

# Color Objectivism and Color Projectivism

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Objectivism, in the philosophy of color, is (roughly) the claim that colors are physically constituted properties, instantiated by objects around us. On this view many objects around us both look colored and are colored. Projectivism is (roughly) the claim that objects around us look colored, but are not colored. On some projectivist accounts, colors are identified with properties instantiated by elements of perceiver's visual systems, resulting in a systematic illusion of the instantiation of color properties by objects around us. Objectivism and projectivism are standardly taken to be incompatible theories of color. Here we argue that this incompatibility is only apparent: objectivism and projectivism, properly articulated so as to deal with basic objections, are in fundamental agreement about the ontology of color and the phenomenology of color perception.

The large majority of philosophical theories of color are primarily about the colors of opaque surfaces that reflect and absorb various proportions of the visible light that strikes them, but do not generate visible light. This essay is exclusively about the colors of such surfaces.

## 1. Objectivism

A theory of color should tell us two things. First, it should tell us what properties the colors are. Second, it should tell us where, if anywhere, those properties are instantiated. Objectivist theories all answer the first question in ways compatible with:

O1. The property of being red is identical to a property that is constituted by some of the physical properties of paradigm red objects, properties that as a matter of fact are involved in the causal processes underlying our experiences of those objects that represent them as red, and similarly for other colors.

'Paradigm red objects' should be taken to mean objects that people would ordinarily call red: ripe tomatoes, fire extinguishers, a matador's cape, and so on. This claim should be taken to apply both to determinable colors, like red, as well as to more determinate shades, like scarlet. Finally, different objectivist theories will be generated as we get more specific about the property with which redness is identified. Some identify colors with intrinsic microphysical properties (Lewis 1997, Jackson and Pargetter 1987), others with dispositions to reflect light or *spectral reflectances* (Dretske 1995, Tye 1995 and 2000, Byrne and Hilbert 1997 and 2003). In this paper we will use Alex Byrne and David Hilbert's theory as a paradigm of objectivism; they identify the colors of opaque surfaces (which do not generate visible light) with spectral reflectance types. What we have to say here about Byrne and Hilbert's view applies, we contend, to other objectivist theories as well.

Let 'red<sub>14</sub>' name some specific shade of red. On Byrne and Hilbert's theory there will be a set of specific spectral reflectance properties corresponding to the spectral reflectance type that is identical to red<sub>14</sub>, and this will be the set of specific spectral reflectance properties instantiated by those objects that look red<sub>14</sub> to normal perceivers in normal viewing conditions.<sup>1</sup> Call this the 'red<sub>14</sub>

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<sup>1</sup> The reason that red<sub>14</sub> is identified with a *type* of spectral reflectance, as opposed to a specific spectral reflectance property, has to do with metamers. X and Y are metamers for subject S in lighting conditions C iff X and Y look exactly the same in color to S in C and their

spectral reflectance set'. Corresponding to a more determinable color property such as redness will be a set of specific spectral reflectance properties instantiated by those objects that look red to normal perceivers in normal viewing conditions, the 'red spectral reflectance set'. Clearly, the red<sub>14</sub> spectral reflectance set will be a subset of the red spectral reflectance set.<sup>2</sup>

This answers the first question, but an objectivist answer to the second is now obvious:

O2. Redness is (usually, most of the time, typically) instantiated by those objects that look red, or would look red, to normal perceivers in normal viewing conditions. And similarly for other colors.

And this, in turn, allows objectivism to maintain an anti-skeptical thesis about color perception:

AS1. If normal perceivers agree that an object looks red, after examination under normal viewing conditions, then it can be assumed that that object is red (unless further evidence undermines that assumption). And similarly for other colors.

Both O2 and AS1 are qualified to allow for non-veridical color perception. The color patches in pointillist paintings that look orange from a short distance away, but are seen to be made up of dots that look red and yellow, respectively, upon close inspection, need not be assumed to be orange. And AS1 allows for the possibility of 'fool's red': scientists might discover that some objects that look red to normal perceivers in normal conditions, which we presently take to be red, are not in

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spectral reflectance properties are different. (There are objects, that are metamers for all human beings in sunlight. And there are objects that are metamers for some human beings in sunlight, but not for others.) Red<sub>14</sub> is taken to be a type of spectral reflectance, namely, spectral reflectance properties instantiated by all metamers of some paradigm red<sub>14</sub> object. Familiar problems surround attempts to give an adequate account of "normal" perceivers and "normal" conditions. These problems plague theories that define the colors in terms of how objects look (i.e. secondary-quality theories of color), but they arise here (in a different way) for objectivism as well.

