

This article was downloaded by: [Ross, Peter W.]

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Philosophical Psychology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713441835>

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Online publication date: 11 October 2010

To cite this Article Ross, Peter W.(2010) 'Fitting color into the physical world', *Philosophical Psychology*, 23: 5, 575 – 599

To link to this Article: DOI: 10.1080/09515089.2010.514568

URL: <http://dx.doi.org/10.1080/09515089.2010.514568>

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Fitting color into the physical world

Peter W. Ross

I propose a strategy for a metaphysical reduction of perceived color, that is, an identification of perceived color with properties characterizable in non-qualitative terms. According to this strategy, a description of visual experience of color, which incorporates a description of the appearance of color, is a reference-fixing description. This strategy both takes color appearance seriously in its epistemic role and avoids rendering color as intractably mysterious. I'll also argue that given this strategy, a plausible account of perceived color claims that colors are physical properties of physical objects.

Keywords: Color; Color Perception; Reduction; Revelation

The problem of the nature of color is posed: what sort of property is *perceived color*, that is, the qualitative property that we attribute to physical objects in virtue of our visual experiences of color and by way of our color terms? The extreme difficulty of this problem is indicated by the range of widely different answers it has received, for example: *physicalism* (color is a physical property of physical objects),¹ *dispositionalism* (it is a disposition of physical objects to produce color experiences),² *subjectivism* (it is wholly explained in terms of color experience itself, and not in terms of colors of physical objects),³ or *realist primitivism* (it is a sui generis property of physical objects).⁴

I'll use the term 'the nature of color' to refer to the mental, physical, or sui generis constitution of color, as well as its simple or complex, monadic or relational, and categorical or dispositional structure. For clarity, I'll call such constitutional and structural characteristics the *constituting nature* of color. So, for example, dispositionalism claims that orange is a disposition of physical properties of objects to produce visual experiences of orange; thus on this view, the constituting nature of orange is a dispositional relation involving physical and mental relata. Physicalism,

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by contrast, proposes that the constituting nature of orange is a physical property which exists independently of its relation to visual experience.

The problem of the constituting nature of color, then, has to do with the metaphysics of a certain qualitative property that we attribute to physical objects—what I call perceived color. Nevertheless, a fundamental question raised in addressing the problem of the constituting nature of color is how the metaphysics and epistemology of color relate. For example, as just noted, dispositionalism, by claiming that orange is a dispositional relation involving visual experience, offers a claim about the metaphysics which incorporates our access to color through visual experience. However, physicalism characterizes the metaphysics of orange independently of its relation to visual experience, and so draws a sharp distinction between the metaphysics and epistemology of color. (By ‘experience’ I’ll always mean a mental state. Sometimes I’ll use ‘experience’ with no qualification to be neutral as to whether the state is perceptual or introspective. I’ll use ‘visual experience’ as the primary term for the kind of perceptual state involving vision; sometimes I’ll use ‘color experience’ to abbreviate ‘visual experience of color’. As I’ll explain further in section 1.1., I’ll use the term ‘appearance of color’ in a way which distinguishes color appearance and visual experience of color; the appearance of color has to do with the simple, monadic, and categorical representation of color by way of a visual or introspective state, while visual experience is a sort of state by which color is represented. Furthermore, as will become important in section 4.2, although visual experience is often conscious, I will not assume that it must be conscious and thus that ‘conscious experience’ must be redundant.)

With an eye to sorting out how the metaphysics and epistemology of color relate, I’ll address the problem of the constituting nature of color by considering purported constraints that, often assumed as obvious, play an important role in arguments for proposals for its solution. In section 1, I’ll distinguish two types of constraints and describe particular constraints falling under one of these types, a type that I’ll call revelation constraints. Then in sections 2 and 3, I’ll reject two of these particular constraints, the consequence being that a description of the appearance of color is nonrevelatory, that is, it tells us nothing about the constituting nature of color. In section 4, I’ll propose a version of physicalism that embraces this consequence.

Characterizations of color can be resolved into two dimensions. One dimension describes the constituting nature of color as a whole range of properties, the question here having to do with its mental, physical, or *sui generis* constitution, as well as its simple or complex, monadic or relational, and categorical or dispositional structure. The second dimension describes particular colors (for example, orange or unique green) in terms of their places in a qualitative ordering which organizes particular colors according to their relative similarities. The general topic of sections 1–3 and the beginning of section 4 is the constituting nature of color, postponing discussion of the qualitative ordering. In these sections, I’ll take up issues having to do with color as the reference of both perceptual and linguistic representation. This is unproblematic since it is widely assumed that the color we see and the color we refer to through language do not differ in constituting nature.

Then in section 4, in the context of proposing a version of physicalism which I'll call *disjunctive physicalism*, I'll address the issue of the qualitative ordering of particular colors and I'll sketch an approach to identifying particular colors with physical properties of physical objects through fixing the reference of particular color terms.

At the end of section 4, I'll take up the question of the constituting nature of color again, offering reasons to accept disjunctive physicalism over views that allow that a description of the appearance of color is nonrevelatory but claim that color is a relation between objects and perceivers.

My primary goals are to motivate a metaphysical reduction of perceived color and outline a strategy for carrying it out, where by 'a metaphysical reduction' of perceived color I mean an identification of perceived color with properties characterizable in non-qualitative terms. As Fodor puts it for intentionality: "if aboutness is real, it must be really something else" (1987, p. 97); I think the same holds for color, and I'll motivate a reduction and offer a strategy for carrying it out.⁵ I'll also argue that given this strategy, according to which a description of visual experience of color is taken as a reference-fixing description, disjunctive physicalism is a plausible account of perceived color.

I won't try to address every argument against a reduction of perceived color. Instead, I'll primarily focus on arguments founded on the idea that the appearance of color tells us about the structural aspect of the constituting nature of color. But, as well, through my defense of disjunctive physicalism in which I speak to certain doubts about reduction, I'll show that a reduction is plausible.

1. Types of Constraints

Constraints of one type, which I'll call *ordering constraints*, claim that the members of whatever range of properties we identify with colors must exhibit a certain qualitative ordering. This ordering is what's called the *psychological color space*, a three dimensional space, with dimensions of hue, saturation, and lightness; this ordering of colors is with respect to relative similarity, such as that orange and red are more similar to each other than either is to green.⁶

Constraints of this type have a bearing on the issue of the constituting nature of color through vetting candidates (physical properties of objects, dispositions of objects to produce color experiences, and so on) in terms of whether a candidate's particular properties exhibit the color space ordering. But again, I'll postpone discussion of the qualitative ordering, as well as of identification of particular colors with particular physical properties, until I elaborate on disjunctive physicalism in section 4.

At this stage, I want to focus on the more fundamental point that a description of a particular color in terms of its place in the qualitative ordering is distinct from a description of the constituting nature of color. Thus, a description of orange in terms of its place in the qualitative ordering is distinct from a description of the

constituting nature of orange. Orange can be described in terms of its relative similarity to red and yellow, and some theorists claim that such descriptions specify the essences of particular colors. And since the term ‘nature’ is sometimes used to mean essence, the expression ‘the nature of color’ is sometimes used to refer to these supposed essences (where essences are necessary properties, according to some sort of necessity). But even if we take descriptions in terms of the qualitative ordering to specify essences, specification of these supposed essences differs from a description of the constituting nature of color. For example, the description of orange in terms of its relative similarity to red and yellow leaves open whether the constituting nature of color is simple or complex, monadic or relational, or categorical or dispositional. And more generally, a description of each particular color in terms of its location in a qualitative ordering is separate from a description of the sort of property that makes up the whole range of particular colors.

Thus, the issue of characterizing a particular color such as orange in terms of a system of qualitative relations among particular colors is separate from the issue of characterizing the whole range of particular colors as a relation in a different sense, namely a relation among constitutive parts (for example, a relation among properties of neural processes, or one between physical properties of surfaces and light, or one between physical properties of objects and perceivers’ psychological responses).

1.1. Description of the Appearance of Color

From the standpoint of the sense of ‘relation’ relevant to constituting nature, that is, a relation among constitutive parts, we describe the *appearance* of color as non-relational—as simple, monadic, and categorical. So, for example, we describe the appearance of the orange of a surface as simple, monadic, and categorical.

We describe the appearance of orange as *simple* in the sense that we don’t describe the appearance as having a component structure, that is, as having distinct component parts that are related to each other. For example, we don’t describe the appearance of orange as having a component structure in the way that we describe the appearance of a surface’s texture as having one—in particular, as having spatially distinct component parts.⁷ (As the qualitative ordering of colors indicates, we can describe the appearance of orange as, in a sense, a mixture of red and yellow. But we don’t describe it as a relation between a red part of the surface and a yellow part.)

We describe the appearance of orange as *monadic* in the sense that we don’t describe it as having relational structure; for example, we don’t describe it as being a relation between physical properties of objects and psychological responses of perceivers. And we describe the appearance of orange as *categorical* in the sense that we don’t describe it as having a specifically dispositional relational structure.⁸

1.2. Revelation Constraints

I’ll examine constraints of a type distinct from ordering constraints, which I’ll call *revelation constraints*. Revelation constraints offer a claim about the extent to which a description of the appearance of color in virtue of ordinary visual experience specifies

the constituting nature of color—in particular, its simple or complex, monadic or relational, and categorical or dispositional structure. (I apply the qualification *ordinary* to visual experience so as to rule out visual experiences provided by scientific instruments such as optical instruments for measuring reflectance or fMRI scanners.)

Assuming that we describe the appearance of color as simple, monadic, and categorical, does a description of the appearance of color as simple, monadic, and categorical provide a specification the constituting nature of color? Or does it pick out properties in terms of features of appearance that tell us nothing about these properties' constituting natures?

I'll consider three claims regarding how much a description of the appearance of color tells us about its constituting nature. The first claim, which, following Johnston (1992/1997), I'll call *Revelation*, contends that ordinary visual experience provides us with access to the structural aspects of the constituting nature of color, and that a description of the appearance of color in ordinary experience specifies these structural aspects, that is, it specifies whether color is simple or complex, monadic or relational, and categorical or dispositional.⁹ (This characterization of Revelation is narrower than Johnston's, whose characterization combines the provision of access to structural aspects of the constituting nature of color [1992/1997, p. 169] and the provision of access to supposed essences of particular colors described in terms of the qualitative ordering [1992/1997, pp. 164–168].¹⁰ My characterization of Revelation is tailored to capture the claim that underlies Boghossian & Velleman's [1989/1997] and McGinn's [1996] arguments with regard to the structural aspects of the constituting nature of color.)

Thus, assuming that we describe the appearance of color as simple, monadic, and categorical, then, according to Revelation, experience tells us that the constituting nature of color is simple, monadic, and categorical.

Revelation in my relatively narrow sense is such an extreme claim that it is only compatible with two sorts of views about the constituting nature of color. It is consistent with subjectivist views claiming that perceived colors are simple, monadic, categorical properties of visual experiences (for example, Boghossian & Velleman, 1989/1997). I'll call these simple, monadic, and categorical mental properties *color qualia*.¹¹ Also, Revelation is consistent with realist primitivist views claiming that perceived colors are simple, monadic, categorical sui generis properties of physical objects (for example, McGinn, 1996).

The second claim, which I'll call *Semi-Revelation*, holds that there are two kinds of color, *physical object color* (a property instantiated by physical objects) and *mental color* (a property instantiated by visual experience). (I intend 'physical object color' to be neutral with respect to specific proposals about the colors instantiated by physical objects and so to leave open whether physical object colors are, for example, dispositions to produce color experiences, or physical properties independent of relations to color experiences, or sui generis. Likewise, I intend 'mental color' to leave open whether the colors instantiated by visual experience are reducible to properties of neural processes or not. Of course, the different views about the constituting

nature of color hold different claims as to whether physical or mental colors exist at all.) According to Semi-Revelation, while visual experience does not provide access to the constituting nature of perceived colors, which are physical object colors, nevertheless, *introspection* does provide access to the constituting nature of mental colors, and it tells us that mental colors are color qualia.

Semi-Revelation is held by a version of dispositionalism proposing that physical object colors are dispositions of physical objects to produce visual experiences with color qualia. This dispositionalist view holds that while a description of the appearance of color does not capture the complex, dispositional nature of physical object color, it does capture the simple, monadic, and categorical nature of mental color.

I'll call the third claim *Non-Revelation*. Non-Revelation is neutral on the question of whether there are two kinds of color. It contends that however many kinds of color there are, neither visual experience nor introspection provides access to the constituting nature of color; in both cases colors are structurally complex, and a description of the appearance of color, as simple, monadic, and categorical, tells us nothing about this complexity. When a description is nonrevelatory about constituting natures, I'll say that it is *merely reference fixing*.¹²

Assuming that we describe the appearance of color as simple, monadic, and categorical, Revelation, Semi-Revelation, and Non-Revelation are the only revelation constraints. For either this description of the appearance is true of the constituting nature of color (as Revelation and Semi-Revelation claim), or colors are structurally complex, and the appearance tells us nothing about this complexity.¹³

I'll propose disjunctive physicalism, which embraces Non-Revelation.¹⁴ All physicalists must claim that ordinary experience provides no access to the constituting nature of physical object color. For they claim that physical object colors are properties such as reflectance properties, which are complex light-dispositional properties of objects' surfaces. However, the view I'm proposing accepts dispositionalism's claim that there are two kinds of color, namely, physical object color and mental color. Yet contrary to dispositionalism, this view holds that physical object colors are characterized as physical properties which exist independently of relations to visual experience. Furthermore, contrary to Semi-Revelation, it denies that introspection tells us that mental colors are color qualia.

According to disjunctive physicalism, a description of the appearance of color tells us nothing about the constituting nature of two ranges of colors, both of which turn out to be ranges of scientific properties. Physical object colors turn out to be experience-independent physical properties of physical objects, such as reflectance properties of surfaces, but also including physical properties of rainbows, flames, and the sky. Mental colors turn out to be properties of neural processes of our visual systems which encode physical object colors.

