύ ἢ γλυκὴ ἢ ἄλμυρόν, ἡδέα γὰρ τότε· ὅλως δὲ μᾶλλον τὸ μικτόν, συμφωνία, ἢ τὸ ὄξύ ἢ βαρὺ, ἀφ᾽ ἧ δὲ τὸ θερμαντὸν ἢ ψυκτόν· ἢ δ' αἰσθησις ὁ λόγος· ὑπερβάλλοντα δὲ λυπεῖ ἢ φθείρει.

³³Cf. Polansky 2007, 391–393, Shields 2016, 270–272. Aristotle may also be relying on an etymological connection between ‘voice’ (*φωνή*) and ‘concord’ (*συμφωνία*) to establish that voice is a concord.

³⁴See *An.* 425^b25–426^a2 (= text 1.5). For a defense of this reading, see ch. 1.3.

perceptual quality scales, namely that, unmixed with their contraries in some ratio, they destroy the sense, and that they are pleasant only when they are brought into a ratio. Both corollaries follow because the sense is a ratio, specifically the one that formally characterizes the quality it is perceiving.

While Aristotle does not explicitly advert to the sense organ in establishing the identity in ratio between sense and perceived quality in actuality, there is good reason to think that the common ratio reflects the condition of the sense organ when it is being affected by a perceptual quality. We observed that Aristotle's argument in text 3.6.1 depends on the sameness of the sense and perceived quality in actuality. But it is a carefully qualified sameness: they are, he says, in a way the same but in a way not. The way they differ is in respect of what it is to be the actuality of a perceptual quality and the actuality of a sense. The one is a type of *motion* and the actuality of an efficient-causal *agent*, whereas the other is a type of *affection* and the actuality of an efficient-causal *patient*. They are however the same in number, for when the actuality of a perceptual quality occurs simultaneously with the actuality of a sense the (active) motion and the (passive) affection are present in one and the same matter (cf. *Met.* 1016^b31–35). Both are present in the perceiver—or, rather, in the organ of sense, the part of the perceiver's body that suffers the affection. Since Aristotle's argument depends on both the sense and the perceived quality in actuality being present in the sense organ, it is plausible that the actualized sense comes to have the ratio of the perceived quality *because* its organ has come to instantiate that quality. If so, then the ratio with which Aristotle identifies the sense in second actuality also reflects the condition of its organ: the sense in actuality corresponds to the ratio of the perceived quality in actuality because, and only insofar as, the organ has been *assimilated* to that quality.

This argument shows that there are implications for the nature of perceptual affection that follow from interpreting the (distinct) ratios identified with the sense in both first and second actuality as alike reflecting the condition of the sense organ, the first in potentiality, the second in actuality. For, on this interpretation, the sense in first actuality is a mean state reflecting the mean composition of the organ, while in second actuality it is a (non-mean) ratio reflecting the

condition of the organ when it is being affected by a perceived quality. It would seem to follow that the result of perceptual affection is that the organ comes to instantiate the same ratio of contraries that formally characterizes the perceived quality, such that it comes to be qualified in the same way as the perceived object.

In one respect, this is an appealing result. As we've seen, Aristotle regards perception as a process of assimilation, in which what perceives, including both the sense and its organ, moves from being potentially to being actually such as the perceived object insofar as it is perceived. The most straightforward application of this thesis to the sense organ would be to say precisely that the affected sense organ becomes such that it somehow instantiates the relevant perceptual quality, thereby becoming actually such as what it perceives. In another respect, however, the interpretation seems to commit Aristotle to an extreme and objectionable form of *literalism*, the view that perceptual affection involves the affected organ literally taking on the perceived quality, such that the eye upon seeing crimson comes literally to *be* crimson, the tongue upon tasting sweet comes literally to *be* sweet, and so on. This claim goes beyond the view of many literalist interpreters, according to whom the a perceived quality comes to be predicable of the sense organ in actuality, but *not* by virtue of the sense organ taking on the relevant quality in the same way as the perceived object. Rather, on their view, the organ has the quality "extrinsically", without the matter of the animate organ coming to be such as the perceptually qualified body affecting it.³⁵ In some passages Aristotle seems sympathetic to this more moderate literalism. He remarks, for instance, that what sees is *as though* it has been colored (ὡς κεχρωμάτισται: *An.* 425^b22–23; cf. *Phys.* 244^b7–11); and there is evidence that there are analogous material changes in the organ of smell.³⁶ However, even this moderate version of literalism has been called into question. The interpretation is objectionable because, as many commentators have argued, Aristotle in *De Anima* 2.5 seems explicitly to reject the idea that perceptual affection results in the

³⁵See Sorabji 1992, 2001, though see Everson 1997, 84 for a statement of this extreme form of literalism, which Caston 2005 calls "Fundamentalism".

³⁶See Johnstone 2012 for a defense of this reading.

perceiver's having acquired the *same* quality as the perceived object, even in a *different* way.³⁷

I agree that Aristotle's arguments in *De Anima* 2.5 entail a distinction between perceptual affection and such literal assimilation of the sense organ to the perceived quality. However, I think it would be a mistake to think that we commit Aristotle to viewing perceptual affection as a case of literal assimilation or ordinary alteration by attributing to him the view that the condition of the sense organ in a state of perceptual affection is characterizable as the same ratio of extreme contraries as the perceived quality. As I shall argue in what follows, all that it commits Aristotle to is that the affected sense organ is, for the duration of the affection, *taking on* the ratio that characterizes the perceived quality, and in the same pair of contraries; but it does not follow from this that the organ actually *takes on* that quality.

The contrast I have in mind concerns, on the one hand, the *way* in which a thing is affected and, on the other, the *result* of the affection. My strategy will be to show that Aristotle's conception of perceptual affection as an *extraordinary* type of alteration turns on a difference in its results compared to those of ordinary alterations. While one way to account for this difference in result is to posit a distinction in how the patient is affected in ordinary and extraordinary alterations, it is also consistent with Aristotle's distinction to insist that patients of ordinary and extraordinary alterations are affected in the same way, though with different results. If this is correct, then we can accommodate the idea that the sense organ in second actuality is materially *affected* in the way the literalist suggests, without conceding that it is thereby materially *altered* in that way.

3.3.1 "Alteration of a sort"

Alteration, in Aristotle's view, is a change between contraries in the category of quality ($\tau\omicron$ ποιόν, *Cat.* 15^b11–16; πάθος καὶ τὸ ποιόν, *GC* 319^b32–320^a2). Prior to qualitative affection, the patient object instantiates one species, F_i , of a quality genus F , for instance warmth or softness. Alteration occurs when the patient object comes into contact with an object that instantiates

³⁷See esp. Caston 2005, 292–299 and Lorenz 2007, 186–188.

a contrary homogeneous quality, F_k , for instance coolness or hardness. The patient is affected by the agent qua F_k , with the result that the patient's initial quality is destroyed and replaced by another in the same genus. It may be that the patient comes to be qualified in the same way as the agent, in which case it comes to be F_k . This would be a case of literal assimilation, but there may also be cases in which, for one reason or another, the patient fails to be fully assimilated to the agent, only acquiring some other, intermediate quality F_j , for instance lukewarm. These too are cases of alteration, since the patient has still lost one contrary and had it replaced by another in the same genus of quality.

An important thing to notice about Aristotle's account is that it defines alteration in terms of its *result*. A thing has a quality if it is said to be qualified somehow (*Cat.* 8^b25), whether as knowing or as ignorant, healthy or ill, dark or light, hot or cold, rough or smooth, triangular or square, or in some other way. Alteration occurs when a thing that was qualified in one way comes to be qualified in another. Since such changes can only occur within a single quality genus, ordinary alterations necessarily involve the destruction of one quality present in an object by its contrary. In *De Anima* 2.5 Aristotle distinguishes two types of ordinary alteration, which I call "privative" and "stative".³⁸

PRIVATIVE ALTERATIONS

Affections in which one species of quality is destroyed by its contrary, with the result that the patient acquires a privative disposition, e.g. *not-F_i*; and

STATIVE ALTERATIONS

Affections in which one species of quality is destroyed by its contrary, with the result that the patient acquires another contrary, F_j , which is a stable state conducive to the patient's nature (417^b12–16).³⁹

³⁸See Lorenz 2007, 181–188, cf. Burnyeat 2002, 53–67.

³⁹As Lorenz (2007, 185n11) argues, it is extremely tempting to excise the *ὡσπερ εἴρηται* at 417^b14, which would remove all doubt that the contrast in these lines is not the one made at b₂–5 between ordinary and "extraordinary" alteration (which we'll presently discuss), but between two types of ordinary alteration.

Stative alterations are actually a special case of privative alterations. The difference is that, in stative alterations, the destroyed quality is replaced by a contrary that contributes to the fulfillment of the thing's nature, as when a learner replaces ignorance of the Pythagorean theorem with knowledge of it. For this reason too the results of stative alteration are more stable and longer lasting than those of merely privative alteration (cf. *Cat.* 8^b27–32). But in both cases the result is the same: the patient, the thing altered qua *F*, is destroyed and replaced with that same object otherwise qualified.

The transition characterizing the perceiver's move from potentially to actually perceiving is an instance of neither of the above types of alteration. Aristotle characterizes perceptual affection as "alteration of a sort" (*ἀλλοιώσις τις*),⁴⁰ but in his view the analogy between perception and ordinary alteration is at best partial. For although what perceives is, in a way, assimilated to the perceived object insofar as it is perceived, this transition does not involve the destruction of one contrary by another but the *preservation* (*σωτηρία*) of the patient qua patient:

Text 3.7 But being affected is no univocal thing. One type [of being affected] is a sort of destruction [of one contrary] by its contrary, and another is more a preservation of what is in potentiality by what is in actuality and is like [that actuality] as a capacity [or potentiality] is to its fulfillment. For one who has knowledge comes to contemplate it, which is either not a case of being altered, since it is a progression into itself and into its fulfillment, or else it is a different kind of alteration.⁴¹ (*An.* 2.5, 417^b2–7)

The first type includes ordinary alterations in which the patient as such does not survive: after the cool object has been warmed, there ceases to be a cool object; after the ill person has been cured, there ceases to be an ill person. The second type is "extraordinary" because the patient as such is *preserved*, and survives the transition: the knower who comes to exercise her knowledge does not thereby cease to be a knower, even though merely having and actually using knowledge are in a sense contraries. For this reason it is somewhat awkward to speak of these transitions as alterations, for there is no destruction of the quality the patient possessed prior to undergoing

⁴⁰See *An.* 415^b24, 416^b34; *Ins.* 459^b4.

⁴¹οὐκ ἔστι δ' ἀπλοῦν οὐδὲ τὸ πάσχειν, ἀλλὰ τὸ μὲν φθορά τις ὑπὸ τοῦ ἐναντίου, τὸ δὲ σωτηρία μᾶλλον ὑπὸ τοῦ ἐντελεχείᾳ ὄντος τοῦ δυνάμει ὄντος καὶ ὁμοίου οὕτως ὡς δύναμις ἔχει πρὸς ἐντελέχειαν· θεωροῦν γὰρ γίνεται τὸ ἔχον τὴν ἐπιστήμην, ὅπερ ἢ οὐκ ἔστιν ἀλλοιοῦσθαι (εἰς αὐτὸ γὰρ ἢ ἐπίδοσις καὶ εἰς ἐντελέχειαν) ἢ ἕτερον γένος ἀλλοιώσεως. Text following Janone.

such affection.

Here too the distinction concerns the results of the two types of affection. In ordinary destructive alterations the patient as such does not survive affection, whereas in extraordinary, or preservative, alterations the patient as such is preserved:

PRESERVATIVE “ALTERATIONS”

Affections in which the patient qua patient is preserved.

Text 3.7 suggests that what allows for the preservation of the patient is the distinctive relation it stands in to the agent of the relevant affection. In preservative alterations, the agent is not simply what the patient is potentially—though it is of course *that*—but the fulfillment (ἐντελέχεια) of the very potentiality that characterizes the patient as such. This relation is exemplified by the connection between the state of merely possessing an item of knowledge and that of actually exercising it in contemplation, for in this case the patient, qua knower, has come more fully into her own and into fulfillment. But it is important to see that Aristotle does not *identify* preservative alterations with transitions into second actuality. For all Aristotle says here, transitioning into second actuality is but one way for the patient to survive alteration.⁴² To be sure, Aristotle explicitly compares the perceiver’s transition to second actuality perception to this type of transition, so it is clear that an adequate account of perceptual affection should construe the perceived object qua perceived as in some way the fulfillment of the perceiving sense qua perceptive of an object so qualified. In one respect this is easy to do: because the function of the animate sense organ is to perceive objects qualified in that way, any such affection will be the fulfillment of the potentiality that characterizes the organ as such. The real difficulty lies in articulating what this sort of affection must be like, such that it turns out to be a preservative alteration and not, say, an ordinary stative alteration, in which the patient’s nature is fulfilled via the destruction of contrary qualities. It is here where I think the distinction between the way a thing is affected and the result of the affection will prove helpful.

⁴²See also ch. 1.6.

3.3.2 *Receiving perceptual form without the matter*

Commentators seeking to articulate the difference between perceptual affection and two types of “destructive” alteration distinguished above have seized upon Aristotle’s qualification that the sense is a capacity to receive perceptual form *without the matter*.⁴³ According to one style of interpretation—that of the so-called *spiritualist* interpreters—the qualification indicates that perceptual affection is a purely *formal* change, one that does not involve *any* material alteration of the organ. Now, it is consistent with this interpretation of Aristotle’s qualification that material changes may attend perceptual affection—there may be, in other words, “standing material conditions” for receiving perceptual form without matter. But the material conditions for perceptual affection form no part of the immaterial reception of perceptual form itself. The spiritualist approach thus distinguishes perceptual affection from destructive alteration by excluding the material components altogether: *whatever* happens to the sense organ when the sense moves to second actuality, it is no part of the preservative alteration in which perception consists. This, however, only partially answers our present question. For there is substantial evidence that there *are* material changes attending perceptual affection: vision, for instance, occurs when the eye has been moved and affected, with the result that it has in a way been colored. To understand how the eye can be so affected and yet retain its potentiality to be acted on in the way necessary for perception to occur, we also need a positive account of the material changes attending the transition to second actuality perceiving.

One such account is offered by “non-literalist” materialist commentators, who argue for a conception of the material aspects of perceptual affection that is superficially akin to the present interpretation of the sensory mean state.⁴⁴ These commentators interpret the claim that per-

⁴³I cannot within this limited space do justice to the rich and detailed history of the debate between spiritualist and literalist interpretations of Aristotle’s psychology of perception. In what follows I sketch, in fairly broad strokes, different interpretive approaches, which may be refined in a number of ways. These sketches will be sufficient for my present purpose, which is merely to establish the possibility (and hopefully the plausibility) of an account of perceptual affection consistent with the present account of the sensory mean state. For a detailed critical overview of the debate, see Caston 2005; I discuss Caston’s positive proposals below. Outliers who fit neatly into neither the literalist nor spiritualist camp include Charles 2008 and Scaltsas 1996.

⁴⁴See Bradshaw 1997, Caston 2005, Silverman 1989, Ward 1988. To my mind, Caston has developed this most

ception is an alteration *of a sort* on the basis of a distinctive reading of the famous wax analogy Aristotle uses to illustrate the reception of perceptual form without the matter:

Text 3.8 Generally concerning each sense one must grasp that the sense is what is receptive of perceptual forms without the matter. For instance, the wax receives the signet of the ring without the iron or gold: it takes on the golden or brazen signet, but not insofar as it [sc. the signet] is gold or bronze. In the same way also the sense of each [perceptual quality] is affected by what has color or flavor or sound, but [(A):] not insofar as each of these is said [or (B): not insofar as it (sc. what has color, etc.) is said to be each of these (sc. color, etc.)], but insofar as it is such and according to *logos*.⁴⁵ (*An.* 2.12, 424^a17–24)

The analogy admits of several interpretations, in part because a crucial clause of the last sentence —*ἀλλ' οὐχ ἢ ἕκαστον ἐκείνων λέγεται*—is grammatically ambiguous. The construal I labelled (A) renders the analogy as follows: just as the wax receives the bronze signet ring not qua bronze but qua signet, the affected sense receives the colored body not qua body or material but qua colored.⁴⁶ For the spiritualist, this illustrates how the sense can be assimilated to the perceived object in respect of its formal properties without being assimilated in its material properties; the sense is affected by the colored object only insofar as it is *such*, namely colored.⁴⁷ The construal I labelled (B) identifies different terms for the analogy: just as the wax receives the bronze signet not qua brazen ring but simply qua signet, the affected sense receives the colored body not qua perceptually qualified in the relevant way, but qua qualified in in some *other* way.⁴⁸

detailed and persuasive version of this approach, so I'll use his interpretation as a representative of the entire non-literalist materialist approach. Nothing I shall have to say about non-literalist materialism should hang on this decision.

⁴⁵καθόλου δὲ περὶ πάσης αἰσθήσεως δεῖ λαβεῖν ὅτι ἢ μὲν αἴσθησις ἐστὶ τὸ δεκτικὸν τῶν αἰσθητῶν εἰδῶν ἄνευ τῆς ὕλης, οἷον ὁ κηρὸς τοῦ δακτυλίου ἄνευ τοῦ σιδήρου καὶ τοῦ χρυσοῦ δέχεται τὸ σημεῖον, λαμβάνει δὲ τὸ χρυσοῦν ἢ τὸ χαλκοῦν σημεῖον, ἀλλ' οὐχ ἢ χρυσοῦς ἢ χαλκός· ὁμοίως δὲ καὶ ἢ αἴσθησις ἐκάστου ὑπὸ τοῦ ἔχοντος χρώμα ἢ χυμὸν ἢ ψόφον πάσχει, ἀλλ' οὐχ ἢ ἕκαστον ἐκείνων λέγεται, ἀλλ' ἢ τοιονδί καὶ κατὰ τὸν λόγον.

⁴⁶Construal (A) (1) takes the grammatical subject of *λέγεται* to be *ἕκαστον ἐκείνων*, (2) which refers back to *τοῦ ἔχοντος χρώμα ἢ χυμὸν ἢ ψόφον*.

⁴⁷See e.g. Burnyeat 1992, Johansen 1997, 189.

⁴⁸For a defense of construal (B), see Caston 2005, 306n120; cf. Silverman 1989, 289n9; Ward 1988, 220–221. This construal (1') takes the grammatical subject of *λέγεται* to be the perceptually qualified object (*τοῦ ἔχοντος . . .*), and (2') reads *ἕκαστον ἐκείνων*, which here refers back to the qualities of the object (*χρώμα ἢ χυμὸν ἢ ψόφον*), as its direct object. It seems to me that another construal that would yield the same sort of analogy (i.e. by preserving (2')) would be to take the grammatical subject of the entire sentence, *ἢ αἴσθησις ἐκάστου*, to be the subject of

Construal (B) is friendly to the non-literalist materialist, for on that view one thing the analogy is supposed to show is that perceptual affection consists, as they sometimes put it, in the successful transfer of “information”. What the wax receives when it accepts the ring’s signet is not simply a collection of marks that alters the contours of its surface, but a *seal* that indicates to its recipient the office or personage from which the sealed item originates. Analogously, on their view, the sense does not simply undergo ordinary material alteration when it receives the form of a perceptual quality. It does do that, but in doing so it also receives *intentional content* bearing information about the body from which it originates.⁴⁹ The analogy also shows that such transmissions of information, though implying literal assimilation and ordinary alteration of a sort, do not require the information to be “encoded” in the same matter when it is transferred to another recipient. Just as the impression does not produce another brazen signet, but rather a *waxen* one, so perceptual affection does not on this view produce another colored object, but rather an object of *another* sort that encodes the same information.

On this view, then, receiving form without the matter is similar to “transduction”, roughly, a process of encoding the same information in a different sort of material.⁵⁰ In support of this interpretation, non-literalist materialists point out that, in text 3.8, the sense is said to be affected by the perceptually qualified object insofar as it is “of *this* sort and according to *logos*”. In their view the operative meaning of ‘*logos*’ is *ratio*, and in particular the ratio of the perceived quality. What enables Aristotle to distinguish perceptual affection from ordinary alteration is that the same ratio can be instantiated by several different contrary quality pairs. Perceptual affection, on this view, preserves the patient as such because the ordinary alterations in which perceptual affection consists do not affect the patency of the affected sense.

λέγεται. Thus the clause could be translated: “not insofar as [the sense of each, when it is affected] is said to be each of these [qualities], but insofar as it is *such*”. Read in this way, too, the purpose of the analogy is to show that the sense, though it has come in a way to be such as the perceived object, is not affected in the same way as it is said to be so qualified. But it avoids the complication of separating the complex description τοῦ ἔχοντος χρώμα . . . , which seems to me an implausible consequence of Caston’s construal.

⁴⁹As Caston (2005, 307 and n122) points out, seals or inscriptions in wax are common metaphors for intentional content in the Greek tradition.

⁵⁰See Caston 2005, 303–304.

In one respect the non-literalist materialist interpretation of text 3.8 supports the suggestion that the sameness in ratio of the sense and the perceived quality is grounded in the instantiation of the relevant proportions of matter in the affected organ. But the present interpretation parts ways with non-literalist materialism at its claim that the contraries in which the sense organ instantiates the proportions are *necessarily different* from those from which the perceived quality is mixed and between which the sense is a mean state. With this claim the non-literalist materialist posits a disconnect between the ratio of the sense in second actuality and its status in first actuality as a mean state of the contraries defining the quality scale it specially perceives; but an interpretation that commits Aristotle to such a disconnect is bound to be unsatisfactory. It is not only that, if this were Aristotle's view, he would owe us an account of how the sensory mean state relates to the condition of the animate organ in second actuality, an account he never actually provides. The deeper difficulty with an interpretation of this sort springs from a general problem for interpretations that regard preservative alteration as dependent on underlying destructive alteration(s). Fortunately, however, there is another, broadly materialist conception of preservative alterations that locates the contrast with ordinary change in the *result* of the affection, rather than in *how* the patient is affected.

3.3.3 *A difficulty for non-literalist materialisms*

Like the spiritualist, the non-literalist materialist accounts for the preservative nature of perceptual affection by distinguishing how the sense is affected in ordinary changes from how it is affected by perceptual qualities in perception. But where the spiritualist locates the distinction in a contrast between matter-involving and non-matter-involving alterations, the non-literalist materialist locates it in a contrast between affections that alter the material disposition necessary for the animate sense organ to be subject to perceptual affection and those that do not. Like the spiritualist, moreover, the non-literalist materialist takes preservative perceptual alterations to depend on ordinary destructive alterations. For the spiritualist these ordinary destructive alterations are part of the standing material conditions for perceptual affection. But for the non-

literalist materialist they are a crucial part of the process by which the ratio of the perceived quality is “transduced” in episodes of perceptual affection. Specifically, they are the alterations within some “relevantly related” genus of qualities whereby information about the perceptual quality is “encoded” in different sorts of matter.

Unlike the spiritualist, then, the non-literalist materialist admits ordinary alterations into the process of perceptual affection. But she does so in a way that appears to allow for the preservation of the perceptual patient, for even though the sense organ on this view undergoes ordinary alterations of a sort, these alterations are not within the quality genus it specially perceives, and relative to whose species it is potentially all but actually none. In reality, however, her account only pushes the problem one step back. Perception is a preservative change because the reception of a determinate perceptual quality—crimson, say—does not destroy the perceiver’s receptivity to that quality: just as the mathematician’s use of the Pythagorean theorem does not undermine (but, if anything, *reinforces*) her ability to call upon it on subsequent occasions, the perceiver’s seeing of crimson does not destroy her ability to see crimson on subsequent occasions. But if the perceiver’s reception of crimson without the matter is dependent on ordinary, destructive alterations within some other quality genus, her ability to receive crimson on subsequent occasions *would* be destroyed.

To see why, suppose you are presented with a series of crimson color chips. According to the non-literalist materialist, in seeing the first chip your eye is assimilated to the ratio definitive of crimson, not however by instantiating it with proportions of black and white (or opaque and transparent), but with contraries definitive of some relevantly related quality genus—call it F . Because the underlying F -change is an ordinary alteration, your eye comes to be differently qualified within F , moving from some initial quality F_i to a contrary one coordinate with crimson—call it F_c . What happens when you are presented with the next color chip? In order to receive *its* crimsonness without the matter, your eye would again have to be assimilated to F_c . Assimilation to F_c requires your eye to be potentially but *not actually* F_c . But given the ordinary change it underwent by the agency of the previous color chip, your eye is *already* actually

F_c .⁵¹ So, despite the fact that the mean condition of your eye in the genus of color has not been affected, your ability to receive crimson without the matter seems not to have been preserved.

I've framed this as an objection to non-literalist materialism, but in fact it applies to any interpretation that takes preservative alteration to depend on ordinary alteration. Whether or not these ordinary alterations are regarded as features of the perceptual affection itself, the perceiver's potentiality to be affected will not have been preserved if a consequence of perceptual affection is that the perceiver has come to be differently qualified in any respect relevant to that potentiality.⁵² The natural way to respond to this worry is of course to deny that the underlying F -alteration is an ordinary destructive alteration: while the eye in a state of affection in fact departs from its initial condition F_i and is temporarily assimilated to F_c , the result of the affection is not that the eye comes to *be* F_c . But this response would raise the obvious question why we could not simply apply such an analysis to the condition of the eye in the genus of *color*, affirming that the eye in a state of affection is temporarily assimilated to the crimson of the color chip, but denying that the result of the affection is that the eye has been *altered* such that it has become crimson. Such an account would draw the distinction between ordinary alteration and perceptual affection, not in terms of *how* the patient is affected, but in terms of their *results*. I find such a result-centered account an appealing alternative, not least because Aristotle's conception of affective qualities seems designed to make room for just such a possibility.

⁵¹Supposing, of course, that you have had no intervening experience of colors other than crimson. This seems to me an innocuous assumption, for simply to stipulate that you can be affected by a subsequent chip of the same color *only after* a "palate-cleansing" experience of a different color strikes me as ad hoc and lacking in textual support (though cf. *An.* 3.1, 425^b4–11: it seems that perception of some common perceptual qualities requires palate-cleansing of this sort). Indeed, such a stipulation would wholly undermine the distinction between destructive and preservative change articulated in text 3.7.

⁵²Note moreover that it won't do for the non-literalist materialist to respond by saying that, on subsequent affections by a single quality species, the relevant information comes to be encoded in *different* pairs or opposites. Several considerations commit Aristotle to the view that there can be at most one genus into which information about a given quality scale is "transduced". First, Aristotle clearly recognizes sameness relations between perceptual qualities mixed in the same ratio of different contrary qualities (cf. the discussion of coordinatehood in ch. 2.5), so stipulating that information about perceptual may be transduced into several different quality genera creates the possibility of the soul confusing heterogeneous qualities mixed in the same ratio. Second, Aristotle is evidently committed to the view that the soul identifies specific unity among qualities by virtue of the same sense discriminating the qualities in the same way (*Sens.* 447^b25–26); yet it is difficult to see how (e.g.) vision would be discriminating two instances of crimson in the same way if the ratio of each was encoded in a different pair of opposites.

3.3.4 *Literalism without ordinary alteration*

On a result-centered account, preservative alterations are simply affections that do not result in qualitative change. Such an account presupposes the existence of *affections* in the category of quality that do not qualify as *alterations*, since the subject does not come to be otherwise qualified but persists qua patient through the affection. Aristotle's discussion of affective qualities in *Categories* 8 provides an attractive model for understanding affections of this type. In that context Aristotle draws a distinction between qualities (*ποιότητες*) and temporary affections (*πάθη*). Qualities in general are stable (*παραμόνιμος*) and hard to change (*δυσκίνητος*). Sweetness, for instance, is a stable attribute of honey, one that would be difficult to displace with a contrary quality; these qualities, Aristotle says, "have been received" (*δεδεγμένα*) by their subjects in the sense that they are had not merely as the result of affection by an external agent, but as stable and enduring attributes (cf. 9^a36, quoted in text 1.3). Of course, one way to acquire an enduring attribute of this sort is *through* affection. In these cases the attribute acquired by the patient turns out to be stable and long lasting, perhaps persisting through the remainder of one's life—think, for instance, of farmers and day laborers who have developed a dark tan from excessive exposure to the sun, or sufferers of chronic illness who have developed a persistent pallor in their complexion (9^b24–27). According to Aristotle, such persisting affections turn out to be *qualities* since, as he puts it, "we are said to be qualified in respect of these" (9^b27). Yet many cases of affection will *not* result in the acquisition of a stable attribute, and in these cases the subject cannot likewise be said to be qualified in that respect. Aristotle gives as examples of such temporary affection turning red from shame or pale from fear. While redness and pallor may indeed qualify a person's complexion, in Aristotle's view "one who has turned red from embarrassment is not called ruddy, nor is one who has turned pale from fear [called] pale, but rather they have been somehow *affected* (*πεπρονθέναι τι*). Thus such [attributes] are called *affections*, not qualities" (9^b30–33, quoted in context in text 1.13).

The contrast between qualities and temporary affections clarifies an important condition on cases of ordinary alteration. An ordinary alteration must be a change in *quality*; a subject that

was qualified in one way must come to be qualified in another, contrary way. On the *Categories* 8 account, coming to be qualified in another way is a matter of being affected so that the affected subject acquires, not just a contrary attribute, but one that endures and is hard to change. Thus the result of all ordinary alterations is that the affected subject comes to possess the contrary attribute in the same way as honey possess its sweetness, in the sense that both “have received” the relevant attribute—note the perfective aspect. By contrast, affections in which the subject acquires a temporary attribute would *not* count as alterations in this sense. For though the subject may temporarily take on a different qualitative condition, the result of the affection is not contrary *qualification*. A person of dark complexion may go white from fear and a person of light complexion may go red from embarrassment, but in neither case does it come to be true that the person no longer has the complexion they had before. In these cases we might say that, although the person was *receiving* pallor or redness (in the progressive aspect) for the duration of the affection, at no point had that person *received* the contrary quality.⁵³

If we understand this condition as a presupposition of Aristotle’s distinction between ordinary, destructive alterations and extraordinary, preservative “alterations”, we can see how the contrast between perceptual affection and ordinary, destructive alteration lies not in the *nature* of the respective affections but in their *result*. For me to be altered in respect of a perceptual quality genus like flavor would be for me to lose one stable flavor attribute and acquire a contrary but equally stable flavor attribute. This however is not what usually happens when I taste flavor. When I taste the sweetness of a bit of honey, my gustatory affection is temporary and fleeting, lasting just as long as I maintain perceptual contact with the honey, or until any lingering (but still temporary) effects in the organ dissipate. Given the condition that a genuine alteration must be a change in *quality*, it is clear that this sort of affection is either not an alteration at all or an alteration of an altogether different sort. My tongue has not lost the condition that made it a suitable patient for such gustatory affection. My tongue qua patient of that gusta-

⁵³There is a striking parallel with the conclusions of Murphy (2005), who argues that Aristotle’s chemistry of affection must allow for objects to take on certain phenomenal qualities (e.g. “hot-to-the-touch) without altering their fundamental elemental composition (e.g. without becoming predominantly composed of the hot).

tory affection possesses the mean value of the flavor scale. True, while it was being affected by the honey's sweetness it became, in a way, true to say that my tongue is sweet. But because my tongue never fully received the sweetness of the honey, it never came to be *qualified* otherwise that it initially was. To adapt Aristotle's language in *Categories* 8—language that we can now see is echoed in *De Anima* 2.5 (see e.g. text 3.3)—when my tongue is acted on by the honey it is *affected* somehow (*πεπονηθέναι τι*), but it has not come to be *qualified* in that respect.⁵⁴ It has never departed from the mean qualification that characterizes its condition qua organ of taste.

It is not just that perceptual affections happen not to result in qualitative change. The animate organ of sense is a hylomorphic unity in which the sense is a mean state between the contraries its organ instantiates in a mean ratio. This condition is a stable attribute of the animate organ, in the way in which sweetness is a stable attribute of honey. So we should *expect* the mean condition of the animate organ to be difficult to change, in part because possessing such a quality is part of what it is to be that sense organ. Of course, as Aristotle acknowledges, there are cases in which the mean quality of the organ can be destroyed (see, in addition to texts 3.2 and 3.6 above, *An.* 435^b7–19). These are primarily cases in which it is affected by the excesses of the relevant quality scale, the unalloyed extremes that in various proportions determine the intermediate values of the scale. In these cases, as when the organ is destroyed due to injury or death, its inability to operate as an organ of sense is that it has departed from the mean condition necessary for it to act as an instrument for the realization for the senses function. For either damage to the organ has replaced its mean condition with a contrary quality or the soul has perished, and the sensory mean state no longer exists to hold it in the proper equilibrium.

To some extent, this account of the contrast between ordinary alteration and perceptual affection validates the moderate literalist's account of receiving the form without the matter. According to Sorabji, the eye is only *as though* (*ὡς*) it had been colored because it has only been colored extrinsically, or with a borrowed color, in the way that the sea or sky at sunset

⁵⁴Importantly, Aristotle is careful not to speak of perceptual affection as an alteration or change in quality in this context, preferring instead to say that affective qualities *instill* or *impress* (*ἐμποιεῖ*) a certain type of affection (*πάθος τι*) with respect to the sense (9^b7–9).

takes on the color of the sky or of the sun.⁵⁵ The present, result-centered account of preservative alteration suggests one way of cashing out this idea: the coloration of the affected eye is extrinsic or borrowed because it is only due to the activity of the perceived quality, which produces a temporary affection in the eye but never alters its mean coloration. But the present account parts ways with moderate literalism in denying that the organ thereby comes in any way to *be* colored. For, on this account, the organ has not been altered at all, though it can be described as temporarily *affected* (e.g. colored) in a certain way.

In short, on the present picture, receiving perceptual form without the matter is *receiving* it without ever having *received* it.⁵⁶ Where the latter consists in the patient's acquiring a wholly different quality, for instance by becoming mixed in an entirely different ratio of the relevant contraries, patients of the former are moved but never actually displaced from their original condition. This interpretation may appear unduly reductive, but it is in fact adequate to Aristotle's purposes. In support of this, notice that it both includes all the affections Aristotle wants to count as receptions of form without the matter and excludes all of those he does not. The wax receives form without matter because it does not acquire the material disposition necessary for being a signet (though its temporary, mutable affection is sufficient for it to act as a seal). Likewise the affected medium does not (impossibly) depart from that nature whereby it is a medium, but is nevertheless affected and assimilated to the quality that affects it. By contrast, plants and homonymous eyes are affected *with* the matter. Plants are affected by hot and cold with the matter because they lack a principle and mean to maintain a stable temperature within themselves, so affections such as heating and cooling that would be mere affections in animals turn out to result in quality change in plants. The same is true for homonymous sense organs,

⁵⁵See Sorabji 1992, 212, Sorabji 2001, 53.

⁵⁶This remark should not be mistaken as a contradiction of the "tense test" for pure actualities in *Met.* 1048^b18–34. There Aristotle's concern is with seeing, not as such the receiving of visual form. So it does not follow from the claim that every instance of seeing is an instance of having seen, together with the idea that seeing involves the reception of visual form, that every instance of receiving visual form is an instance of having received visual form. First, the reception of form without the matter is only a necessary condition for perception, since the medium too receives form without the matter. And second, it is clear that the tense test is an intensional context: processes can be multiply described, and their satisfaction of the tense test is sensitive to how one describes the relevant process.

such as those severed from the living body or belonging to a corpse, for without a principle to make stable their mean condition, they are much more susceptible to qualitative change.

Admittedly, one consequence of this interpretation is that there are far more preservative changes than commentators have tended to recognize. For if, as I have suggested, a preservative alteration is any affection in which the patient as such is preserved, then we'll have to count affections such as turning red from embarrassment or pale from fear as preservative alterations. But expanding the range of preservative alteration does not undermine the uniqueness of transitions to second actuality of the sort undergone in active perceiving or contemplating. For unlike the above cases of preservative alteration, transitions to second actuality are progressions into the nature and fulfillment of the patient. In these cases, then, the patient is not only preserved through the affection, but comes more fully to express its own nature for the duration of that affection. The same cannot be said of preservative alterations that are not also transitions to second actuality: to turn red from embarrassment or pale from fear is no more a fulfillment of one's nature than the affection of an illuminated medium by actual color or the sealing of wax by a signet.

This further feature of second actualities testifies to the formal and final causal role of the mean state. By maintaining a stable mean condition in its organ, the sensory mean state determines and regulates the sort of affections to which its organ is subject. This is evident in the fact that most perceptual affections—at any rate, those that do not damage or destroy the animate organ—are preservative alterations, affections that do not result in the displacement of the organ's mean condition. More than that, the sensory mean state makes it such that its organ undergoes such affections *for the sake* of realizing its psychological function, namely to perceive and discriminate the range of qualities defined by the contraries of which it is a mean state. In this way the role of the sensory mean state in second actuality is continuous with its role in first actuality. In first actuality, the sensory mean state makes it so that its organ instantiates the relevant mean prior to perception. And in second actuality, it makes it so that its organ instantiates the ratio of the perceived quality in such a way that it does not displace the mean condition

necessary for realizing its perceptual and discriminative function.

3.4 Concluding remarks

The sensory mean state reconciles the incongruities between Aristotle's two models of the special senses, as miniature souls and as ratios of their respective organs. I have proposed an interpretation of the sensory mean state that captures the essential features brought out by both models, according to which the sense is a mean state because it is the form and final cause of an animate organ that, qua organ, must instantiate the mean value of the quality scale specially perceived by the sense. The sensory mean can be seen as a formal and final cause in this way in both first and second actuality. While there is a strong objection to this picture stemming from recent interpretations of perceptual affection, I have argued that this objection is not decisive. There is an attractive alternative picture that allows for the present account of the sensory mean state. While more needs to be said about the result-centered picture I have proposed, I hope to have said enough to establish its plausibility, and to recommend it as a topic for further research.

One of the more striking consequences of the interpretation so far developed is that, in Aristotle's view, what makes a sense organ a suitable instrument for realizing the perceptual and discriminative functions of the sense is that it is composed of equal portions, or a 1 : 1 ratio, of a certain pair of contrary extremes. In other words, the organ qua organ is a *mean*. We've seen at least one reason why the organ qua organ must be a mean is that it must belong to the quality genus it specially perceives, while at the same time lacking determinate qualification within that genus. This is a condition on the possibility of perceptual affection. But there is another reason why the sense organ must be a mean, namely that perception is a *discriminative* capacity. In text 3.4.3 Aristotle presents an argument connecting meanness and the power to discriminate. The task of the next chapter is to consider what the connection might be.

4

Aristotle's Doctrine of the Discriminative Mean

Discrimination (*κρίσις*) is the fundamental concept of Aristotle's cognitive psychology. It is in his view an operation common to all of the capacities and states by which the soul engages in cognition (*γνώσις*),¹ and it is integral to his accounts of thinking, learning, practical calculation, recollection, dreaming, and other processes involving cognitive capacities.² Most strikingly, it plays a central role in his account of sense perception. Whereas his predecessors tended to deny the senses the power to discriminate, Aristotle regards them as the most basic and universal of the soul's discriminative powers.³ At the basic level, the senses are discriminative of the qualities they specially perceive: vision discriminates colors, hearing discriminates sounds, taste discriminates flavors, and so on.⁴ But in many cases these basic discriminations give rise to more complex ones, including cross-modal discriminations, discrimination of similarity and difference among perceptual qualities, and perhaps also discrimination of so-called commonly perceived qualities such as number.⁵ For Aristotle, then, the soul's cognitive abilities cannot be

¹*An.* 427^a17–21, 428^a3–5

²Thinking: *An.* 3.4, 429^b10–22 et passim; cf. 434^b3; learning: *APo.* 99^b32–35; practical calculation: *MA* 700^b17–22; recollection: *Mem.* 452^b7–12; dreaming: *Ins.* 460^b16–18.

