

Chapter 4

Aristotle and Alexander of Aphrodisias on Colour



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Abstract The aim of this paper is to unravel Aristotle’s reasoning with regard to the ontological status of colours; also, to get a better understanding of his views on the production of the whole spectrum of colours; and finally, to evaluate the explanatory power of his theory of colours. The texts I mainly draw my evidence from is Aristotle’s *De sensu* 3 and the relevant passages from the *De anima* as well as from other Aristotelian treatises; in addition, I use for my interpretation remarks made by Alexander of Aphrodisias in his commentary on the *De sensu*, in his *Quaestiones* and in the dubious treatise *Mantissa*.

Contemporary scholars interested in Aristotle’s theory of colours have been preoccupied, for the most part, with the question of how, according to Aristotle, we perceive colours. Many studies have been written on this subject, and different interpretations have been put forward of the central texts in which Aristotle dealt with it, namely *De anima* 2.7 and 3.2.¹ For Aristotle, though, it is crucial to distinguish the question of how we perceive colours from the prior question concerning the nature of colour in itself. Right at the beginning of the third chapter of the *De sensu* (439a6–12), Aristotle explicitly says that it is one thing to talk about the way the sense objects affect each of our sense organs, an issue which he is concerned with in the *De anima*, and another thing to examine the nature of the sense objects in themselves, an issue which he discusses in the *De sensu*. As to the priority of the question about the nature of the sense objects in themselves, Aristotle claims in the *De anima* (415a14–22) that in order to give an account of the faculties of the soul,

¹E.g. Silverman (1989), Sorabji (1992, 2001), Burnyeat (1992, 1995), Broadie (1993), Everson (1997), Sisko (1998), Broackes (1999), Woolf (1999), Magee (2000), Ganson (2002), Caston (2005), and Lorenz (2007).

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one needs to explain what their proper activities are, and in order to explain the activities, one first needs to explain their proper objects; for instance, in order to explain sense perception one first needs to examine the nature of the sense objects in themselves (cf. Johansen 2012, ch. 3: “The priority of the objects over the capacities of the soul”). In the case of vision, in particular, Aristotle states (*De anima* 418a29–b2) that colour is its cause, but it is not essential to the nature of colour that it be visible; for he seems to believe that there is no vision without colours, although there can be colours that are not perceived.

I, for my part, am primarily interested in the question to which less attention has been given, that is, the prior question concerning the nature of the sense objects in themselves, and especially the question concerning the nature of colour. That is to say, I am primarily interested in what exactly, according to Aristotle, makes our world coloured. The text I mainly draw my evidence from is Aristotle’s *De sensu* 3, but I also make use of relevant passages from the *De anima* as well as from other Aristotelian treatises. In addition, it proves extremely useful to refer to remarks made by Aristotle’s commentator Alexander of Aphrodisias, remarks which are found especially in Alexander’s commentary on the *De sensu* (43.17–47.20) as well as in some relevant passages from his *Quaestiones* (1.2 5.1–7.17) and from the dubious treatise *Mantissa* (147.26–150.18). The three specific issues that I want to address are the following:

1. What, according to Aristotle, makes things coloured?
2. What does it mean for something to have a particular colour?
3. Why does Aristotle think that his theory of colours constitutes an advance on those of his predecessors?

I want in this way to unravel Aristotle’s reasoning with regard to the ontological status of colours; also, to get a better understanding of his views on the production of the whole spectrum of colours; and finally, to evaluate the explanatory power of his doctrine. After all, clarifying these issues may also help us to deal with the other, more notorious, question concerning Aristotle’s theory of colour perception.

1 What, According to Aristotle, Makes Things Coloured?

We find two accounts of the nature of colour in the Aristotelian treatises: In the *De sensu* Aristotle characterizes colour as “the limit of the transparent in a determinately bounded body” (439b11–12),² while in the *De anima* he describes colour as what “is capable of setting in motion that which is actually transparent” (418a31–b1; cf. 419a9–11).³ There clearly are differences between these two accounts of colour; what they have in common, however, is that in both cases Aristotle refers to “the transparent” (τὸ διαφανές). Thus, in order to understand Aristotle’s views on the nature of colour, the obvious question to start with is what precisely he means by this term.

² ὅσπε χρῶμα ἂν εἴη τὸ τοῦ διαφανοῦς ἐν σώματι ὀρισμένῳ πέρας.

³ πᾶν δὲ χρῶμα κινητικόν ἐστι τοῦ κατ’ ἐνέργειαν διαφανοῦς.