<sup>2</sup> This theory raises some obvious questions about the causal powers of color properties, in particular if spectral reflectance types are taken to be disjunctive properties. Byrne and Hilbert hold that, when we see a red object as red, usually the redness of the object is part of what causes us to see the object as red. Since they also hold that redness is a disjunctive property, they go on to argue that disjunctive properties can enter causal interactions - a controversial position. However, an objectivist who identifies colors with spectral reflectance types could hold that reflectance-types are disjunctive properties, and deny that reflectance-types enter causal interactions. The account of color perception would go something like this. When sunlight hits a surface its micro-structure causes, in part, the pattern of light that enters the eye from the surface. Because of the way the visual system reacts to this pattern of light, the visual system represents the surface as instantiating a reflectance-type. The reflectance-type of the surface is its color, and is an objective feature of the surface, which the surface instantiates. However, the reflectance-type does not do causal work. The causal work is done by the micro-structure of the surface. The advantage of this position is that it shows how redness fits into an objectivist ontology and at the same time explains why red things do not seem to enter into causal interactions in virtue of being red; that is, red things do not seem to enter into causal interactions in virtue of being red because red things do not in fact enter into causal interactions in virtue of being red.

fact red, because they are physically kin to uncontroversially green objects, and not to other paradigm red objects.

## 2. The basic objection to objectivism

Recall Byrne and Hilbert's claim: redness is a spectral reflectance type. Given this commitment, along with O2, an obvious question is whether objectivism implies that paradigm red objects look like they instantiate a spectral reflectance type. The anti-skeptical thesis AS1 suggests that, at least in some important sense, the color properties that objects appear to have are (typically) properties that they really do have. If colors are spectral reflectance types, then is the objectivist committed to the view that objects appear to instantiate spectral reflectance types? And if not, how do colored objects appear; what properties do they look like they have?

The basic objection to objectivism is that there is at least one obvious sense (of 'looks') in which paradigm red objects do not *look* like they instantiate a spectral reflectance type. When I look at the matador's cape, the cape does not *appear* to have a certain type of spectral reflectance, at least in one obvious sense (of 'appear'). Alternatively, the cape is not *seen as* instantiating a spectral reflectance type, at least one obvious sense (of 'seen as'); or alternatively: the cape is not *presented as* instantiating a spectral reflectance type. The point we are making here is phenomenological, and no particular jargon is needed to make it. So even if there are senses, important senses, in which a matador's cape looks like it instantiates a spectral reflectance type, appears to instantiate a spectral reflectance type, is seen as instantiating a spectral reflectance type, or even is presented as instantiating a spectral reflectance type, there is *some* sense in which the cape does *not* look that way. Call this the *phenomenological claim*.

We are inclined to say that the cape not only fails to look (in some sense) like it instantiates a spectral reflectance type, but also that it looks (in the same sense) like it instantiates a qualitative, sensuous, and intrinsic property – what anti-objectivists (see §3) would call *redness*. For now, call this property *phenomenal redness*, or *p-redness*, and similarly for other *phenomenal colors* or *p-colors*. The stronger claim – that paradigm red objects look p-red – is not essential to the phenomenological claim. That claim is simply that, in some sense of 'looks', paradigm red objects don't look like they instantiate a spectral reflectance type. Our appeal is to the reader's familiarity with the phenomenology of color perception; we maintain that there is a claim whose correctness can be recognized, here, regardless of how precisely that claim is formulated (regardless, in other words, of whether one can explain the precise sense in which it is true that a matador's cape doesn't look like it instantiates a spectral reflectance type). How can the objectivist respond to this?

She cannot say that the phenomenological claim is straightforwardly true – that the matador's cape just doesn't look like it instantiates a spectral reflectance type, in any sense of 'looks' – because this claim is in serious conflict with O2 and AS1, which imply the for-the-most-part veridicality of color perception. There must be some sense of 'looks', then, on which the matador's cape looks like it instantiates a spectral reflectance type.