³See e.g. Anaxagoras 59B21 DK (= Axx61 Graham); Plato, *Tht.* 186B; cf. Democritus 68B11 DK (= Dmc140 Graham). For a classic statement of the view that Aristotle “expands perceptual content” by extending discrimination to the senses, see Sorabji 1993.

⁴*An.* 418^a11–16, cf. texts 4.1 and 4.8 below

⁵Cross-modal discrimination: *An.* 426^b12–427^a9; discrimination of specific and generic similarity and difference: *Sens.* 447^b21–448^a1; discrimination of common perceptibles: *Sens.* 442^b14–17, 447^b24–26, *Ins.* 460^b22.

restricted to rational or intellectual capacities. *All* animals have some share of cognition, since all have some share of perception. And at the most general explanatory level, the soul's ability to discriminate and cognize must be viewed as the joint work of thought and perception.⁶

This chapter develops a general account of this fundamental aspect of cognition by focusing on its most basic and universal form: sensory discrimination of special perceptual qualities such as color, sound, and flavor. Modern interpreters disagree about whether Aristotle's views on perceptual discrimination, at the level of either the individual senses or the perceptual capacity as a whole, reflect his views on cognition in general. One influential interpretation regards perceptual discrimination as the apprehension of differences between types of perceptual object, for instance between white and black, white and sweet, and so on.⁷ On this view, it is natural (though not required) to individuate *all* cognitive capacities by the types of difference they discriminate among cognitive objects: as vision enables the animal to discriminate differences in color, so does perception as a whole enable it to discriminate differences between cross-modal objects, and intellect to discriminate differences between a thing and what it is to be that thing.⁸ According to another proposal, however, the discrimination of special perceptual qualities refers to the production of "phenomenal content", which in Aristotle's framework consists in the isolation of perceptual form from the proximate matter of the perceived quality.⁹ Presumably, on this view, the phenomenal content provided by sensory discrimination also furnishes content for more complex forms of discrimination, but the discriminative power of the senses is *sui generis*, distinct from that of the more sophisticated cognitive capacities that depend on it.

Aristotle's explicit reasons for accepting that the senses discriminate suggest a rather differ-

⁶An. 432^a15–17; cf. GA 731^a30–34

⁷See Ebert 1983; cf. De Haas 2005, 326–328, Marmodoro 2014, 161. The current orthodoxy of rendering *κρίσις* (and cognates) into English as 'discrimination' (and cognates) in the context of Aristotle's psychology is due in large part to the influence of Ebert's interpretation. I shall suggest towards the end of my discussion (sect. 4.8) that this translation is perhaps misleading.

⁸Cf. Ebert 1983, 194–195.

⁹See Corcilius 2014

ent account of discrimination. According to an argument Aristotle presents in *De Anima* 2.11, the senses discriminate because each is a “mean state of the contrariety present in what it perceives”:¹⁰

Text 4.1 Indeed, this is why [each sense] discriminates the objects it perceives. For it is the mean that is capable of discrimination, since in relation to each [extreme] it comes to be the other extreme.¹¹
(*An.* 2.11, 424^a5–7)

I’ll argue that a close reading of this argument—which I’ll call Aristotle’s “master argument”—exposes a highly general pattern of reasoning that extends beyond the discriminative power of the senses. Using a specific notion of meanness—what I, adapting a bit of Aristotelian terminology, call the “object-relative arithmetic mean”—Aristotle draws an explanatory connection between meanness and discrimination, which on this view appears as a certain *perspectival* feature of cognitive capacities, a feature that marks the capacity as occupying a perspective from which items in the domain appear as they in fact *are*, whether darker or lighter, more bitter or more sweet, and in general lesser or greater on the scale along which the items are differentiated. This explanatory connection suffices to show that the senses discriminate the qualities they specially perceive, but it also extends to other discriminative capacities of soul, and in particular to thought. I’ll suggest that this connection between meanness and discrimination is sufficiently general to be called a “doctrine” of the discriminative mean, in much the same way as commentators on Aristotle’s ethics refer to a doctrine of the ethical mean in his account of character virtue.

4.1 Background: the senses as mean states

Before turning to the details of the argument in text 4.1, let me remark briefly on Aristotle’s notion of the sensory mean state. *De Anima* 2.11 is where Aristotle first introduces the idea that

¹⁰See ch. 3 for a comprehensive account of the sensory mean state.

¹¹καὶ διὰ τοῦτο κρίνει τὰ αἰσθητά. τὸ γὰρ μέσον κριτικόν· γίνεται γὰρ πρὸς ἑκάτερον αὐτῶν θάτερον τῶν ἄκρων.

the each sense is a mean state (*μεσότης*). His immediate aim in introducing this notion is to establish how the sense organ, and in particular the organ of touch, is such that it is potentially but not actually each of the qualities it specially perceives (423^b30–424^a2). As I argued in chapter 3, Aristotle thinks that the sense organ satisfies this condition by being composed in a sort of equilibrium of the contrary qualities it specially perceives. The organ of touch, for instance, is equally cold and hot, soft and hard, and so on for each such scale of tangible quality, so that it is receptive only to what exceeds or falls short of it—that is, to objects that are either colder than they are hot or vice versa, softer than they are hard or vice versa, and so on. The same account applies to the other sense organs. Each sense organ is composed in this sort of equilibrium because each sense, which is the form and final cause of its organ, must be a mean state of the contrariety present in its special objects. In this way Aristotle's claim that the senses are mean states is meant to reflect the condition of their bodily organs, which qua organ must be composed in an equilibrium of contrary qualities (cf. *An.* 435^b21–24).

This account fits with the ontology of perceptual qualities Aristotle develops in detail in *De Sensu* 3–5, and which is presupposed throughout this stretch of *De Anima*.¹² According to that ontology, perceptual qualities are mixtures falling along a one-dimensional scale. The scale is defined by two primary contraries, for instance white and black or sweet and bitter, pairs whose members are opposed as the respective presence and absence of some nature: transparency in the case of white and black, nutriment in the case of sweet and bitter. Qualities falling along the scale are mixtures in different ratios of the primary contraries: at the extremes are qualities mixed in “pure” ratios (of 1 : 0 and 0 : 1) of the primary contraries; qualities falling between the extremes are mixed in various ratios of both, their position on the scale determined by which extreme dominates and to what degree it exceeds its contrary; and finally, at the middle of each scale is the unique value mixed in a 1 : 1 ratio of the extremes (see figure 4.1). So in requiring that the organ of touch be composed in an equilibrium of hot and cold or wet and dry, Aristotle is saying that the condition of the sense organ corresponds to this mean value of the scale, a

¹²See ch. 2 for detailed discussion.

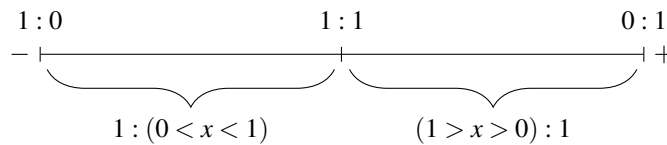


Figure 4.1 The structure of a perceptual quality scale

condition that is reflected in his description of the sense organ as a mean state of the contrariety present in their objects.¹³

4.2 Aristotle's "master argument"

This much has been indicated by Aristotle's remarks on the sensory mean state in the lines leading up to the argument in text 4.1. As we saw above, its conclusion that the senses discriminate is supposed to follow from the claim that the senses are mean states of the sort just described. Curiously, however, the argument seems not to appeal to any specifically *perceptual* features of the sensory mean state. As I read it, the argument proceeds in two stages. In the first stage what is mean ($\tau\acute{o}$ μέσον) is shown to be capable of discrimination ($\kappa\rho\iota\tau\iota\kappa\acute{o}\nu$), on the grounds that what is mean (or mean in the relevant way) comes to be, relative to each extreme, the contrary extreme. In the second stage the senses are shown to be capable of discriminating their special objects because each is a mean state of the contrariety present in those objects. The reasoning here seems perfectly general: Aristotle gives no indication that the connection between meanness and discrimination applies only in the case of the senses, or even only to cognitive capacities like the senses. His language rather suggests that the power to discriminate belongs to *whatever* is mean in such a way that it operates relative to each extreme as its contrary. This invites the possibility that other things, indeed *many* other things, may be shown by the same argument to be capable of discrimination.

¹³This is also true of the non-tactile sense organs, despite the fact that Aristotle insists that they lack *all* qualification on the relevant scale. For the mean value of each perceptual quality scale is incapable of producing perceptual affection, and so is not in the relevant sense a perceptual quality at all; see *Sens.* 447^a25–29 and, for discussion, ch. 2.9.3.

Arg. 4.1.1	{	<p>Major Premise: DISCRIMINATIVE belongs to all CONTRARY TO BOTH EXTREMES</p> <p>Minor Premise: CONTRARY TO BOTH EXTREMES belongs to all MEAN</p> <hr style="width: 80%; margin-left: 0;"/> <p>Conclusion: DISCRIMINATIVE belongs to all MEAN</p>
Arg. 4.1.2	{	<p>Major Premise: DISCRIMINATIVE belongs to all MEAN</p> <p>Minor Premise: MEAN belongs to all C</p> <hr style="width: 80%; margin-left: 0;"/> <p>Conclusion: DISCRIMINATIVE belongs to all C</p>

Argument 4.1 The “master argument” schema of text 4.1

We find further support for this reading if we consider the argument’s ultimate explanans: the attribute of being, relative to each extreme, the contrary extreme (or, as I shall sometimes say, being the contrary of both extremes). I say that this attribute is the ultimate explanans because it is evidently supposed to explain the connection between meanness and discrimination that enables Aristotle to show that the senses discriminate their special objects. But this is a feature of means that extends far beyond sense perception. Aristotle appeals to it, for instance, in explaining why alteration from intermediate (*μεταξύ*) qualities does not violate the principle that change is between opposites (*Phys.* 224^b32–35, 229^b19–21). It also appears in Aristotle’s description of the virtuous mean state (*EE* 1220^b31–33, *EN* 1108^b11–19 [= text 4.2]). Far from highlighting any distinctive features of the senses, then, the strategy of text 4.1 seems to be to show that the sensory mean state conforms to a general *pattern* of meanness, and then to show that means of this sort have the power to discriminate.

For these reasons, I suggest, we should think of text 4.1 not merely as giving an argument for *sensory* discrimination, but as offering a “master argument” for demonstrating the power to discriminate *simpliciter*. I offer argument 4.1 as a schematic representation of the master argument. It highlights two features that I take to be essential for understanding what Aristotle is up to in attributing the power to discriminate to the senses. First, it construes both stages of the argument as first figure syllogisms (in *Barbara*), so that *anything* that is mean in the relevant way is also capable of discrimination.¹⁴ One feature highlighted by this way of framing the

¹⁴Note that I do not intend this claim as a semantic *analysis* of the universal affirmative propositions expressed here in Aristotle’s syllogistic. For present purposes it will do to understand these predications extensionally, so that

argument is that the ultimate explanans of the sensory power to discriminate is a feature of the relevant sort of meanness, namely that it is the contrary of both extremes. Framed in this way, then, the key to understanding how the *senses* discriminate is to understand how this feature of meanness enables *anything at all* to discriminate. So a second and related feature this framing highlights is that the master argument demonstrates the power to discriminate of an *arbitrary* minor term: because the argument does not appeal to any particulars of the mean in perception, any *C* that satisfies the minor premise of argument 4.1.2 (sc. that MEAN belongs to all *C*) can be shown to be discriminative.

Stated in its full generality, the master argument may appear to prove too much. Discrimination is supposed to be a cognitive achievement, so it should be thought of as a capacity common to some, if not all, of the cognitive capacities of soul. For the same reason, it should also be thought to belong *only* to cognitive capacities of soul, capacities that enable their possessors to make such cognitive achievements. The master argument however seems to show that many other things are also capable of discrimination, for instance the character virtues, or anything that happens to possess mean or intermediate values of an arbitrary quality scale, perhaps even a political constitution (*Pol.* 1294^b18). If so, and if Aristotle's proof in text 4.1 is not woefully inadequate for its purpose, then we should expect to find some implicit restriction of the argument's scope, perhaps one rooted in a distinctive feature of the *sensory* mean state.

The worry, however, is premature. I've already suggested that the main interpretive challenge posed by the master argument is to understand how, in Aristotle's view, being the contrary of both extremes endows the mean with the power to discriminate. Central to understanding this claim is clarifying the notion of meanness at issue. As we'll see later, clarifying the relevant notion does in a way limit the scope of the argument, though not in a way that harms the generality I'm insisting on. Moreover, once we've come to grips with how this attribute of meanness endows a thing with the power to discriminate, we'll see that the cognitive ability the master

a predication of the form 'A belongs to all B' in Aristotle's syllogistic is truth-functionally equivalent to a sentence of the form ' $\forall x(Bx \Rightarrow Ax)$ ' in the predicate calculus. Note that, so understood, it is *sufficient* (though not necessary) for the truth of 'A belongs to all B' that A belongs to B *as such*, i.e. that A belongs to B in virtue of what B is.

argument attributes is plausibly said to belong to what has the mean even of non-perceptual quality scales. For, as I'll argue in what follows, the power to discriminate is a *perspectival* feature of a cognitive subject, one that marks it as occupying a perspective from which items in the discriminated domain appear as they are in themselves, namely (intrinsically) lesser or greater, colder or hotter, darker or lighter, and generally as occupying the position between the extremes of the relevant scale that qualifies it as the sort of thing it is.

What, then, is the notion of meanness operative in the master argument? The question is difficult because Aristotle may have any of several notions in mind when he adverts to the idea of the mean. These notions spring from two traditional sources of Greek thinking about the meanness, so in asking which notion is relevant to the master argument we will have to tease apart these two influences on Aristotle's conception of meanness.

4.3 Aristotle's conception of meanness

Generally speaking, Aristotle has two models for thinking about meanness. The first model is that of bodily health, understood as an equilibrium among opposed bodily constituents; this model, of course, derives from the Greek medical tradition. The second is that of an abstract property, such as a note on a musical scale, whose meanness is constituted by a certain mathematical relation to its extremes; this model, by contrast, derives from the Pythagorean harmonic theory of the 4th century. Both models have a discernible impact in significant cases in which Aristotle appeals to the mean, including his accounts of both the character virtues and the senses, but the latter takes priority in Aristotle's proof that the senses discriminate.

Let's look first at the medical model. Scholarly treatments of Aristotle's "doctrine of the mean" typically cite the influence of the Greek medical conception of the body as a complex of opposing constituents, whether of qualities, or powers, or humors, or elements.¹⁵ On this conception, states of the body are defined by the relative proportions of these constituents: health

¹⁵For an overview of these views and extensive commentary on their influence on Aristotle's physiological theory, see the excellent and under-appreciated Tracy 1969.

is the state defined by their proportionality (*σύμμετρον*) or equilibrium (*μετριότης*), whereas illnesses of various sorts are due to excesses and deficiencies among the constituents. Commentators have rightly seen parallels with this model of bodily health in Aristotle's conception of character virtue.¹⁶ Just like bodily excellences such as health and strength, virtues of character such as temperance and courage are destroyed by excess and deficiency, but preserved by the mean (*EN* 1104^a12–27). Too much fear and we become cowardly, too little and we become rash; it is only by feeling a mean amount of fear that we become and remain courageous. Character virtue thus appears as the psychic analogue to bodily health, the excellent condition of soul that strikes a mean between excess and deficiency. For similar reasons this model of health extends to Aristotle's conception of the sensory mean state. Aristotle thinks that in perception too exposure to the extremes pains or even destroys the sense (*An.* 424^b28–32, 426^b3–7, 435^b7–19). Moreover, we've seen that Aristotle characterizes the condition of the well-functioning sense organ as a compound of equal portions (a 1 : 1 ratio) of contrary extremes. The well-functioning eye, for instance, is composed of a “proportionate” (*σύμμετρον*) density of fluid—proportionate, that is, between densities that would render the eye opaque or transparent (*GA* 779^b26–34). In a way, then, the sensory mean state is analogous to the health of the sense organ, insofar as sense's meanness reflects the optimal condition of its organ.¹⁷

Health is a useful model in these cases because it exemplifies a kind of meanness that depends on the particular “bodily” or material constituents from which the mean thing is compounded. This is the kind of meanness that is necessary, for instance, for the senses to be receptive to the full range of the qualities they specially perceive, a status that I've argued depends on their being the form of an organ composed of a proportional blend of contrary extremes. The respect in which virtue is comparable to bodily health, namely that it is preserved by the mean and harmed by excess and deficiency, likewise invites the idea that virtues of character depend on an equi-

¹⁶See, in addition to Tracy 1969, Angier 2010, Brown 2014, Hutchinson 1988, Terzis 1995, and Young 1996.

¹⁷The analogy is only partial, however, since Aristotle rejects a harmonic conception of the senses. For discussion, see ch. 3.2.

librium between certain underlying extremes.¹⁸ Aristotle treats such dependence on material constituents as a general feature of this sort of meanness. This proportionality or equilibrium is characteristic of health only because it is a proportionality or equilibrium of *these* constituents composing the body: even if attributes such as health may be expressed numerically (e.g. as the ratio of the relevant corporeal mixture), their belonging is nevertheless sensitive to the sorts of matter in which they are present (cf. *An.* 408^a5–9).

Aristotle however also recognizes aspects of meanness that do not depend on the sort of matter in which the relevant numerical attribute is present. In Aristotle's terminology, these features are *abstract* (*ἀφαιρούμενον*), for although they are always present in some matter or other, they are separable from matter in thought and so may be studied independently of considerations of the sort of matter to which they belong (for instance by the mathematician: *Phys.* 193^b23–194^a2, cf. *An.* 403^b9–16, *Met.* 1026^a7–10). To bring out these aspects of meanness Aristotle appeals to the quite different model—or rather *models*—provided by the Pythagorean tradition in acoustical harmonics.¹⁹ Meanness, in this tradition, is a strictly formal or mathematical concept, an equality of ratios or formulae (*λόγοι*) among terms of a musical proportion.²⁰ Despite its considerable influence on Aristotle's thinking about meanness, including its application to ethics and psychology, this tradition has received comparatively little scholarly attention, so it will be worth spelling out its approach to meanness in some detail.

In the Pythagorean tradition of Archytas and Philolaus, a musical proportion is an ascending numerical progression consisting of four terms: two extremes and two means (*μέσαι* or *μεσότητες*²¹), each of which puts the extremes “into proportion” in terms of some mathe-

¹⁸On this see esp. Hutchinson 1988.

¹⁹For the identity of these theorists as Pythagorean, see Plato, *Resp.* 530C–531C, and for an overview of the Pythagorean conception of musical intervals as ratios, see Barker 2007, esp. 25–29.

²⁰Aristotle seems to agree; cf. *Met.* 1078^a14–16: “the same account [sc. that sciences are more exact (*ἀκριβής*) which do not posit magnitudes] applies also to harmonics and optics. For neither studies [its objects] qua seeing or qua voice (*ἢ ὄψις ἢ ἢ φωνή*), but qua lines and numbers (*ἢ γραμμὰ καὶ ἀριθμοί*), even though they [sc. their objects] are affections proper to these [sc. seeing and voice]”.

