

## Chapter 2

# Plato: Interaction Between the External Body and the Perceiver in the *Timaeus*

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### 2.1 Introduction

To put it very crudely, history of philosophy provides us with two options concerning perception. The perhaps most common alternative, deriving originally from Aristotle, is the receptive model. According to that model, the perceiver receives the form from an external body or an object of perception. If everything goes well, that is, if the transmission from the external body to the perceptible organ and the organ itself function as they should, the form of the body is actualised in the mind fully and correctly, although without the matter of the body, in some kind of sensible mode. From this idea derives, one could claim, the whole empirical tradition, with its close connection between perception and knowledge.

The alternative model is perhaps even less unified. Some kind of common denominator within the approaches in that group is emphasis, in different ways, on the activity on the part of the perceiver. Typically, this is connected to nativist theories of the mind, in which aspects of knowledge or certain of our mental abilities are considered to exceed what can be given in perception. Thereby the mind becomes understood in possession either of innate knowledge or, as is more common, of innate abilities that contribute to the way that our concepts and knowledge are formed. This latter nativism goes well with the idea that perception is not mere reception. When I look, I tend to focus on things that mean something to me in my environment, on objects that I recognise, that respond to some of my needs and expectations, that interest me. I go to the world grasping and reaching for things, searching and probing my environment, and focusing on its familiar, salient or personally significant features.

Of course, very few “reception” view holders would deny that the mind has some kind of a role to play in perceiving, and particularly in forming conceptual content out of what is perceived. The difference is a difference of degree: which one is more crucial for the understanding of the content of perception, the external object or the

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activity of the perceiving mind? What are the respective roles of each? How organised is perceptual information and what organises it?

This presentation targets the one text that people most often mention as a source for the notion of active perception, namely the account given in Plato's *Timaeus*, and particularly its description of a ray of vision proceeding from the eye towards the object (42e–47e, 64d–69a).<sup>1</sup> My intention here is to try and give a reading of the relevant three passages, contextualised within the overall theory of the *Timaeus*.

In general expositions, Plato is treated as the ur-nativist,<sup>2</sup> but also sometimes the ancestor of the idea of perception as a force that is not merely receptive, but an active power of grasping the world. Yet is it not entirely clear what Plato contributes to this discussion. The schoolbook Plato presents a challenge to any study on Plato on perception. According to it—correctly although by no means exhaustively—Plato thought of perception as unreliable, and its objects as changing and unreal, unfit for proper objects of knowledge. All knowledge is of innate forms, while perception, rather, deceives.<sup>3</sup> Scholarship has showed that the picture is much more subtle and complicated. Not all the dialogues would seem to suggest that knowledge itself is innate—rather, what is innate are some abilities or propensities. As regards perception, in some places in the dialogues it seems, for instance, that Plato assumes that direct acquaintance is better than second hand reports. This kind of assumption is at the background of the famous example of knowing the road to Larissa in the *Meno* (97a–c).<sup>4</sup> Some kind of veracity would thereby be connected to direct perceptual acquaintance, even though this falls short of proper knowledge, for reasons having to do, presumably, with the holistic and systematic nature of knowledge in Plato.

Connectedly, interpreters have given perception either a meager or a significant role in knowledge acquisition. By the readers of Plato inclined to emphasise the separation and dissimilarity of the objects of knowledge with the objects of sense-perception, only a highly limited role can be given to sense-perception in cognitive development towards knowledge.<sup>5</sup> Others see the question involving two kinds of cognitive powers rather than, so much, the dissimilarity of their objects, and the interconnections of these powers as much more closely related.<sup>6</sup> Some give a proper place for sense-perception in triggering reasoning.<sup>7</sup>

For the interpretation of the *Timaeus*, it seems significant that the connection between nativism and activity is not necessary. Insofar as a nativist sees perception as insufficiently organised to yield any proper knowledge, she might locate all proper activity in a temporally later and cognitively more important and distinct phase of

<sup>1</sup> Whether there is any activity involved in this materialistic account has been challenged in some recent scholarship; Grönroos (2001, p. 46) contends that the perceptual qualities are mind-independent, at least in the case of vision.