One possibility is for the objectivist to adopt a *representational account of visual experience*, on which an object O looks P to S iff S visually represents O as P. This is the view preferred by Byrne and Hilbert:

In general, the proposition that *p* is part of the content of a subject's visual experience if and only if it visually appears to the subject that *p*. [...] The

representational content of a subject's experience specifies the way in which the world appears *to the subject*. (2003, p. 5, italics in original)

How objects look to a subject, therefore, is a matter of the properties she visually represents them as having. This provides the needed sense in which the matador's cape looks red: the cape is visually represented as instantiating the red spectral reflectance type. This explains why its looking red is a reliable indication of its being red, i.e. a reliable indication of its instantiating that spectral reflectance type. The basic objection remains, however: in what sense does the cape *not* look like it instantiates a spectral reflectance type?

Byrne and Hilbert argue that the phenomenology of color perception is not a matter of the representational content of color experience. They distinguish between the phenomenal character of an experience and its representational content; the phenomenal character of an experience is what it is like to undergo that experience. They write:

Let a *green-representing experience* be a visual experience that represents the world as containing something green [i.e. something that instantiates the green spectral reflectance type]. ... [W]hen people with normal vision look at grass, shamrocks, and jade, in daylight, they have green-representing experiences. These experiences are thus similar in respect of content. Assuming, as we shall, that "spectrum inversion" does not actually occur, such experiences are also phenomenologically alike: there is something obviously similar in respect of what it is like to undergo them. Let a *green-feeling experience* be a visual experience with this phenomenological character. (1997, p. 264. Our parenthetical remark.)

So experiences that represent green objects have a certain phenomenal character, experiences that represent red objects have their own distinctive phenomenal character, and so on. But does this explain the truth of the phenomenological claim?

We submit that, given a representational theory of visual experience, it does not. The phenomenological claim is a claim about how objects appear (in some sense of 'appear'), about how they look (in some sense of 'look'); given the representational theory, this means that the phenomenological claim is a claim about the representational content of the experiences involved in color perception. To say that our experiences of green objects have a phenomenal character – i.e. that there is something that it's like to undergo them – is correct; but this falls short of vindicating the phenomenological claim. That claim said not only that there is *something* that it's like to perceive green objects; it said something more specific about *what* it's like to perceive green objects, namely, that they don't look like they instantiate a spectral reflectance type (in some sense of 'look'). What is wanted is a positive account of what it means for objects to look green in this sense of 'look'. Byrne and Hilbert say that experiences of green objects feel a certain way, but this fact about them does not capture the way that their feeling this way figures into the representational content of the experience of seeing an object as green. And given the representational theory, the objectivist needs to tell us how and in what sense looking green, in the sense of 'look' used in the phenomenological claim, is related to the representational content of visual experience.

We see two possibilities for the objectivist. On the first, there are two important sorts of properties involved, in one way or another, in color perception: colors and p-colors. The matador's cape is both represented as instantiating, for example, a spectral reflectance type (redness) *and* represented as instantiating p-redness. P-redness is not, given O1, a color property, but it is involved in the

perception of paradigm red objects.

What is the relationship between these two instances of representation? A plausible answer is that we represent the cape as red *by* representing it as p-red; the cape looks red *in virtue of* looking p-red. So our representation of the cape as both red and p-red is not an instance of two distinct instances of representation (as when, say, we represent the cape as both red and square). Rather, representing the cape as p-red is the *way* that we represent it as red. On this account, the representation of color properties is analogous to cases in which, for example, one hears that John has arrived, by hearing his car pull into the driveway. So the suggestion is not that the cape doesn't look like it instantiates a spectral reflectance type, but rather that it's looking like it instantiates a spectral reflectance type is mediated by its looking like it instantiates a p-color property.

The second possibility, for the objectivist, is to appeal to something like "modes of presentation": redness, a spectral reflectance type, can be presented *as* a spectral reflectance type (as when, for example, scientists study the surfaces of paradigm red objects), or it can be presented *as* a qualitative property (as when normal perceivers look at paradigm red objects in normal conditions). But this idea needs elucidation. What does it mean for an object O to be presented to S as P?

