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*Colour as a Secondary Quality*¹

PAUL A. BOGHOSSIAN AND
J. DAVID VELLEMAN

The Galilean Intuition

Does modern science imply, contrary to the testimony of our eyes, that grass is not green? Galileo thought it did:

Hence I think that these tastes, odors, colors, etc., on the side of the object in which they seem to exist, are nothing else than mere names, but hold their residence solely in the sensitive body; so that if the animal were removed, every such quality would be abolished and annihilated. Nevertheless, as soon as we have imposed names on them, particular and different from those of the other primary and real accidents, we induce ourselves to believe that they also exist just as truly and really as the latter.²

The question whether Galileo was right on this score is not really a question about the content of modern scientific theory: aside from some difficulties concerning the interpretation of quantum mechanics, we know what properties are attributed to objects by physics. The question is rather about the correct understanding of colour concepts as they figure in visual experience: how do objects appear to be, when they appear to be green? Galileo seems to have found it very natural to say that the property an object appears to have, when it appears to have a certain colour, is an intrinsic qualitative property which, as science teaches us, it does not in fact possess.

Subsequent philosophical theorizing about colour has tended to recoil from Galileo's semantic intuition and from its attendant ascription of massive error to ordinary experience and thought. Thus, in a recent paper Sydney Shoemaker has written:

[S]ince in fact we apply color predicates to physical objects and never to sensations, ideas, experiences, etc., the account of their semantics recommended by the Principle of Charity is one that makes them truly applicable to tomatoes and lemons rather than to sense experiences thereof.³

Should a principle of charity be applied in this way to the interpretation

¹ We have benefited from discussing the material in this paper with: Sydney Shoemaker, David Hills, Larry Sklar, Mark Johnston, and participants in a seminar that we taught at the University of Michigan in the fall of 1987. Our research has been supported by Rackham Faculty Fellowships from the University of Michigan.

² *Opere Complete di G. G.*, 15 vols, Firenze, 1842, IV, p. 333 (as translated by E. A. Burt in *The Metaphysical Foundations of Modern Science*, Doubleday, Garden City, NY, 1954, p. 85).

³ Sydney Shoemaker, 'Qualities and Qualia: What's In The Mind?' (manuscript), p. 2.

of the colour concepts exercised in visual experience? We think not. We shall argue, for one thing, that the grounds for applying a principle of charity are lacking in the case of colour concepts. More importantly, we shall argue that attempts at giving the experience of colour a charitable interpretation either fail to respect obvious features of that experience or fail to interpret it charitably, after all. Charity to visual experience is therefore no motive for resisting the natural, Galilean response to a scientific understanding of light and vision. The best interpretation of colour experience ends up convicting it of widespread and systematic error.⁴

Charitable Accounts of Colour Experience

According to the principle of charity, the properties that objects are seen as having, when they are seen as coloured, must be properties that they generally have when so perceived. Two familiar interpretations of visual experience satisfy this principle.

The physicalist account

The first of these interpretations begins with the assumption that what objects appear to have, when they look red, is the physical property that is normally detected or tracked by that experience. Since the physical property that normally causes an object to be seen as red is the property of having one out of a class of spectral-reflectance profiles—or one out of a class of molecular bases for such profiles—the upshot of the present interpretation is that seeing something as red is seeing it as reflecting

⁴ One might be tempted to dissolve the conflict between the Galilean view and the charitable view of colour experience by rejecting a presupposition that they share. Both sides of the conflict assume that the properties mentioned in our descriptions of visual experience are properties that such experience represents objects as having. The only disagreement is over the question whether the colour properties that are thus attributed to objects by visual experience are properties that the objects tend to have. One might claim, however, that visual experience does not attribute properties to objects at all; and one might bolster one's claim by appeal to a theory known as adverbialism. According to adverbialism, the experience of seeing a thing as red is an event modified by some adverbial property—say, a seeing event that proceeds red-thing-ly. Not all adherents of adverbialism are committed to denying that such an experience represents an object as having a property; but adverbialism would indeed be useful to one who wished to deny it. For adverbialism would enable one to say that the phrase 'seeing a thing as red' describes a seeing event as having some adverbial property rather than as having the content that something is red. One could therefore contend that the question whether things really have the colour properties that they are seen as having is simply ill-formed, since colour properties figure in a visual experience as adverbial modifications of the experience rather than as properties attributed by the experience to an object.

Our view is that this extreme version of adverbialism does unacceptable violence to the concept of visual experience. Seeing something as red is the sort of thing that can be illusory or veridical, hence the sort of thing that has truth-conditions, and hence the sort of thing that has content. The content of this experience is that the object in question is red; and so the experience represents an object as having a property, about which we can legitimately ask whether it is a property that objects so represented really tend to have.

incident light in one of such-and-such ways, or as having surface molecules with one of such-and-such electron configurations.⁵

Now, we have no doubt that experiences of an object as having a particular colour are normally correlated with that object's possessing one of a class of spectral-reflectance profiles. But to concede the existence of such a correlation is not yet to concede that membership in a spectral-reflectance class is the property that objects are seen as having when they are seen as having a particular colour. Indeed, the claim that visual experience has this content yields unacceptable consequences.

In particular, this claim implies that one cannot tell just by looking at two objects whether they appear to have the same or different colours. For according to the physicalist interpretation, which colour one sees an object as having depends on which spectral-reflectance class one's visual experience represents the object as belonging to; and which spectral-reflectance class one's experience represents an object as belonging to depends on which spectral-reflectance profiles normally cause experiences of that sort. Hence in order to know whether two objects appear to have the same colour, under the physicalist interpretation, one must know whether one's experiences of them are such as result from similar spectral-reflectance profiles. And the latter question cannot be settled on the basis of the visual experiences alone: it calls for considerable empirical enquiry. The physicalist interpretation therefore implies that knowing whether two objects appear to have the same colour requires knowing the results of empirical enquiry into the physical causes of visual experiences.

But surely, one can tell whether two objects appear similarly coloured on the basis of visual experience alone. To be sure, one's experience of the objects will not necessarily provide knowledge of the relation between their actual colours. But the physicalist account implies that visual experience of objects fails to provide epistemic access, not just to their actual colour similarities, but to their apparent colour similarities as well. And here the account must be mistaken. The apparent colours of objects can be compared without empirical enquiry into the physical causes of the objects' visual appearances; and so the properties that objects appear to have, when they appear coloured, cannot be identified with the physical properties that are detected or tracked by those appearances.

Dispositionalist accounts

We turn, then, to another class of theories that respect the principle of charity in application to colour experience. These theories are united

⁵ D. M. Armstrong, *A Materialist Theory of Mind*, Routledge & Kegan Paul, London, 1968; J. J. C. Smart, 'On Some Criticism of a Physicalist Theory of Colour', in *Philosophical Aspects of the Mind-Body Problem*, ed. Chung-yin-Chen, University of Hawaii, Honolulu, 1975 (as cited by Christopher Peacocke, 'Colour Concepts and Colour Experience', *Synthese*, 1984, pp. 365-81, n. 5).

under the name of dispositionalism. All of them are based, in one way or another, on the claim that the concept of colour is such as to yield a priori truths of the following form:

- (i) x is red if and only if x appears red under standard conditions.⁶

Different versions of dispositionalism interpret such biconditionals differently and apply them to the vindication of colour experience in different ways.

Applying the biconditionals: the direct approach

Perhaps the most direct way to argue from the dispositionalist biconditionals to the veridicality of colour experience is to point out that the biconditionals assert, as a priori truths, that there are conditions under which things appear to have a colour if and only if they actually have it, and hence that there are conditions under which colour experience is veridical. The possibility of global error in colour experience is thus claimed to be excluded a priori by the very concept of colour.

We think that this version of dispositionalism misappropriates whatever a priori truth there may be in the relevant biconditionals. We are prepared to admit that the concept of colour guarantees the existence of privileged conditions for viewing colours, conditions under which an observer's colour experiences or colour judgements are in some sense authoritative. But colour experiences and colour judgements may enjoy many different kinds of authority, some of which would not entail that objects have the properties that colour experience represents them as having.

Even philosophers who regard colour experience as globally false, for example, will nevertheless want to say that some colour experiences are correct in the sense that they yield the colour attributions that are generally accepted for the purposes of describing objects in public discourse. Of course, such a claim will yield slightly different biconditionals, of the following form:

- (ii) x is to be described as red if and only if x appears red under standard conditions.

Our point, however, is that (ii) may be the only biconditional that is strictly true, and that (i) may seem true only because it is mistaken for (ii). If biconditional (ii) expresses the only genuine a priori truth in the vicinity, then the authority of experiences produced under standard conditions may consist in no more than there being a convention of describing objects in terms of the colours attributed to them in such experiences. As we shall argue at the end of this paper, such a convention

⁶ The final clause of this biconditional is often formulated so as to specify not only standard conditions but a standard observer as well. But the observer's being standard can itself be treated as a condition of observation; and so the distinction between observer and conditions is unnecessary.

may be perfectly justifiable even if all colour experience is, strictly speaking, false. