

Color*

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1 Color Ontology and Its Significance

Questions about the ontology of color matter because colors matter. Colors are (or, at least, appear to be) extremely pervasive and salient features of the world. Moreover, people care about the distribution of these features: they expend money and effort to paint their houses, cars, and other possessions, and their clear preference for polychromatic over monochromatic televisions and computer monitors have consigned monochromatic models to the status of rare antiques. The apparent ubiquity of colors and their importance to our lives makes them a ripe target for ontological questions such as the following:

- What is the nature of colors?
- Are they, as they seem to be, properties of objects?
- Or are they, as many have claimed, illusory inexistents erroneously projected onto objects by our minds?

Such questions can seem even more pressing in light of the difficulty of locating colors within our best fundamental theories of the furniture of the world. These theories include properties like *mass*, *charge*, and *spin up* in their inventories, but they seem not to mention properties like *red* and *blue* at all. This fact has led some to conclude that there are no colors after all. But it has led others to the conclusion that the inventories of our best fundamental physical theories don't exhaust the properties of the world. Indeed, this line of thought has even led some to hope that reflection on the nature of color might provide lessons about how to reconcile our best physical theories with other kinds of properties that don't appear in physical inventories, such as *value*, *moral goodness*, *beauty* (see Hume, 1978, Book III, Part i, sec. I). Thus, reflection on colors also leads to these questions:

- What is the relationship of colors to the properties recognized by our best physical theories?

*To appear, Routledge Companion to Philosophy of Psychology; Calvo and Symons (eds).

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- What is the relationship of colors to properties apparently *not* recognized (*per se*) by our best physical theories, but which many philosophers have wanted to admit into their ontologies?

Importantly, when they are asked about colors, these ontological questions are directed on a domain that has been the object of longstanding scientific research which can itself be drawn upon in providing philosophical answers. Indeed, many of the great historical philosophers writing on these matters — e.g., Aristotle, Galileo, Locke — have explicitly drawn on the best contemporary color science to provide constraints on their ontological theorizing. While this interplay between color ontology and color science may have been less robust during much of the 20th century, it is once again the rule rather than the exception that writings on color ontology make extensive and crucial use of empirical results in color science. This fact has a special importance in light of the aforementioned possible analogies between colors and other properties not listed in inventories of the physical. For while several of the ontological questions listed above could be asked about properties other than colors (e.g., with respect to aesthetic or moral properties), many have thought that they can be pursued more fruitfully (at least for now) with respect to color precisely because there is, in that domain, a vast body of empirical results that can constrain philosophical inquiry. If so, then, even philosophers whose main interests lie in aesthetics and metaethics, for example, have a stake in matters of color ontology.

2 Theories of Color

In this section I'll describe critically some of the most popular views about the nature of color. This discussion is not meant to be exhaustive, but only to present some of the most popular views in current philosophical discussion, and to lay out some of the most important advantages and disadvantages of these views.

2.1 Eliminativism

Color eliminativists believe that, strictly speaking, nothing in the actual world is colored: ripe lemons are not yellow, traffic stoplights are not red, and so on. Of course, eliminativists allow that these objects are perceptually represented as bearing colors: ripe lemons *look* yellow, traffic stoplights *look* red, and the like. It is just that, in their view, these perceptual representations are erroneous.

Philosophers have offered several reasons for endorsing color eliminativism. First, one might reject the existence of all properties, and regard color eliminativism as a special case of a more thoroughgoing nominalism (Goodman and van Orman Quine, 1947; Goodman, 1951). Second, one might accept color eliminativism because it is entailed by the claims that (i) colors are not found among the properties listed by the inventories of the basic physical sciences, and (ii) the only properties we should posit are those that are found among the inventories of the basic physical sciences (Aune, 1967, 172). Third, some

eliminativists (Hardin, 1988; Maund, 1995; Pautz, 2006b) have argued that no realist/non-eliminativist account of color properties can both avoid internal difficulties and satisfy certain intuitively and empirically motivated constraints about what colors must be.

Eliminativism is sometimes associated with the *mentalist* view that internal mental items (e.g., sense-data), rather than ordinary fruit, lights, and the like, are the true bearers of colors. Although it is true that mentalism and eliminativism are in some ways alike (e.g., they agree in treating the ordinary perceptual representation of colors of external objects as erroneous projections), they are in fact incompatible (at least as formulated above), given the assumption that the mental items the mentalist takes to exemplify colors are actual. For if so, then the mentalist is committed to saying that the colors are exemplified by actual individuals, thereby denying eliminativism.

(It should also be noted that, on the above formulation, eliminativism about color leaves open that colors are exemplified by non-actual objects. Eliminativists who adopt this line will claim that colors are *bona fide* properties that are not exemplified, but might have been.)

The most pressing objection against color eliminativism, to my mind, is that it convicts ordinary perception of an extremely widespread error, and so is obviously a deeply revisionary view. Now, eliminativists might respond to this objection by noting that deep revisions are sometimes appropriate — especially if, as eliminativists maintain, what initially seemed to be less revisionary alternatives turn out, on inspection, to have exorbitant costs of their own. However, it seems to me that this strategy of response, while reasonable as far as it goes, leaves the would-be eliminativist in a fairly weak dialectical position. For it amounts to admitting that eliminativism should only be adopted at such time as all other alternatives are decisively shown to be unacceptable — it makes eliminativism a position of last resort. And since refutations in philosophy are almost never decisive, this means that we may have to wait an awfully long time to be in a position to accept eliminativism.

2.2 Dispositionalism

Dispositionalism is family of views of color ontology according to which colors are dispositions to have certain effects on the visual systems of certain perceivers in certain conditions. This core claim, however, requires considerable clarification: to fill out her view, the dispositionalist needs to say more about which perceivers, which circumstances, and exactly which effects in those perceivers in those circumstances, she has in mind. The many species of dispositionalism can be distinguished by the ways they fill in those blanks. For example, one canonical form of dispositionalism holds that red is the disposition to cause red sensations (/to look red) to normal observers in normal circumstances. Versions of dispositionalism have been ascribed (controversially) to modern philosophers such as Galileo, Boyle, Newton, and Locke. More recent defenders of disposi-

tionalism include McGinn (1983); Peacocke (1984); Johnston (1992).¹

One reason for taking dispositionalism seriously as a color ontology comes from the observation that the objects we take to exemplify colors do, uncontroversially, exemplify dispositions to look colored to perceivers — e.g., red ripe tomatoes are uncontroversial bearers of the disposition to look red to normal trichromatic observers (say, under uniform daylight illumination and viewed at a distance of one meter). One particularly simple and attractive way of explaining the extensional overlap of colors and dispositions to look colored is to identify the two, thereby endorsing dispositionalism.

A second motivation for dispositionalism is that the view is well-suited to explain interpersonal and intrapersonal perceptual variation in respect of color, which turns out to be widespread (this motivation can be found in the writings of Galileo and Boyle, among others; for more recent versions, see McGinn (1983); Cohen (2004)). For instance, consider that an unilluminated region of the television looks greyish when the television is off, but dark black (even though illuminated in exactly the same way) when it falls within the part of the screen on which the villain's hat is represented. This single region of the screen, though locally qualitatively identical in the two viewing conditions, looks grey in one viewing condition and black in another. Partly because neither of these viewing conditions has a plausible claim to be more naturalistic than the other, it has seemed to some that there is no principled reason for claiming that the way it looks in either viewing condition is a veridical representation of its color at the expense of the other. One could instead claim that *neither* representation is veridical; but this strategy, suitably generalized to cover all cases of perceptual variation, would entail the counterintuitive eliminativist conclusion that no objects bear the colors they look to have. But if it is implausible both to side with one representation at the expense of the other and to reject both of them, then the only option left is to claim that both are correct — that the television region has one color in one circumstance, and a different color in a different circumstance.

