

ARISTOTELIAN COLORS AS CAUSES

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For Aristotle the study of living things, speaking quite generally, takes place within the larger context of the study of objects that have their own intrinsic principles of change. These are the natural, or physical objects, and the intrinsic principle of change of such an object is its nature. It is the task of natural philosophy to explain the physical or natural activities and behaviors of these objects. Here the English terms ‘natural’ or ‘physical’ do not mark out a distinction between different respects in which they are to be studied or different sets of phenomena to be explained. The natural/physical is simply what pertains to a substance’s nature. The explanation of physical changes treats them as hylomorphic composites, and the nature of a composite is identified with its form.

This is true quite generally of all physical objects. Living things are themselves a part of the natural world, and as such are compounds of matter and form, where the form of a living thing is its nature. Their study is incorporated into the larger project through the identification of their form, and hence their nature, with their soul. Since what is physical or natural for an object is what is due to or pertains to its nature, and what is psychological is what is due to or pertains to its soul, the psychological is thereby a special case of the natural. That is, for Aristotle psychological activity is a special case of physical activity. There are many types of physical processes, states and behaviors, and specifically different kinds of physical objects have specifically different natural behaviors.

It is from this perspective that Aristotelian science studies the distinctive aspects of the various inhabitants of the observable,

changeable world. Some of its inhabitants, the animals, engage in a variety of forms of cognition and awareness as a part of their distinctive ways of life, and as such these activities are due to their natures. It was in relation to this observation that Julius Moravcsik and I have said:

“Aristotle treats psychological activity as requiring definable structures, but does not hold that the elements that enter into the specification of the form and structure are properties, features, powers or relations that belong to matter that can exist outside of the realization of some enlivening potential.”¹

Cognition involves both a structure on the side of the knower and a structure on the side of the known. In the article just cited, in connection with the structure on the knower’s side we said that “it is a mistake to see these structures as arising from the powers of inanimate matter.”² All cognitive functioning of animals presupposes perceptive capacities, and for the basic sense modalities he famously characterizes perceptive capacities as ‘receiving form without matter’. About this we wrote:

“In the context of describing perception, ‘receiving form without matter’ remains a basic, primitive notion. It points in the direction of what we would call ‘content’ or ‘information’ today.”³

For instance, through the exercise of a capacity to receive visual information animals become aware of the colors that physical objects have. In order for this to be possible there must be on the

¹ Alan Code and Julius Moravcsik, “Explaining Various Forms of Living,” Essays on Aristotle’s *De Anima*, Martha C. Nussbaum and Amélie Oksenberg Rorty (eds.), Oxford (1992), p. 133.

² *ibid.*

³ *Op.cit.*, p. 137.

animal's side a suitable condition of receptivity to this kind of information. However, the information is information that one physical object has about another. To have a suitable receptive capacity, the perceiver and what is perceived must be suited naturally to each other.

For Aristotle colors either are or possess causal powers. Colors have the capacity to cause themselves to be seen. Each color has an active power to change a transparent medium that is continuous between the surface having that color and the organ of sight.⁴ Sight is a passive, or receptive capacity, and what has sight is acted on through the medium in such a way that the sighted organism perceives the color. This is a causal feature of color. In fact, this pretty much sums up the causality that Aristotle attributes to color. To be sure, there are various phenomena connected with the reflection of colors, such as rainbows, halos and mirrors of various sorts. However, in his treatment of them his concern is with the ways in which reflective devices, natural or manmade, enable one to perceive colors and colored shapes.

In Aristotle's philosophy of nature colors are there to be perceived, but leave inanimate objects as well as plants alone.⁵ Unlike tangible qualities such as heat, moistness and their contraries, colors do not cook things, crumble them, rot them or make them wither away. Nonetheless animals that can be affected by them in such a way as to see them thereby receive a great deal of information about the world that they inhabit. This information

⁴ See *de An.* III.12, 434b27-29, for a general description of conditions on the media required for perception at a distance.