Moreover, properties of neural processes are never themselves experienced as being qualitative properties through perception or introspection. The qualitative properties we experience through perception or introspection of color—and have a simple, categorical, and monadic appearance—are always physical object colors. In this

respect my view is consistent with intentionalism, which claims that the qualitative properties of either perception or introspection of color just are (or are supervenient on) represented physical object colors.

It might seem off-base to charge color appearance's lack of structural complexity with deception. It is powerfully intuitive to think that we must take color appearance seriously, where 'taking it seriously' is construed to require that we dismiss this charge. Yet, by supposing a description of the appearance of color to be a specification of the constituting nature of color, we are led to the mystery of how a macroscopic, but nevertheless wholly structureless, range of properties relates to the complex properties of the physical world.

Perhaps we have to live with some mysteries, but we might not have to live with mysteries produced by controversial metaphysical proposals. In the case of the problem of the nature of color, if a characterization of the constituting nature of color places an intractable limit on our understanding of certain aspects of color (for example, how anything can instantiate color), then we're motivated to look for alternative characterizations. I'll propose such an alternative as well as a strategy that avoids such mysteries. By allowing that a description of the appearance of color is part of a description that is merely reference fixing, it is possible to take the appearance of color seriously, where 'taking it seriously' involves making salient its merely epistemic role (in part characterized in terms of the biological function of color vision). In this case, the constituting nature of color can have structural complexity, just as other macroscopic properties do.

I'll clear the way for disjunctive physicalism by arguing against Revelation and Semi-Revelation. My first target will be Revelation.

2. Against Revelation

First, I'll offer an argument that targets Revelation directly. Then, in section 2.2, I'll argue against versions of subjectivism consistent with Revelation, namely, versions holding that perceived colors are color qualia, on the basis of an argument against subjectivism in general. Thus, if the argument of section 2.2 is successful, we can eliminate even those versions of subjectivism which purport to reject Revelation, and conclude that perceived colors are properties of physical objects.

2.1. Directly against Revelation

The claim that ordinary visual experience reveals the nature of color might seem a matter of common sense, as McGinn contends (1996, pp. 541 & 545). However, the distinction between the constituting nature of color and a particular color's place in the qualitative ordering is crucial here. Although McGinn's claim is with respect to revelation of color's constituting nature (1996, pp. 538–544), it is only plausible with respect to a particular color's place in the qualitative ordering.

It might well be a bit of common sense that orange and red are more similar to each other than either is to green, and, more generally, that we can describe particular

colors in terms of their places in the qualitative ordering of colors. But, even if we take these descriptions to specify the essences of particular colors, they are distinct from a description of the constituting nature of color. Again, the description of orange in terms of its relative similarity to red and yellow leaves open whether the constituting nature the whole range of particular colors is simple or complex, monadic or relational, or categorical or dispositional. And in line with this distinction, it's commonplace to point out that ordinary experience doesn't tell us about constituting natures. Indeed, common sense offers no general view about the constituting nature of color—that is, no view which encompasses both afterimages and traffic cones—at all.

Moreover, there are theoretical grounds for rejecting Revelation. Assuming that we describe the appearance of color as simple, monadic, and categorical, Revelation claims that the constituting nature of color is wholly structureless. But then it is a mystery how this range of wholly structureless properties fits into the physical world. McGinn states, “to a certain type of metaphysical outlook [the irreducibility of colors to either mental or physical properties] makes colors seem mysteriously free-floating, other-worldly, *de trop*” (1996, p. 549). McGinn disparages this outlook as “unwarranted prejudice” (1996, p. 547). Yet, McGinn gives no reason to accept his purportedly enlightened metaphysics apart from the mere assumption of Revelation (1996, pp. 538, 542, & 549). If Revelation is true, though, colors really are mysteriously free-floating, for despite McGinn's claim that colors are instantiated by physical objects external to the mind, how a range of wholly structureless macroscopic properties could be instantiated by external physical objects—or by brains, as Boghossian and Velleman's (1989/1997) subjectivist view seems to claim—is a mystery.

McGinn, for example, claims that perceived colors are necessarily coextensive with complex properties of objects, namely dispositions of physical objects to produce color experiences (1996, pp. 544–547). But what could possibly explain this necessary coextension? McGinn denies that identity does, but he gives no alternative suggestion. While there is no mystery in how physical objects instantiate dispositions (assuming they are grounded in objects' physical properties), how they would instantiate wholly structureless macroscopic properties is obscure. And an appeal to an unexplained necessary coextension doesn't aid our understanding.

Furthermore, if, as a tack to avoid this problem of instantiation, one claims that perceived colors are not instantiated by anything, color *perception* becomes a mystery—as I'll explain in the next section.

2.2. Subjectivism and Color Perception

All versions of subjectivism claim that the world external to the mind is colorless. Thus, subjectivists owe us an account of color perception that does not involve a causal relation between perceivers and colors instantiated by physical objects external to the mind. However, I'll argue that no such account is plausible. (My approach to the plausibility of subjectivism from the standpoint of color perception has the virtue

of encompassing subjectivist theories whether they claim that perceived colors are instantiated or not.)

My argument focuses on the relation between perceived color and perceived *location*. We, of course, perceive colors as being at locations (for example, on the surfaces of particular objects). Thus, an account of color perception is required to include an account of how color is spatially located by vision. And, thus, we are led to the question: what is the nature of *perceived* location, a property which, parallel with perceived color, we attribute to the external world in virtue of perceptual experience? The possibilities are: external physical location or something distinct from external physical location. Either way, subjectivism renders color perception unintelligible.

One version of subjectivism which claims that perceived location is external physical location also claims that perceived colors are mental events instantiated by visual experience. (Boghossian & Velleman [1989/1997, pp. 94–96] seem to hold this version of subjectivism.) According to this view, these mental events, as perceived colors, become part of what is seen, that is, they are part of what is represented by visual experience. There is a sense in which we can see our mental events, since we have ways of imaging them (using fMRI, for example). But the view I'm considering proposes a specific sense in which we see mental events: in having a visual experience of a green road sign, the green is a mental event which is a part of the very experience in virtue of which we see the location of the road sign.

According to this version of subjectivism, classifying an external physical object by color category (such as green or orange) involves introspection rather than perception, for, by hypothesis, it involves classifying aspects of perceptual states themselves. So, on this view, classifying objects as green or orange is like classifying headaches as mild or severe; both cases involve introspection. (I'll assume for the sake of argument that pain is a mental property, although theories claiming that this property is a non-mental property of the body, in particular bodily damage, are currently popular.) And, since this view holds that perceived spatial properties are external physical properties, classifying an external physical object by spatial categories is different from both color and pain classifications; it doesn't involve introspection, but rather perception.