The discussion of the transparent in the *De sensu* seems to differ considerably from the relevant discussion in the *De anima*, so that Aristotle's views on the nature of colour become at first glance somewhat obscure. In the *De anima* (418b4–7) Aristotle talks about the transparent in the following way⁴:

And I call transparent what is visible, not strictly speaking visible in itself, but because of the colour of something else. Of this sort are air, water, and many solid bodies. (trans. D. W. Hamlyn)

However, if only air, water, and many solid bodies, like for instance glass or crystal, are said to be transparent, the account of colour in the *De sensu* does not make sense, since it clearly implies that all bodies need to be in some sense transparent in order to have colour. Indeed, Aristotle claims in the *De sensu* (439a21–25) that all bodies are transparent to a greater or lesser degree, and not only air, water, and those bodies that are usually called transparent:

But what we call transparent is not something peculiar to air, or water, or any other of the bodies usually called transparent, but is a common nature and power, capable of no separate existence of its own, but residing in these, and subsisting likewise in all other bodies to a greater or lesser degree.⁵ (trans. J. I. Beare, rev. J. Barnes)

How can we explain the seeming discrepancy between Aristotle's two accounts of the transparent in the *De sensu* and in the *De anima*?

To start with, it is important to take into consideration the general context of these two treatises in which Aristotle presents his views on colour. In the *De anima* the focus is on how we perceive colours, and thus what is transparent refers here to the medium of vision, that is, what makes something else visible. This is why Aristotle claims that the transparent is not visible in itself, but because of the colour of something else which is seen through it; and this is why he primarily refers to air and water, that is, to what the medium of vision usually consists of. Therefore, what is transparent should be understood in this text as what lets something else be seen through it. In the *De sensu*, on the other hand, the focus is on the nature of colour in itself, and thus it is not only the medium of vision that is characterized as transparent, but all bodies to a greater or lesser degree. Aristotle unambiguously says in the *De sensu* (439b8–10) that it is precisely because of the fact that all bodies are transparent to a greater or lesser degree that they partake of colour, and are hence visible⁶:

It is therefore the transparent, according to the degree to which it subsists in bodies (and it does so in all more or less), that causes them to partake of colour. (trans. J. I. Beare, rev. J. Barnes)

⁴ διαφανές δὲ λέγω ὃ ἔστι μὲν ὁρατόν, οὐ καθ' αὐτὸ δὲ ὁρατόν ὡς ἀπλῶς εἰπεῖν, ἀλλὰ δι' ἄλλότριον χρῶμα. τοιοῦτον δὲ ἔστιν ἀήρ καὶ ὕδωρ καὶ πολλὰ τῶν στερεῶν.

⁵ ὃ δὲ λέγομεν διαφανές οὐκ ἔστιν ἴδιον ἀέρος ἢ ὕδατος οὐδ' ἄλλου τῶν οὕτω λεγομένων σωμάτων, ἀλλὰ τίς ἐστι κοινὴ φύσις καὶ δύναμις, ἢ χωριστὴ μὲν οὐκ ἔστιν, ἐν τούτοις δ' ἔστι, καὶ τοῖς ἄλλοις σώμασιν ἐνυπάρχει, τοῖς μὲν μᾶλλον τοῖς δ' ἧττον.

⁶ τὸ ἄρα διαφανές καθ' ὅσον ὑπάρχει ἐν τοῖς σώμασιν (ὑπάρχει δὲ μᾶλλον καὶ ἧττον ἐν πᾶσι) χρώματος ποιεῖ μετέχειν.

This second use of the term “διαφανές” greatly surprises us. For when we nowadays say, for example, that a curtain is transparent, we simply mean that we can see something else through it; we would never say that a stone, a tree, or a human being is transparent. But, obviously, this is not what Aristotle has in mind when he claims that all bodies are transparent to a greater or lesser degree. What exactly, then, does he have in mind?

To make some progress on this question, let us turn to Alexander of Aphrodisias’ relevant comments concerning the transparent, or concerning what he himself sometimes calls “the transparency” (ἡ διαφάνεια) of bodies (e.g. *Quaestiones* 1.2 5.29; *Mantissa* 147.27; 30; 148.32; 149.9). There is a passage in his commentary on the *De sensu* (45.11–16; cf. *Mantissa* 148.7–9), in which Alexander suggests that there are two senses of the term “διαφανές”:

Only bodies through which things are seen are peculiarly transparent, as they are customarily described, from the fact that they bring <things> to light. That which is apprehensible to sight when it is in the light (and φῶς is light) is described in the proper sense as coming-to-light. <Bodies> whose colour is <light> are peculiarly transparent. For <bodies> which admit light (φῶς or φῶς), through which all visible bodies are seen, are generally described as transparent for both reasons, because they admit light, i.e. φῶς, and because they are responsible for the fact that all the other <bodies> come to light and are seen. (trans. A. Towey)