Think of how political maps use colors to represent boundaries between countries, without representing those countries as having those colors. The map represents the boundary between Spain and Portugal by making the part of the map representing Spain pink, and the part of the map representing Portugal blue. In this case the representation (the map) has features which are not a matter of its representational content: the part of the map representing Spain is blue, but Spain is not represented as being blue. But, we might say, Spain is *presented as* being blue. This is part of the "mode of presentation" of Spain, on this map.

Or, to consider an example involving visual perception, when someone removes her glasses, or for some other reason has blurred vision, the world looks fuzzy, although would be wrong to say that she visually represents the world as being fuzzy. Rather, the world is *presented as* being fuzzy, but not represented as fuzzy. And here is the important point for our purposes: that the world is presented as being fuzzy is a matter *how things look to the perceiver*. The world, in some sense, *looks* fuzzy to someone who has blurred vision.

We can distinguish, then, between representational and presentational content. In the case of visual perception, the representational content of a visual experience will constitute how things look, to the perceiver, on one sense of 'looks', while the presentational content of a visual experience will constitute how things look, to the perceiver, on another sense of 'looks'. On the present objectivist proposal, paradigm red objects are represented as red, and therefore look red, in one sense of 'looks', namely the sense relevant for O1 and AS1; but paradigm red objects are presented as p-red, in another sense of 'looks', namely, the sense relevant for the phenomenological claim. (This proposal gives up the representational account of visual experience for the weaker claim that if S visually represents O as P then O looks P to S.)

Now the upshot of all this, which will be important below, is that objectivism is committed to p-colors, as part of the content of visual experience, in her response to the basic objection raised above. On one version of objectivism, p-redness is part of the representational content of visual experience when we perceive paradigm red objects. On another version, p-redness is part of the presentational content of visual experience when we perceive paradigm red objects. But, in any event, the objectivist is committed to two claims: (1) that color properties are instantiated by objects

around us, and (2) that p-color properties are part of the content of visual experience.

### 3. Projectivism

We now turn to projectivism (Boghossian and Velleman 1989, Averill 2005). Given the objectivist distinction between colors and p-colors, above, we can formulate projectivism's first claim as follows:

P1. The property of being red is identical to the property of being p-red, i.e. the qualitative, sensuous, and intrinsic property that paradigm red objects look like they have when viewed in normal conditions. And similarly for other colors.<sup>3</sup>

'Looks' here should be taken in its representational sense: according to P1, paradigm red objects are represented as being p-red. Now projectivism, at a minimum, answers the second question for any theory of color with the following:

P2. Color properties are not instantiated by objects around us.

A consequence of this is that paradigm red objects are not, in fact, red.<sup>4</sup> P2 distinguishes projectivism from the view that objects around us do instantiate the qualitative color properties that they are represented as instantiating. (Non-reductive color objectivism is often called 'color primitivism'.) Given P1 and P2, projectivism says that color experience is systematically non-veridical: objects around us look colored, but are not colored.

P2 does not fully answer the question of where, if anywhere, color properties are instantiated. As Sydney Shoemaker has observed, there are two different ways the projectivist can go here:

[L]et us distinguish *literal projectivism*, which says that our experiences represent external things as having properties that in fact belong only to experiences, and *figurative projectivism*, which says that in virtue of properties they do have our experiences represent external objects as having properties that in fact belong to nothing. (1990, p. 127)

Literal projectivism says that colors are instantiated in our experiences, or, alternatively, in our visual systems, in the "visual field," in sense-data, or in the mind or brain, or parts of the mind or brain. Figurative projectivism says that colors are not instantiated anywhere. They exist only in as much as we visually represent objects as instantiating them. We will continue to use generic 'projectivism', as the distinction between literal and figurative projectivism is not relevant for our concerns here.

Although projectivism maintains that color experience is systematically non-veridical, the view can admit that visual representations of color distinctions are often veridical. Suppose a person is looking at two adjacent color squares under the same lighting conditions, and the squares are visually represented as different in color. In this case the squares must be different in their light reflecting properties. So the squares instantiate different light reflecting properties, and the difference between

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<sup>3</sup> Absent the assumption that the paradigm red objects look the same to most people, P1 could be relativized to individuals. Alternatively, on the assumption that the paradigm red objects look the same to most people, P1 could be read as identifying redness with the property that paradigm red objects look like they have, for normal perceivers.