<sup>2</sup> See, e.g. Simpson et al. (2005, p. 4).

<sup>3</sup> See, e.g. Scott (1995).

<sup>4</sup> Cf. Modrak (2006).

<sup>5</sup> See, e.g., Cornford (1957); Scott (1995).

<sup>6</sup> See, e.g., Cooper (1970, pp. 123–126); Frede (1997, 1999).

<sup>7</sup> See, e.g., Johansen (2004); Modrak (2006).

cognition, such as reasoning, treating perception as mainly passive.<sup>8</sup> According to the interpretation defended here, the *Timaeus* does not, however, separate perception and reasoning as two entirely distinct cognitive functions.<sup>9</sup> The theory under inspection combines, we shall argue, active perception with the emphasis on the role of reason, and defends some input of learning through perceiving. Perception is very closely tied to the rational abilities of the soul. We might even call perception a kind of intellection. It is a power intermingled with intellectual cognitive capacities, but with its own directionality and purpose. It is a power that ensures our access to the world and its intelligible order, and a power that can be developed and habituated by continuous perceiving and by rationally developing on what is perceived. It is a power through which human beings learn some of the most basic things in the world.

There are a number of outstanding, detailed studies on Plato on perception.<sup>10</sup> The purpose of the article at hand is not to challenge the readings, for example, of Luc Brisson, Thomas Johansen or Katerina Ierodiakonou of the *Timaeus*.<sup>11</sup> Rather, we shall be building on these seminal studies. The interpretation given will differ in some details, but more in its having a specific focus and question in mind. Has Plato merited the role given to him in history of philosophy, namely as someone providing, or launching, an alternative to what later became known as Aristotelian, receptive accounts of perception? What, if anything, is active in perception, according to Plato?

## 2.2 The Anthropological Context, Sensation and Perception

The overall explanatory framework we get in Plato's *Timaeus* is one that combines materialistic accounts of the cosmos and its phenomena with emphasis on intelligence and purpose in nature. This it does in a very distinctive way. The *Timaeus* separates between (at least) two kinds of causes, Reason and Necessity. While these, broadly, coincide with teleological and material cause, some features particular for the Timean account need to be emphasised. The material elements are, in a sense, naturalized: they are soulless and purposeless, although with certain characteristics that possibly affect their interaction. This is a description of, as Plato says, auxiliary causes (*sunaitiai*; 46c7, *summetaitiai*, e6). The material cosmos gets its structure

<sup>8</sup> As regards Plato, there is a question as to whether he thought it possible to distinguish such a thing as "bare" perception, i.e. a non-cognitive power. Frede (1987); Burnyeat (1976) seem to find such a notion of perception, but mainly in the *Theaetetus*.

<sup>9</sup> Both Brisson (1999, pp. 147–176); Carpenter (2010, pp. 281–303), in reading the *Timaeus*, take it that some kind of intelligising belongs to the perceptual process.

<sup>10</sup> Most discussed is, surely, the *Theaetetus*. See, e.g., Cornford (1957); Cooper (1970); Burnyeat (1990).

<sup>11</sup> Brisson (1999); Johansen (2004); Ierodiakonou (2005). Grönroos (2001) discusses both the *Theaetetus* and the *Timaeus*.

not just, nor primarily, from the basic elements, but from a separate or transcendent principle of order and purpose, the Demiurge or Divine Craftsman.<sup>12</sup> What the Craftsman brings into the universe is a matter of interpretation and some controversy. Readings differ from attributing all recognisable order to him to limiting the Craftsman's role to wisdom and greater purpose, while attributing basic regularities to the auxiliary or material causes. The question would seem to turn on which basic regularities we think of as serving a certain purpose, for such teleological ordering would already seem to require something more than mere auxiliary causes (46e3–5). According to a reasonable interpretation by Steven Strange,<sup>13</sup> while Reason, the demiurgic cause, is always needed for good order and purposeful outcome, Necessity is not the mere cause of chaos, disorder or evil, but contains both elements that disturb the good order as well as elements that in themselves are neither good nor bad, but which condition the way in which Reason functions. By and large, it is impossible to distinguish sharply the kind of items in nature that we should explain through one or another framework: most items and phenomena can and have to be approached from both perspectives.<sup>14</sup>

This, as we shall see, is precisely what happens with perception. As a predominantly material process, perception could perhaps be looked from the perspective of necessity alone. However, as we shall see, even the material side described is governed by mathematical ratios, thus delivering a process with distinct intelligible order. Moreover, to understand perception in full, its purpose within human life and cognition has to be included in the explanation. Thereby this causal framework already blurs any clear line between, on the one hand, anything that we might think of as bare, passive reception, and, on the other, active power of judgement.<sup>15</sup> In *Timaeus*, purpose and beauty of the outcome are interwoven with physical elements or bodies and their material organisation. The whole of cosmology becomes, as

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<sup>12</sup> Also, whether the story about the creation or generation story involving the Craftsman is intended as a mere presentational device, a way of explicating nature's laws and features, or whether it involves some kind of real proto-historical scheme, is a matter of scholarly dispute. Broadie (2012, Chap. 1) for instance, holds that the proto-historical structure is needed to ensure that the authorship of the Demiurge is distinct from its product. As regards perception, this question is not central. What will be of some interest is to which extent the account of perception is intended as an account of the development of this capacity in human beings.

<sup>13</sup> Strange (1998).

<sup>14</sup> Strange (1998) suggests that such a division is possible: Reasons' creation of elements, soul and other things that happens entirely unimpeded; the entirely mechanistic elements, like random motions, elemental transformations etc. that are due to Necessity; and finally that which comes out of interaction between these, namely human body, plants, animals and their functions and dysfunctions. However, in making this division, Strange is sometimes at pains in saying where a given phenomenon belongs to. The account of vision, as he notes, is not an easy case: it is discussed within the first account, that of Reason, yet most of the description is highly mechanical in tone.

<sup>15</sup> This means that any results of studies that concentrate on the *Theaetetus* cannot be applied to the *Timaeus* without much further work. This goes, for instance, to the view of Frede (1987), who distinguished perception as a passive power and all judgements, even those of perceptual kind, due to another, active power of reason. While this division is inapplicable to the *Timaeus*, the flavour of the theory is nonetheless similar: even the simplest perceptual judgements display the presence of reason.

Sarah Broadie<sup>16</sup> puts it, infused with human values of formal beauty and intellectual fitness. This is a universe with aesthetic, rational and moral significance.

As regards human nature, the dialogue “weaves mortal into immortal” (41d1–2). The cosmos only becomes perfect through the existence of mortal rational beings (41b).<sup>17</sup> While the Craftsman moulds the immortal part of this rational-mortal-being to be, he gives the creation of its mortal part to ancillary gods (41c–43a). The bodies of human beings are made out of the same ingredients as the cosmos: fire, air, water and earth. The bodies thus composed are further united with the immortal orbits of the Same and the Different, the soul’s basic motions. Out of necessity, there are things flowing into these bodies and things flowing out of them. To cut a long story extremely short, human souls are placed in bodies and thereby subjected to the influx and efflux within the material universe. As we shall see, the material fluxes cannot change the basic nature of the soul, but they seriously affect the motions of the orbits. The results of the influx and efflux are the phenomena of nutrition, sensation (*aisthêsis*),<sup>18</sup> desires and emotions. (Esp. *Tim.* 42a3–b1.)

What can be read out of this story is a broad meaning of *aisthêsis* as an encounter or a relationship of the soul with something external to it, and with something external to the body that the soul embodies. I will call this sensation.<sup>19</sup> In the story, we shall later be given two different causal accounts of perception, one primary and the other secondary, according to the overall causal distinction between material causes and the divine purpose for which this power was created.