²¹Huffman 2005, 178 suggests that the terms come to be used interchangeably to refer to the mean term of a series. Tracy 1969, 344–346, however, claims that *μεσότης* is ambiguous between this notion of meanness and the proportion itself, in which case it is close in meaning to proportion, *ἀναλογία*.

mathematical formula. One of these means, the so-called *arithmetic* mean, expresses proportional difference, where the mean term B between (greater) A and (lesser) C is such that

$$A - B = B - C$$

The other, the so-called subcontrary or *harmonic* mean, is by contrast that B such that

$$\frac{(A - B)}{A} = \frac{(B - C)}{C}$$

What interested the Pythagorean harmonic theorists about these equations is that, in numerical series in which the ratio of the last term to the first is an octave (2 : 1), the harmonic mean stands to the first in the ratio of the fourth (4 : 3), whereas the arithmetic mean stands to the first in the ratio of the fifth (3 : 2).²² The standard ancient example is the series 6, 8, 9, 12. In this series, the ratio of 12 to 6 is that of the octave; the harmonic mean, 8, stands to 6 as a fourth; and the arithmetic mean, 9, stands to it as a fifth. Finally, yet another mean emerges if we consider a progression of such series, in which the last term of the second series stands to the first term of the first series as a double octave (4 : 1). In this case the last term in the first series puts these extremes into proportion according to the following equation (where A is the double octave of C):

$$\frac{A}{B} = \frac{B}{C}$$

This they called the *geometric* mean.²³

²²Hence the last term is the fifth of the harmonic mean and the fourth of the arithmetic; see Barker 2007, 302–303.

²³Cf. Archytas, fr. 2 Huffman (= Porphyry, *in Harm.* 93.6–17 Düring): “There are three means in music: first is the arithmetic, second the geometric, and third the sub-contrary . . . [Def. 1] [Means are] **arithmetic** when the three terms are in proportion as follows: the second [i.e. the mean] exceeds the third by that which the first exceeds the second. And in this proportion the interval of the greater [term] turns out to be smaller and the [interval] of the smaller greater. [Def. 2] [Means are] **geometric** whenever [the terms are such that] as the first is to the second so the second is to the third. Of these the greater and the lesser make the interval equal. [Def. 3] [Means are] **sub-contrary**, which we call harmonic, whenever they are such that by which part of itself the first term exceeds the second, the mean [i.e. the second] exceeds the third by this part of the third. In this proportion the interval of the greater terms comes to be greater, and the [interval] of the lesser [terms] lesser” (tr. Huffman, modified).

These three “Pythagorean” means are of great interest to musical theory, for by using them alone one can construct the standard harmonic interval of the octave from two fourths and a whole tone (separating the fourth and fifth)—an impressive feat since, as they knew, these ratios could be reproduced using several different musical instruments, such as the pan flute, the *aulos*, the lyre, or metal cymbals. But Aristotle’s interest in the Pythagorean means lies almost entirely in their application *outside* of musical theory.²⁴ Indeed, in several passages he displays remarkable ingenuity with these means, extending their Pythagorean definitions in order to fit them to novel cases. In his discussion of distributive justice in *EN* 5.3/*EE* 4.3, for instance, he distinguishes between two types of numerical proportion (*ἀναλογία*). All proportion is an equality of ratios (1131^a31), but not in every case is there a mean term occurring on both sides of the equation. For example, the proportions $2 : 4 :: 4 : 8$ and $2 : 4 :: 5 : 10$ both express the equality of quotients characteristic of the geometric mean, but only the first identifies a term (namely 4) that satisfies the Pythagorean definition of the geometric mean.²⁵ Aristotle calls the first type of proportion, which does yield a mean value in a continuous series, “continuous” (*συνεχής*); and he calls the second type, which merely expresses an equality of quotients, “discrete” (*διηρημένη*). In Aristotle’s view, then, the Pythagorean definitions apply only to a subclass of proportions, the “means” that belong to continuous proportions.

Such repurposing of the Pythagorean means reflects Aristotle’s interest in a much broader range of “mean” phenomena. What interests him about the geometrical mean is not the equality of intervals on either side of the equation, but the fact that if $A : B :: C : D$ then, alternando, $A : C :: B : D$ —a feature that applies to discrete as well as continuous geometric proportions. Thus the mean in accordance with geometrical proportion provides an illuminating model for distributive justice, since it seems to show that proportionality in distribution (in which party *A* receives amount *C* and party *B* receives amount *D*) amounts to a proportionality in the amount

²⁴The only exception I know of is a fragment recounting the construction of the octave from two tetrachords described above, which Ps.-Plutarch attributes to Aristotle; see *Mus.* 1139b (= frag. 47 Rose) and, for discussion, Barker 2007, 329–338.

²⁵See Archytas, fr. 2 [Def. 2], quoted in note 23 above.

distributed (*EN/EE* 1131^b5–20). Similarly, the feature of arithmetic means that interests Aristotle is not the feature that most intrigued the Pythagorean harmonic theorists—namely the inequality of the intervals between *A* and *B* and between *B* and *C*.²⁶ What interests Aristotle is rather the observation that the mean in accordance with continuous arithmetic proportion is “equidistant from each of the extremes”—that, in other words, the mean is no closer, and so no more similar, to one extreme than to the other. For this reason the arithmetic mean is instrumental to Aristotle's presentation of the mean operative in his analysis of character virtue, since this latter mean too is characterized as avoiding the excess and deficiency of its extremes (*EN* 1106^a26–32, quoted in text 4.3 below).

In both contexts Aristotle is adamant that the mean under investigation is an abstract mathematical property, though of course it is always present in some quantifiable unit(s) of matter. He prefaces his appeal to the discrete geometrical mean in his discussion of distributive justice with the remark, “proportion (*ἀναλογία*) not only belongs to numbers understood as units (*μοναδικόν*), but to number as a whole” (*EN/EE* 1131^a30–31). His remarks are similarly far reaching in opening discussion of the nature of character virtue: “we must appreciate that in *everything* continuous and divisible there is excess, deficiency, and a mean . . .” (*EE* 1220^b21–22; cf. *EN* 1106^a26–27, quoted in text 4.3 below). Aristotle's emphasis on the abstract, matter-indifferent character of the mean in question seems to be precisely to contrast it with the compositional notion exemplified by bodily health. This is perhaps why, in more than one such context, Aristotle explicitly identifies the type of mean in question as, for instance, what the “mathematicians call geometrical proportion” (*EN* 1131^b12–13) or the “mean in accordance with arithmetic proportion” (1106^a35–36, quoted in text 4.3 below).

If so, then in thinking about how Aristotle uses meanness as an explanatory concept we

²⁶See Archytas, fr. 2 [Def. 1], quoted in note 23 above. Archytas' interest in the relative magnitudes of the intervals given by these means is somewhat mysterious. Barker 2007, 303n37 makes the attractive suggestion that it is because Archytas “noticed and was intrigued by the fact that the insertion of arithmetic and harmonic means between terms in the same ratio always generates the same pair of ratios in the opposite order”. This is because the harmonic mean is the fourth of the first term and the last is its fifth, whereas the arithmetic mean is the fifth of the first term and the last is its fourth.

should be careful to distinguish which model he has in mind. We should, for instance, distinguish the respects in which the character virtues are means on the model of bodily health from those in which they are means on the model of musical proportion, which arguably cleaves more closely to what commentators are thinking of when they refer to Aristotle's "doctrine of the mean".²⁷ This is especially important for the interpretation of passages in which Aristotle is not clear on which model he has in mind, or seems even to conflate the two models. One such passage is the *Eudemian Ethics* account of character virtue (1220^b21–35), which otherwise neatly corresponds with the account in *Nicomachean Ethics* 2.6. I believe text 4.1 is another such passage. For though Aristotle clearly appeals to the model of health in explicating how the senses are receptive to the full range of their qualities, his proof that the senses discriminate must by contrast appeal to the musical model sketched above—specifically, to a variety of this type of mean we can call the *object-relative arithmetic mean*.

4.4 The object-relative arithmetic mean

Text 4.1 and its immediate context offer two clues to the type of mean at work in the master argument. The first clue is provided by the attribute I earlier called the ultimate explanans of the argument, namely being the contrary of both extremes. The other is provided by Aristotle's description of the sensory mean state as being between "the contrariety present in the objects it perceives" (*An.* 424^a4–5). Together they suggest that the *discriminative* mean—the mean shown by the master argument to have the capacity to discriminate²⁸—must satisfy two criteria: first, it must exhibit *proportional difference* relative to its extremes; and second, at least insofar as it applies to the senses, it must be an *object-relative* mean, one taken in reference to the nature of the object itself. As it turns out, Aristotle explicitly discusses a type of mean that fits just this description.

²⁷For a defense of this reading, see Rapp 2006, whose distinction between the "analytical" and the "empirical" doctrines of the mean very closely approximates the distinction I have in mind.

²⁸See argument 4.1.1 above.

4.4.1 Proportional difference

Consider first the attribute of being the contrary of both extremes. That this is the ultimate explanans of the master argument already indicates that Aristotle is working with the musical model of meanness; for possession of this attribute plainly does not depend on which contraries are at issue, as it would on the medical model. If the master argument is in fact presupposing the musical model, then which of the Pythagorean means is at issue? To answer this question we have to get clear on just what this attribute is supposed to be. We find Aristotle giving his fullest account of what it is to be the contrary of both extremes in spelling out the opposition between character virtue and the vices of excess and deficiency:

Text 4.2 Given that there are three dispositions [of soul]—since two are vices, one in respect of excess and one in respect of deficiency, and one, virtue, is the mean state—all are in a way opposed to all. **For the extremes are contrary to one another and to the mean, and the mean [is contrary] to the extremes. For just as the equal is greater in relation to the lesser and lesser in relation to the greater, in this way mean [psychological] states exceed the lesser [psychological states] and fall short of the greater [psychological states] in the domain of affection and action.**²⁹ (EN 2.8 1108^b11–19)

One thing that seems to follow from this explanation is that a mean that is the contrary of both extremes stands to each in the way its contrary does. If, for instance, it is mean between a greater quantity and a lesser quantity, it will be both, like the lesser extreme, less than the greater extreme and, like the greater extreme, greater than the lesser extreme. But while this is a feature shared by all three Pythagorean means,³⁰ what Aristotle here calls “the equal” is in another way distinctive in its relation to the extremes. It is not just that the equal is mutually opposed to its extremes, but that it is opposed to the each extreme *in the same amount*. Prior to text 4.2, Aristotle noted that the equal here is equal because it “exceeds and is exceeded in equal measure

²⁹τριῶν δὴ διαθέσεων οὐσῶν, δύο μὲν κακῶν, τῆς μὲν καθ' ὑπερβολὴν τῆς δὲ κατ' ἔλλειψιν, μιᾶς δ' ἀρετῆς τῆς μεσότητος, πᾶσαι πάσαις ἀντίκεινται πως· αἱ μὲν γὰρ ἄκραι καὶ τῇ μέσῃ καὶ ἀλλήλαις ἐναντίαι εἰσίν, ἡ δὲ μέσῃ ταῖς ἄκραις· ὥσπερ γὰρ τὸ ἴσον πρὸς μὲν τὸ ἔλαττον μείζον πρὸς δὲ τὸ μείζον ἔλαττον, οὕτως αἱ μέσαι ἕξεις πρὸς μὲν τὰς ἐλλείψεις ὑπερβάλλουσι πρὸς δὲ τὰς ὑπερβολὰς ἐλλείπουσι ἐν τε τοῖς πάθεσι καὶ ταῖς πράξεσιν.

³⁰In the series 6, 8, 9, and 12, for instance, both the harmonic mean (8) and the arithmetic mean (9) are (like 6) less than 12 and (like 12) greater than 6, and the same holds for the geometric mean (12) between 6 and its “double octave” (24).

(ἴσῳ)” (EN 1006^a34–35, quoted in text 4.3 below). That is to say, the greater extreme is greater than the equal in the same amount that the equal is greater than the lesser extreme. This second feature expresses a relation of *proportional difference*, and unlike the first, it belongs only to the arithmetic mean.³¹

Text 4.2 gives us good reason to think that the arithmetic mean uniquely bears the attribute of being the contrary of both extremes. This however is not the *complete* description of the mean operative in the master argument. As he did in applying the geometric mean to distributive justice, Aristotle goes beyond the Pythagorean definition in applying the arithmetic mean to sensory discrimination. In this case he extends the Pythagorean definition by distinguishing two ways of measuring the arithmetic mean. The distinction sets up an important contrast between the discriminative mean operative in the master argument and the otherwise parallel “ethical” mean of action and affection in terms of which Aristotle characterizes the character virtues. For whereas the latter mean is famously *relative to us*, the mean operative in the master argument must be *object-relative*, in that its meanness is determined by its relation to the relevant extremes.

4.4.2 The object-relative mean

The master argument applies to perception not only because each sense is a mean state, but because each is a mean state of *the contrariety present in the objects it perceives* (τῆς ἐν τοῖς αἰσθητοῖς ἐναντιώσεως, An. 424^a5). I’ve argued that we should understand this extra qualification as a reference to the ontology of perceptual qualities that Aristotle develops in *De Sensu* 3–5, on which account each of the qualities specially perceived by a sense is composed of a mixture of opposite extremes: black and white in the case of color, bitter and sweet in the case of flavor, and so on. In reference to Aristotle’s claim that the sense organ is (as far as possible) potentially all but actually none of the qualities to which it is receptive, I suggested that the

³¹In the series 6, 8, 9, and 12, for instance, only the arithmetic mean (9) exhibits proportional difference between 6 and 12. This is no surprise, since proportional difference is in fact the feature in terms of which the Pythagoreans defined the arithmetic mean. (See Archytas, fr. 2 [Def. 1], quoted in note 23 above.) and since it moreover fits with Aristotle’s preferred characterization of the arithmetic mean as what is equidistant from each of the extremes.

sense is a mean state of this contrariety because its organ is composed in a 1 : 1 ratio of these extremes. But there is a further implication of this qualification, namely that the contrariety between which the sense is a mean is the one that *defines* the quality scale it specially perceives. This amounts to a further condition on the type of meanness to which the master argument applies because, in Aristotle's view, there is more than one way to "take" the mean.

Here again we find clarity in Aristotle's discussion of character virtue, where he draws a distinction between taking the mean with respect to the object itself and taking it "relative to us". The distinction recalls one Plato makes between measuring the great and the small in relation to each other and in relation to what is in "due measure",³² but once again Aristotle puts an old idea to novel use. The character virtues, he argues, are mean states relative to what is mean in action and affection, though not of what is mean in accordance with the object itself. Like the crafts, character virtue pertains to the mean "relative to us" (cf. 1106^b15–29):

Text 4.3 In everything continuous and divisible it is possible to take a greater, a lesser, and an equal, and these [sc. greater, lesser, and equal] either [1] in accordance with the object itself or [2] in relation to us. Now [in each case] the equal is a sort of mean between excess and deficiency, [1] but I call the equal "mean [in accordance with] the object" when it, being equidistant from the extremes, is one and the same for all, [2] and [I call] "relative to us" that [sc. mean] which is neither too much nor too little; this is neither one nor the same for all.

[1] For example, if 10 is many and 2 is few, 6 is taken as the mean in accordance with the object, since it exceeds and is exceeded in equal measure. This is mean in accordance with arithmetic proportion. [2] What is [mean] relative to us should not be taken in the same way. For it is not the case that, if 10 minae is a large portion and 2 minae is a small portion for a person to consume, the trainer will [therefore] prescribe 6 minae. For it may be that this [portion] is large or small for the [specific] person taking it—for it will be small for Milo, but large for the one who is just beginning gymnastic training. The same applies to running and wrestling. Indeed, every expert avoids excess and deficiency in this way, but rather seeks after the mean and chooses this—the mean not of the object but relative to us.³³ (EN 2.6, 1106^a26–^b7)

³²As the EE 2.3 version of the distinction makes especially clear (1220^b23–26). Compare Plato, *Pol.* 283E, and see Angier 2010, ch. 4 for a useful recent discussion of the connection between the Platonic and Aristotelian distinctions.

³³ἐν παντὶ διή συνεχεῖ καὶ διαιρετῶ ἔστι λαβεῖν τὸ μὲν πλείον τὸ δ' ἔλαττον τὸ δ' ἴσον, καὶ ταῦτα ἢ κατ' αὐτὸ τὸ πρᾶγμα ἢ πρὸς ἡμᾶς. τὸ δ' ἴσον μέσον τι ὑπερβολῆς καὶ ἐλλείψεως· λέγω δὲ τοῦ μὲν πράγματος μέσον τὸ ἴσον ἀπέχον ἀφ' ἑκατέρου τῶν ἄκρων, ὅπερ ἐστὶν ἐν καὶ τὸ αὐτὸ πᾶσιν, πρὸς ἡμᾶς δὲ ὁ μήτε πλεονάζει μήτε ἐλλείπει· τοῦτο δ' οὐχ ἔν, οὐδὲ ταῦτὸν πᾶσιν. οἷον εἰ τὰ δέκα πολλὰ τὰ δὲ δύο ὀλίγα, τὰ ἐξ μέσα λαμβάνουσι κατὰ τὸ πρᾶγμα· ἴσω γὰρ ὑπερέχει τε καὶ ὑπερέχεται· τοῦτο δὲ μέσον ἐστὶ κατὰ τὴν ἀριθμητικὴν ἀναλογίαν. τὸ δὲ πρὸς ἡμᾶς οὐχ οὕτω ληπτέον· οὐ γὰρ εἴ τῶ δέκα μναὶ φαγεῖν πολὺ δύο δὲ ὀλίγον, ὁ ἀλείπτῃς ἐξ μνᾶς προστάξει· ἔστι γὰρ ἴσως καὶ τοῦτο πολὺ τῶ ληφόμενῳ ἢ ὀλίγον· Μίλωσι μὲν γὰρ ὀλίγον, τῶ δὲ ἀρχομένῳ τῶν γυμνασίων πολὺ. ὁμοίως ἐπὶ

OBJECT-RELATIVE MEAN	SUBJECT-RELATIVE MEAN
equidistant from extremes	neither too much nor too little
one	not one
the same for all	not the same for all

Table 4.1 Text 4.3's distinction between the object-relative and subject-relative means

There are three points on which text 4.3 distinguishes the two ways of taking the mean, which I summarize in table 4.1. It gives as an example of the object-relative mean what is equal in terms of arithmetic proportion. As in the standard musical proportion we considered earlier, 6 is the arithmetic mean of the series 2...6...10 because it is the value of B in the formula $10 - B = B - 2$. Moreover, since 6 is the only such term in the series, it is the unique arithmetic mean of this sort. And since 6's status as the arithmetic mean is fixed by nothing apart from its relation to 2 and 10, it will vary neither depending on the circumstances in which it is measured nor depending on who is taking the measurement. This arithmetic mean is thus *object-relative* in the sense that its value is fixed solely by its proportional difference relative to the contrary extremes defining the relevant scale.

The same is not true of what I call the *subject-relative* mean. To see why, Aristotle asks us to suppose that the quantities being measured are portions of food, and asks us to imagine an evaluative context in which a trainer, an expert in diet, is to recommend to a trainee an appropriate portion of food. Interpretations of Aristotle's example vary widely; here is how I propose to read it.³⁴ The trainer's goal is to take a portion of food that is neither too much

δρόμου καὶ πάλης. οὕτω δὴ πᾶς ἐπιστήμων τὴν ὑπερβολὴν μὲν καὶ τὴν ἔλλειψιν φεύγει, τὸ δὲ μέσον ζητεῖ καὶ τοῦθ' αἰρεῖται, μέσον δὲ οὐ τὸ τοῦ πράγματος ἀλλὰ τὸ πρὸς ἡμᾶς.

³⁴Aristotle's doctrine of the ethical mean has been extensively discussed, and, to say the least, not every available interpretation coheres with the account of the distinction between object-relative and subject-relative meanness I provide here. To clarify the dialectical stance of the preceding account, I note the following commitments of my account: (1) Character virtues are mean states derivatively, because (a) each aims at and hits upon the subject-relative mean of the relevant domains of action and affection, and because (b) each is therefore "between" contrary vicious extremes, which respectively aim at and hit upon excess and deficiency in those domains. (2) The training analogy of text 4.3 clarifies the subject-relative mean by comparing moral agents to the evaluative position of the trainer (so *not* to those of Milo and the novice trainee). (3) The subject-relative means of action and affection are

nor too little for the trainee to eat. Suppose the trainer knows that 10 minae (or pounds, let's say) of food is too much for anyone to eat, and 2 pounds is too little. This bit of knowledge is undoubtedly pertinent, but it is not enough for her to go on. For while it tells the trainer that 10 pounds is too much and 2 pounds too little to recommend *anyone*, it does not show how much would be *neither* too much *nor* too little for any *specific* person. It would be wrong, in short, to conclude from the fact that 10 pounds and 2 pounds are respectively too much and too little of a portion for *anyone* that 6 pounds—the object-relative mean between them—is the right amount for *everyone*.

On what basis then does the trainer arrive at the mean portion of food for the trainee? Her recommendation will clearly depend on the trainee's condition: the good trainer will consider several factors, including what the trainee is training for and her stage in the training, before recommending a portion. Trainees who differ in these variables will require the trainer to deviate from the object-relative mean to different degrees. The portion of an expert wrestler like Milo, for instance, will exceed the object-relative mean, while that of a novice may fall short. But even if the portion recommended by the trainer coincides with the object-relative mean, it would not be mean for the same *reason*. The trainer is not interested in arriving at the portion that is equidistant between the greater and the lesser but the one that is neither *too much* nor *too little* for each trainee. What satisfies this sort of meanness will not be unique, since it varies according to who or what *specifically* it is relative to which the mean is being evaluated. Nor then will it be the same for all, since there is nothing to guarantee that the mean between too much and too little will be invariant when taken relative to different persons or things. This sort of mean is thus subject-relative because it is *evaluative*; its status as a mean depends on factors external to its proportional difference to the extremes.

What makes the mean taken in this way “subject-relative” is therefore *not* that it is subjective.

mean because they avoid excess and deficiency in the relevant domain (so *not* because they are “middling” or issue from a mean disposition). (Note that for present purposes I needn't take a stance on the “parameters” relative to which the subject-relative mean is evaluated.) I believe an interpretation of this sort can be gleaned from Brown 1997, 14 and Rapp 2006; see esp. Brown 1997 for a defense of (2) and critical commentary of rival interpretations, and see Brown 2014 for (1) and (3).

To the contrary, *both* sorts of mean (as I have described them here) are objective in the sense that their status as a mean does not depend on the attitudes of the measurer. Just as there is an objective fact of the matter whether 6 is the object-relative arithmetic mean between 2 and 10, so too is there an objective fact of the matter whether 4 pounds of food is the subject-relative arithmetic mean—neither too much nor too little—for the trainer to recommend a given trainee. What distinguishes the subject-relative arithmetic mean is rather that the factors determining which value of a scale is the subject-relative arithmetic mean (relative to some evaluative context) are not limited to the numerical relations to the extremes that determines that value's position on the scale. These additional factors are “subject-relative” in Aristotle's view because they usually reflect certain norms specific to the evaluative context in which the measurer takes the mean—training, for instance, or building. This norm-governed aspect of the subject-relative arithmetic mean is further reflected in the fact that it is mean between what is too much and too little, and not simply between what is greater and lesser.

So understood, the contrast between the object-relative arithmetic mean and the subject-relative arithmetic mean is an important one for Aristotle to highlight in spelling out the notion of meanness characteristic of the senses. The quality scales specially perceived by the senses are defined in terms of a distinctive pair of extremes, and the discrete values of those scales are likewise defined in terms of the numerical relations to the extremes that determine their respective positions on the scale. In specifying that the senses are mean states of the contrariety present in their their objects, then, Aristotle is claiming that the sensory mean state is an *object-relative* mean state, one whose status as a mean relates it to the defining features of the perceptual qualities it specially perceives. This sets up an important disanalogy with the ethical mean state, which we've so far observed to be a near perfect analogue.

4.4.3 *What the virtuous person doesn't discriminate*

I've argued that the master argument extends the power to discriminate to the senses insofar as they are *object-relative* mean states of the quality scales they specially perceive, but this conclu-

sion may appear too strong. Aristotle more than once describes the *phronimos*, the ideal moral agent possessed of both character virtue and practical wisdom, as one who discriminates.³⁵ Yet, as we know, the meanness characteristic of character virtue is *subject-relative*. At first blush, then, the requirement that the senses be *object-relative* mean states may seem superfluous, for it seems that the connection between arithmetic meanness and discrimination obtains *however* one takes the mean. But Aristotle's qualification has a point, one that comes to light if we consider what the virtuous person as such does—and more importantly does *not*—discriminate.

Recall first the parallels between the mean state characteristic of the virtues and the mean state characteristic of the senses. Courage, for instance, is a mean state because it is related to the practical and affective means in a sphere of human activity: it aims at and hits upon what is mean between feelings of fear and confidence and in standing firm in the face of dangers (*EN* 1115^b10–13). As such, courage falls in a way “between” a vice of excess, namely rashness, and a vice of deficiency, namely cowardice, which respectively aim at and hit upon feelings of undue confidence or fear, and so fail in different ways to stand firm in the face of the right dangers and for the right reasons (1116^a4–7). I've argued that the senses are mean states in an analogous way. Vision, for instance, is a mean state because it is related to the chromatic mean: it is the form and final cause of an organ that qua organ instantiates the mean value of the color scale. As such, it too falls “between” a range of extreme states, which to various degrees exceed or fall short of vision's mean position.

Both courage and vision are accorded their status as mean states by being related to a sort of mean. But since the means to which courage and vision are respectively related are taken in different ways, they must differ in the *perspective* they gain on the relevant scales by being so related to the mean. Occupying the mean state of a subject-relative mean between excess and deficiency allows you to tell whether an item on the relevant scale is too much or too little *relative to some evaluative context*, where the status of that item as the subject-relative arithmetic mean is inextricably bound to the norms specific to that evaluative context. By contrast, occupying the

³⁵See *EN* 1099^a22–24, 1113^a29–31; cf. 1143^a8–10, 29–32.

mean state of an object-relative mean between excess and deficiency allows you to tell whether an item on the relevant scale is *in itself* greater or lesser, where its status as greater, lesser, or “equal” makes the item the sort of thing that it is and holds *independently* of any evaluative context.

To see the difference, consider Aristotle's observations about the opposition between virtue and its opposed vices immediately following text 4.2:

Text 4.4 For the courageous man appears rash in comparison to the cowardly but cowardly in comparison to the rash; similarly, the temperate man [appears] indulgent in comparison to the insensible but insensible in comparison to the indulgent, and the generous man [appears] wasteful in comparison to the ungenerous but ungenerous in comparison with the wasteful. **For this reason too each of the extreme [states] confounds the mean with the other [extreme state]; the coward calls the courageous man rash and the rash man calls him a coward, and analogously in the other cases.**³⁶ (EN 2.8, 1108^b19–26)

Aristotle is contrasting the perspectives afforded by virtue and the vices of excess and deficiency. Because virtue, like the vice of deficiency, falls short of the vice of excess, it too appears deficient from the perspective afforded by the vice of excess. But it appears excessive from the perspective afforded by the vice of deficiency. The implication is that, whereas the vicious extremes confound³⁷ the mean with the contrary extreme, both extremes appear as they are from the perspective afforded by the virtuous mean, namely as excessive and deficient.

A similar point applies to the sensory mean state.³⁸ From the perspective afforded by the “extreme” states of sense, states in which the sense organ is mixed in a ratio of contraries that deviates from the object-relative mean in the direction of either the greater or the lesser extreme, values of the relevant quality scale appear unduly greater or lesser. For instance, when the tongue is excessively bitter (due perhaps to illness), objects will appear bitter even when they are not (An. 422^b8–10). Similarly, objects will appear darker or lighter than they are to people with

³⁶ὁ γὰρ ἀνδρείος πρὸς μὲν τὸν δειλὸν θρασὺς φαίνεται, πρὸς δὲ τὸν θρασὺν δειλός· ὁμοίως δὲ καὶ ὁ σώφρων πρὸς μὲν τὸν ἀναίσθητον ἀκόλαστος, πρὸς δὲ τὸν ἀκόλαστον ἀναίσθητος, ὁ δ' ἐλευθέριος πρὸς μὲν τὸν ἀνελεύθερον ἄσματος, πρὸς δὲ τὸν ἄσματος ἀνελεύθερος. διὸ καὶ ἀπωθοῦνται τὸν μέσον οἱ ἄκροι ἐκάτερος πρὸς ἐκάτερον, καὶ καλοῦσι τὸν ἀνδρείον ὁ μὲν δειλὸς θρασὺν ὁ δὲ θρασὺς δειλόν, καὶ ἐπὶ τῶν ἄλλων ἀνάλογον.

³⁷Literally ‘push away’, ἀπωθοῦνται.

³⁸The parallel is also noticed by Johansen 2002, 181, who does not however draw the important contrast I shall go on to draw in the perspectives afforded object-relative and subject-relative arithmetic means.

with dark and light eyes, which are respectively composed of an excess or deficiency of fluid (GA 779^b35–780^a7). Here too the implication is that the perspective afforded by the sensory mean state, the state in which the sense organ is mixed in a way that corresponds precisely to the object-relative arithmetic mean of the relevant scale, is the only one from which items in the scale appear sweet or bitter, light or dark, and in general greater or lesser the mean when and only when they *are*.

But here the analogy in the “perspectives” afforded by character virtue and the sensory mean state gives way to a contrast. Because the mean relative to which the character virtues are mean states is subject-relative, items on the scale the virtuous person discriminates appear as too much or too little, not in themselves, but only *relative to some evaluative context*. Indeed, the courageous person and the cowardly person could *agree* on whether a certain emotional response is exceedingly fearful, in the sense that it lies close to the extreme on the scale between feelings of fear and confidence. What however they must disagree on, and that correctness about which characterizes the perspective of the courageous person, is whether that response is too much, too little, or just what is called for in some practical situation. That is because the extremes in the latter case are extremes of a *subject-relative* mean, which is fixed not only in relation to the object itself, but also to factors specific to an evaluative context. Matters are different in the case of the sensory mean state. Healthy Socrates and Sick Socrates cannot agree on whether the same wine is sweet or bitter (or, if sweet, how sweet), because it is only to Healthy Socrates that the flavor of the wine appears as it is *in itself*. This is because the mean relative to which the sense is a mean state is *object-relative*, fixed by its relation to the extremes that define the quality scale it specially perceives.

For Aristotle, then, the common status of the senses and the character virtues as *arithmetic* mean states accords both a perspective from which items in their respective domains appear as they are. But because we determine what is arithmetically mean in different ways in characterizing the sensory and ethical mean states, the ways in which items in the relevant domains appear as they are likewise differ. From the perspective afforded by the virtuous mean state—

a state characterized by its relation to a subject-relative arithmetic mean—items appear as too much, too little, or just right relative to various practical situations. This perspective presents the virtuous person with objective features of the items in the relevant domains of action and affection, features such as the suitability of certain practical or emotional responses in different practical situations; but it does not *as such* present the virtuous person with the features that make them the actions and affections they are in themselves. The trainer's expertise in prescribing the right amount of food does not consist in (though it may presuppose) appreciation of what counts as greater, lesser, or equal portions of food, but rather in a sensitivity to factors that may determine different amounts as appropriate for different trainees. For the same reason, it is no mark of virtue to know whether a particular action or affection counts as greater, lesser, or equal on the scale that determines the sort of action or affection it is. The virtuous person must also be able to tell whether the relevant action or affection (such as it is) is too much, too little, or precisely what is called for in various practical situations.

By contrast, the perspective afforded by the sensory mean state—a state I've argued is characterized by its relation to an object-relative arithmetic mean—is precisely one from which items appear as they are on the relevant scale, namely greater, lesser or equal. As we've seen, these are the features that define the essential nature of the qualities specially perceived by a sense. So there is a point to Aristotle's stipulation that the senses must be *object-relative* mean states of the quality scales they specially perceive. The point is to clarify that their perspective on these quality domains is one from which the qualities appear as they are in themselves, independent of any evaluative context: whether greater or lesser, lighter or darker, sweeter or more bitter.

4.5 Discrimination as a perspectival feature

Here, then, is one thing that follows from Aristotle's claim that the senses are mean states, and in particular *object-relative* mean states, relative to the quality scale(s) they specially perceive, namely that the senses occupy a perspective from which qualities falling on the relevant scale(s) appear as they are in themselves. If this is the feature of meanness that is supposed to be brought

out by the conclusion that the senses discriminate in text 4.1, it imputes to Aristotle a strikingly different conception of basic sensory discrimination in comparison with the ones suggested by the interpretations mentioned at the start of the chapter. According to this conception, the senses' ability to discriminate seems to consist neither in the ability to cognize differences between perceptual qualities, nor in the production of phenomenal content through separating perceptual form from its proximate matter. It is rather a *perspectival* feature of the senses, a feature that marks them as occupying a perspective from which one can determine how the qualities specially perceived by a given sense are in themselves, namely greater or lesser on the scale that defines each as the kind of quality it is.

One major advantage of interpreting discrimination as a perspectival feature of this sort is that it allows us to see the connections between Aristotle's argument for sensory discrimination and other ancient discussions of the issue. One particularly significant discussion is in Plato's *Theaetetus*, and in particular its critique of Protagoras' *homo mensura* doctrine in the first part of the dialogue.³⁹ As we observed in the introduction,⁴⁰ Socrates interprets Protagoras' claim that man is the measure of all things as equivalent to the claim that each person is the "determiner" or "judge" (*κριτής*) of what is and is not the case for her:

SOCRATES. . . . Now, Protagoras, "Man is the measure of all things" as you people say—of white and heavy and light and all that kind of thing without exception. He has the criterion (*κριτήριον*) of these things within himself; so when he thinks that they are as he experiences them (*οἷα πάσχει*), he thinks what is true and what really is for him.

(*Tht.* 178B; tr. Levett-Burnyeat)

In saying that each person has within themselves the criterion for determining the perceptual attributes of things, Socrates takes himself to be offering an account in support of the thesis that each person's perceptions or sensory affections are *true*, so that, for instance, a breeze perceptually *appears* cold or warm to someone only if the breeze *is* cold or warm (cf. 160c) As we saw before, Socrates seems to think that viewing sensory affections as the criteria for perceptible

³⁹Cf. Nancy 1996, who also notes a connection between Aristotle's account of perceptual discrimination and the *Theaetetus*, but is led to very different conclusions.

⁴⁰See Introduction, xxviii–xxxii.

attributes naturally goes with, and perhaps even entails, a relativism about perceptual qualities according to which things come to be perceptually qualified in some way only *for* some cognitive subject. Socrates, we noted, rejects such relativism on independent grounds. But even apart from the relativist ontology he recommends for the Protagorean doctrine, Socrates denies that the *senses* could be the criteria for determining the perceptual attributes of things. For even if we perceive the hardness of a hard thing and the softness of a soft thing, it is not the soul through the senses but the soul by itself that must determine (*κρίνειν*) the hard thing's hardness or the soft thing's softness: the knowledge of such things must therefore lie, not in the sensory affections, but in the processes of reasoning about them.

Like the Socrates of the *Theaetetus*, Aristotle rejects the relativist implications of the Protagorean doctrine. But he remains sympathetic to the idea that sensory affections are the standards or criteria on which to determine the perceptual qualities of things. Also like the Socrates of the *Theaetetus*, Aristotle finds this idea implicit in the Protagorean doctrine. But whereas, on Socrates' picture, this idea leads naturally to the relativist conclusions that both he and Aristotle reject, Aristotle sees it as an innocuous and even trivial consequence of the Protagorean doctrine.⁴¹

Text 4.5 We call both scientific knowledge and perception a measure of things for the same reason, [namely] because we cognize something by them, since they are measured rather than measure. But what happens for us is just as though we came to know how large we are because someone measured *us*, applying the cubit-length to us so many times. **Indeed, Protagoras says that man is the measure of all things, as if he were saying the knower or the perceiver, and them because the one has perception and the other scientific knowledge, which we say to be the measure of their underlying objects. He seems to be saying something remarkable when in fact he is saying nothing remarkable.**⁴²

(*Met.* 10.1, 1053^a31–b³)

⁴¹See McReady-Flora 2015, esp. 74–91 for detailed discussion of the contrast between Aristotle's treatment of Protagoras in this passage and (his considerably less friendly) remarks on the *homo mensura* elsewhere in the corpus.

⁴²καὶ τὴν ἐπιστήμην δὲ μέτρον τῶν πραγμάτων λέγομεν καὶ τὴν αἴσθησιν διὰ τὸ αὐτό, ὅτι γνωρίζομεν τι αὐταῖς, ἐπεὶ μετροῦνται μᾶλλον ἢ μετροῦσιν. ἀλλὰ συμβαίνει ἡμῖν ὥσπερ ἂν εἰ ἄλλου ἡμᾶς μετροῦντος ἐγνωρίσαμεν πηλίκου ἐσμέν τῷ τὸν πῆχυν ἐπὶ τοσοῦτον ἡμῶν ἐπιβάλλειν. Πρωταγόρας δ' ἄνθρωπόν φησι πάντων εἶναι μέτρον, ὥσπερ ἂν εἰ τὸν ἐπιστήμονα εἰπὼν ἢ τὸν αἰσθανόμενον· τούτους δ' ὅτι ἔχουσιν ὁ μὲν αἴσθησιν ὁ δὲ ἐπιστήμην, ἃ φαμεν εἶναι μέτρα τῶν ὑποκειμένων. οὐθὲν δὲ λέγοντες περιττὸν φαίνονται τι λέγειν. See McReady-Flora 2015, 80–83 for a defense of this reading of οὐθὲν δὲ λέγοντες περιττὸν φαίνονται τι λέγειν in ^b3.

What is true about the Protagorean doctrine in Aristotle's view is that we can treat the knower and the perceiver each as a "measure" (*μέτρον*) of its underlying objects.⁴³ This is because scientific knowledge and perception are alike "measures" of their respective objects. But for Aristotle they are measures in a curious way. Perception and scientific knowledge are not measures by measuring but by *being measured*. Aristotle's remarks are obscure, but in light of the connection with the *Theaetetus* we're now considering, his point may be this: perception and scientific knowledge do not cognize and so "measure" their object by virtue of acting on the world but by virtue of the world acting on *them*.⁴⁴ According to this suggestion, the status of the perceiver and the knower as a measure of perceptible and scientifically knowable objects depends on the way that perception and scientific knowledge are "affected" by their respective objects. If so, then *pace* the Socrates of the *Theaetetus*, the standard or criterion whereby the perceiver determines perceptible attributes lies in the sensory affections themselves.

The conception of discrimination as a perspectival feature, which I've suggested is expressed in the master argument, is continuous with this picture of perception as the measure of perceptual objects. If Aristotle's view is that the senses are the criteria and measures of the qualities they specially perceive by virtue of being affected by these qualities in the right way, then he owes an account of the *conditions* under which the senses are affected in the right way by the relevant qualities. My suggestion is that the master argument is Aristotle's way of delivering this account. To sum up our results so far, the first stage of the master argument (arg. 4.1.1) connects the power to discriminate, here understood generically as the power characteristic of what operates as the criterion of some range of cognitive objects, to a certain perspective on those objects, a perspective I've argued Aristotle characterizes in terms of the arithmetic mean. The sort of perspective associated with the power to discriminate differs with how one takes the relevant arithmetic mean. But in the case of the senses Aristotle is clear that the requisite mean must be an object-relative one. For it is only from the perspective of this mean that the qualities

⁴³Cf. *An.* 426^b8–9 for a parallel use of *ὑποκείμενον* used in reference to special perceptual objects.