As a result, this view holds that classifying a highway sign as being a dark green rectangle involves simultaneously perceiving spatial properties in virtue of a visual state, and introspecting colors of this same state. It isn't clear whether we in fact can simultaneously perceive in virtue of and introspect the same state. (Even on a Dretskean theory of introspection as displaced perception, according to which we introspect a perceptual state by way of employing it in perception [Dretske, 1995, p. 40], it isn't clear that we can *simultaneously* perceive in virtue of and introspect the same state. For, even on this view introspection doesn't involve focusing on perceived properties—that would *simply* be perceiving. Rather, it involves employing perceived properties to classify a mental state. But classifying a mental state requires focusing on the mental state, and in particular on Dretske's view, it requires a variety of focusing that is not perceptual [1995, pp. 42–44 & 62–63].) Yet even if we can

simultaneously perceive in virtue of and introspect the same state, it would be difficult. But classifying a highway sign as being a dark green rectangle is not difficult.

This subjectivist might reply that classifying a mild pain in a certain location on a finger as a mild pain in that location would also involve simultaneously perceiving spatial properties and introspecting a mental property. And since there's no difficulty involved in doing this, there really is no problem with this sort of case generally. However, if one classifies a pain by location and severity, it's plausible that the location in question would be that represented by a pain state. In this case, classifying a pain (at least through touch) involves introspection for both location and severity. (The location of a pain might also be seen, but this visual state isn't the same state in virtue of which the severity of pain is felt.)

Moreover, this problem with perceiving in virtue of and introspecting the same state shows that insofar as this subjectivist view's proposed characterization of visual experience *seems* plausible, this plausibility rests on conflating perception and introspection. For consider: this characterization of visual experience takes perceived colors—the colors attributed to physical objects—to be mental events. Taken *as perceived*, there seems to be no problem regarding simultaneously perceiving them along with perceived spatial properties; we simply assume the simultaneous perception of colors and spatial properties. Nevertheless, since perceived colors are by hypothesis mental events, they are classified by color category through introspection rather than perception. Thus, this subjectivist characterization of visual experience inadvertently takes perceived colors to be simultaneously related to two separate kinds of mental relation, both perception and introspection, with the result that perceived colors are not coherently characterized as mental related at all. But then this version of subjectivism fails to give a coherent account of color perception.

Another version of subjectivism claims that perceived location is external physical location, but holds that colors are not instantiated by anything (for example, Pautz, unpublished manuscript). But this view also makes color perception unintelligible. Subjectivists can accept a notion of correctness with respect to classifying perceived objects by color category (Boghossian & Velleman, 1989, pp. 99–101). In fact, subjectivists require a notion of correctness to make sense of our ability to communicate about colors.

But if we did not come into contact with instances of perceived colors, there would be no mechanism by which our classifications of perceived objects by color category would be systematic enough for the idea of correctness to even get a grip. And we would not come into contact with instances of these properties if they were uninstantiated.¹⁵

A proponent of this version of subjectivism might reply that we correctly classify perceived objects by color category in virtue of certain properties of neural events. Nevertheless, an appeal to properties of neural events just pushes the problem back a step: how is it that we correctly classify perceived objects by color category in virtue of properties of neural events? It is exactly here—in this relation between properties of neural events and perceived colors—that it seems we need to come in contact with instances of perceived colors in order to explain how we (in virtue of certain

properties of certain neural events) correctly classify perceived objects by color category. Color perception remains unintelligible.

A version of subjectivism which holds that perceived location is *separate* from external physical location also leads us to mystery. McGilvray (1994), who claims that perceived colors are neural events, offers the most worked out current version of this sort of subjectivist view. He claims that perceived spatial properties are neural events which encode external physical spatial properties, and that these neural events, along with the neural events identified with perceived colors, are a display (McGilvray, 1994, pp. 211–212 & 216–218). The idea of a display is phenomenologically compelling, but I'll show that its spatial properties inadvertently invoke a mental space not identifiable with physical spatial properties.

McGilvray's view is that the spatial properties of this display are not identifiable with external physical spatial properties. However, they are not plausibly identifiable with the physical spatial properties of neural events either (Clark, 2000, p. 99). Instead, McGilvray's proposal seems to be that our undergoings of certain neural events are, from the first-person perspective, perceived locations (1994, pp. 211–213). In that case, though, he introduces a first-person aspect of undergoing neural events which, in order to avoid the implausibility of identifying perceived locations with physical spatial properties of neural events, invokes a mental space not identifiable with physical spatial properties at all.

But assuming that there is a causal relation between neural events and perceived locations, how are we to understand this causal relation if perceived locations are in an altogether distinct mental space? As Kim argues (2005, chapter 3, especially pp. 81–82), a physical spatial framework is necessary for understanding causality. Since an altogether distinct mental space has no place in this framework, this causal relation is mysterious, and, again, color perception becomes a mystery.

The argument of this section has shown that subjectivism's characterization of the constituting nature of color makes color perception unintelligible. Thus, if the subjectivist rejects Revelation and holds that colors are structurally complex, or even claims that colors are not instantiated by anything, still, mysteries persist with respect to color perception. And, again, if a controversial proposal about the metaphysics of perceived color places an intractable limit on our understanding of certain aspects of color, we are motivated to look for alternatives. In section 4 I'll offer an alternative that avoids the mysteries resulting from both Revelation and subjectivism.

3. Against Semi-Revelation

I'll now argue against Semi-Revelation, according to which there are two kinds of color, and introspection reveals the constituting nature of mental color, telling us that mental colors are color qualia.

While a version of dispositionalism holds Semi-Revelation, I'll argue directly against Semi-Revelation by denying that visual experiences have color qualia (but see section 4.4 for a general argument against relational views, of which dispositionalism

is a type). I'll argue that while visual experiences have mental colors, we should not characterize mental colors as color qualia, that is, as simple, monadic, categorical properties that are what it's like to be conscious of color, but rather as properties of neural processes.¹⁶

Those who characterize mental colors as being qualia advocate the anti-reductionist intuition—the intuition that the appearance of (in this context, mental) color cannot mislead about its constituting nature.¹⁷ Indeed, qualia proponents are right to emphasize the description of the appearance of color as simple, monadic, and categorical. And if physical object colors don't fit this description, surely, it seems, mental colors must. A reason for urging the anti-reductionist intuition is that it takes the appearance of color seriously and qualia opponents apparently don't. Furthermore, because Semi-Revelation claims that perceived colors, that is, the colors we attribute to physical objects, are physical object colors, it avoids the problems regarding perception posed for subjectivism.

Yet, if mental colors are structureless, then how they fit into the physical world is as mysterious as how Revelation's structureless perceived colors do. Since both proponents of Semi-Revelation and Revelation accept wholly structureless colors, they are in exactly the same position on this point.

Moreover, there is an alternative. Qualia opponents are able to address the point that the appearance of color cannot be described in relational terms by distinguishing between a description of the *appearance* of color and a description of *visual experience* of color (that is, a certain sort of *perceptual state*). Qualia opponents can accept the description of the appearance of color as simple, monadic, and categorical, but also put this description in a broader context as part of a description of visual experience.

And since visual experience is a perceptual state, we can describe *it* in relational terms. We can describe it in terms of a causal relation between perceivers and objects perceived, a relation that involves physical properties of objects and viewing conditions as well as properties of neural processes of perceivers' visual systems.