There are analogous cases of perceptual variation that turn on variation between perceivers. Thus, consider that a chip can look blue without looking at all greenish to one observer but bluish green to another, even if both observers pass all the standard psychophysical tests for normal color vision. As before, rejecting both representations of the chip's color leads quickly to eliminativism, while there don't seem to be principled, non-arbitrary reasons for favoring one representation at the expense of the other. Consequently, many have thought, the best theory of color should sustain the verdict that *both* representations are veridical.

These considerations motivate dispositionalism because that theory (or some forms of it) can indeed secure the verdict that both representations are veridical.

¹In recent years several philosophers have attempted, in different ways, to retain some of the advantages of dispositionalism while rejecting (or at least remaining agnostic about) the specific claim that colors are identical to dispositions to affect perceivers. See, for example, Jackson and Pargetter (1987); Lewis (1997); McLaughlin (2003); Cohen (2004); Matthen (2005).

For example, a dispositionalist can say that the region R of the television screen is grey to a perceiver S_1 in perceptual circumstance C_1 by virtue of being disposed to look grey to S_1 in C_1 , and compatibly that it is black to perceiver S_2 in circumstance C_2 by virtue of being disposed to look black to S_2 in C_2 . Likewise the problematic chip can bear the disposition to look blue but not greenish to S_1 in C_1 while simultaneously and compatibly exemplifying the disposition to look bluish green to S_2 in C_2 ; consequently, if these dispositions are identical to (distinct) colors, as per dispositionalism, then the chip can exemplify both of them simultaneously, and thereby make true both of the representations of its color (viz., the way the chip looks to S_1 , the way it looks to S_2).

Notwithstanding its advantages, dispositionalism faces a number of challenges.

A first difficulty is aimed at only some forms of the view — those that invoke the notion of a normal/standard observer or a normal/standard circumstance in filling out the core dispositionalist claim given above. The problem here is that there do not appear to be anything like principled specifications of normal/standard observers or circumstances (Hardin, 1988); in particular, the various standards in psychophysics and industrial applications (presumably our best motivated candidates) seem to have been chosen for mathematical convenience or industrial standardization, but are (from a metaphysical point of view) arbitrary. But without a principled way of unpacking the notions of normal/standard observer and normal/standard circumstance, it would seem hard to understand forms of dispositionalism that invoke these notions as making any substantive claim at all.

A second difficulty for dispositionalism is that it threatens to preclude distinct individuals (or even time slices of one individual) from ascribing the same color to an object. For example, suppose that the chip looks blue but not greenish to you in C_1 , but my visual system attributes to the chip a color of the form c to me in C_2 . Unless $\text{me}=\text{you}$ and $C_1 = C_2$, it would seem that the colors attributed on these two occasions will be necessarily distinct, and thereby prevents distinct individuals (/time slices of one individual) from perceiving the single color. It also clearly threatens the possibility of our agreeing about the colors of objects (compare: if you are in Vancouver and I am in New York, then even if we both utter the sentence ‘it is raining here’, we are not agreeing about the weather in any place). It also threatens the possibility of our disagreeing about colors, since it seems to be a presupposition of such disagreement that the property you ascribe is incompatible with that I ascribe (compare: if you utter ‘it is raining here’ while in Vancouver and I utter ‘it is not raining here’ while in New York, we do not thereby manifest disagreement about the weather in any place). A related difficulty concerns the dispositionalist’s treatment of errors of color perception; briefly, the worry is that the very inclusiveness that undergirds the dispositionalist’s response to perceptual variation will prevent her from saying that *any* representation of x ’s color is erroneous (on this topic, see Cohen (2006b)).