⁴⁴McReady-Flora (2015, 77)'s suggestion that Aristotle's remarks indicate that "on his view the world is prior to and determines how we apprehend it" would be another suggestion amenable to the present interpretation.

of perceived bodies appear as they are in themselves, and therefore only from this perspective that the senses are in a position to act as a measure of their special objects, perceiving things as having them when and only when they do.

As we observed earlier in this chapter, however, Aristotle's reasoning in the master argument does not seem to be restricted to the *sensory* mean state; it seems to extend to anything that occupies the perspective of the relevant (object-relative) arithmetic mean. When we turn in the next section to examine the second stage of the master argument (arg. 4.1.2), I'll suggest that the theoretical role of the master argument depends crucially on its generality. In particular, I'll suggest, Aristotle also wants the master argument to provide an account of the conditions under which *thought*, the other basic discriminative capacity of soul, discriminates scientifically knowable objects. The master argument, in short, is intended to give a *unified* account of discrimination—a “doctrine of the discriminative mean” similar to the well-known doctrine of the ethical mean—and, as I'll show, the lengths to which Aristotle goes to maintain the parallel between sensory and intellectual discrimination testifies to his commitment to such a unified account.

But before turning to the second stage of the master argument, let me briefly address the worry about the generality of the master argument we raised earlier.⁴⁵ The worry was that the master argument seems to overgenerate discriminative capacities: Aristotle seems to regard discrimination as a cognitive achievement, but if the master argument applies across the board to *anything* occupying the perspective of the relevant mean, then it seems that we'll have to treat as discriminative much more than just the cognitive capacities of soul. The present interpretation offers at least two ways to respond to this worry, but I think one is decidedly the optimal response. The suboptimal response would be to accept the conclusion on the grounds that being discriminative on Aristotle's view is simply a matter of occupying the right sort of perspective on the discriminated domain. On this view the senses would be “discriminative” of their special objects in the same way that a thermostat is “discriminative” of a room's ambient temperature

⁴⁵See sect. 4.2.

or a whistling kettle is “discriminative” of when the water inside it exceeds 100°C; that is, they would be tools that may be used to discriminate the qualities they specially perceive. Admittedly, this view is compatible with the present interpretation of the master argument, and in at least one passages Aristotle speaks as if we discriminate perceptual qualities by *using* the relevant sense as a mean state.⁴⁶ However, in text 4.1 as well as other passages,⁴⁷ Aristotle is explicit that it is the *senses* that do the discriminating. These passages suggest that Aristotle does not distinguish between the sensory affection and the cognitive process of discriminating, neither of which can be undergone (e.g.) by plants or inanimate objects. In order to account for this aspect of Aristotle's view, I think it is better to treat it as a *presupposition* of the master argument that what instantiates the discriminative mean must be a cognitive subject, for instance a sense or the intellect.

On what I take to be the optimal response, the reason why the master argument does not attend to the cognitive aspects of discrimination is because it is not designed to give a complete account of what it is for a sense (or any other discriminative capacity) to be capable of discrimination. As I've argued, its aim is the more modest one of articulating the conditions under which the senses (and other cognitive capacities) are affected in the way necessary for them to be the criteria of their special objects; and for this purpose it is entirely reasonable for Aristotle to ignore features of discriminative capacities that are nevertheless essential to their status as discriminative. But the generality I'm taking Aristotle to insist on in text 4.1 still has a point. For, in a different respect, the aim of the master argument is not modest at all. To articulate the conditions under which the perceiver and the knower are respectively measures of what can be perceived and scientifically known is a big task indeed. That's because, in Aristotle's view, *everything* is ultimately an object of perception or of scientific knowledge:

Text 4.6 The soul is in a way all the things that are, since the things that are are either objects of perception or of thought, and scientific knowledge is in a way the objects of scientific knowledge, perception in a way the objects of perception . . . Thus the soul is just like the hand, for as the hand is a tool of tools,

⁴⁶ὡς μεσότῳτι χρώμενοι; see *Meteor.* 382^a16–21 (= text 0.3).

⁴⁷See e.g. *An.* 426^b8–12 (= text 4.8)

intellect is a form of forms and perception is a form of perceptible objects.⁴⁸ (*An.* 3.8, 431^b21–432^a3)

So the master argument *must* be as general as it is, if it is to describe the conditions under which both perception and thought discriminate all of their objects. Aristotle takes a systematic approach to explaining how perception and thought discriminate their objects. To this extent, then, text 4.1's proof that the senses discriminate is just one application of an overarching *doctrine*, one according to which the conditions under which a cognitive capacity discriminates are the conditions under which it takes the perspective of the object-relative arithmetic mean.

4.6 A doctrine of the discriminative mean

Aristotle's claim that the character virtues are mean states is sometimes called his "Doctrine of the Mean". It seems to me that one reason why 'doctrine' is an apt label for his claim is that its theoretical role is in part to *unify* otherwise disparate phenomena. Courage, temperance, generosity, and the other character virtues are a motley bunch. To be sure, each is an excellence of character in some domain of human activity, and each governs agents' practical and affective responses to a certain range of situations. But the practical and affective responses that virtue calls for in different domains of activity and in different practical situations may appear wildly divergent—the same indignation required by courage on the battlefield may be an exercise of bad temper in peacetime, and the same charitable contribution may in different situations (or for different persons) be an expression of generosity, liberality, or miserliness. The idea that each of these virtues is a mean state imposes enough order on these phenomena to allow the ethical theorist to study them at some level of abstraction. Armed with this idea, she can say that each virtue aims at the subject-relative arithmetic mean in the domains of action and affection proper to it; that each is flanked by two (sometimes hitherto nameless) vices of excess and deficiency; and that what counts as the mean or correct practical or affective response at which each aims is

⁴⁸ἡ ψυχὴ τὰ ὄντα πῶς ἐστὶ πάντα· ἡ γὰρ αἰσθητὰ τὰ ὄντα ἢ νοητά, ἔστι δ' ἡ ἐπιστήμη μὲν τὰ ἐπιστητά πως, ἡ δ' αἴσθησις τὰ αἰσθητά . . . ὥστε ἡ ψυχὴ ὡσπερ ἡ χεὶρ ἐστὶν· καὶ γὰρ ἡ χεὶρ ὄργανόν ἐστὶν ὀργάνων, καὶ ὁ νοῦς εἶδος εἰδῶν καὶ ἡ αἴσθησις εἶδος αἰσθητῶν.

ineliminably contextual, such that the criterion for the correctness of an action or affection can only be its choiceworthiness for the virtuous person herself.

The same unifying theoretical role may be given to the claim that the discriminative capacities of soul are mean states. The two basic discriminative capacities of soul, perception and thought, are in many ways very different psychological capacities.⁴⁹ Yet both perception and thought have the power to *discriminate* the cognitive objects to which they are receptive. To explain how both capacities share a common discriminative function, Aristotle introduces the idea that the power to discriminate is a feature of the object-relative arithmetic mean. Armed with this idea, Aristotle can give a common account of how these different cognitive capacities manage to discriminate the objects they do. The master argument, which in its first stage shows that one way of being discriminative of a domain is to take the perspective of the (object-relative arithmetic) mean of that domain, offers Aristotle one way to give such a common account. For if perception and thought can be shown to be appropriately mean in the relevant domains, they can be shown to be alike discriminative of those domains. It is therefore not entirely accurate to say that Aristotle has a single "Doctrine of the Mean"; if he has any, he has at least *two*. His doctrine of the *ethical* mean states that virtues of character are mean states corresponding to the subject-relative arithmetic mean of some domain of action and affection. Similarly, his doctrine of the *discriminative* mean states that one way to be discriminative of a certain domain of objects is to be a mean state corresponding to the object-relative arithmetic mean of that domain.

In this section we examine how the claim that the discriminative capacities of soul are mean states is applied in Aristotle's accounts of perception and thought. As we'll see, matters are much clearer in the case of perception, but nevertheless the same pattern of explanation can be discerned in Aristotle's discussion of intellect, which draws explicitly on his account of perception. Thus, I submit, if we make clear the explanatory structure present in Aristotle's discussion of perception, we can spot hitherto unnoticed references to the sensory mean state in his discus-

⁴⁹For which reason Aristotle criticizes predecessors (like Parmenides, Empedocles, Democritus, and others) who treated thinking as identical to perceiving; cf. *An.* 427^a21–29, *Met.* 1009^b12–38.

Arg. 4.2.2	{	<p>Major Premise: DISCRIMINATIVE belongs to all MEAN</p> <p>Minor Premise: MEAN belongs to all SENSE</p> <hr style="width: 100%;"/> <p>Conclusion: DISCRIMINATIVE belongs to all SENSE</p>
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Argument 4.2 The master argument applied to the senses

sion of the capacity for thought.

4.6.1 *The senses as object-relative arithmetic mean states*

We've already taken note of the importance of determining which model Aristotle has in mind when he adverts to the mean in explanation of some phenomenon. This is especially important for understanding the proof that the senses discriminate in text 4.1 (see argument 4.2), since it turns out that Aristotle actually appeals to *two* notions of meanness in this context. He appeals to the compositional mean exemplified by health in describing the senses as mean states of the contrariety present in their special objects, and he appeals to a version of the Pythagorean arithmetic mean when he argues that the senses thereby discriminate their special objects. An adequate interpretation of the argument must therefore show how the senses, *by being mean states corresponding to the compositional mean*, are also mean states corresponding to the object-relative arithmetic mean.

I propose to read the argument as follows. I claimed in section 4.1 that a sense must be a mean state because it is the form and final cause of an organ that, qua organ, is composed in an equilibrium of contrary qualities (of black and white, or of bitter and sweet, etc.). This constraint applies to the sense for reasons quite independent of discrimination: in order for the animate sense organ to be receptive to the full range of the qualities it specially perceives, it must be potentially but not actually such as each of these qualities. For if it were actually such as one of these qualities, it could not be affected by—and therefore would not be receptive to—objects qualified in that way. Now, in Aristotle's perceptual ontology, what it takes to be actually such as a perceptual quality is to be mixed in the same proportion of the relevant extremes—for instance, anything mixed in a 2 : 3 ratio of black to white is colored in the same shade (yellow, say). So the

best way for the animate organ to lack all such qualification, while remaining *potentially* such as its these qualities are, is for it to be composed in an *equilibrium* (or 1 : 1 ratio) of the relevant contraries, a position on the scale at which there exists *no* quality that could affect it.⁵⁰ The application of the master argument to the senses is meant to bring out that the senses, by being related in this way to the compositional mean of the relevant scale, are also related to the object-relative arithmetic mean, for the simple reason that the two means *coincide* in quality scales of this type. They coincide because, as we noted earlier, the compositionally mean (1 : 1 mixed) value of the scale falls exactly between the “pure” (1 : 0 and 0 : 1 mixed) values at the extremes of the scale. So the sense, by being a compositional mean state in the way sketched above, also exhibits proportional difference between these extremes: it is the form of an organ that falls short of one extreme (the one corresponding to the maximal presence of some nature, such as nutriment or transparency) to the same degree that it exceeds the other (the one corresponding to the maximal absence of that nature). According to the master argument, being mean in *this* way is sufficient for having the capacity to discriminate items on the relevant scale. Hence, it is because the senses are mean states in this compositional sense that they are mean in the respect sufficient for discrimination, as text 4.1 asserts.

These technical details of Aristotle's argument are important for two reasons. First, they show how the conditions under which the senses are receptive to perceptual form can come apart from those under which they discriminate their special qualities, despite the fact that both sets of conditions appeal to considerations of meanness. They come apart because a sense may be receptive to a quality without being discriminative of it. Consider again the case of Sick Socrates, who tastes the wine—and so, presumably, is receiving its gustatory form—but who nevertheless fails to discriminate its flavor: the wine tastes bitter to him, when it is in fact sweet. We analyzed this case in terms of Sick Socrates' illness, which caused his gustatory organ to deviate from its mean position: the deviation did not prevent him from tasting the wine, since apparently his gustatory organ was not qualified in the same way as the wine; but it did prevent

⁵⁰Matters are only slightly different in the case of touch; see ch. 3.2.3.

its flavor from appearing to him as it is in itself. It is only when the organ is “healthy”—when, that is, it corresponds to the compositional mean—that it is in a position to discriminate the qualities to which it is receptive.⁵¹

Second, the technical details of Aristotle's account expose the *mechanism* whereby the senses discriminate their special qualities. This allows us to see how satisfying the condition on object-relative arithmetic meanness—namely, being the contrary of both extremes—enables the senses to be such that their special objects appear as they are in themselves. Consider now the case of Healthy Socrates, who both tastes and discriminates the wine because his gustatory organ is in its proper equilibrium condition. He manages to do so because the gustatory form he receives from perceptually interacting with the wine turns out to be the *same* as the one the wine actually has. In other words, the result of the interaction is that Socrates' gustatory organ comes to be (temporarily, and in the relevant way⁵²) exactly like the wine in respect of gustatory form. This form is given by the ratio of the mixture composing the wine's flavor—let's say it is mildly sweet, a 1 : 3 mixture of bitter (lack of nutriment) and sweet (presence of nutriment). When the wine perceptually interacts with the gustatory organ, it temporarily displaces the latter from its mean position and moves it closer to its own condition. Now, the character of the gustatory motion produced by the wine is a function of its mixture, so in this case the gustatory organ will be moved twice as much in the direction of the sweet as it is moved in the direction of the bitter. Because Healthy Socrates' organ is in the right compositional mean state, the resulting motion will be such that it comes into perfect correspondence with the flavor of the wine, from a 1 : 1 to a 1 : 3 ratio of bitter to sweet. Contrast Sick Socrates, who will not come into perfect correspondence with the wine's flavor, though the motion exerted by the wine on his gustatory organ is the same: if his organ falls short of the mean (2 : 1, say), the wine will taste more bitter than it really is (1 : 2, say), and if his organ exceeds the mean (1 : 2, say), the wine will taste

⁵¹Thus I am only in qualified agreement with the suggestion of De Haas 2005 that perceptual discrimination and the reception of form are the same in number but different in being. They can be, but only in the optimal case in which the organ corresponds precisely to the compositional mean.

⁵²See ch. 3.3.4.

sweeter than it really is (1 : 4, say).

Interpreted in this way, sensory discrimination appears to be precisely the sort of passive “affection by the world” that text 4.5 led us to expect. It is the passive process by which perceptual objects are presented (or represented) to the cognitive subject *accurately*, in a way that corresponds to the nature of the qualities the perceived object actually possesses. The senses manage this cognitive feat by exploiting the causal powers of the objects in the environment, such as objects’ abilities to move transparent bodies (color), or compacted air (sound), or to heat and chill (temperature). For Aristotle what is crucial to this process is that the animate sense organ is in such a condition that causal affection in these ways will result in the object being presented as it really is. The mean in his view guarantees this perspective because it situates the animate sense organ in such a way that affection by these objects results in the subject coming to be such as these objects already are.

4.6.2 *Intellect as an object-relative arithmetic mean state*

Aristotle’s discussion of intellect testifies to his determination to present this model of sensory discrimination as just one instance of a broader explanatory connection between meanness and discrimination. This is in spite of some crucial differences between perceiving and thinking. Most pertinent among these is that, whereas perception is the result of a causal interaction between the perceiver and an external body, thought does not depend on the presence of an external agent, since its objects are already in a way present in the soul (*An.* 417^b15–16). Nevertheless, Aristotle elects to construe thinking as another case in which the cognitive subject is “affected” or otherwise acted on by its cognitive object:

Text 4.7 If then thinking is just like perceiving, it would be a type of affection by the objects of thought, or something else of that sort. It must therefore [1] be unaffected, but receptive of the form and potentially such [as it is], without [actually] being it; and [2] in the same way as what can perceive is related to the objects it perceives, so too [must] the intellect be related to what it thinks.⁵³ (*An.* 3.4, 429^a13–18)

⁵³εἰ δὲ ἐστὶ τὸ νοεῖν ὡσπερ τὸ αἰσθάνεσθαι, ἢ πάσχειν τι ἂν εἴη ὑπὸ τοῦ νοητοῦ ἢ τι τοιοῦτον ἕτερον. ἀπαθὲς ἄρα δεῖ εἶναι, δεκτικὸν δὲ τοῦ εἶδους καὶ δυνάμει τοιοῦτον ἀλλὰ μὴ τοῦτο, καὶ ὁμοίως ἔχει, ὡσπερ τὸ αἰσθητικὸν πρὸς τὰ αἰσθητά, οὕτω τὸν νοῦν πρὸς τὰ νοητά.

Arg. 4.3.3	{	Major Premise: DISCRIMINATIVE belongs to all MEAN
		Minor Premise: MEAN belongs to all INTELLECT
		Conclusion: DISCRIMINATIVE belongs to all INTELLECT

Argument 4.3 The master argument applied to the intellect

Aristotle's remarks are very general, but I believe there is a plausible and attractive interpretation of them on which the parallel between perception and intellect includes the idea that intellect satisfies the master argument (as in argument 4.3). On this interpretation, thought stands to a wide range of intelligible forms as an object-relative arithmetic mean state, and it does for reasons analogous to those that motivated this conclusion in the case of the individual senses.

The parallel between perception and thinking is at the level of first actuality. This is the level at which the perceiver, having been born and in possession of fully developed sense organs, requires only the causal agency of a perceptually qualified object for actual perception.⁵⁴ Similarly, it is the stage at which the thinker, having fully received some intelligible form through education or intellectual discovery, is in a position to contemplate that form at will. According to text 4.7, the thinker's transition to actually contemplating that form is effected in some way by the *agency* of what the thinker contemplates: even though it is entirely up to the thinker whether and when she contemplates this form, her thinking is somehow brought about through "affection" by the object of thought. As I understand the passage, Aristotle derives from this two further parallels with perception.⁵⁵ The first has to do with the "composition" of the intellect in first actuality. To be receptive to the full range of its objects in this state, the intellect must be potentially but not actually such as what it can think. On the one hand, this is a further parallel with the senses, each of which satisfies this constraint by being the form of a compositionally mean organ. On the other hand, the constraint is exponentially more demanding in the case of thought, since thought must be receptive to *everything there is*. In a complicated series of arguments, Aristotle leads us to the conclusion that the nature of intellect prior to actual thinking

⁵⁴Given, of course, the presence of an appropriate medium for the interaction.

⁵⁵See Cohoe 2013 for another recent commentator who also finds two conclusions in this text.

is *nothing* apart from this potential (*An.* 429^a21–22), and so must lack a dedicated bodily organ (^a24–27).⁵⁶ The controversial details of the arguments needn't detain us, however, since it is in any case clear that they advert to considerations similar (if not identical) to those that lead him to conclude that the senses are compositional mean states. Were there a dedicated organ for thought, it would be qualified in some way, so that it would be not just potentially but actually such as one of its special objects. So even if, as Aristotle acknowledges, what perceives and what thinks are unaffected by their objects in different ways—since what perceives is unaffected by being the form of a bodily organ (cf. ^a29–^b5)—there remains an important analogy between the cognitive subjects of perception and thought.

The second parallel concerns the resulting relation between the intellect and its special objects. Aristotle claims that intellect is related to intelligible objects as a perceptual capacity is related to its objects. He does not go into further detail about the character of this relation here, but if he is alluding earlier remarks about the relation of the senses to their special objects, they are perhaps these:

Text 4.8 So then, each sense, by being present in its sense organ qua sense organ, is of its underlying perceptual object and discriminates the differences⁵⁷ of that underlying perceptual object. For instance, vision [discriminates] white and black, taste [discriminates] sweet and bitter, and so on in the other cases.⁵⁸ (*An.* 3.2, 426^b8–12)

This passage references both elements of the above-given account of sensory discrimination: that a sense is *of* a given scale of perceptual qualities because it is the form of an organ composed of the contraries defining that scale; and that it *discriminates* the values of that scale because the ratio of the organ's mixture coincides with the scale's object-relative arithmetic mean. A maximally literal extension of this account to thought would require saying that the intellect, by virtue of being none of the objects it can think prior to thinking them, is thereby discriminative of these

⁵⁶For discussion of these arguments see, in addition to Cohoe 2013, Caston 2000 and Sisko 1999.