Though the text is badly corrupt at the beginning, it seems that the term “διαφανές,” according to Alexander, has a wide sense when it signifies what admits or receives (δέχεται) light, and a narrow sense (ιδίως διαφανές) when it signifies what both admits light and lets something else be seen through it.⁸ In other words, what lets something else be seen through it necessarily admits light, whereas what admits light does not necessarily let something else be seen through it. To avoid possible confusion, Alexander also uses the term “δίοπτρον” in the case of what is transparent in the narrow sense of both admitting light and letting something else be seen through it. So, although I choose to use the standard translation of “διαφανές” as “transparent,” the implication is that it is only in its narrow sense of both admitting light and letting something else be seen through it that “διαφανές” should be understood as transparent in our modern sense; in its wide sense of admitting light “διαφανές” could perhaps be translated as “translucent” and be understood as referring to what comes to light (φαινόμενον).

⁷ ἰδίως δὲ διαφανῆ, ὡς εἶθισται λέγεσθαι, τῶν σωμάτων μόνα τὰ δίοπτα, ἀπὸ τοῦ *** φαινόμενον μὲν κυρίως λέγεσθαι τὸ τῆ ὄψει ἀντιληπτὸν παρὰ τὸ φῶς (φῶς δὲ τὸ φῶς)· ὧν δὲ τοῦτο χροῖα, ταῦτα ἰδίως διαφανῆ. τὰ γὰρ δεχόμενα τὸ φῶς ἤτοι φῶς, δι’ οὗ πάντα τὰ ὀρώμενα ὀράται, ταῦτα λέγεται συνήθως διαφανῆ κατὰ ἄμφω, ὅτι τε τὸ φῶς δέχεται, ὃ ἐστὶ φῶς, καὶ διότι τοῖς ἄλλοις πᾶσιν αἰτία ταῦτα τοῦ φαίνεσθαι τε καὶ ὀρᾶσθαι. The translator here follows Diels’ emendation: ἀπὸ τοῦ < φαίνειν >. φαινόμενον μὲν < γὰρ > κυρίως λέγεσθαι.

⁸ Aristotle uses the expression “to admit light” only in one passage, in *De sensu* 438b10–11, in which he talks about the part within the eye that needs to be transparent and capable of admitting light (δεκτικὸν φωτός), just as the medium of vision does. I am indebted to Pavel Gregorić for bringing this passage to my attention.

According to Alexander, therefore, Aristotle uses the term “διαφανές” in the *De anima* in a narrow sense that applies to the medium of vision, namely air or water, signifying what both admits light and lets something else be seen through it, that is, signifying that such bodies become visible by making the colour of other bodies visible through them. In the *De sensu*, on the other hand, he uses it in a wide sense that applies to all bodies, signifying that all bodies admit light, that is, signifying that they all become visible by partaking of colour. To put it briefly, transparency is understood in terms of the notion of visibility; the degree to which something becomes visible depends on the degree to which it is transparent, and *vice versa*. It is after all on account of the notion of visibility that the narrow and the wide sense of the term “διαφανές,” which Alexander distinguishes, turn out to be perfectly compatible with each other; something transparent in the wide sense becomes visible because it admits light and partakes of colour, something transparent in the narrow sense becomes visible because it admits light to such a degree that it lets the colour of something else be seen through it. So, although it may sound to us counter-intuitive to claim that the more transparent something is the more visible it is, because we think that the more transparent a curtain is, for example, the less visible it is in itself, it makes perfect sense in the Aristotelian context; for the more transparent a curtain is it makes the colour of other bodies more visible through it, and in this sense it becomes more visible.

In fact, this double usage of the term “διαφανές” seems to reflect a common practice in Aristotle’s time. In Plato’s dialogues, for instance, “διαφανές” usually means “transparent,” as in the case of transparent waters (*Phaedrus* 229b8), but it also means “apparent,” “manifest,” “distinct,” “conspicuous,” as in the case of the power of a city which is said to be transparent because of the city’s virtue and strength (*Timaeus* 25b6; cf. *Republic* 544c8; 600b4). Similarly, the verb “διαφαίνειν” usually means “to let something else be seen through,” but it also means “to be apparent,” “to stand out,” “to excel,” “to be conspicuous.” That is to say, the proposition “δια-” can also function as an intensifier, and in this case the term “διαφανές” refers to something being thoroughly apparent, manifest, conspicuous, visible. But is it actually the case that Aristotle has this double usage of the term “διαφανές” in mind, when he says in the *De anima* that the medium of vision is transparent and when he says in the *De sensu* that all bodies are transparent? Aristotle never states in an explicit way that “διαφανές” has more than one sense. Still, he clearly argues that it is due to its transparency that the medium of vision becomes visible, and he thereby seems to recognize a connection between transparency and visibility, which he ventures to extend so that he can explain how all bodies become visible. For, according to Aristotle, both the medium of vision as well as what it lets be seen through it become visible due to their being transparent to a greater or lesser degree; in the case of the medium of vision, its transparency makes it visible because other bodies are seen through it, in the case of all other bodies, their transparency make them visible because it causes them to partake of colour. Nevertheless, it is most probably Alexander who first introduces, and further elaborates upon, the two senses of “διαφανές” in order to interpret Aristotle’s relevant passages.