It becomes soon clear that *aisthêsis* should not be understood merely as a material thing. Before handing over the task of moulding the mortal bodies to the ancillary gods, the Demiurge makes himself some preparatory ordering towards an innate capacity that will actualise itself once the soul is connected to the body and subjected to influx and efflux. *Aisthêsis* is the first capacity mentioned, belonging to all human beings, in a list of innate capacities, followed by “love mingled with pleasure and pain”, as well as fear and spiritedness (42a). Perception appears here as an innate (*sumphuton*) capacity or tendency of the soul, distinct from such phenomena as passions, but like them insofar as it can only be actualised once it undergoes the material flux in the body.

Plato goes on to tell how the lesser gods continued the work of the Demiurge, binding the bodies of human beings out of the bits of the four elements, and investing

<sup>16</sup> Broadie (2012, p. 279).

<sup>17</sup> An oddity of the account is that there may not be animal souls at all—see e.g. Carpenter (2010).

<sup>18</sup> The word is challenging in itself: it has been argued that the verb, *aisthanesthai*, has still in Classical antiquity a broad rather than fixed meaning; Frede (1987).

<sup>19</sup> Whether or not we should or could read into the text a distinction made explicit much more later, namely the one between sensation as qualitative experiences and perception as something that goes beyond thus given, perhaps as the ways we take the external objects to be, is a question I cannot really go in here. I shall simply stipulate a broad and a narrow usage of *aisthêsis*: by “sensation” I denote the broad category of any encounter that the body has with the external world that is neither nutrition nor desire, but connected to sensing. I shall use the translation “perception” for those of the encounters that will reach the soul and its rational orbits.

this body in the orbits of the soul. The soul thus finds itself in the mighty “river” of influx and efflux, unable to control it and being thus tossed in different directions:

For mightly as the nourishment-bearing billow was in its ebb and flow, mightier still was the turbulence produced by the disturbances (*pathēmata*) caused by the things that struck against the living things. Such disturbances would occur when the body encountered and collided with external fire (i.e. the fire other than the body’s own) or for that matter with the hard lump of earth with the flow of gliding waters, or when it was caught up by a surge of air-driven winds. The motions produced by all these encounters would then be conducted through the body to the soul, and strike against it. *That is no doubt why these motions as a group afterwards came to be called ‘perceptions’ (aisthêseis), as they still are called today.* It was just then, at that very instant, that they produced a very long and intense commotion. They cooperated with the continual flowing channel to stir and violently shake the orbits of the soul... (43b5–d2)

A couple of things are worth noting here: first, the kind of approach that dominates the *Timaeus* is here fully visible. The account given is in a broad sense materialist, done in the vocabulary of the elements that make up the material universe. *Aisthêsis* is, and partially has to be, explained through the motions, properties and collisions of the primary elements.<sup>20</sup>

Second, the quote starts again from a broad phenomenon of encounter with external world, here specified as particles of fire, earth, water and air. These encounters give rise to “disturbances”, *pathēmata*, which are a necessary condition for there to be a sensation. However, of interest are a specific group of disturbances, namely the encounters that ultimately reach, or “strike” the soul. Later it is attested that to be perceptible, the affections in question have to reach the rational soul/brain (*phronimon*; 64a6–b6).<sup>21</sup> For clarity, I shall call these perceptions. Perception seems thus subsumed under the broader category of sensation, a *pathēma* caused by a collision with the external world, but one which reaches, further, to the soul.

Third, as we shall later see in more detail, some kind of principle of direct acquaintance seems to be in use. For something to be a perception, it has to involve a direct acquaintance with the external body (or as in a slightly later quote, material fire coming from the object). Given the wider class of encounters it belongs to, it is, as we might put it, a tactile colliding, and not, for instance, a movement of immaterial form or information.

Fourth, this phenomenon disrupts the soul. After the passage quoted, the way that the orbits are disturbed in this encounter is immediately further explicated: these motions are apparently both so many, so forceful and so unorganised that they have the power of hindering the most perfect circular motion, that of the Same,

<sup>20</sup> Even the soul is not defined as something non-material or non-physical. The soul, while not constituted of the four elements, is made of its own proper “materials”, that of the “same” and the “different”, in complicated pastry of mathematical relations (*Timaeus* 35–36). As this “soul-matter” is moulded into orbits that can be shaken by a flow of mass, it seems that the soul, too, is described as something with nearly physical properties and some kind of extension, and thus not purely as an abstract entity. Perhaps it is best described as geometrical, as having a possible but not necessary orientation and location in space.