Thus, we can accept the qualia proponent's emphasis on the description of the appearance of color but fasten on an alternative relation between the appearance and constituting nature color—an alternative which both takes this description of the appearance seriously by making salient its merely epistemic role (which I'll endeavor to do throughout section 4) and avoids the mystery of how qualia fit into the physical world. The proposal that I'll offer is that a merely reference-fixing description of visual experience of color can be used to pick out physical object color. Moreover, we fix the reference of terms for both of the two ranges of color, physical object color and mental color, by a description of the causal relation between perceivers and objects which characterizes visual experience. Physical object colors are physical properties of physical objects which serve as one relatum; mental colors are properties of neural processes that encode the physical object colors and serve as another relatum.

While there are many proposals compatible with Non-Revelation, I'll propose and defend disjunctive physicalism as a plausible account of perceived color consistent with its metaphysical reduction.

4. A Defense of Disjunctive Physicalism

First, I'll describe disjunctive physicalism more fully, giving reasons for accepting disjunctive physical object colors as well as for accepting mental colors. In the context of elaborating the view, I'll address the issue of the qualitative ordering of particular colors as well as the issue of identifying particular colors with particular physical properties. Then, in section 4.4, I'll argue against relationalist views compatible with Non-Revelation.

4.1. Disjunctive Physicalism

It is well known that a variety of the microphysical mechanisms (many involving electron transitions among shells) underlie the colors of physical surfaces, rainbows, and flames (Nassau, 1980/1997). As it turns out, different mechanisms can ground (for example) a particular reflectance property. And additional mechanisms underlie the colors of rainbows and flames. This shows that physical orange has no unifying description in terms of non-disjunctive microphysical predicates. From the standpoint of microphysical properties, physical orange is an indefinitely large disjunction.

Furthermore, due to metamerism, different reflectance properties can look the same color to a perceiver in given viewing conditions. Even from the standpoint of reflectance properties, physical orange is an indefinitely large disjunction.¹⁸ There seems to be no standpoint from which we can understand particular physical colors to be physical kinds (that is, kinds referred to by non-disjunctive predicates of physics).

Why think that colors are physical properties if they are not physical kinds? Metamerism itself gives us a suggestion.

Metamerism is a result of our visual systems. Evolutionary pressures have driven the development of visual systems which, rather than being detectors of physical kinds, identify physically disjunctive colors. These disjunctive properties have biological relevance because they facilitate, for example, discrimination of objects against backgrounds, and recognition of object type and the (for example, edible) state of the object. (This account of the biological function of color vision is controversial but well supported by Hatfield, 1992, pp. 496–501, 2003, pp. 192–195; Thompson, 1995, pp. 175 & 195–198. For an alternative view, see Byrne & Hilbert, 2003a, pp. 15–16; Dretske, 1995, pp. 88–93; Hilbert, 1992.) If this account of the biological function of color vision is right, then it's not surprising that particular physical object colors, such as physical orange, are not physical kinds.

Against disjunctive physicalism, some would balk at disjunctive properties, pointing to the property referred to by the predicate 'is a raven or a writing desk' as an example. The objection is that such artificial properties are unacceptable. However, the property referred to by 'is a raven or a writing desk' is a misleading example with respect to disjunctive physical object colors. Disjunctive physical object colors are no more artificial than the evolutionary pressures that developed systems

permitting us to perceptually access them. Again, considering these pressures, it's unsurprising that physical orange is not a physical kind.

However, another objection holds that disjunctive properties cannot figure in causal laws, undermining their status as legitimate properties whatever the case might be with respect to artificiality. Yet Antony (2003) and Clapp (2001) offer similar arguments for the claim that a disjunctive property such as orange can figure in causal laws (or, more accurately, that a term such as 'orange' is co-extensive with a disjunctive physical predicate, and this disjunctive physical predicate picks out a property that can figure in causal laws). They distinguish disjunctive predicates referring to artificial properties (that is, predicates of the 'is a raven or writing desk' sort) from disjunctive predicates referring to legitimate properties; in the case of legitimate properties, the disjunctive predicate refers to a set of causal powers which are overlapping amongst the disjuncts and which are distinctive of the disjunction. Consequently, legitimate disjunctive predicates do not refer to the total causal powers of any disjunct, but rather this overlapping and distinctive subset of causal powers (Antony, 2003, pp. 9–18; Clapp, 2001, pp. 126–131). The issues here are controversial, but it might well be that at least some disjunctive properties can figure in causal laws.

If evolutionary pressures had not developed our visual systems so that we could access physical object colors such as physical orange through visual experience, they would have escaped our notice. But this is a strictly epistemological point. As I'll argue in the next section, our conscious experience does not metaphysically endow otherwise non-qualitative properties of physical objects with qualitiveness.

4.2. *The Qualitative Ordering*

I'll describe qualitative properties as follows:

A range of properties is a range of *qualitative properties* if and only if members of the range can be ordered into an N -dimensional space in which the ordering is owing to relative similarity amongst phenomenally simple properties.¹⁹

According to this description, qualitiveness is a matter of being orderable in terms of relative similarity; in turn, relative similarity can be understood in terms of relative closeness along a continuous span of properties where properties that are sufficiently close are indiscriminable, even though properties farther apart are discriminable.²⁰ When properties are orderable in this way, the ordering is a psychological quality space, for example, the psychological color space.

This description allows that *mental* colors (which are properties instantiated by visual experience) are qualitative—even though (as I claim) they are never experienced as being qualitative properties through perception or introspection. Instead, mental colors are orderable by way of an inference from an ordering among properties which we do experience as being qualitative, namely perceived colors (that is, the properties we attribute to physical objects).²¹ In particular, mental colors are orderable by way of a causal inference of the sort made by the opponent

process theory. Consequently, both mental colors and perceived colors (which on my view are physical object colors) are ordered according to the color space.²²

Moreover, considering that mental colors provide us with perceptual access to properties which facilitate discrimination and recognition of objects, they have evolutionary value. Consequently, the mirroring of mental colors and perceived colors (which on my view are physical object colors) can be explained by the evolution of mental qualitative properties to provide us with perceptual access to the physical qualitative properties.

In addition, this description of qualitateness helps explain how it is that physical object colors are qualitative even though the qualitative ordering amongst physical object colors is not describable in non-disjunctive physical terms. According to this description, qualitateness is a matter of being orderable in terms of relative similarity. But an ordering among physical object colors in these terms is what obtains when our visual systems filter out a great deal of physical information. (For a brief discussion of this filtering process, see Hardin, 1990, p. 556.) Since this mental filtering operates on a biological level, we have no way of stating this ordering in terms natural to physics.²³ (This description of color perception as filtering out physical information, but, nevertheless, accessing physical properties is broadly similar to the view about color perception called selectionism [see Hilbert & Kalderon, 2000 and Kalderon, 2007].) The charge that physicalism must be able to state the qualitative ordering in terms natural to physics (for example, see Hardin, 1993, p. 66) seems to rest on the assumption that disjunctive properties are (always) illegitimate. But, as I've argued, this assumption is mistaken.