Assuming now that all bodies are transparent, it is reasonable to raise the issue of how transparent bodies differ from each other, that is, how some transparent bodies let other bodies be seen through them while others partake of colour. Aristotle claims in the *De sensu* (439b14–18) that the actualization of transparent bodies such as air or water produces light, whereas the actualization of the transparent in all other bodies produces their colour⁹:

Now, that which when present in air produces light may be present also in the transparent; or again, it may not be present, but there may be a privation of it. Accordingly, as in the case of air the one condition is light, the other darkness, in the same way the colours white and black are generated in bodies. (trans. J. I. Beare, rev. J. Barnes)

Colour and light, therefore, share a common nature in Aristotle's view; light is the actualized state of the transparent medium, namely air or water, when fire or an element similar to that of a celestial body acts upon it, while colour is the actualized state of the transparent in all bodies, when there is light. And it is in this sense that light is said by Aristotle to be a sort of colour (*De anima* 418b7–20; cf. 439a18–21).¹⁰ As to the difference between light and colour, Aristotle seems to claim (*De sensu* 439a26–29) that it is due to the fact that air and water are indeterminate bodies (ἀόριστα), having no boundaries of their own, whereas all other bodies are determinately bounded (ὀρισμένα)¹¹:

Here, then, we must say that light is a nature inhering in the transparent when the latter is without determinate boundary. But it is manifest that, when the transparent is in bodies, its bounding extreme must be something real; and that colour is just this something we are plainly taught by facts. (trans. J. I. Beare, rev. J. Barnes)

Thus, Aristotle sometimes refers to the colour of determinate bodies as their own proper colour (ἴδιον: e.g. *De sensu* 439b13; οἰκεῖον: *De anima* 419a2; 6), whereas the colour of indeterminate bodies is said to be borrowed (ἀλλότριον: *De anima* 418b6), since they take on the colour of something else that is seen through them.¹²

Alexander, too, presents, in his commentary on the *De sensu* (42.24–43.4; 46.2 1–47.14), a similar distinction between proper (οἰκεῖον) and incidental (κατὰ συμβεβηκός) colour, which he further clarifies by indicating that determinate bodies are coloured (κεχρωσμένα) while indeterminate bodies are illuminated

⁹ ἔστι μὲν οὖν ἐνεῖναι ἐν τῷ διαφανεῖ τοῦθ' ὅπερ καὶ ἐν τῷ ἀέρι ποιεῖ φῶς, ἔστι δὲ μή, ἀλλ' ἐστερηῆσθαι. ὡσπερ οὖν ἐκεῖ τὸ μὲν φῶς τὸ δὲ σκότος, οὕτως ἐν τοῖς σώμασι ἐγγίγνεται τὸ λευκὸν καὶ τὸ μέλαν.

¹⁰ Interestingly enough, Aristotle also says in the *De sensu* (439b2) that the transparent medium of vision has its own colour, namely the colour "bright" (αὐγή), which can be no other than light itself.

¹¹ ἢ μὲν οὖν τοῦ φωτός φύσις ἐν ἀορίστῳ τῷ διαφανεῖ ἐστίν· τοῦ δ' ἐν τοῖς σώμασι διαφανοῦς τὸ ἔσχατον ὅτι μὲν εἴη ἄν τι, δηλόν, ὅτι δὲ τοῦτ' ἐστὶ τὸ χρῶμα, ἐκ τῶν συμβαινόντων φανερόν.

¹² On Aristotle's distinction between the determinate bodies' own colour and the indeterminate bodies' borrowed colour, cf. Sorabji (2004, esp. 129–131). Sorabji is right to point out that there is a problem with Aristotle's account, since it is not always the case that bodies with fixed boundaries have their own colour whereas those with no fixed boundaries borrow the colour from other bodies; for instance, milk has its own colour while glass has borrowed colour.

(πεφωτισμένα). Moreover, Alexander provides us in the same commentary (48.20–49.4) with the reason why this is so, by spelling out what Aristotle only hints at¹³:

This is how he shows the differentiation between light and colour, and between the transparent <bodies> in which these <are present>. For light is in the transparent <body> which is indeterminate and does not possess an end proper <to itself>. For just as bodies of this sort, in so far as they are bodies, do not possess a boundary proper <to themselves> but are always being defined and bounded by another <body>, so too they do not possess a colour proper to themselves. This is because the colour of the body is its boundary, in so far as <the body> is transparent and able to admit colour and visible, whereas <indeterminate bodies> do not possess a boundary proper <to themselves>. (trans. A. Towey)

In other words, since indeterminate bodies do not have *qua* bodies some proper limit, but are always determined and bounded by something else, they do not have a proper colour in virtue of the fact that colour is defined by Aristotle as a limit; determinate bodies, on the other hand, have a limit and this is where they exhibit their proper colour.