<sup>21</sup> Brisson (1999, p. 152). What this means for perception will be discussed more below; see also Carpenter (2010). A similar point is made at *Philebus*, 33d.

from moving, and shake the rations of the orbit of the Different, and “mutilated and disfigured the motions in every possible way”. (43d–e, esp. at 43e1–2.) Thereby the account is already related to a teleological account: sensations are considered something violent and problematic, in need of calming down.

### 2.3 Interaction I: Fire Meets Fire

Having established this overall model, Plato goes on to give an account of one of the sense modalities, namely vision. It is divided into two parts, the materialistic and the teleological, the former coming in two lengthy passages (45b–d; 61c–69a). In the first part, what is suggested is the interplay or relationship between three things: the eyes, the object and of light:

They [the gods] contrived that such fire as was not for burning but for providing a gentle light should become a body, proper to each day. Now the pure fire inside us, cousin to that fire, they made to flow through the eyes: so they made the eyes—the eye as a whole but its middle in particular—close-textured, smooth and dense, to enable them to keep out all the other, coarser stuff, and let that kind of fire pass through pure by itself. Now, whenever daylight surrounds the visual stream (*hotan oun methêmerinon ê phôs peri to tês opseôs reuma*), like makes contact with like, and coalesces with it to make up a single homogeneous body (*hen sôma*) aligned with the direction (*euthôria*) of the eyes. This happens wherever the internal fire strikes and presses against an external object it has connected with. And because this body of fire has become uniform throughout and thus uniformly affected, it transmits the motions of whatever it comes in contact with as well as whatever comes in contact with it, to and through the whole body until they reach the soul. This brings about the sensation we call seeing. (45b4–d2)

Here perception of this specific kind, of vision, is given three conditions.

I “*A stream of vision*” or a “*visual stream*” (to tês opseôs reuma) *coming from an eye*. This is a body of pure fire extending from the eye towards the external body, akin to the fire of day-light.

II *A particular material for the stream to dwell in and unite with*. What is needed is a body of same kind of material—the pure fire of day-light. The transmission of motions from the external body happens only when, by a principle of attraction of like by the like, the stream coalesces with the fire of day-light. The thus formed body of light being, in all its parts, of like nature, it is capable of distributing the movements in encounters through itself all the way to the soul.<sup>22</sup>

<sup>22</sup> An alternative reading is provided by Taylor (1928, pp. 277–278), according to whom the day-light here refers to the sunlight that the external bodies reflect, and there would thus not be any separate medium needed, only the fire coming from the object and that coming from the eye. Taylor’s interpretation suits better to the second account of the physics of perception given later in the dialogue (67c4–7; see below), where no day-light is mentioned, but where the bodies emit some light themselves. There are, however, three reasons to object to this view: first, the text itself suggests the medium picture, with its “*peri*”, “around”. The fire coming from the object, rather than surrounding the stream of vision, encounters and penetrates it. Second, the fires emitted from the bodies in the later passage are what constitute, or rather, as we shall see, give rise to colours, and it would be odd if Plato would here merely refer to them as daylight. Third, what is underlined in this first encounter is the likeness between the stream from the eyes and the fire of day-light.

III *An external body encountered.* For the stream to “report” or distribute something back to its source, it has to be halted by an external body. The body of the stream adopts or copies the movements coming from the external body, and, because of the homoiogeneous nature of the stream as a whole, is capable of transmitting these motions all the way to the soul.