<sup>4</sup> Note that this is consistent with the way we defined 'paradigm red objects' above.

these properties is visually represented as a difference in color properties. Again: although the edge between the squares is seen as a color distinction, and the surfaces do not instantiate the color properties that they are represented as instantiating, there is a real difference in the way the squares reflect light, and this difference is visually represented. The upshot is that projectivists can maintain that the visual representation of the edges is veridical; presumably this point generalizes to the perception of many geometric properties.

#### 4. The basic objection to projectivism

Consider ordinary attributions of color, which we all make, for example: ‘The matador’s cape is red’. The objectivist is in a position to easily provide a charitable semantics for such utterances, by holding that ordinary color terms – ‘red,’ ‘green,’ ‘scarlet,’ etc. – denote, say, spectral reflectance types. If the matador’s cape does instantiate the relevant spectral reflectance type, then ‘The matador’s cape is red’ will come out true. By contrast, the projectivist maintains that the cape is not red, and therefore seems forced to say that ‘The matador’s cape is red’ is false, along with all other (positive) ordinary attributions of color.

That is an unappealing concession. First, it is always a theoretical cost to posit systematic falsehood in ordinary language. Projectivism, by definition, is an error theory in the sense that it says that color experience is systematically non-veridical. It now seems forced to posit additional error in our talk about the colors of objects around us. Second, there seems to be some important difference, even for the projectivist, between saying that the matador’s cape is red and saying that the matador’s cape is green. Both are, strictly speaking, false, according to projectivism. But the former claim has something going for it, some kind of correctness, which the latter lacks. The projectivist needs to come up with some way of distinguishing between the correct ordinary attributions of color, and the mistaken ordinary attributions of color.

To deal with this objection, projectivists can propose an alternative, charitable semantics for ordinary attributions of color. What are needed are properties – not color properties, given the projectivist’s identification of colors with p-colors – to serve as the meanings of ordinary uses of color terms, properties which *are* instantiated by objects around us. Such a set of properties can be defined by using colors to set out a sufficient condition for an object’s instantiating one of another set of properties, which we call a-colors.

AS2. Necessarily, an object is a-red if normal perceivers agree, or would agree, that the object looks red under normal conditions; and similarly for other a-colors.

‘Looks’ should again be taken in its representational sense. A-colors are so called because they depend on agreement. But how extensive is such agreement? There is wide spread agreement about the determinable colors of objects, but not for determinate colors. There are many cases where normal people, looking at two color chips, which reflect light differently, will disagree as to whether or not the two chips look exactly the same in color; that is, whether or not they are the same determinate color. This is due to the slight differences in the way normal human beings see colors.<sup>5</sup> The upshot is that a-colors are mostly determinable colors. This presents no problem for the projectivist, because all she wants to capture is our ordinary agreement about the colors of things,

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<sup>5</sup> This disagreement among normal observers is set out as a criticism of objectivism in Hardin 2004. Byrne and Hilbert (2007) agree with Hardin about the disagreement among normal observers, but claim this is exactly what we should expect if their theory is right.

and observers can agree in general on the determinable colors of things but not, in many cases, on their determinate colors.

The projectivist should maintain, we submit, that we use ordinary color terms, at least sometimes, to denote a-color properties, not color properties. 'Red', at least sometimes, is used to denote a-redness, and similarly for other color terms.<sup>6</sup> Since the matador's cape *is* a-red, the sentence 'The matador's cape is red' is (or at least could be) *true*, according to this projectivist semantics. The objectionable systematic error is thereby avoided.<sup>7</sup>

To what extent, then, is projectivism an error theory about color? The introduction of a-colors as the semantic values of some uses of ordinary color terms suggests a charitable account of common sense beliefs about the colors of objects around us, as beliefs about the a-colors of objects. But a-colors are not literally seen. We do not see objects as being the subject of actual or possible agreement on how they look in color to normal observers under normal conditions. When a perceiver sees an object, the a-color of the object is inferred (unconsciously, for the most part) by the perceiver on the basis of the color the object appears to have to the perceiver and the conditions, particularly the lighting conditions, under which the perceiver sees the object. A-colors are thus cognitively, not visually, represented. Thus projectivism is an error theory about the visual representation of color.

The upshot of all this is that projectivism must introduce a set of properties, properties that are instantiated by objects around us, to serve as the semantic values of some uses of ordinary color terms, to respond to the basic objection raised above. In any event, the projectivist is committed to two claims: (1) that color properties are part of the content of visual experience, and (2) that a-color properties are instantiated by objects around us.

## 5. The theories compared

Projectivists maintain that objects around us look p-colored (in some sense of 'look?'), but are not p-colored. Objectivists, we have argued, must agree about the first conjunct of that claim. Must they agree about the second? The principal reason we see for rejecting the thesis that objects around us instantiate p-color properties is that such properties are not known to enter into the causal interactions of objects around us, nor to otherwise enter into explanations of physics or chemistry. (This explains the fact that, in scientific circles, some form of error-theory about color is orthodox.) In short, the reason projectivists give, for rejecting the instantiation of p-colors by objects around us, is also a reason for objectivists to agree that p-colors are not instantiated by objects around us.

We are now in a position to put forward our thesis: objectivism and projectivism are in fundamental agreement about the ontology of color and the phenomenology of color perception.

Consider phenomenology first. Both theories vindicate the phenomenological claim by maintaining that p-colors are part of the content of visual experience. Projectivists say that the matador's cape is visually represented as being red (p-red); objectivists say either that the cape is represented as being p-red or that it is presented as being p-red. All parties agree that the cape looks p-red.

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<sup>6</sup> Note, then, that on this view 'ordinary color talk' is not, strictly speaking, talk about the colors, just as, according to projectivism, paradigm red objects are not, strictly speaking, red.

<sup>7</sup> This projectivist semantics is sketched in Averill 2005, p. 223. Cf. Van Inwagen 1990, pp. 101-7.

Second, consider ontology. Both theories are committed to p-color properties, in the sense that both theories maintain that p-colors are part of the content of visual experience. Now it might seem that projectivists are under some pressure to say something more: that p-colors are instantiated somewhere – by our experiences, for example. But the objectivist faces this problem as well, given her commitment to the idea that p-colors are part of the content (either representational or presentational) of visual experience. The only reason the projectivist is under any pressure to posit the real instantiation of color properties, however, is that it seems hard to imagine how we could account for the phenomenology of color perception (and in particular the fact that p-colors are part of the content of visual experience) without saying that p-colors are instantiated *somewhere*. But since objectivists, just as much as projectivists, have to say that p-colors are part of the content of visual experience, this problem is just as much a problem for objectivism, as it is for projectivism. So if the only viable form of projectivism is literal projectivism, then the only viable form of objectivism is one that says that p-colors are instantiated somewhere.

Both theories are committed to certain real properties of objects around us which play a crucial role in the causal explanation of color perception. Both theories are, in some sense, anti-skeptical theories, and can give a charitable interpretation of ordinary talk about colors. AS1 tells us how we can identify the colors of objects from the way objects look. AS2 tells us how we can identify the a-colors of objects from the way objects look. Both theories can explain how our ordinary attributions of color to objects around us are sometimes true: objectivists can say that those uses of ordinary color terms denote physically constituted properties, e.g. spectral reflectance types; projectivists can say that they denote a-colors.<sup>8</sup>

Projectivists, presumably, will agree that paradigm red objects all instantiate some spectral reflectance type (along with various other related physically constituted properties), just as objectivists should agree that paradigm red objects are a-red (by definition). The ontological commitments of the two theories seem to be the same. To get at this point note that seeing an opaque object as colored involves a causal chain – call it the *visual chain* – that begins with illuminants that produce light at wavelengths of various intensities. The light strikes the surface of the opaque object and its surroundings. Because of the molecular structure of the surface some of the light is absorbed and some is reflected. Some of the reflected light may be diffused (as with matt surfaces) and some may be specular (as with mirrors and glare). The reflected light from the surface enters an observer's eyes, causing a reaction that eventually results in the object looking a certain way to the observer, in the distinctive phenomenology of color experience. The molecular structure of an object is the basis in the object for its disposition to reflect light in the way it does, thus determining its spectral reflectance type; and this same molecular structure is the basis in the object for its disposition to cause human observers, who see it under normal conditions, to reach agreement about its color. The objectivist calls our attention to an early stage in the causal process by which we come to see objects as colored, and holds that colors are instantiated at this early stage. The projectivist points to a much later stage in the same causal process and holds that colors enter the picture at this later stage. But everyone agrees about the causal process itself. All agree that some of the physically constituted properties of an object are part of the causal explanation of our experiences of the object; projectivists just deny that such properties are colors. Similarly, all agree

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<sup>8</sup> There are differences here. Objectivism holds that even if an object looks red under normal circumstances, it might not be red. Projectivism holds that if an object looks red under the appropriate conditions then the object must be a-red. So AS2, unlike AS1, does not allow for fool's red.

that phenomenal color properties are part of the content of color experience; objectivists just deny that these properties are colors. The two parties do not disagree about the ontology of the visual chain; rather, they disagree about which features in the chain should be said to be colors.

Objectivism has been widely criticized because, on objectivist accounts, the objects that instantiate the unique hues cannot be identified. Consider unique green (a pure green that has no blue or yellow in it). When normal observers are asked to identify spectral lights that are unique green they pick lights that vary from 490nm to 520nm – a range of 30nm. Since 15nm more than unique green looks bluish-green and 15nm less looks yellowish-green, this is a wide variation. Similarly, there is no general agreement among normal observers, who are asked to pick out the unique green color chip from among a set of chips that range from yellow to green to blue, as to which chip is the unique green chip. The same problem arises for the other unique or pure hues – pure red, pure blue and pure yellow. So which objects instantiate the pure colors? AS1 says if normal perceivers agree on the color of a nearby object then we can assume that the object has the color these perceivers see it as having. But when it comes to identifying those objects that instantiate the unique or pure hues AS1 is of no use, because there is no general agreement among normal perceivers. However, exactly the same problem arises for projectivism: because there is no general agreement among normal observers as to which objects look unique green, AS2 cannot be used to identify unique green objects. So unique green is not an a-color. Thus we can see another way in which the theories are in the same boat, this time epistemologically.

There is, of course, a significant difference between the two theories: projectivists maintain that color experience is systematically non-veridical; objectivists need not say this, if they opt for the view that p-colors are merely part of the presentational content of visual experience. Objectivists maintain that color experience is usually veridical: for example, for Byrne and Hilbert, objects instantiate the spectral reflectance types we visually represent them as having under normal conditions. Projectivists maintain that objects do not instantiate the p-color properties we visually represent them as having. But, again, the ontological commitments of the theories are the same: objectivists can (and should) agree that objects do not instantiate the p-colors that they look like they instantiate (in some sense of ‘looks’); projectivists can and should agree that objects do instantiate properties that partially explain their color appearances and the fact that we tend to agree about the colors of objects (i.e. a-colors and their categorical bases).

Both theories agree that there is *something* misleading (as it were) about color experience: objects are either presented or represented as instantiating properties which they do not have. And both theories agree that paradigm red objects have real properties that enter into the causal explanation of their looking red to us. The dispute, again, appears to be over which set of properties to identify with the colors.

What could settle that question? Perhaps a careful conceptual analysis of the concept of a *color* is required, or a check of the theories against pre-theoretical intuitions (e.g. Johnston 1992); perhaps the theories should be compared in terms of simplicity, or their coherence with plausible theories in other areas of philosophy (consider, e.g., objectivism’s apparent commitment to disjunctive properties). But we do not believe that such considerations show conclusively that either of these theories is false or unacceptable.

There remains a substantial metaphysical question, which neither theory addresses: how does the phenomenology of color experience fit into a naturalistic account of the world? How are experiences with the distinctive phenomenology of color experience possible, in a physical world?

This question arises for both the objectivist and the projectivist, and both theories, ultimately, require an account of color experience that answers it.

The explanatory burden here is heavy. Are p-color properties instantiated anywhere? If so, where? If not, how are they part of the content of visual experiences? If p-colors are instantiated somewhere, how does this fit into a naturalistic account of the world? Do these properties enter into causal interactions? How are these properties involved in the visual system, and how does it end up being the case that objects around us appear colored? These, we submit, are the substantial metaphysical questions that a complete theory of color must deal with; neither objectivism nor projectivism addresses them.<sup>9</sup>

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