Indeed, Aristotle in the *De sensu* defines the colour of a determinate body as the limit of the transparent; not the limit of the body, that is, its surface, but the limit of the transparent at the limit of the body. Does this mean, however, that the colour of a determinate body is only at its surface? On the contrary, in Aristotle's view (*De sensu* 439a31–b1), determinate bodies seem to be coloured inside as much as outside, due to being transparent throughout¹⁴:

For it is at the limit of the body, but it is not the limit of the body; but the same nature which is coloured outside must be thought to be so inside too. (trans. J. I. Beare, rev. J. Barnes)

But is the inside of determinate bodies said to be coloured in the same way as the outside? This brings us to a distinction which Aristotle draws both in the *De sensu* (439a12–17) and in the *De anima* (426a20–26), namely the distinction between actual (ἐνεργεία) and potential (δυνάμει) colour. Aristotle says in the *De anima* that there are actually and potentially perceived colours; colours are *per se* potentially perceived but when there is light they are actualized. In the *De sensu*, however, the distinction between actual and potential colour concerns the nature of colour in itself, that is, the actuality or the potentiality of the transparent in the body. The issue here is not under which conditions colours are actually or potentially perceived, but under which conditions colours are actually or potentially generated in determinate bodies; we have actual colour when the transparent at the surface of a determinate body is actualized by being exposed to light, whereas we have potential colour at the surface of a determinate body which is in the dark or in the inside of determinate bodies (cf. Alexander, *in De sensu* 42.7–13). Aristotle,

¹³ τὴν διαφορὰν δὲ φωτὸς τε καὶ χρώματος καὶ τῶν ἐν οἷς ταῦτα διαφανῶν δείκνυσι διὰ τούτων. τὸ μὲν γὰρ φῶς ἐν τῷ ἀορίστῳ διαφανεῖ καὶ οἰκεῖον οὐκ ἔχοντι τέλος. ὡς γὰρ οὐκ ἔχει τὰ τοιαῦτα σώματα, καθὼ σώματα, οἰκεῖόν τι πέρας, ἀλλ' αἰεὶ ὑπὸ ἄλλου ὀρίζεται καὶ περατοῦται, οὕτως οὐδὲ χρῶμα οἰκεῖον ἔχει τῷ τὸ μὲν χρῶμα πέρας καὶ τοῦτο εἶναι τοῦ σώματος, καθὼ διαφανές τε καὶ χρώματος δεκτικὸν καὶ ὀρατόν, ταῦτα δὲ μὴ ἔχειν οἰκεῖον πέρας.

¹⁴ ἔστι μὲν γὰρ ἐν τῷ τοῦ σώματος πέρατι, ἀλλ' οὐ τὸ τοῦ σώματος πέρας, ἀλλὰ τὴν αὐτὴν φύσιν δεῖ νομίζειν ἥπερ καὶ ἔξω χρωματίζεται, ταύτην καὶ ἐντός.

therefore, seems to recognize a fourfold distinction: actual colour, potential colour, actually perceived colour, and potentially perceived colour; and this fourfold distinction implies that a determinate body is said to have actual colour when it is exposed to light, even if it is not actually perceived, that is, even if there is no sentient being to perceive it (cf. Taylor 1990; Gottlieb 1993; Ganson 1997).

2 What Does It Mean for Something to Have a Particular Colour?

Having thus established that bodies are coloured due to the fact that they are transparent, what still needs clarification is the nature of the transparent and exactly how it determines the particular colour a body has. Aristotle states that determinate bodies are coloured, because they are transparent to a greater or lesser degree. In fact, there are several passages in Aristotle's works which suggest, for instance, that a body is white because it is transparent to a great degree, and black because it is not at all transparent; that is to say, the colour black is regarded as the privation ($\sigma\tau\acute{\epsilon}\rho\eta\sigma\iota\varsigma$) of the colour white (cf. *De sensu* 439b14–18; 442a25–26; *Met.* Λ 1070b18–21; *GA* 780a34–36).