In the absence of any of these three conditions there is no perception. Trying to look in either complete darkness, or while one’s eyelids are closed (45d-e), does not produce perception, for in both cases one condition, the external fire of day-light, is absent. Presumably Plato is here interested in giving an account that would fit together with the every-day empirical experience that to see something some light is needed.<sup>23</sup> In the case of dreams we are dealing with after-images or (in the purely mechanistic vocabulary of Plato) after-motions. In this case, none of the three conditions is met: the present (instead of past) existence of an external object; the present (instead of past) existence of the stream of the inner fire directing itself to the external object; as well as the actual (instead of past) presence of day-light. These are not perceptual errors or failures, but, rather, non-visions.

To which extent does this model, then, differ from a straightforwardly receptive model? At the purely material level it can be noted that the ray or stream is not from the object to the eye—as it is in some ancient theories—but, at least initially, from the eye to the object. However, when this ray meets the external body in right light conditions, it seems that a transmission of the movements that cause the conscious vision in the soul happens in the opposite direction, from the external body, through the ray and the organ, to the soul. Moreover, we should not forget that Plato has earlier called all these encounters *pathēmata*: something external affects the stream rather than vice versa. But why is there, then, the stream from the eyes to the external body? Why could not the transmission of the motions in the fire coming from the external body, in suitable light conditions, to the eye, be enough? If the eye is of the same kind of body as the light in between the external body and the organ, could not these motions move through this kind of body without any need of the stream coming from the eyes, merely through the fire that exists in between the perceiver and the object?

Staying purely on the “mechanistic” or materialistic level of the story: in such a model, the external object, presumably, would transmit its motions to each of the directions surrounding it that were properly lit. Thereby the air & fire surrounding all external bodies would be full of “half-sensations”—these motions travelling in

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In the second encounter with the object there has to be, presumably, some similarity as well, but what is underlined there (see below) is the dissimilarity of proportions. Now, as to whether Plato thought that the colour-fire originates in daylight which the bodies reflect is another matter, for or against of which I do not see evidence in the passage. The interpretation involving a medium is also chosen by, e.g., Modrak (2006, p. 137); Broadie (2012, pp. 173–174); Grönroos (2001, pp. 32–34); Brisson (1999, p. 155).

<sup>23</sup> Grönroos (2001, p. 34) argues that the dependency of the visual stream on the day-light is not one of existence—the stream is composed and originated even without it—but one of strength: without the day-light the body of the stream is not strong enough to reach far from the eyes, or far enough to many external bodies.



the air—waiting to collide with an eye, but existing quite independently of the existence of the eye. The role of the eyes would be to offer a proper kind of receptacle for these motions. Thereby the perception itself would, of course, be dependent upon the receiving eye and soul, but the travelling of the motions through the distance in between would not. Perception would take place when one or more of the floating half-perceptions happens upon a suitable receptacle, a perceptual organ. Plato's model is different by giving a larger role to the looking eye: only the paths or streams from the eyes in the air & fire between us and the external bodies transmit these movements. Not only is perception dependent upon the existence of the eye, the transmission of the movements coming from the external bodies in the air is also so dependent.

As to why the originator of the ray is given this emphasis, there is a small but significant detail: the perceiver does more than just emit a ray or body of fire: this ray has always a straight direction (*euthuôria*). This is a direction “according to the eyes” (*kata tēn tōn ommatōn euthuôrian*, 45c5) i.e. to the direction that the eyes point towards. A deflationist reading could say that this simply means that the ray comes from the eyes, rather, than say, from the ear or the back of my head.<sup>24</sup> I find this insufficient to explain the text in its context. Plato has just explained how the fire coming from the eyes coalesces with the fire that surrounds it, that of daylight. Thereby the addition of the direction would seem to limit the ray of vision from everything else in the visual field: without this direction, the fire of the eyes would be dispersed everywhere in the surrounding fire of daylight. What keeps the ray together is this internally originated direction. I take it, further, that besides blocking the physical problem of dispersion of the ray everywhere in the surrounding fire, this suits extremely well in a very common-sensical experience of it being very hard, if not impossible, to look everywhere inside the perceptual field with equal concentration, without concentrating on something particular. Looking is directional.