A third objection against dispositionalism involves the accusation that the view is, when combined with popular views about sensory experience, viciously

circular. Recall that, for dispositionalists, the definiens used to understand color properties include mention of color experiences; thus, *red* is identified with (as it might be) the disposition to look red to normal observers in normal conditions of observation. How should we understand the expression ‘looks red’ that occurs on the right hand side here? One response, advocated by Peacocke (1984), is to deny that ‘red’ is a semantically significant constituent of that expression (thereby avoiding regress), and instead to maintain that the expression ‘looks red’ picks out a state of undergoing a particular kind of sense-datum. Many philosophers, however, reject a sense-datum understanding of visual experience, and instead favor the so-called intentionalist/representationalist view that something’s looking red just is that thing’s being visually represented as red (Harman, 1990; Tye, 1995; Dretske, 1995). But this treatment has the consequence that ‘red’ occurs in an unreduced form on the right hand side of the dispositionalist’s account of *red*. And many have claimed that this regress is a fatal flaw of dispositionalism (see Boghossian and Velleman (1989); for responses, see Lewis (1997); McLaughlin (2003)).

A final objection against dispositionalism urges that the view does violence to ordinary color phenomenology — that colors just do not look to be relational/dispositional (Boghossian and Velleman, 1989; McGinn, 1996). In response, dispositionalists have sometimes maintained that colors do in fact look to be dispositional — given an appropriate understanding of what it would mean for a property to look dispositional (McDowell, 1985; Levin, 2000).

2.3 Physicalism

Color physicalism is best understood as a kind of identity theory of color analogous to identity theories familiar from philosophy of mind; it says that colors are identical to particular (physically or functionally specifiable) kinds.² Although earlier physicalists tended to identify colors with microphysical constitutions (Armstrong, 1968; Smart, 1975), more recent physicalists have tended to prefer to identify colors with (classes of) reflectance functions — i.e., functions that represent surfaces’ dispositions to reflect differing percentages of the incident light of different wavelengths. The older sort of color physicalism can be thought of as a form of type-physicalism (/type-identity theory) about color, while the newer sort can be regarded as a form of token-physicalism (/token-identity theory) about color.³

Proponents of color physicalism sometimes motivate the view by pointing to

² It should be noted that there is nothing particularly more or less physicalist about color physicalism than other views; dispositionalism and primitivism, for example, are straightforwardly compatible with the claim that colors are physical (they can be regarded as token-identity theories of color), and even an eliminativist could maintain that colors are physical but uninstantiated by actual objects. Moreover, one who held that colors are type-identical with non-physical kinds might reasonably be thought of as sharing the most important theoretical commitments with some color physicalists (whether or not to apply this label to such a view strikes me as more or less an unimportant terminological matter). The label ‘physicalism’, then, is unfortunate and potentially misleading, but by now (lamentably) well-entrenched.

³Here I adopt the usual assumption that functional types are not physical types.

its consonance with the broadly physicalist and reductionist ideas in the current philosophical zeitgeist. Whether one finds this motivation compelling will depend not only on one's sympathy for the zeitgeist, but also on one's view of how competing views fare on this dimension (see note 2). A more specific consideration adduced on behalf of physicalism concerns the phenomenon of color constancy, which we might characterize this way: subjects will characterize a ripe tomato as red when viewed under a variety of illuminants (say, under direct noontime sunlight and under indoor fluorescent light), although the character of the light reaching their eyes from that tomato is markedly different in the two conditions. Color physicalists often take this and similar cases as justifying the claim that objects (appear to) maintain their colors under different illuminants, and therefore that we should prefer a theory, such as color physicalism, that vindicates this claim by making colors observer-independent, conditions-independent properties of objects (see, for example, Tye (2000, 147–148), Hilbert (1987, 65), Byrne and Hilbert (2003, 9); but see Cohen (2006a); Thompson (2006)).

Color physicalism has been criticized for failing to do justice to the facts about perceptual variation discussed in §2.2. Consider again the chip that looks blue but not greenish to you while looking bluish green to me. If its color is, as per physicalism, determined by which observer-independent, circumstance-independent physical kind the chip exemplifies, then it would seem to follow that at most one of the competing representations of its colors (that in your head, that in mine) is veridical. But what could make it the case that one of them is veridical rather than the other?