The proposed description of qualitateness avoids defining it in terms of conscious experience of qualitateness. (For an extended description and defense of a characterization of qualitateness along these lines, see Rosenthal [2005]; he offers this characterization in order to characterize consciousness independently of qualitateness.) While this strategy might seem off track, I justify it by pointing out that psychophysics has established a framework for identifying qualitative properties through inference. Indeed, within this framework, by using techniques such as multidimensional scaling, we can identify qualitative properties perceived by non-human creatures, where no assumption need be made that the creature has conscious experience of qualitateness. (In this context, relative similarity is tested through stimulus generalization; for more discussion of this, see Ross [2008].)

Furthermore, by freeing us from the idea that our conscious experience endows otherwise non-qualitative properties with qualitateness, this description allows us to consider that, rather than qualitateness, what our conscious experience introduces is the appearance of color as simple, monadic, and categorical. And it is the introduction of *this* illusory appearance which has made reduction of perceived color so difficult to accept. Armstrong (1981, pp. 30–31, 1993, p. 281) has made this point, but its force is strengthened by the distinction that I've drawn between the constituting nature of the whole range of particular colors and a particular color's position in the qualitative ordering. While conscious experience introduces an

illusory appearance with respect to constituting nature, the qualitative ordering exists independently of conscious experience.

Considering this illusory appearance we can address a common—and fundamental—objection to physicalism. This complaint is that though physicalism purports to give an account of perceived color, it changes the subject to the non-qualitative physical causes of color experience. Color—with its characteristic simplicity, monadicity, and categoricity—is simply nothing like a physical property. But this complaint conflates the constituting nature of color and the simple, monadic, and categorical appearance of color, which is in fact *misleading* about its constituting nature: while it tells us nothing about its constituting nature, we are easily made to think that it tells us so much as to rule out reduction.

4.3. *Determinate Physical Object Colors*

Next, I'll propose how we can use descriptions of visual experience which are merely reference fixing to identify particular colors with particular physical properties. In this context, I'll address two objections to physicalism: the problem of characterizing the type of visual experience to employ in fixing the reference of color terms, and the problem of individual differences in color perception.

Visual experience of color is characterized in terms of perceptual circumstances, in particular, perceiver and viewing conditions. Thus the form of a reference-fixing description used to pick out physical orange is:

the property attributed to physical objects in virtue of their having a simple, monadic, categorical orange appearance in illumination I with surround S and angular size A to perceiver type P .²⁴

(The reference-fixing description used to pick out mental orange replaces 'the property attributed to objects in virtue of their having' with 'the property of encoding.')

Yet things can have an orange appearance in all sorts of perceptual circumstances where we vary perceiver or viewing conditions. In order to distinguish cases where we would say that a visual experience of an orange appearance is veridical from cases where we would say it is illusory, we need to nail down reference relative to some limited perceivers and viewing conditions.

I propose to nail down the semantics of our ordinary color terms (for example, 'orange') by way of a reference-fixing description of visual experiences of standard perceivers in standard viewing conditions. Thus, the reference-fixing description used to pick out physical orange is:

the property attributed to physical objects in virtue of their having a simple, monadic, categorical orange appearance in standard illumination with a surround and angular size which is standard for the viewing of the colors of objects for standard perceivers.

(This proposal for identifying referents for ordinary color terms is similar to Smart's [1975/1997] proposal, also adopted by Armstrong [1987/1997, pp. 39–44].)

But which viewing conditions and perceivers are standard? I propose that the specification of standards be justified in terms of their usefulness in promoting communication about objects through application of ordinary color terms. Thus, as Lewis (1997, p. 327) points out, this specification encompasses a range of perceptual circumstances in which people usually find themselves. Accordingly, standard viewing conditions include, for example, a range of illumination (sunlight and ordinary incandescent light are examples) and a range of angular sizes in the visual field. Pragmatically justified standard perceivers are human trichromats with normally functioning cones (and not dichromats or so-called anomalous trichromats whose cones don't function normally).

Since the reference-fixing description is given in terms of human trichromats rather than human dichromats, what is the status of the color attributions made by human dichromats? Are their color attributions systematically false? No: for reasons having to do with promoting communication about colors among the greater human population, human dichromats, for example those whose cones function such that red and green cannot be distinguished by hue, defer to trichromats' color terms, and typically apply them correctly (due to cues for object hue). Moreover, even if human dichromats were to devise alternative color terms which more closely spoke to the color discriminations that they make, these alternative color terms would still refer to disjunctive physical properties, although different ones.

And this point can be extended to non-human color perceivers. While my reference-fixing description is anthropocentric, this anthropocentrism is justified in terms of promoting communication about objects amongst human beings, and, in any event, anthropocentrism makes no difference with regard to the constituting nature of the color properties attributed.

But, it might be objected, take a situation where a human trichromat and an avian tetrachromat visually attribute different colors to the same caterpillar. Whose attribution is right? From the standpoint of linguistic attribution, we have no color terms which refer to the colors visually attributed by the bird. But we could devise alternative color terms which better capture the color discriminations that the bird makes. In this case, ordinary color terms and these alternative color terms refer to different sets of disjunctive physical properties, and both the human trichromat and the avian tetrachromat are right relative to the color terms tailored to the creature's discriminatory abilities. Furthermore, if Antony's (2003) and Clapp's (2001) characterization of disjunctive properties is on target, there is no problem with a caterpillar having the combination of disjunctive physical properties attributed. For each disjunctive physical property would be a distinctive subset of the causal powers of the caterpillar's surface properties, differentiated, for example, by its accessibility to human color vision. (For a similar view, but which focuses on perceptual rather than linguistic attribution, see Bradley & Tye, 2001, pp. 486–487.)

Specifying standard conditions as a range of typical perceptual circumstances does have the result that a range of shades, and not a single shade, of (for example) orange is picked out. But our ordinary color term 'orange' is imprecise enough to allow this. In fact, the vagueness, as well as the typicality, of standard conditions is crucial from

the standpoint of promoting communication about objects through ordinary color terms.

Moreover, it's plausible that pragmatically justified standards track an aspect of reality (and so the reference of color terms isn't merely a matter of arbitrary linguistic convention), since the best explanation of the usefulness of standards to promote communication about objects is that standards tune us into an aspect of reality.²⁵

I'm not proposing that a pragmatic justification of standards plays a role in determining the content of visual representation of color—that is, the color physical objects look. Instead, a pragmatic justification of standards plays a role in determining the reference of color terms.²⁶ And different standards (for example, more precise ones taken up in a psychophysics lab) wouldn't change the colors that things look; they would only change the circumstances where we say that things are the colors they look.

Currently, however, the most common way of addressing the problem of the constituting nature of particular colors is from the vantage point of the reference of visual, not linguistic, representation of color. But the linguistic approach offers the following contribution: the judgments we make in applying ordinary color terms incorporate a great deal of background knowledge (for a classic statement of this point, see Sellars, 1956/1997, pp. 43–45 & 75–77). Part of this background knowledge is recognition of the conditions in which we say objects are the colors that they look; these are standard conditions. Since these standards are pragmatically justified, and assuming pragmatic justifications track an aspect of reality, the linguistic approach gives us a method for identifying particular colors with particular properties.

Yet, visual representation is more precise than ordinary color language. And now consider the problem of individual differences. The problem is: psychophysical findings show it's common for different standard perceivers to see the same physical stimulus in the same viewing conditions as slightly different determinate colors. For example, one person might see the stimulus as bluish green and another might see it as what's called unique green, that is, a green that's not at all bluish or yellowish. Moreover, different individual's visual representations of fully determinate colors vary so greatly that interpersonal agreement in representation exists for only small segments of the standard human color perceiver population (Hurvich, 1981, pp. 222–223).

It seems that physicalism must adjudicate the question of who are the veridical perceivers of unique green in terms of physics. And it might seem awkward for the physicalist to be forced in this direction, for, as Byrne and Hilbert (2003a, p. 17) indicate, there's no reason in terms of physics to choose any particular property as the referent for the determinate unique green. But, again, this should be unsurprising considering the evolutionary pressures on the visual system to access properties of biological relevance rather than physical properties *per se*.

Byrne and Hilbert's physicalist solution is to claim that some human color perceivers are veridical perceivers of unique green, but (so far as we know) it is unknowable who the veridical perceivers are and which physical property is unique green (2003a, p. 21). I think this solution is correct.²⁷ For an epistemic mystery to be

palatable, however, it's important to show that it doesn't have its source in a controversial metaphysical proposal, namely physicalism, but rather in a general feature of the epistemology of color. While Byrne and Hilbert don't show that this is the case for unique green, I think that it's possible to show. Thus, I'll try to support their solution by showing that the epistemic mystery they point out has an epistemic source.

One thing that we do know is that there are explanations for the variability of perceived colors. Quite a few of the variables which affect perceived color, and the most obvious ones, involve features of viewing conditions. The example of unique green is interesting because it demonstrates that even among standard perceivers there are additional variables having to do with relatively subtle differences in individual visual systems (for example, the absorption spectra of their cones [Hurvich, 1981, pp. 222–223 & 229–230]). Byrne and Hilbert (2003a, p. 17) point out that when we consider highly determinate object shapes, there are similarly subtle differences in individual visual systems which render individual differences in shape perception. Yet with shape there's no epistemic mystery as to who the veridical perceivers are. So how are the cases of unique green and highly determinate shape different?

The appearance of shape has a component structure—it can be described in terms of the relations among component parts—and the appearance of color doesn't. As a result, for the appearance of shape we can set up a structural ideal, and compare individuals' perceptions against ideal relations among component parts (where ideal relations include, for example, an exact right angle). By contrast, since color appearance is simple, monadic, and categorical, there's no structural ideal against which we can compare individuals' perception of unique green. The simple, monadic, categorical appearance of physical color gives us no components to work with at all.²⁸

But if the overall argument I've presented is along the right lines, the appearance of color as simple, monadic, and categorical is misleading about the complex constituting nature of color—it is just an epistemic illusion introduced by our visual systems. Consequently, the epistemic mystery associated with unique green does have its source in a general feature of the epistemology of color—that the appearance of color is simple, monadic, and categorical—rather than the physicalist's metaphysical proposal about perceived colors. (Note that I haven't claimed that I have removed the epistemic mystery. Rather I've shown that the epistemic mystery doesn't conclusively settle the matter against physicalism.)

4.4. A Defense Against Relational Alternatives

Relational views are views which hold that perceived colors are relations between physical properties of objects and visual experience (for example, dispositionalism, or functionalism). (See Cohen [2003] for a proposal of functionalism, according to which colors are whatever properties dispose objects to produce color experiences. By contrast with dispositionalism, functionalism holds that colors are properties that

play the functional role of being disposed to produce color experiences, not dispositions.) Views of this sort which reject qualia offer interesting alternatives to physicalism.

According to these relational views, experience doesn't reveal the constituting nature of the color (either mental or physical); nevertheless, physical object color is always characterized in terms of color experience. Thus the claim is that the orange we attribute to physical objects is a disposition of objects (or, according to functionalism, whatever property disposes objects) to produce visual experiences of orange. Relational views in effect tether orange to the appearance of orange in visual experience.²⁹

This might seem to be a satisfying result. Cohen points out: "if [the physicalist's] appeal to disjunctions is to effect a principled, rather than *ad hoc*, grouping... we need to explain why the various disjuncts are all gathered together into the type identified with [orange]" (2003, p. 30). The relationalist offers this explanation in terms of being tethered to visual experience of orange.

However, the objection here seems to be that disjunctive physical object colors are artificial (like the property referred to by 'is a raven or a writing desk'). Again, they are no more artificial than the evolutionary pressures that gave rise to systems that allow us to perceptually access them.

Moreover, a version of relationalism which aims at metaphysical reduction of perceived color, can't characterize visual experience of orange in terms of physical orange; for it characterizes physical orange in terms of visual experience of orange, and this circularity would block reduction.³⁰ If a relationalist attempts to break out of this circularity through using a reference-fixing description to pick out properties of visual experience, it becomes unclear why we shouldn't likewise use a reference-fixing description to pick out physical object color.

And, of course, an anti-reductionist version of relationalism will not provide a characterization of the constituting nature of color in non-qualitative terms. But then the constituting nature of color is left as primitive, and how color fits into the physical world remains an intractable mystery.

Alternatively, we can employ the reference-fixing strategy. In this case, although color appearance has an epistemic role in picking out physical object color, once physical object color is picked out, it can be identified independently of its relations to visual experience and the constituting nature of color becomes nonmysterious.

I've appealed to the idea of avoiding mystery many times. One might retort: assuming that perceived orange *is* a physical property, still, it's a mystery how an object's having *any* physical property explains its having the simple, monadic, categorical appearance of orange. (As Kalderon [2007, section 8] points out, the problem, closely related to Levine's problem of the explanatory gap, is Sellars's problem of the manifest.) Doesn't a reductionist proposal about the constituting nature of color, such as physicalism, serve to produce *this* mystery?

But whether one considers this mystery to be intractable depends on one's view about the relation between the metaphysics and epistemology of color. If one already assumes that a description of the simple, monadic, categorical appearance of color

specifies its constituting nature, then this mystery *will* seem intractable. However, we can break the grip of this powerful intuition about the way the metaphysics and epistemology of color relate. If—and only if—it is broken, the question of how physical properties have a simple, monadic, categorical appearance will take its place as among the most intriguing and difficult, but tractable, questions of perceptual psychology.

Acknowledgements

I am grateful to David Rosenthal, Larry Hardin, Jonathan Cohen, Richard Gray, Amy Kind, Eric Schwitzgebel, and two anonymous reviewers for comments on early or late versions and large or small portions of this paper.

Notes

- [1] Physicalism is held in different forms by, for example, Byrne and Hilbert (1997b, 2003a), Hilbert (1987), Lewis (1997), and Smart (1975/1997).
- [2] Dispositionalism has been proposed by, for example, Johnston (1992/1997).
- [3] Subjectivism is proposed in different versions by, for example, Boghossian and Velleman (1989/1997), Hardin (1993), and McGilvray (1994). A terminological point: what I am calling subjectivism often goes by the term ‘eliminativism’. I prefer the label ‘subjectivism’ in order to avoid a purely negative label for this view, which, after all, must show us that the claim that the external world is colorless can be combined with a plausible positive account of color perception.
- [4] Proponents include McGinn (1996). Primitivism also has eliminativist versions, which I would categorize as versions of anti-reductive subjectivism. For a helpful discussion of primitivist views, see Byrne and Hilbert (2007).
- [5] As will become clear, the reduction I’m proposing is not that a particular perceived color such as perceived orange is a physical natural kind, but merely that it be physically realized in all of its instances.
- [6] For further description of the psychological color space, see Clark (1993, pp. 119–122).
- [7] For a description of the appearance of color as simple, also see Armstrong (1993, p. 281). Texture, by contrast, has spatial complexity which can be identified by either sight or touch (Warren & Rossano, 1991, pp. 120–121 & 129–132).
- [8] Boghossian and Velleman (1989/1997) and McGinn (1996) stress these points about a description of the appearance of color.
- [9] However, Revelation leaves it open that there are other aspects of the constituting nature of color which aren’t specified by the appearance of color—such as whether colors are mental or sui generis.
- [10] Byrne and Hilbert (2007, pp. 76–77), also make this point. However, Johnson only endorses the idea that we have access to supposed essences of particular colors, and so only endorses a “qualified form of Revelation” (1992/1997, p. 167).
- [11] This is a metaphysically loaded meaning of ‘qualia’, according to which qualia are physically irreducible properties that are what it’s like to be conscious of color. Another common use of the term ‘qualia’ is to describe them in terms of what it’s like to be conscious of qualitative properties but reject the metaphysical conclusion that they are simple, monadic, and categorical. This non-metaphysical way of characterizing qualia would reject Revelation (and Semi-Revelation, described below).

- [12] I am using the expression ‘merely reference fixing description’ specifically for descriptions which pick out referents without specifying constituting natures; indeed, as I’ll argue, these descriptions pick out referents while being misleading about constituting natures.
- [13] Another possibility is that color does not exist—that is, it is not instantiated by anything at all—and so has no constituting nature. I’ll consider this view in the section 2.2.
- [14] Thus I embrace what is called an error theory in the sense that the appearance of color is misleading with regard to the constituting nature of color. However, I do not embrace an error theory in the sense that perception is systematically erroneous in representing colors as properties of physical objects. (See Ross, 1999, pp. 240–242, for more discussion of different meanings of ‘error theory’.)
- [15] Chalmers, who Byrne and Hilbert (2007, p. 80) classify as ‘sympathizing’ with the claim that colors are not instantiated by anything, admits that “if perfect redness is never instantiated in our world, then we have never had contact with any instances with it” (Chalmers, 2006, p. 83). (Perfect redness is a simple, monadic, categorical property [Chalmers, 2006, p. 66]. Chalmers imagines an ‘edenic’ world in which perception reveals the ‘intrinsic nature’ of things without causal mediation. The ‘intrinsic nature’ of colors seems to combine the constituting nature of color and the places of particular colors in qualitative ordering. But, distinguishing these, if we can deny that perception reveals the constituting nature of color, then supposing that we can classify objects by color category without causal mediation might be idle.)
- [16] One might object that there can be a level of description according to which properties of neural processes are described as simple, monadic, and categorical. To the contrary, however, assuming that introspection tells us that mental colors are simple, monadic, and categorical, Semi-Revelation claims that there is no level of description at which mental colors have structure. And in that case, they can’t be neural processes, since neural processes have physical structure.
- [17] Kripke seems to be a color physicalist who also accepts mental colors, and characterizes mental colors as color qualia (1972/1980, pp. 140, 152, & 128). Although Kripke doesn’t say much about color qualia, as Lewis (1995) points out, Kripke embraces the revelation intuition with respect to pain. As Stoljar (2009) discusses, interpretation of both Lewis and Kripke is a complicated matter. However, whatever else Lewis has in mind by what he terms the Identification Thesis (1995, p. 142) or the doctrine of revelation (1997, p. 338), he takes it to include the claim that experience reveals the structural aspect of constituting natures: “but if nothing essential about the qualia is hidden, then if they seem simple, they *are* simple” (1995, p. 142). And this particular claim about structure, i.e., that qualia are simple, monadic, and categorical, fits with Kripke’s anti-reductionism.
- [18] Although Churchland claims (2007, pp. 125–137 & 147–148) that there are idealized ways of describing commonsense colors such as perceived orange in non-disjunctive physical terms, he admits that few objects satisfy such idealized descriptions (2007, p. 141). Ultimately, he rejects commonsense colors altogether (Churchland, 2007, pp. 140–144). However, he never considers holding that commonsense colors are disjunctive properties, which I’ll argue is an acceptable alternative.
- [19] By contrast with Clark (2000, p. 2), I am using the term ‘qualitative property’ in a general sense which encompasses any properties, of the mind or of external objects, which can be ordered into a psychological quality space. The qualification that similarities be amongst phenomenally simple properties avoids counting relative similarities amongst, for example, cars, as orderable into psychological spaces, and thus counting carhood as a qualitative property.
- [20] For a discussion of relative similarity, see Clark (1993, pp. 79, 91–94, & 117–119).
- [21] For a discussion of mental colors as properties inferred from perceived colors, see Clark (2000, pp. 8–10).

- [22] For a classic proposal of two mirroring ranges of color properties, see Sellars (1956/1997, pp. 110–112, 1963/1991, pp. 418–419). Also see Rosenthal's (2005) for a development of Sellars's proposal.
- [23] Churchland (2007) disagrees with this point with respect to reflectance properties. However, I am including rainbows and flames as being physical orange.
- [24] For a more complete description of viewing conditions, see Clark (2000, p. 213).
- [25] For a recent expression of this common way of connecting utility and reality, and one which is relevant to disjunctive physical object colors, see Antony (2003, pp. 12–13). Also, there is empirical evidence that the reference of color terms in fact isn't merely a matter of arbitrary linguistic convention (Kay & Regier, 2006).
- [26] I wasn't clear about this distinction in Ross (2000), as Byrne and Hilbert (2003b, p. 792) rightly point out.
- [27] So I retract my disagreement in Ross (2003). In fact, as I should have seen, the sharp distinction physicalism draws between the metaphysics and epistemology of color strongly suggests this solution.
- [28] From the standpoint of Kalderon's (2007) helpful structuring of the debate into the problem of conflicting appearances (having to do with determining which, if any, qualitative property is truly attributed to an physical or mental entity) and Sellars's problem of the manifest (having to do with characterizing physical object colors in non-qualitative terms), this is a point at which the former gives rise to the latter.
- [29] Cohen is clear that for a property to be a color, it must be disposed to produce color experiences: "any property lacking this functional role, ipso facto, is not a color property" (2003, p. 29). Also see Cohen (2005, section 2.1).
- [30] Byrne and Hilbert (1997a, pp. xxi–xxii) make this point with respect to dispositionalism, but it applies to relationalist views generally.

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