But what is it that makes the eyes turn to a certain direction? What makes us perceptually focus on a certain thing? Do the external bodies attract our vision, or does the looking follow from an internally originated interest or determination? I.e. is this direction endogenously (from within) or exogenously (from without) determined? It seems that both internal and external determinations are accommodated in the account. Note how two subclasses of the encounter between the stream and the body are mentioned: “[the ray transmits] the motions of whatever it has come into contact with as well as of whatever comes in contact with it” (45c7–d1). These two cases could well present the two possible ways that we come to perceive something: in one the visual stream comes into contact with something, say, Peter turning

<sup>24</sup> As suggested to me in a seminar by Miira Tuominen. I also differ from Grönroos (2001) who translates the lines 45c4–6: ...“is united in one single body in straight course from the eyes; this happens whenever the stream issuing forth from within stands firm against that of the things outside with which it meets”. Grönroos wants to connect this passage with the idea that the day-light makes the stream from the eyes stronger. While the passage is compatible with such a view, I connect the passage with the line 45c7–d1, and consider the translation “direction” more plausible also because it is used by Plato in that meaning in *Rep.* 436e4.

to look towards a tree, which body then blocks the visual stream coming from the eyes. In the other the external body, rather, comes into contact with the stream, as in Peter's dog running in between Peter and the tree, and thus entering Peter's vision. The "direction" that the stream of vision has is not elaborated into anything like the later notion of "attention" by Plato,<sup>25</sup> but it is well compatible with this idea. What we can safely say is that it is a direction that can perhaps be attracted from without, but *originated* only by the perceiver, not by an external body.

All in all, the account is preparatory before the later explication of the perceivable qualities and the connected, detailed account of the material encounter of the ray and the external body. This second account of the mechanistics of vision given in the *Timaeus* both clarifies and complicates the picture formed so far.

In the cosmology of the *Timaeus*, sensible particulars consist of Empedoclean elements of fire, water, earth and air. But importantly for Plato, these elements are linked to polyhedra: fire to tetrahedron (pyramid), air to octahedron, water to icosahedron and earth to cube (54c–56a). This means that, as Luc Brisson puts it, particulars can be translated to mathematical formulae.<sup>26</sup> Each of the regular solids further exists in different sizes, thus rendering more flexibility to the explanation of particular bodies and the phenomena connected with them. What is perceived, however, are perceptual qualities: hot, cold, soft, hard, heavy, light, sweet, acid, pungent, salty, as well as the colours of the colour spectrum.

To take, again, the case of vision:

Color is a flame which flows forth from bodies of all sorts, with its parts proportional to our sight so as to produce perception. ... Now the parts that move from the other objects and impinge on the ray of sight are in some cases smaller, in others larger than, and still in others cases equal in size to, the parts of the ray of sight itself. Those that are equal are imperceptible (*anaisthêta*), and these we naturally call transparent. Those that are larger contract (*sunkrinonta*) the ray of sight while those that are smaller, on the other hand, dilate (*diakrinonta*) it, and so are 'cousin' to what is cold or hot in the case of the flesh, and, in the case of the tongue, with what is sour, or with all those things that generate heat and that we therefore call pungent. So black and white, it turns out, are properties of contraction and dilation (*ekeinôn pathêmata*), and are really the same as these other properties, though in a different class which is why they present a different appearance (*phantazomena de alla*). This, then, is how we should speak of them: white is what dilates the ray of sight, and black is what does the opposite. (67c6–7; d2–e6)

Again, apart from references to how human beings experience these things, the account given is materialistic: we are looking at two material things, and their material encounter. Visual perception is described as a material change in the stream of vision, caused by the kind of fire particles that it encounters.

As has been noted by both A.E. Taylor and Katerina Ierodiakonou,<sup>27</sup> Plato borrows not merely the idea of the four elements, but also the basic picture of the material encounter with the perceiver and the external body from Empedocles. Empedocles defined colour as "an effluence from things which is commensurate with

<sup>25</sup> That this distinction is at work as early, already, as Augustine, see Brown (2007).

<sup>26</sup> Brisson (1999, p. 149).

<sup>27</sup> Taylor (1928, pp. 278–282); Ierodiakonou (2005, p. 221, 223).



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