Color physicalists have sometimes answered: what makes one (yours, say) veridical at the expense of another (mine, say) is that yours represents the chip as being blue but not greenish *and the chip is blue but not greenish*, whereas mine represents the chip as being bluish green *and the chip is not bluish green* (Byrne and Hilbert (2003, 17), Byrne and Tye (2006, 11), Tye (2006, 3)). In support of this answer, physicalists sometimes offer an analogy concerning representational variation with respect to shape. Thus, although a figure might look circular when viewed from angle θ_1 and elliptical when viewed from angle θ_2 , at most one of these visual representations is veridical: the representation in θ_1 is veridical (say) insofar as it represents the figure as being circular, *and the figure is circular*.

But this response is unconvincing. It is of course correct that what *would* make one representation R of the chip veridical at the expense of others would be that (i) R represents the chip as being some particular color that the others do not, and (ii) that the chip in fact exemplifies the color that R represents it as having but does not exemplify the color that the others represent it as having — that two part condition correctly unpacks what it is for a representation to be veridical at the expense of other representations. But laying out this condition does not answer the question asked; instead it pushes that question back a step. For in asking what makes it the case that one representation is veridical at the expense of the others, the critic is precisely asking what makes it the case that that two part condition is satisfied by at most one representation, as the

physicalist maintains. And the response we are considering does nothing to answer that question.

Moreover, the analogy with shape properties is questionable (indeed, it seems to presuppose something like a physicalist understanding of color). A reason for doubting that analogy is that, in the shape case, the properties at issue have (abstract) essences — essences that comprise the subject matter of plane geometry — that serve as a representation independent standard for veridicality of particular representations. In contrast, in the color case, we seem not to be committed to the existence of an (abstract or natural) essence that would adjudicate between competing representations of objects' colors. (This explains why, among other things, the range of inductive causal generalizations we are willing to make about red things seems far smaller than the corresponding range for circular things.)

In short, the physicalist's commitment to a single, uniquely veridical variant in all cases of perceptual variation with respect to color is hard to accept, and physicalists' attempts to make this commitment seem more palatable have been (in my view) unpersuasive.

A second objection to color physicalism, due originally to Hardin (1988), concerns its ability to respect certain structural features of the colors. For example, the colors stand in certain similarity and exclusion relations (red is more similar to orange than it is to green, no shade of blue is a shade of yellow). Moreover, there are exactly four chromatic colors (yellow, blue, red, green) that have shades that seem to be perceptually unmixed, or "unique," while the shades of all other colors are such that they appear perceptually mixed, or "binary" (every shade of orange looks reddish and yellowish, every shade of purple looks reddish and bluish, etc.). The objection we are now considering holds that, as the physicalist construes them, there is no obvious explanation for these structural properties of the colors: for example, there is no obvious similarity metric defined over classes of reflectance functions that would make the class the physicalist identifies with red more proximate to that associated with orange than it is to that associated with green (for responses and evaluation of this argument, see Cohen (2003); Byrne (2003); Pautz (2006a)).

2.4 Primitivism

Color primitivism amounts to a kind of quietism about color. The primitivist maintains that colors are irreducible in the sense that there are no true and informative type-identities of the form $\lceil C = P \rceil$, where $\lceil C \rceil$ is the name of a color and $\lceil P \rceil$ picks out a property in terms that don't include color vocabulary (but might include physical, functional, phenomenal, or intentional vocabulary). Primitivists think that colors are genuine properties, but that the irreducibility of these properties makes them primitive, or *sui generis*. In recent years, color primitivism has grown in popularity; some form of the view is endorsed by Westphal (1987, 2005); Campbell (1993); Yablo (1995); McGinn (1996); Watkins (2002, 2005); Johnston (ming) and (arguably) Stroud (2000).