⁵⁷“Differences” (*διαφοράς*) here refers to the determinate species of the perceptual quality genus, for example determinate flavors or shades of color; cf. *An.* 422^b10–14.

⁵⁸ἐκάστη μὲν οὖν αἴσθησις τοῦ ὑποκειμένου αἰσθητοῦ ἐστίν, ὑπάρχουσα ἐν τῷ αἰσθητηρίῳ ἢ αἰσθητήριον, καὶ κρίνει τὰς τοῦ ὑποκειμένου αἰσθητοῦ διαφοράς, οἷον λευκὸν μὲν καὶ μέλαν ὄψις, γλυκὺ δὲ καὶ πικρὸν γεῦσις· ὁμοίως δ' ἔχει τοῦτο καὶ ἐπὶ τῶν ἄλλων.

items—again because in this condition it somehow coincides with the object-relative arithmetic mean of the relevant scales. If extending the account in this way seems absurd, it is because it is not at all obvious (and Aristotle does not here indicate) that intelligible objects exhibit the scalar structure necessary for there to be a mean of this sort. But the idea is more promising than it may seem: there is in fact considerable evidence that Aristotle regards a substantial subclass of intelligible objects as scalar in a way precisely analogous to perceptual qualities.

Aristotle routinely claims that there is single knowledge (*ἐπιστήμη*) of contraries.⁵⁹ The claim may be taken as saying that contraries belong to same *science*, or body of knowledge; or it may be taken as saying that it belongs to the same *expert*, or possessor of scientific knowledge, to know both of a pair of intelligible contraries. Either way, it implies that some intelligible domains are structured in a way similar to perceptual quality scales. Certainly some intelligible opposites will not admit of intermediate values, for instance odd and even, both of which belong to the same mathematical knowledge of number. But others certainly will. An immensely important class of these opposites belong to *biological* kinds. It is well known that Aristotle takes biological species belonging to the same genus to differ among themselves only by degree. As he puts it, species belonging to the same genus differ according to “the more and the less” (*μᾶλλον καὶ ἥττον*), or “excess and deficiency” (*ὑπεροχὴν καὶ ἔλλειψιν*), whereas heterogeneous species are related at most by analogy (cf. *PA* 644^a16–21, *HA* 486^a21–24):

Text 4.9 Roughly speaking, it is by the figures of the parts and of the whole body that kinds have been defined, when they bear a likeness—e.g. members of the bird kind are so related to each other, as are those of the fish kind, the soft-bodied animals, and the hard-shelled animals. **For their parts differ not by analogous likeness, as bone in humans is related to fish-spine in fish, but rather by bodily affections, e.g. by largeness [and] smallness, softness [and] hardness, smoothness [and] roughness, and the like—speaking generally, by the more and less.**⁶⁰ (*PA* 1.4, 644^b7–15; tr. Lennox, modified)

⁵⁹A particularly salient context in which Aristotle mentions this is *An.* 3.3, 427^a5–6, but there are references to it littered throughout the corpus; see Bonitz s.v. *ἐπιστήμη* § 4.

⁶⁰σχεδὸν δὲ τοῖς σχήμασι τῶν μορίων καὶ τοῦ σώματος ὅλου, ἐὰν ὁμοιότητα ἔχωσιν, ὠρισταὶ τὰ γένη, οἷον τὸ τῶν ὀρνίθων γένος πρὸς αὐτὰ πέπονθε καὶ τὸ τῶν ἰχθύων καὶ τὰ μαλάκιά τε καὶ τὰ ὄστρεια. τὰ γὰρ μόρια διαφέρουσι τούτων οὐ τῇ ἀνάλογον ὁμοιότητι, οἷον ἐν ἀνθρώπῳ καὶ ἰχθύϊ πέπονθεν ὄστουν πρὸς ἄκανθαν, ἀλλὰ μᾶλλον τοῖς σωματικοῖς πάθεσιν, οἷον μεγέθει μικρότητι, μαλακότητι σκληρότητι, λειότητι τραχύτητι καὶ τοῖς τοιούτοις, ὅλως δὲ τῷ μᾶλλον καὶ ἥττον.

This passage is striking not only for its similarity to the language Aristotle uses to describe mathematical notions of meanness (cf. text 4.3 above), but also for its claim that kinds within the same biological genus differ primarily in the *bodily affections* (σωματικοῖς πάθεσιν) of their parts, all of which affections are quantifiable in terms of a certain pair of contraries. For instance, kinds of bird differ according to the largeness or smallness of their feathers, and the hardness and softness of their beak. The sum of these quantifiable differences ranged between contrary opposites constitute the differences between kinds falling under the genus bird, and so at least in part constitute the *essence* of each of these kinds.⁶¹ It would therefore belong to the expert ornithologist—the first-actuality knower who can exercise her knowledge of the genus bird at will—to know how bird species are ranged with respect to each of these quantifiable differences in respect of which they differ by the more and the less.

It seems that we can apply the master argument to give an account of intellectual discrimination within at least this limited class of intelligible objects. Intellectual discrimination of individual species within the genus bird, for instance, requires the first-actuality intellect to be neither large nor small, nor hard nor soft, nor rough nor smooth, nor any of the contraries in terms of which bird species differ according to the more and the less. For if it were, it would not be appropriately subject to the agency of each intelligible object within this domain. A natural way to account for how the intellect achieves such radical unaffectedness relative to this intelligible domain (and indeed vary many others) is to say that it lacks bodily affection altogether. In this way the bodily “composition” of the intellect is a limit case of the composition of the sense organs: whereas the sense organs must lack qualification within to the limited range of bodily affections (perceptual qualities) they perceive, the intellect must lack qualification with respect to *all* types of bodily affection, since it can think things that differ in respect of any of these affections. For similar reasons, intellect could plausibly be said to be discriminative of its objects. For just as the senses occupy a perspective from which causal interaction with their special objects presents them in perception as they are in themselves, so too does the intellect

⁶¹See Lennox 1980 for a classic statement of this view.

occupy a perspective from which the agency of *intelligible* objects presents them in thought as what they are essentially and in themselves. In both cases this perspective is owing to the way in which the cognitive subject is unaffected: the sense by being the form of a compositionally mean body, the intellect by lacking a bodily organ altogether.

These remarks on intellectual discrimination are admittedly sketchy. A more complete account would require understanding the agency Aristotle attributes to intelligible objects in text 4.7, an interpretive project that would involve the daunting task of coming to grips with the role of the active intellect.⁶² It is not impossible that, given a fuller understanding, the structural parallel between sensory and intellectual discrimination will turn out to be looser than I have suggested. But the similarities Aristotle evidently sees between perception and thought, as well as those between his ontologies of perceptual and intelligible objects, seem to me strong evidence that the explanatory connection between meanness and discrimination expressed by the master argument is not meant to apply only to the senses. What seems more likely is that it gives expression to a general doctrine extending to both of the basic discriminative capacities of soul.

4.7 The importance of discrimination

To be sure, even if the explanatory connection between discrimination and the object-relative arithmetic mean is as far reaching as I've suggested, there will be kinds of both perceptual and intellectual discrimination to which it does not apply. The perceptual capacity as a whole, of which the individual senses are only logically distinguishable parts (*Sens.* 449^a16–20), is not only responsible for the discrimination of special perceptual qualities. It is also responsible for the discrimination of sameness and difference, both within and across sensory modalities, as well as cross-modally accessible qualities like shape, number, and motion.⁶³ Likewise, the intellectual capacity is responsible for more than the discrimination of intelligible domains structured like

⁶²For an account of agent intellect that retains this aspect of the parallel between perception and thought by identifying active intellect with the objects of thought, see Charles 2000, esp. 130–135.

⁶³Though perhaps this also occurs at the level of individual senses; cf. *Ins.* 460^b22.

biological kinds: the domain of intelligible objects also includes things like odd and even, which do not admit of a mean, as well as items like number and substance, which for Aristotle do not admit of contrariety at all (*Cat.* 3^b24–31).

On the one hand, the existence of these further kinds of discrimination is entirely consistent with the doctrine of the discriminative mean, for as I've presented it, it only states a *sufficient* condition for having the power to discriminate. But on the other hand, we cannot say with the same certainty that the structure of discrimination is the same in all of its varieties. Aristotle does attempt to show that some of these more advanced kinds, such as the perceptual discrimination of sameness and difference, depend on more basic modes of discrimination.⁶⁴ Other kinds he seems explicitly to ascribe to different cognitive capacities. For instance, it belongs not to thought (*διάνοια*) but to the rational faculty of *nous* to grasp items like substance and perhaps number, which are among the first principles of a demonstrative science and so cannot be understood in the same way as the truths demonstrable from them. (It also seems to be a lesson of *Posterior Analytics* 2.19 that the grasp of these principles originates in basic perceptual discriminations, which in some subjects serves as the starting point of a long inductive process culminating in the grasp of first principles by *nous*—a point that is perhaps also reflected in Aristotle's claim elsewhere that perception is necessary for “discriminative *nous*” (*An.* 434^b3).) Even so, it is likely that these more advanced kinds of discrimination will not be brutally passive and causal in the way I've described its most basic forms. If so—if, that is, in these advanced kinds the subject is not purely passive, but actively contributes to shaping the content of the discriminative episode—there will not be as neat of a connection between discrimination and presentational accuracy. The subject's input will have introduced the possibility of error.

Nevertheless, special attention to its most basic forms puts us in the best position to appreciate the fundamental importance of discrimination, and especially sensory discrimination, for

⁶⁴For instance, the soul “proclaims” (*λέγει*) specific unity “by means of (a) the discriminating sense and (b) the way [sc. it is discriminating]” (*Sens.* 447^b25–26). I take it that (a) is the means by which soul discriminates generic unity, since special perceptual qualities are efficacious relative to at most one sense; and (b) is the means by which it discriminates specific unity (since identical qualities will affect the sense in identical ways, as Aristotle goes on to explain [^b26–448^a1]). For helpful discussion see Alexander, in *De sens.* 142.12–142.27.

Aristotle's account of cognition. On the interpretation developed here, discrimination is not fundamental because it is responsible for the subject's awareness of differences between cognitive objects; to the contrary, this turns out to be a *derivative* kind of discrimination on the order of discriminating specific and generic sameness, which in Aristotle's view depend on prior discriminations of individual qualities.⁶⁵ Nor is *sensory* discrimination fundamental because it is responsible for the production of phenomenal content, since the result of sensory discrimination is not the isolation of perceptual form from its proximate matter in the perceived quality. Rather, discrimination, and especially sensory discrimination, is fundamental because it is the most basic way in which the subject, the living animal, gets a cognitive grasp on what the world around it is really like.⁶⁶ In Aristotle's biology, animals are endowed with cognitive capacities in the first place because the distinctively animal form of life makes certain demands of the natural environment. Animals need to find food that will nourish and not harm them, to evade predators and other sorts of danger, and to select mates for sexual reproduction. Accomplishing these tasks with even a minimal rate of success requires the animal to have some way of gaining access to objects in the environment, and of telling which features an object has that may be relevant to its needs. If the animal is to survive, it must (for instance) be able to use taste to tell whether an object is nourishing, hearing to tell whether a nearby animal is a conspecific, and vision to see if what is circling it is a predator. Aristotle's insight is that cognitive capacities *are* the way in which the animal gains this access to its environment. Primarily, when the animal perceives, but also when it exercises sensibility or thinks, it "discriminates and cognizes one of the things that are" (*κρίνει τι . . . καὶ γνωρίζει τῶν ὄντων*, *An.* 427^a20–21). In Aristotle's view, these modes of cognition consist in part in a receptivity to a certain range of objects. But receptivity alone is not sufficient for the animal to be presented with these objects as they are in themselves. My suggestion is that the other function of cognition, the presentation of the objects to which the animal is receptive as they really are in themselves, is secured by discrimination.

⁶⁵See note 64 above.

⁶⁶See Introduction, xxi–xxvi.

Basic sensory discrimination, as I've presented it, is ideally suited to facilitate this cognitive task. The objects populating the animal's natural environment are bodies endowed with a complex array of causal powers, qualities that enable them to move and affect other bodies. One way for an animal to gain cognitive access to these objects is to make itself receptive to certain of these affective qualities. For this purpose nature has endowed the animal with organs dedicated to the reception of certain types of bodily affection. Nature has moreover attuned these organs to coincide with a specific sort of mean, so that affection by any one of these perceptually qualified bodies produces awareness (not to say *conscious* awareness) of how the causally relevant body is actually qualified. In these cases the animal *discriminates* the quality of the relevant body, and thereby gains the wherewithal to tell whether the object is food, or a predator, or a mate.

Aristotle thinks that much the same story can be told in the case of basic intellectual discrimination. Here, however, the cognitive demands are not restricted to the animal's survival. They also include intellectual goals like and scientific knowledge and understanding, goals that are in an important sense internal to the activity of intellectual discrimination itself. Despite these differences, and despite the absence of a dedicated bodily organ in virtue of which thought is receptive to intelligible objects, thought no less than perception gains the requisite sort of cognitive access by virtue of exploiting the (quasi-) causal powers of intelligible objects. Here too, then, the power of thought to discriminate its objects, to be presented with them as they really are, depends crucially on how it is "attuned" with respect to its objects.

4.8 *Κρίσις* and 'discrimination'

The present interpretation of *κρίσις*, the process I've been calling *discrimination*, contrasts sharply with those canvassed at the outset of this chapter. According to these interpretations, *κρίσις* consists in some type of *separation* or *telling apart*, whether the telling apart of different cognitive objects (e.g. discriminating white *from* black) or separating perceptual form from its matter (e.g. discriminating black *from* its matter). In the context of these interpretations, 'dis-

crimination' (and its cognates) seems apt as a translation of *κρίσις* (and its cognates). On the present interpretation, by contrast, discrimination seems singularly *inapt*, since on this view *κρίσις* needn't (and in its most basic forms *doesn't*) involve any sort of separating or telling apart cognitive objects. This may be viewed as a difficulty for my interpretation, since at least one shade of meaning of the Greek term *κρίσις* (and its cognates) *is* separation and telling apart. In closing, then, I'd like to respond to this worry by remarking on the shade of meaning of *κρίσις* (and its cognates) from which the present interpretation draws.

Aristotle clearly appropriates *κρίσις* (and its cognates) as a term of art in his psychology, but translators have not agreed which among its several meanings is being picked up on in this context. According to one tradition of interpretation, Aristotle's usage draws from its meaning in forensic contexts to refer to the judgment or decision of a judge, or *κριτής*.⁶⁷ This interpretation was influentially criticized by Ebert (1983). He argued first on philological grounds that this translation is anachronistic, since the forensic sense of *κρίσις* (and cognates) was not standard until after Aristotle's time. Second, he objected on philosophical grounds that judgment is not sufficiently cognitively basic to capture the psychological meaning of *κρίσις*: judgments are propositional, whereas psychological *κρίσις* needn't be. Ebert proposed that *κρίσις* should instead be taken in its basic meaning of separation and selection, which we also find Aristotle using in parts of the corpus.⁶⁸ For the interpretive tradition that takes Aristotle to be drawing from this meaning, *κρίσις* and its cognates refer to processes of discrimination or discerning. Understood in this way, the sorts of processes Aristotle has in mind correspond closely to others in the history of psychology. Understood in Ebert's preferred way as the cognitive activity of discriminating the difference between two cognitive objects, Aristotle's concept of *κρίσις* compares with the notion of discrimination or discernment in classical empiricist psychology. Discrimination in this tradition is a mode of the association of ideas, one that contrasts with mental operations like comparison or association.⁶⁹ Other commentators who have adopted

⁶⁷See e.g. Hamlyn 1993, Hicks 1907: 'judge'; Barbotin and Jannone 1966 (cf. Narcy 1996): 'juger'.

⁶⁸See Bonitz s.v. *κρίνειν*.

⁶⁹See, e.g., Locke, *Essay* II. XI, James 1890, Vol. 1, Chapter XIII. Aristotle too has a version of the association of

this translation seem to have in mind a different, more contemporary notion of discrimination current in vision science. According to this notion, discrimination consists in the separation of figure and ground, or the selection of a visual object from its surrounding environment.

Though I have elected to retain the (by now standard) translation of 'discrimination,' in part to avoid the awkwardness of transliterating *κρίσις* and its cognates throughout, I do not share the view that Aristotle's use draws on their meaning of separation or selection, nor do I suspect that his concept of *κρίσις* finds many parallels in the subsequent history of psychology. As I noted earlier,⁷⁰ the closest parallel to Aristotle's use of these terms in his psychological works is found in Plato's *Theaetetus*. In attributing the power to discriminate to the senses, Aristotle is insisting that, under the right conditions, we can use them to determine how things are in themselves. To this extent Aristotle's use of *κρίσις* is related to aspects of its forensic—or perhaps *proto-forensic*—meaning. This connection needn't imply (as Ebert worries) that discrimination is propositional (though in some of its forms it may be), nor that it is not cognitively basic. To ward off these misunderstandings, we could perhaps retain the translation 'discrimination,' giving it the somewhat artificial sense of 'telling apart X from not-X': white from not-white, sweet from not-sweet, etc.⁷¹ But if we want to avoid all of the potentially misleading implications of words like 'judgment' or 'discrimination,' a better translation of *κρίσις* (and cognates) in this context might be 'detection' (and cognates). This word at any rate seems better to capture what I have argued to be the fundamental role of *κρίσις* in Aristotle's psychology: namely to facilitate animals' cognitive access to the objects and attributes of their environment that mean the most to their survival and flourishing.

ideas: when recollecting, for instance, we can move from one preserved sensory affection to another that is similar, or contrary, or continuous with it; cf. *Mem.* 451^b15–20 and, for discussion, Lorenz 2006, 148–173.

⁷⁰See sect. 4.5 above.

⁷¹Cf. Gregorić 2007, 145.

Conclusion

With the conclusion that the senses discriminate (*κρίνειν*) the qualities they specially perceive, Aristotle upholds a thesis that was as controversial in his intellectual milieu as it is in ours.¹ For, according to Aristotle, what it is for a sense to discriminate its special qualities is for it to be affected in such a way that those qualities are presented to the perceiver as they essentially are: namely, in his view, as greater or lesser on the scale that defines the quality as the one it is. To the extent that Aristotle succeeds in establishing special perception as a “discriminative” capacity of soul, his conclusion may therefore be regarded as support for a naïve conception of sense experience as a state in which the perceiver is presented with the essential nature of some range of an objects’ perceptually accessible properties.

The foregoing chapters examined in detail the reasons Aristotle offers in support of this conclusion. We saw that Aristotle’s defense of basic sensory discrimination has two basic components. The first is a physicalist perceptual ontology that analyzes perceptual qualities on a model of “chemical analysis.”² According to this model, a determinate perceptual quality is a mixture of contrary extremes of state and privation, its essential nature and causal efficacy fixed by the degree to which one extreme dominates over its contrary in its constitutive mixture. This ontological picture of perceptual qualities sets up the second component of Aristotle’s defense, an argument for sensory discrimination that derives the senses’ ability to discriminate their special objects from their status as mean states of the contrariety present in those objects. Aristotle regards the senses as mean states because each is the form and final cause of an animate bod-

¹See note 3 of ch. 4 for references to some ancient opponents of perceptual discrimination.

²See chs. 1 and 2.

ily organ that, *qua* organ of that sense, is a compound of the same extremes that define the quality genus it specially perceives.³ The hylomorphic conception of the animate sense organ implied by this characterization generates an argument for sensory discrimination, which takes the form of a general account of the conditions under which the essential nature of a specially perceived quality is actually present in the affections it produces in the perceiver.⁴ In Aristotle's view, each sense discriminates its special objects insofar as it is the form of an organ that occupies the object-relative arithmetic mean of the quality scale it specially perceives—a perspective characterized as one from which the qualities affecting the perceiver appear as they essentially are.