⁵ *de An.* II.12 424b10-11: "Light or darkness, sounds and smells leave bodies quite unaffected." All translations of Aristotle are from The Complete Works of Aristotle: The Revised Oxford Edition, edited by Jonathan Barnes, Princeton (1984).

enhances their ability to navigate their way around and support their activities. Like the other sense modalities, sight too provides “a means of preservation in order that, guided by antecedent perception, they may both pursue their food, and shun things that are bad or destructive.”⁶

Indeed, for Aristotle visual information is the most useful sensory information for an animal when it comes to coping with the needs of life and survival. Physical objects are colored, and by seeing their colors together with the shapes and sizes and motions that accompany them animals are able to keep track of objects, and to distinguish by visual appearance food, water, predators and prey. Of course, in intelligent creatures the information acquired through sight and the other senses is the indispensable starting point for various sorts of knowledge, culminating ultimately in scientific understanding.

How can nature be like this? How is it that physical objects, both animate and inanimate alike, have properties or features in virtue of which they cause other physical objects to be aware of them? It is this topic that he takes up in *de Sensu* 3:

“The point of our present discussion is to determine what each sensible object must be in itself, in order to produce actual sensation.”⁷

In the *de Anima* Aristotle had explained how sensible forms such as colors act through various media on sense organs. In the case of sight, there must be a transparent, or ‘diaphanous’, medium such as water or air that is in contact with both the organ of sight and the color seen, and is continuous between the two. For the color to affect the organ, the medium through which it acts must at

⁶ *Sens.* 1, 436b20-437a1.

⁷ *Sens.* 3, 439a16-17.

the time of acting be *actually* transparent. On his account that is another way of saying that there must be light in order for colors to be seen by acting on the organ of sight.

What Aristotle here calls ‘the transparent’ plays a central role in his account of colors and the awareness of colors. The transparent is not itself a physical body, but rather is described by him as a nature that is present to physical bodies. It is especially apparent in air, water and the like, but is in fact present to some degree in all bodies:

“...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 in a greater or less degree.”⁸

What Aristotle is here calling ‘the transparent’ is a power that is common to all physical bodies. For a body to be transparent is for it to be able to contain light, and light itself just is the exercise of this capacity. As he puts it in the *de Anima*:

“Of this ... light is the activity--the activity of what is transparent *qua* transparent”⁹

For a physical body actually to be transparent is for light to be present to it. To some degree or other every physical body has the ability to contain light,¹⁰ and the presence of light in that body just is its exercise of this capacity. For light to be present in a body of air there must be fire, or, he says, something such as the ‘upper body’ (i.e., the fifth element). A predominant source of light is the

⁸ *Sens.* 3, 439a21-25.

⁹ *de An.* II.7, 418b9-10.

¹⁰ See *Sens.* 3, 439b8-10 together with 439a21-25.

sun, and when the sun is overhead it typically lights up the sky in all directions. Darkness is simply the absence of light, and when the sun is not present and there is no source of light in the vicinity (such as a fire), then a transparent body is dark.

However, transparency and its absence do not characterize only the medium. They also characterize the visible objects that are seen through the medium. In the former case, that of the medium, the body of air (or whatever) lacks a determinate boundary of its own. The body of air does at any given time have a finite spatial extension, and is bounded by whatever bodies contain it. However, it lacks a surface of its own. Insofar as it is actually transparent, its transparency is not a feature of its boundary. It is rather the case that its actual transparency is no other than light, the very condition required of a medium through which colors act on the organ of sight.

Such indeterminate transparent bodies often *appear* to have a color, though in fact they really do not have any color of their own. For instance, sometimes the sky appears blue or the sea appears a certain shade of purple. Nevertheless, Aristotle observes that when the body has no definite boundary of its own, it has no fixed color. In favor of this we might consider the fact that the part of the sky that is close to us does not look blue, and in general that the indeterminate bodies do not have the same color appearances from different distances.

On the other hand, a body that does have its own determinate boundary, and hence a surface, exhibits fixed colors:

“...whereas in determinate bodies the colour presented is definitely fixed, unless, indeed, when the atmospheric environment causes it to change.”¹¹

¹¹ *Sens.* 3, 439b5-6.

Both indeterminate and determinate bodies appear colored, though only in the latter case is the color a property of the colored object. Even so, Aristotle states quite emphatically that:

“...it is clear that that in them which is susceptible of colour is in both cases the same.”¹²

According to the *de Anima*, light is the color of the medium of sight.¹³ However, light just is the activity of the transparent, and as such it is the transparent itself that is ‘susceptible of color’. When the sky looks dark blue at sunset this is not really its color, for being an indeterminate body it can have no color of its own. It merely appears to us to be dark blue at that time and from a certain perspective. This is a transitional period between daylight and the darkness of night, and it is this resulting combination of light and dark that appears bluish.¹⁴

What Aristotle is claiming at 439b6-7 is that whatever it is that takes on the appearance of color is the same in all bodies, regardless of whether the body has or lacks a surface. This has important consequences for his account of colors. It is in virtue of the transparent and its absence that bodies appear colored. The difference between the case of the medium and that of a physical object that has its own color is simply that in the latter (i.e., when the color is fixed) there is a surface. Aristotle appeals to this fact to locate the color as a feature of the surface itself. The surface of a body is a fixed part of that body, and the particular combination of transparency and darkness in that surface is what we are seeing when we see the color of that body. The surface does not change depending upon our proximity or our angle of viewing, and neither does the color that we see when we look at it.

¹² *Sens.* 3, 439b6-7.

¹³ “Light is as it were the proper colour of what is transparent” (*de An.* II.7, 418b11).

¹⁴ In this regard it may be useful to consult *de Coloribus*. Although this treatise is not by Aristotle, its explanation of the apparent colors of the sea or the sky fits well with the account of colors as mixtures in his *de Sensu*.

At this point it is worth repeating the well-known fact that unlike modern accounts of color, Aristotle's treatment of color does not distinguish hue from luminosity. This is relevant to the fact that the Greek adjective '*leukos*' that gets translated as 'white' in Aristotle's discussion of color, is also commonly used to mean 'bright' or 'clear'. Contemporary translators usually treat the latter as a different usage of the term. However, it is significant that for Aristotle the basic use¹⁵ of '*leukos*' as a color term is for what is produced in a determinate body when whatever it is that produces light is present:

“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 [*to leukon*] and black are generated in determinate bodies.”¹⁶

Hence in his theoretical understanding of colors, there is a sense in which these two apparently different uses of the term are picking out the same phenomenon. For instance, fire produces light in an indeterminate transparent body; if the body is *determinate* what it produces is the primary color 'white', '*to leukon*'. In the case of an indeterminate medium the absence of fire or a like substance results in darkness, whereas the condition that results if the body has a surface is called 'black'. Just as light is the actuality of the indeterminate transparent medium, so too the color white is what fire produces at the extremity of a determinately bounded transparent object. Likewise the color black is produced at the surface of the object by the absence of fire or a kindred substance.

¹⁵ I say 'basic use' to indicate that here I am talking about his use of this term as a primary color in his theory. In ordinary language the term has a range of uses corresponding to a range of colors, "varying from the pure *white* of snow...to the *grey* of dust" (*A Greek-English Lexicon, 9th revised edition, edited by Henry George Liddell and Robert Scott*, Oxford: 1996).

¹⁶ *Sens.* 3, 439b14-18.

Accordingly, when at 439b5-6 (cited above) Aristotle states that determinate bodies have fixed colors he is including transparent solid bodies in this general statement. Ross's note on these lines indicates that Aristotle does not mean to include them, but this does not seem to be the case.¹⁷ Such a restriction would go against Aristotle's attempt to characterize colors as features of the determinate boundaries of physical objects. Even a transparent body is visible if it has its own surface, and in order for it to be visible it has a color. As Aristotle is using the term '*leukon*', the primary color that characterizes a transparent glass sphere is *leukon*.

There is a similar use of the term in the Peripatetic treatise *de Coloribus* when it says:

“Simple colours are those which belong to the elements, i.e. to fire, air, water, and earth. Air and water in themselves are by nature white [*leuka*], fire (and the sun) yellow, and earth is naturally white.”¹⁸

Since here white, yellow and black are the primary colors, the text contradicts Aristotle's own view that there are just two primaries, and also does not easily square with his view that the sun in itself appears *leukos*, not yellow.¹⁹ Nonetheless, the author feels no difficulty in applying *leukon* as a color term to the natural color of air, despite the fact that it is transparent and not what we would ordinarily classify as something that is colored 'white'.

Indeterminate bodies also appear colored²⁰ but for them the color

¹⁷ Ross comments as follows: “...of course transparent solids should be coupled with air and water, and he here means ‘solids that are not transparent’,” *Aristotle: Parva Naturalia, A Revised Text with Introduction and Commentary*, Sir David Ross, Oxford (1955).

¹⁸ *Col.* 1, 791a1-4.

¹⁹ See *Sens.* 3, 440a10-11, for the latter.

²⁰ Though not, *pace* Beare and Ross, at their extremities. See note 21.

they appear to have at any particular time is not properly speaking their color at all. Rather it is the result of a combination of its actual transparency at the time and the lack thereof in the body as a whole. In a way the indeterminate bodies are colored. In the sense in which they are colored it is their light that is their color. However, strictly speaking only the determinately bound physical objects have their own colors, and it is this idea that Aristotle captures in his definition of color:

“Whence it follows that we may define colour as the limit of the transparent in determinately bounded body. For whether we consider the special class of bodies called transparent, as water and such others, or determinate bodies, which appear to possess a fixed colour of their own, it is at the exterior bounding surface that all alike exhibit their colour.”²¹

For Aristotle the primary colors are white and black; or *clear* and *dark*. They are contraries, and all other colors are intermediaries that are mixtures of these two primary colors. The simplest mixtures are whole integer ratios of clear to dark such as 3 to 2 or 4 to 3. These are the colors thought to be the most pleasing.²²

²¹ *Sens.* 3, 439b11-14. Note that in this translation the punctuation follows Beare (and later Ross) in putting a comma after *huparchein*, rather than after *eschaton*. Against this, I would note that the definition of color does *not* apply to the sense in which indeterminate bodies appear colored. Accordingly, I would propose translating “...which appear to possess a fixed color of their own at the limit, color belongs to all in a similar manner.”

²² *Sens.* 3, 439b31-33. As examples Aristotle gives *halourgon* and *phoinikoun* (440a1), purple and crimson. The former is literally ‘wrought by the sea’, from *hals* and *ergon*; the latter a variant of *phoinikeon*—red, purple-red, crimson. Cf. *HA* 592b23-4 for crimson as the color of the crest of the wren, and *Metaph.* X.7, 1057a24-6, on crimson being an intermediary between white and black; see also *Col.* 2, 792a9-26 on how various mixtures of clear and dark give rise to the appearance of crimson or purple.

The other colors are mixtures of white and black in which there is more of one and less of the other, but no whole integer ratio that obtains between the quantities of each. The majority of the colors will be those for which the excess of one and deficiency of the other is *asummetron*, or incommensurable:²³

“It is plain that when bodies are mixed their colours also are necessarily mixed at the same time; and that this is the real cause determining the existence of a plurality of colours.”²⁴

So, with the exception of the two primary colors, all other colors are mixtures of the two primaries.

What we see when we look at a determinately bounded body is the mixture of white and black at its surface. Such bodies are colored in virtue of the condition of their surface, their bounding limit. As the *de Anima* puts it:

“Whatever is visible is colour and colour is what lies upon what is in itself [*kath hautō*] visible; ‘in itself’ here means not that visibility is involved in the definition [*logos*] of what thus underlies colour, but that that substratum contains in itself the cause of visibility.”²⁵

It is surfaces that are visible in their own right, or *kath hautō*, in the second of the two senses of the term distinguished in *Posterior Analytics* I.4. Although the surface of an object is visible this is not part of the essential nature captured by the definition of what it is to be a surface. Nonetheless, being visible is an intrinsic feature of surfaces due to the fact that the surface is mentioned in the definition of color. It is in this sense that a surface is colored in its own right. A color is a feature of a surface, and since color is the cause of visibility, it follows that the cause of visibility is a *per se* attribute of surface.

²³ *Sens.* 3, 439b27-30.

²⁴ *Sens.* 3, 440b14-15.

²⁵ *de An.* II.7, 418a29-31.

The surface has many other features, but all that is relevant to its *visibility* is its specific mixture of white and black. On this theory, the color of the body is a feature that its surface possesses insofar as that surface is the limit of something transparent. The transparent has no separate existence from the body, and its limit is the limit of the body in which it is present, the body of which it is a power. The color is what this surface is insofar as it is the surface of the transparent.