What about all other colours? How is the degree to which bodies are transparent responsible for their having the different colours they exhibit in our everyday experience? Aristotle does not give us a clear reply to this question, but in a passage from the *De generatione animalium* (779b28–33) he explains the black or blue colour of some animals' eyes on the basis of how much water they consist of; more water makes the eyes less transparent, and therefore black, less water makes them more transparent, and therefore blue. In the same passage, he also discusses the example of the different colours of the sea, which at its bottom is dark blue or black, but gradually changes closer to the surface to light blue, or even to white if there are waves; this is due to the fact, Aristotle claims, that the bottom of the sea has more water than the surface does, and therefore is less transparent. Moreover, in another passage from the same treatise, he explains that animals which drink hot waters, and thereby obtain more air, are white, whereas those which drink cold waters, and thereby obtain more water, are black (*GA* 786a2–7).¹⁵ And there are more passages which indicate that, according to Aristotle, heat and air make bodies white, whereas water and earthy matter make bodies black (e.g. *GA* 735b33–37; 784b13–15; 786a12–21; *Meteor.* 374a7–8; 18–19; 377b22–23). It thus seems reasonable to infer that, for Aristotle, the presence of each of the four elements, fire, air, water, and earth, influences the degree to which a body is transparent; hence, the colour of a body seems to depend on the proportion of the different elements it consists of.

¹⁵To these examples we should also add that of the different colours of the rainbow, though this is a more complicated phenomenon, since it involves, in Aristotle's view, the reflection of our vision (*Meteor.* 373a32–375b15); cf. Berryman (2012).

It is, again, Alexander who assumes the role of explaining in more detail the Aristotelian view on the production of the different colours on the basis of the degree of their transparency (*in De sensu* 45.26–46.6; *Quaestiones* 1.2 5.26–30; 6.33–7.7; *Mantissa* 147.27–29; 148.9–22; 149.36–150.13). Light, Alexander claims, is in some sense the colour of bodies that are transparent to the highest degree. Then comes white which characterizes bodies that are transparent to a great degree. At the other end of the spectrum black is the colour of those bodies that are transparent to a very small degree. Each of the other bodies, Alexander explicitly states, is transparent to a degree that depends on the proportion of the different elements it consists of; and thus, its colour depends entirely on this proportion. That is to say, something is white, or has a colour adjacent to white, for instance yellow, when it has more fire and air than water and earth; something is black, or has a colour adjacent to black, for instance blue, when it has more water and earth than fire and air.

Counter-intuitive though it may be for us to say that it is because of the presence of fire and air that something is transparent to a great degree, and therefore has a colour adjacent to white, or that it is because of the presence of water and earth that something is transparent to a small degree, and therefore has a colour adjacent to black, it makes sense in the context of the Aristotelian theory of colours. For the four elements should not be identified with the fire, the air, the water, and the earth of our everyday experience, and most importantly the notion of something being transparent that Aristotle and Alexander use should not be thought of as the same as our modern notion.

Furthermore, it is also important to point out that Aristotle understands the production of the various colours as resulting from the mixture of just two colours, namely white and black. In the *De sensu* (439b18–440b25) Aristotle presents three theories that explain in different ways how it is actually possible to produce all colours from the combination of just white and black. According to the first theory, all colours are produced by the juxtaposition (*παρ' ἄλληλα θέσις*) of very small white and black particles which are the constituents of all things; although the white and black particles are not themselves apparent, because of their minute size, things acquire certain colours as a result of the specific proportion in which the white and black particles are found in each one of them. As I have argued elsewhere, this theory can be safely attributed to Empedocles (Ierodiakonou 2005). According to the second theory, which corresponds to what ancient painters often did when they painted, all colours are produced by the superposition (*ἐπιπόλασις*) of white and black pigments, just as the painters used to put a darker colour on top of a brighter colour so that one colour shows through another, and thus a new hue is produced. To illustrate how this works, Aristotle gives the example of the white sun looking red when seen through mist or smoke. The third theory is Aristotle's own explanation of how the various colours are generated. He claims that we get different colours because different bodies are mixed together in different proportions in a complete mixture (*μίξις*). The complete mixture of different bodies to which he most probably refers here is the mixture of the four elements described in the *De generatione et corruptione* 1.10; that is to say, the four elements are mixed together in such a

way that their characteristics survive only in a modified way. Therefore, when Aristotle says that the colour of a body is produced by the mixture of black and white, what he seems to have in mind is that its colour depends on the proportion of the different elements this body consists of.