Appreciation of these ontological and psychological details of Aristotle's conception of sensory discrimination brings to light two important features I mentioned in the introduction. First are the teleological considerations driving Aristotle's support for the naïve conception of sense experience.⁵ We saw that, in characterizing sense perception as a component of animals' cognitive function, Aristotle takes the contribution of the senses to animals' survival and flourishing to be governed by the norm of truth or, as we might say, presentational accuracy: the senses belong to the animals that have them in order to furnish them with an *accurate* presentation of the qualities of objects that make a difference to their survival and flourishing. The present interpretation allows us to see this teleological role reflected in Aristotle's conception of the senses as *mean states* of the quality scales they specially perceive. In Aristotle's view, the essential nature of a perceptual quality is identical to a mixture characterized by the excess of one among a pair of extreme contrary ingredients. To furnish the animal with an accurate presentation of a quality of this sort, the senses must be in a position to present that quality as excessive or deficient in respect of the relevant extremes. That the senses meet this condition on satisfying their teleological role is in Aristotle's view reflected in their nature as mean states of the contrariety present in their special objects. For, as such a mean state, each is the form and final cause of an

³See ch. 3.

⁴See ch. 4.

⁵See ch. 4.7 and Introduction, xxi–xxvi.

organ that, *qua* organ, occupies the object-relative arithmetic mean of the quality scale(s) it specially perceives, the unique position from which affection by any one of those qualities presents it as excessive or deficient in the way characteristic of its essential nature.⁶

Another feature of Aristotle's defense of basic sensory discrimination that the present interpretation brings to light is Aristotle's response to rival theories of sensory affection and experience, and most prominently to a theory he finds implicit in Plato's argument for the distinction between perception and knowledge in the *Theaetetus*.⁷ As Aristotle understands it, this argument purports to show that the perception (*αἴσθησις*) of a quality like the hardness of a hard thing must be distinct from the knowledge (*ἐπιστήμη*) of that quality, since knowledge of that quality would require grasp of the being or essential nature (*οὐσία*) of the hard thing's hardness. However, the argument goes, only the soul by itself—and *not* via the senses—can determine (*κρίνειν*) the being of such qualities. For the Socrates of the *Theaetetus*, this conclusion amounts to a decisive rejection of the Protagorean hypothesis that each person “has the criterion (*κριτήριον*) of these things within himself; so when he thinks they are as he experiences them, he thinks what is true and what really is for him” (*Th.* 178B); for the argument shows that the knowledge of such qualities are *not* present in the sensory affections (186D).

We've seen that Aristotle signals his rejection of this theory when he claims—with explicit reference to the Protagorean *homo mensura* doctrine—that sense perception, along with more advanced cognitive states such as scientific knowledge (*ἐπιστήμη*), is a *measure* (*μέτρον*) of its underlying objects.⁸ The previous chapters have detailed Aristotle's reasons for rejecting the theory underlying Socrates' argument in the *Theaetetus*. Where Socrates argued that the being of perceptual qualities cannot reach the soul through the senses, we saw that Aristotle defends a view on which the objective, perceiver-independent nature of a perceptual quality can also be present in the perceptual affections it produces. Where Socrates distinguished sensory affections

⁶See ch. 4.6.1 for discussion of the details of this picture of perceptual affection.

⁷See *Th.* 184B–186E, esp. 186B–C. I defend this view of Aristotle's reception of this part of the dialogue in the Introduction, xxviii–xxxii and ch. 4.5.

⁸Cf. *Met.* 1053^a31–^b3, quoted as text 4.5; for discussion, see ch. 4.5.

from the cognitive processes by which the soul determines (*κρίνειν*) the being of a hard thing's hardness and a soft thing's softness, we saw that Aristotle articulates the conditions under which *touch* discriminates what is hard and soft without qualification.⁹ The conditions under which touch discriminates hard and soft are in Aristotle's view the conditions under which each of the soul's cognitive capacities discriminate its special objects, namely insofar as each is a mean state of the relevant range of cognitive items.¹⁰ So where Socrates alleged that the soul that perceives through touch the hardness of a hard thing or the softness of a soft thing has not thereby grasped the being or essential nature (*οὐσία*) of these qualities, Aristotle argues that these are precisely the cases in which touch discriminates hard and soft.

As I suggested in the introduction, much of the contemporary philosophical interest of Aristotle's theory of perceptual discrimination stems from the fact that it expresses a conception of sense experience that coincides closely with the naïve conception, since on both conceptions the perceiver is presented in sense experience with the essential nature of some range of an object's perceptually accessible properties. We saw that, for some contemporary theorists, to vindicate this naïve conception would be to claim that sense perception is a form of *knowledge* of those properties.¹¹ However, it would be wrong to conclude on this basis that Aristotle himself therefore conceives of sense perception as a form of knowledge. For though, as we've seen, Aristotle rejects the *argument* Socrates gives for distinguishing perception of a perceptual quality and knowledge of that quality, it is not obvious that he rejects Socrates' *conclusion*. First of all, the consideration Socrates adduces in support of this conclusion—that the senses cannot discriminate and so have no share in the being or truth of what they perceive—states only a *necessary* condition for knowledge of perceptual qualities. Moreover, Aristotle *agrees* with the letter of Socrates conclusion that *αἴσθησις*, perception, must be distinct from *ἐπιστήμη*, knowledge, since in Aristotle's view the latter term denotes the intellectual cognitive state of

⁹Cf. *Meteor.* 382^a16–21, quoted as text o.3.

¹⁰See ch. 4.6.

¹¹For an overview of this conception of sense experience, which I call Weak Revelationism, see Introduction, xii–xx.

scientific knowledge, which must strictly be distinguished from perception.¹² So Aristotle's defense of basic sensory discrimination makes a case for perceptual knowledge only in the limited sense that it supports the *contemporary* view that perception, on the naïve conception, is a form of knowledge of some range of an object's perceptually accessible properties.

Still, I think it would be equally wrong to conclude that Aristotle therefore sees no epistemic implications following from his rejection of the claim that the senses cannot discriminate and so have no share in the being or truth of what they perceive. To the contrary, even though Aristotle maintains that *αἴσθησις* or perception must be sharply distinguished from *ἐπιστήμη* or scientific knowledge, he regards perception and scientific knowledge each as a type of *cognition* (*γνώσις*). It belongs to a different study to consider what epistemological consequences Aristotle takes to follow from the claim that perception is a type of cognition. But I would like, in closing, to mention two areas of further research where I believe the present interpretation stands to make a contribution: first, the unity of Aristotle's conception of cognition; and second, the role of perception in scientific inquiry.

1. The unity of cognition in Aristotle. Aristotle is sometimes held to have an “implicitly graded” notion of cognition.¹³ According to this interpretation, Aristotle thinks of cognition in two distinct ways, but only in one of these ways does perception qualify as a type of cognition. Sometimes he thinks of cognition as a sort of *awareness* or grasp of the truth of some fact, and at these times perception appears to be a type of cognition. At other times, however, he thinks of cognition as a state of *understanding*, in which the cognizing subject is not only aware of the truth of some fact but is also in a position to explain *why* it is the case; and at these times perception appears *not* to be a sort of cognition.

Some commentators claim to find evidence for an implicit gradation in Aristotle's notion of cognition in passages where Aristotle characterizes cognition as a state in which the subject has

¹²See esp. *APo.* 1.31.

¹³The claim goes back to Burnyeat 1981, cf. Barnes 1994. Fine 2014, 189–190 is a representative recent example of this interpretation.

cognitive access (*γνωρίζειν*) to the primary causes and principles of what she cognizes.¹⁴ For, whereas Aristotle explicitly defines advanced cognitive states like scientific knowledge as states in which the subject has cognitive access to the causes of what she cognizes (see *APo.* 79^b9–12), we are nowhere told that *perception* is likewise a state in which the perceiver has cognitive access to the primary causes of what she knows. However, if the present interpretation of sensory discrimination is correct, this evidence is not as decisive as it may seem. To see why, we only have to recall that Aristotle is a *physicalist* about perceptual qualities. In his view, colors, flavors, and other perceptual qualities are in essence *causes* of perceptual motion and affection; they are, as Aristotle summarizes his view in *De Sensu*, features of a perceptually qualified object “being which it will *produce* (*ποιήσσει*) perception and actuality [sc. more generally]”.¹⁵ Since, on the present interpretation, the perceiver who discriminates a specially perceived quality is presented with it as it essentially is, it would seem to follow that there is a way in which perceivers too have cognitive access to the cause of what they cognize, namely, the quality responsible for her current perceptual affection.

A full defense of this view would involve addressing difficult interpretive questions that have been put aside for the purposes of the present study. Chief among these would perhaps be questions concerning the character of the discriminating subject’s *awareness* of the essential nature of the qualities she discriminates. Aristotle seems committed to the idea that perceptual affection is in its very nature a process of which the subject is aware.¹⁶ But special questions arise when we consider the special case of sensory discrimination. For instance, when a perceiver discriminates by taste the sweetness of a morsel of food, and is thereby presented with the relative excess of nutriment that is causing the occurrent sensory affection, is her experience phenomenologically any different from a perceiver whose experience of sweetness is erroneous owing to some temporary deviation of the gustatory mean state? Or, rather, are the two experiences indis-

¹⁴See *Phys.* 184^a12–14; cf. 194^b12–14, *Met.* 983^a25–26, 994^b29–30, 996^b14–16. For discussion of these passages, see Burnyeat 1981, 106–108.

¹⁵*Sens.* 439^a16–17; for discussion of this passage, see chs. 1.1 and 2.1.

¹⁶See *Phys.* 244^b15–245^a1; I briefly discuss the qualitative character of sense experience in ch. 1.7.

tinguishable, even though one of the tasted objects *is* sweet while the other is only *apparently* sweet?¹⁷ Addressing questions of this sort might reveal crucial differences in the way perceivers have access to the causes of what they cognize and the way, for instance, scientific knowers have access to the causes of what they cognize. Nevertheless, the present interpretation at least opens up the prospect that Aristotle may have a unified conception of cognition according to which *all* cognitive states are modes of cognitive access to the causes of what the subject cognizes.¹⁸

2. Perception and scientific inquiry. We have until now been concerned with sensory cognition of perceptual qualities, states in which the subject perceives and discriminates a perceptual quality by means of the sense specially perceptive of it. But Aristotle also regards perception as a mode of cognition—and indeed the most authoritative mode of cognition—of *particulars*, including the particular substances that possess the qualities specially perceived by the senses.¹⁹ This characterization serves in part to distinguish perceptual cognition from states like scientific knowledge, which are exercises not of perception but of *thought*, and in which subjects characteristically cognize *universals*.²⁰ But it also clarifies the contribution that perceptual cognition makes to scientific inquiry and intellectual learning. For Aristotle, the object of scientific inquiry

¹⁷These questions become especially pressing when we consider the role of sensory discrimination in Aristotle's account of animal motivation. On the one hand, Aristotle wants to *identify* both perceptual pleasure (and pain) and actual appetitive desire (and aversion) with certain episodes of perceptual discrimination; see *An.* 431^a8–14, cf. *MA* 700^b17–22. On the other hand, the traditional “intensional” interpretation of perception's role in appetitive desire squares neither with the present interpretation of discrimination, nor (as it seems to me) with the alethic function that I've argued underlies Aristotle's conception of the senses' teleological role. I leave this issue too for future research. On the unity of perception and desire in these cases of animal motivation, see esp. Charles 2006 and Whiting 2002 (though cf. Moss 2012, 36). For an overview of the traditional intensional reading, see Moss 2012, 30–41; for objections to this reading and a defense of an alternative “extensional” reading that better fits the present interpretation, see Corcilius 2011.

¹⁸Aristotle sometimes distinguishes perception from intellectual cognition by saying that perception cognizes the *fact* whereas the latter cognize the *cause* or reason why; see e.g. *Met.* 981^b10–13. While these passages might be taken to imply that Aristotle denies perceptual access to causes, the proponent of the present suggestion would reply that Aristotle's claim is restricted to denying that perceivers grasp the causes of facts *known in intellectual states such as scientific knowledge*. In other words, the facts whose causes are not grasped in perception are *universal* facts that are made clear in perception through their particular instances, facts such as that fire is hot, or that lunar eclipses are the interposition of the earth between the sun and moon; cf. *APo.* 88^a1–8. Aristotle's denial that perceivers grasp causes would therefore not extend to *particular* facts whose causes are grasped only incidentally in states like scientific knowledge (*APo.* 71^b28–29; cf. *APr.* 67^a27–28), facts such as that *this* (or *this* fire) is now hot, or that the earth is now interposed between the sun and the moon; cf. *APo.* 90^a24–30, 88^a12–17.

¹⁹See esp. *Met.* 981^b11; cf. *APo.* 87^b28–30.

²⁰See e.g. *APo.* 87^b37–39 and *An.* 417^b21–23 in addition to the passages cited in note 19.

is to know the causes explanatory of observable phenomena, a process that leads ultimately to knowledge of the most universal and explanatorily prior principles of the relevant domain.²¹ All scientific inquiry must begin, however, with what is explanatorily posterior but more cognitively accessible (*γνωριμώτερον*) to us and to perception, namely the concrete particular substances we encounter in perception.²² To the extent that perception furnishes the starting points of inquiry—namely the facts from which the search for causes begins—it is necessary for all scientific inquiry (*APo.* 1.18). But perception's most distinctive contribution is that it furnishes the "prior cognition" (*προϋπάρχουσα γνώσις*) from which knowledge of the unexplained first principles of a science ultimately arises. As Aristotle argues in *Posterior Analytics* 2.19, perception does so by means of an inductive process whereby it "instills" (*ἐμπαιεῖν*) the universal from which knowledge of first principle arises in the soul of the inquirer (100^b1–5); for "though we perceive the particular, perception is of the universal: for instance human being, not Callias the human being" (100^a16–^b1).

The nature of the inductive process Aristotle describes in *Posterior Analytics* 2.19 is the subject of extensive controversy. It is certain, however, that Aristotle takes perception's ability to furnish the prior cognitions from which knowledge of first principles arises to be rooted in its status as an "innate discriminative capacity" (*δύναμις σύμφυτος κριτική*, 99^b35). Of course, the sort of perceptual discrimination of concrete particular substances that could plausibly underpin the inductive process Aristotle describes would extend far beyond the basic sensory discriminations we've been considering. The discriminations we've been considering coincide with episodes of *special* perception, in which the subject perceives an object insofar as it is (e.g.) colored or flavored by means of the sense defined by its receptivity to qualities of that type. By contrast, the discriminations that seem to be most relevant to the inductive process Aristotle describes coincide with episodes of *incidental* perception, in which the subject perceives an object, not insofar as it is perceptually qualified, but insofar as it is a particular substance, for in-

²¹See *APo.* 2.2 with

²²See *Phys.* 184^a15–21, 24–25; *APo.* 71^b33–72^a5; *EN* 1095^b2–3.

stance Callias or a human being, which happens also to be perceptually qualified in some way.²³ Now, as I claimed in Chapter 4,²⁴ it is likely that the discrimination of common and incidentally perceived attributes of objects is not the brutally causal and passive process that we find at the level of basic sensory discrimination. Nevertheless, it is plausible that incidental perceptual discrimination, like the incidental perceptual episodes with which it coincides, is to a large extent dependent on the basic sensory operations that give rise to special perceptual discrimination. To this extent, the present interpretation promises to shed light on the psychological basis for the epistemological role Aristotle sketches for perception in *Posterior Analytics* 2.19.

However, a complete account of the psychological underpinnings of perception's epistemological role would have to take into account two further considerations that go beyond the scope of the present study. First is how, and to what extent, the presence of intellect (*νοῦς*) amplifies the content available to rational perceivers who are capable of the inductive process Aristotle describes in *Posterior Analytics* 2.19. The capacity for the basic sensory discriminations we have been considering belongs to rational and non-rational animals alike, since it is based in the formal and final causal nature of the senses as mean states of the quality scales they specially perceive. Aristotle affirms the generality of this mode of perceptual discrimination in introducing the epistemological role of perception (99^b34–35). But it quickly emerges that the inductive process Aristotle has in mind is available only to rational animals for whom perception can also generate reason or an account (*λόγος*), an ability that for Aristotle also implies such advanced perceptual capacities as memory, the ability to store percepts (99^b36–100^a3).

Commentators have seen a role for intellect in the operation of advanced perceptual capacities distinctive of rational animals. Some have argued that intellect plays a role in incidental perception, from which it would follow that the sort of discriminations required for induction to first principles are not available to non-rational animals.²⁵ Others have argued that intellect's

²³See *An.* 418^a20–24; for further discussion of the distinction, see note 25 of the Introduction.

²⁴See ch. 4.7.

²⁵For a recent defense of this traditional view, see Herzberg 2011, 137–155; cf. Kahn 1995, 367–368. Johansen (2012, 282–283) argues for a moderate interpretation according to which possession of intellect, while not necessary for incidental perception, provides additional content to rational perceivers.

contribution lies rather in rational animals' ability to form *refined experience* (*ἐμπειρία*) from a body of memories of the same phenomenon.²⁶ For while Aristotle allows that non-rational animals have some share in refined experience (*Met.* 980^b25–28), these commentators argue that this sort of experience falls short of the grasp of facts involving universals from which arise the prior cognitions necessary for knowledge of first principles.²⁷ Both of these claims are controversial,²⁸ and I take no stand on them here. But if we are right to suppose that the more advanced discriminations of particular substances available only to rational animals depend on basic sensory discriminations available to all animals, then the present interpretation could serve as a constraint on conception of the role of intellect in the more advanced modes of perceptual discrimination. For, whatever the contribution of intellect to the content available to rational perceivers, it must be limited to what is not already made available from basic sensory discrimination and the psychological operations whereby perceivers discriminate objects' common (and perhaps incidentally perceptible) attributes.

The present interpretation would also seem to operate as a constraint in respect of the second controversy an account of the psychological underpinnings of perception's epistemological role would have to consider, namely how, if at all, perception *justifies* the intellectual knowledge that arises from it. There is an undeniably empiricist ring to Aristotle's claims that perception furnishes the starting points of scientific inquiry and the prior cognitions necessary for knowledge of first principles. But some commentators have argued that there is nevertheless a major gap between perception and the rational subject's grasp of first principles. For whereas perception may in Aristotle's view be necessary for grasp of first principles, it is not sufficient; rational subjects additionally require the rational faculty of intellect to apprehend principles as the ultimate

²⁶See *APo.* 100^a4–6, *Met.* 980^b28–981^a1.

²⁷See Hasper and Yurdin 2014; Gregorić and Grgić 2006 argue for two kinds of refined experience, a basic kind available to non-rational animals, and a more advanced kind available exclusively to rational animals.

²⁸For an alternative interpretation of incidental perception according to which it not essentially dependent on intellect, see Cashdollar 1973. For an alternative interpretation of refined experience as a state in which subjects do not grasp universals, see Charles 2000, 150–153; cf. Frede 1996.

explanatory items of the relevant domain.²⁹

Again, for the limited purposes of this dissertation, I need not take a stand on this controversy. For all that I have argued, perception may not have a justificatory role in the inductive process whereby rational perceivers acquire knowledge of first principles. But if perception's ability to furnish the prior cognition from which such knowledge arises is rooted in basic discriminative capacities shared by all animals, the role of intellectual intuition would here too be limited to activities beyond what can be provided by perceptual discrimination alone. In this dissertation I hope only to have illuminated those basic discriminative capacities which are available to rational and non-rational perceivers alike.

²⁹See Frede 1996 for an extreme version of this view, according to which perception plays only a causal role in grasp of first principles; cf. Barnes 1994, 267–269 and Irwin 1989, 134–136, 531–532. For criticism of these approaches, see Bolton 1991, 15–17 and Charles 2000, 149–161.

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