Primitivism is ordinarily counted a form of realism about color, but it need

not be. For, just as there can be eliminativists who think that colors are, say, physical types that might be but are not in fact exemplified, there can be eliminativists who think that colors are primitive properties that might be but are not in fact exemplified.

Of course, primitivists deny that colors are identical to the physical types and dispositions with which physicalists and dispositionalists claim they are identical; but the primitivist is free to hold that colors are universally correlated with these sorts of properties. Color primitivists who think there is such a correlation, then, are not denying the existence or exemplification of the physical types or dispositions that their opponents take to be identical to colors. Rather, they are convinced (perhaps by some of the objections given above against these views) that such properties cannot be identified with the colors, and therefore that the colors must be distinct (even if universally correlated).

The most frequently invoked motivation offered in support of color primitivism is an argument from the failure of other views. After showing the problems with these other views, primitivism is then held out as a way of endorsing realism about color (but see above) without falling victim to the faults that plague other theories.

Unfortunately, like the corresponding argument offered in support of eliminativism (see §2.1), the argument for primitivism from the failure of alternatives leaves the primitivist in a relatively weak dialectical position, for it essentially begins by conceding that primitivism is a position of last resort. Moreover, like all arguments by elimination, this argument is only as good as the weakest of the refutations of it which it makes use. As before, this is a serious dialectical weakness, given the non-decisive quality of philosophical argumentation.

Moreover, critics have objected that primitivism is *ad hoc*. For, while primitivism's *sui generis* colors are surely coherent, it is suspiciously easy (i.e., unconstrained) to construe some property/properties as *sui generis* when we are otherwise unable to understand them. For example, this strategy seems no less applicable to such properties as *witch* or *phlogiston* (about which, presumably, eliminativism is a more appropriate response) or for that matter *heat* at a time prior to the emergence of thermodynamics (about which the correct response, though unknown at the time, turned out to be some kind of reductive physicalism). But if primitivism would have led to erroneous ontological verdicts in these cases, we should be wary of embracing it in the case of color.

Finally, Byrne and Hilbert (2006) have objected to color primitivism on the basis of considerations about color vision in non-human animals. Their objection builds on the observation that goldfish can discriminate surfaces that human beings fail to discriminate based on differences in those surfaces' dispositions to reflect light in the near ultraviolet range (this light falls out of the range to which human cones are sensitive). The natural (and common in comparative color science) description of the situation is that, in so discriminating, goldfish are responding to the surfaces' colors. For primitivism makes no room for any (reductive) explanation of what counts as a color, but can only rely on the discriminations of human subjects (with respect to which the surfaces are exactly alike). Thus, Byrne and Hilbert allege, color primitivism makes unavailable the

best descriptions of the visual behavior of non-human animals.

3 Conclusion

Color has attracted significant and growing attention from philosophers in recent years. Moreover, the empirical and philosophical sophistication of work in this area has increased rapidly in recent years. While the present essay comes nowhere near exhausting the territory, I hope it provides a useful point of entry into philosophical controversies about color.

4 Suggested Readings

Anthologies	Byrne and Hilbert (1997b,c); Backhaus <i>et al.</i> (1998); Gegenfurtner and Sharpe (1999)
General	Byrne and Hilbert (2003); Hardin (1988); Matthen (2005)
Eliminativism	Hardin (1988, chapter 2), Maund (1995, chapter 2), Pautz (2006a)
Dispositionalism	Boghossian and Velleman (1989); Peacocke (1984); Jackson and Pargetter (1987); Johnston (1992); McGinn (1996); Cohen (2004); McLaughlin (2003)
Physicalism	Smart (1975); Boghossian and Velleman (1991); Lewis (1997); Byrne and Hilbert (1997a, 2003)
Primitivism	Campbell (1993); Yablo (1995); Watkins (2002, 2005); Byrne and Hilbert (2006)

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