Finally, in the *De sensu* Aristotle further elaborates his theory of the production of mixed colours, by associating each particular colour with a certain mathematical ratio. It is not my aim here to work out the details of the Aristotelian account (cf. Sorabji 1972; Fine 1996). Still, I want to underline that Aristotle's theory of mixed colours shares with Empedocles' theory the thesis that all colours are produced from some kind of combination of just two colours, namely white and black. This clearly suggests that Aristotle understands the colours white and black in a certain way that obviously differs from ours; for white and black, and consequently all other colours, depend on how transparent determinate bodies are. It is in this sense, therefore, that white and black are said to be the two extremes of a continuum, which is considered as similar in nature to that of the opposites light and darkness; all other colours are treated by Aristotle as shades of white and black. Hence, it may be argued that Aristotle's conception of the colours white and black as basic should encourage us to at least reconsider, if not justify, the provocative position defended by some contemporary scholars that the Greek colour terms have luminosities rather than hues as their primary connotation (cf. Platnauer 1921; Osborne 1968).¹⁶

3 Why Does Aristotle Think That His Theory of Colours Constitutes an Advance on Those of His Predecessors?

Aristotle often criticizes his predecessors' views on colour and colour vision, by pointing out that the consequences drawn from them contradict the observed phenomena. He criticizes Empedocles' and Plato's view that the eyes consist of fire and that vision is due to the emanation of fire, by pointing out that, if this were the case, vision would have been as possible in the dark as it is in the light, and it would be impossible in rain or frosty weather (*De sensu* 437b10–23). He also criticizes Democritus for claiming that vision is nothing but the mere mirroring on the smooth surface of the eye, by pointing out that, if this were the case, all other smooth surfaces on which things are mirrored would be able to see (*De sensu* 438a5–12). So, Aristotle seems to introduce his own theory on the nature and perception of colour because he thinks that it manages to explain the observed phenomena better; or in other words, he thinks that his theory manages to save the phenomena. For instance, Aristotle's account of colour is meant to adequately explain why it is that, although we see the air and the sea as having different colours from a distance and close by,

¹⁶For the opposite view, cf. Bruno (1977, 47–51), Pollitt (2002).

other bodies always retain under normal conditions the same colour (*De sensu* 439b3–6)¹⁷:

But the colour which air or sea presents, since the body in which it resides is not determinately bounded, is not the same when one approaches and views it close by as it is when one regards it from a distance; whereas in determinate bodies the colour presented is definitely fixed, unless, indeed, when the atmospheric environment causes it to change. (trans. J. I. Beare, rev. J. Barnes)

That is to say, Aristotle's distinction between indeterminate and determinate bodies and his account of the different way in which colour is generated in them helps him to adequately explain the phenomenon of the changing colours of the air and the sea; for the colour of the air and the sea changes, according to him, because these bodies have no proper colour but take on the colour of the body which is seen through them, whereas the proper colour of determinate bodies is fixed and changes only under special conditions.

But does the explanatory power of Aristotle's views on colour fully account for his decision to define colour in terms of the transparent? It is important to note here that the Aristotelian doctrine concerning the production of colours does not imply that the elements themselves are coloured. On the contrary, Aristotle distances himself in this respect from Empedocles who claims, if my interpretation of his fragments is correct, that the element of fire is white and the element of water is black. He also moves away from Plato's theory of colours in the *Timaeus* (67c4–68d7), according to which colour is defined as streams of fire particles. In Aristotle's theory, by contrast, none of the four elements is itself coloured. The only opposites that characterize the elements are hot and cold, dry and wet; as he says in the *De generatione et corruptione* (329b10–12; 330a30–b7), fire is hot and dry, air is hot and wet, water is cold and wet, and finally earth is cold and dry.

However, postulating that the four elements are not themselves coloured leaves Aristotle with the task to give an explanation of the ontological basis of the colours that bodies exhibit. This is, I think, what he aims at when he introduces, as we have seen at the beginning (*De sensu* 439a21–25), the common nature (κοινή φύσις) and power (δύναμις) that is inherent in all bodies to a greater or lesser degree and is responsible for their colour, namely their transparency. And most importantly, Aristotle regards this power or disposition of bodies to affect perceivers in a certain way as perfectly real and objective; for he makes clear that the colours of bodies depend not on the way we perceive them, but on the degree of their transparency that in its turn depends on the proportion of the different elements they consist of. Hence, although Aristotle's colour theory differs considerably from Empedocles' and Plato's, they all share the thesis that colours are properties which bodies do actually have independently of the sentient beings which perceive them.

¹⁷ ἄλλ' ἐκεῖ μὲν διὰ τὸ ἐν ἀορίστῳ οὐ τὴν αὐτὴν ἐγγύθεν καὶ προσιοῦσι καὶ πόρρωθεν ἔχει χροᾶν οὐθ' ὁ ἄηρ οὐθ' ἡ θάλαττα· ἐν δὲ τοῖς σώμασιν, ἂν μὴ τὸ περιέχον ποιῆ μεταβάλλειν, ὄρισται καὶ ἡ φαντασία τῆς χροᾶς.

Interestingly enough, however, Alexander adds that the transparency of bodies should also be understood as some kind of matter (ὕλη πως) underlying colours.¹⁸ Moreover, he justifies this additional characterization by putting forward the following analogy, which brings to mind Aristotle's account of quality in the eighth chapter of his *Categories*: as there is a certain matter, Alexander says, of large and small, hot and cold, moist and dry, light and heavy, capable of receiving all such oppositions in turn, so the matter of opposition in colour is the transparent (*Mantissa* 147.29–148.1)¹⁹:

Diaphaneia is in a way the matter of colour. For as there is a certain matter of great and small, and of light and heavy, and of the other oppositions similarly, capable of receiving them in turn, so the *diaphanes* is the matter of opposition in colour. (trans. R. W. Sharples)

Or again, since in the case of all qualities which are generated and exist in something else there is some matter underlying them, capable of receiving all such oppositions in turn, colour, too, being a quality of this kind, has some matter underlying it; and this is not the elements, which are not themselves coloured, but the common nature and power that characterizes them, namely the transparent (*Quaestiones* 1.2 5.30–6.3)²⁰:

For since colour is among the things that are and is also among those whose nature is to be in other things, there had also to be some body in which colour [might be], and this is *diaphanes* body. For this is the proximate matter of colour, what is *diaphanes* in actuality possessing [colour] in actuality, what is [*diaphanes*] potentially being like matter receptive of colours that are opposite to one another and of those that are intermediate between these. And in every body that possesses colour or is receptive of colour there is mixed in also the nature of the *diaphanes*. (trans. R. W. Sharples; cf. also Alexander, *In De sensu* 44.22–45.4; *Mantissa* 148.29–30)

This is Alexander's interpretation of the nature of the transparency of bodies. In this issue, just like in all others previously discussed, for instance the issue concerning the sense in which all bodies are transparent and that concerning the differences between transparent bodies, Alexander tries to explain Aristotle's concise and somewhat obscure remarks. However, in commenting on the nature of the transparency of bodies, Alexander goes, I think, further than simply providing us with a clarification and explanation of Aristotle's doctrines. For he seems to make an attempt to combine Aristotle's principles of the structure of bodies with those employed by his theory of vision; and he does it in such a way, so that the Aristotelian system can be

¹⁸ It is worth noting that this characterization of the transparent of bodies as some kind of matter for colours may go back to Theophrastus; cf. Priscian of Lydia, *Metaphrasis in Theophrastum* 13.31–14.2.

¹⁹ ἔστι γὰρ ἡ διαφάνεια ὕλη πως χρώματος. ὡς γὰρ ἐστὶ μεγάλου καὶ μικροῦ ὕλη τις, καὶ κούφου καὶ βαρέος καὶ τῶν ἄλλων ἐναντιοτήτων ὁμοίως, ὁ δεκτικὸν αὐτῶν ἐστὶ παρὰ μέρος, οὕτως καὶ τῆς ἐν χρώμασιν ἐναντιότητος ὕλη τὸ διαφανές.

²⁰ ἐπεὶ γὰρ τῶν τε δυντῶν τὸ χρῶμα καὶ τῶν ἐν ἄλλοις εἶναι πεφυκότων, εἶναι τι ἔδει καὶ σῶμα, ἐν ᾧ τὸ χρῶμα, καὶ ἐστὶ τοῦτο τὸ διαφανές σῶμα. ὕλη γὰρ τοῦτο προσεχῆς χρώματος, τὸ μὲν ἐνεργεῖα διαφανές ἔχον αὐτὸ ἐνεργεῖα, τὸ δὲ δυνάμει ὡς ὕλη ὄν δεκτικὸν τῶν τε ἐναντίων χρωμάτων ἀλλήλοις καὶ τῶν τούτοις μεταξὺ. καὶ ἐν παντὶ σώματι χρῶμα ἔχοντι ἢ ὄντι χρώματος δεκτικῷ ἐστὶ μεμιγμένη καὶ ἡ τοῦ διαφανοῦς φύσις.

presented as consistent. That is to say, Alexander in his comments makes sure that the Aristotelian theory of the four elements is perfectly in tune with the role of the transparent according to Aristotle's views on the nature and perception of colour.

To conclude, it is really intriguing that no ancient philosopher before or after Aristotle explained the colour of bodies by referring to the notion of "the transparent" (τὸ διαφανές). There is even evidence that some of the Peripatetics after Aristotle abandoned this notion altogether, and decided to attribute colour directly to the four elements themselves (Ganson 2004). Nevertheless, Aristotle seems to have stressed the role of the transparent, first because he believed that perception, and in particular vision, requires the transparent medium, and second because he realized that light and colour are of a similar nature, a nature that is responsible for making bodies visible. It is his commentator Alexander, however, who became aware of the need and took upon him to bring the transparency of bodies into line with Aristotle's general principles of their structure. And this, I think, further confirms the view, shared both by ancient thinkers and by contemporary scholars, that Alexander's interpretation of Aristotle's doctrines should be regarded as the most philosophically insightful, though tricky at times.

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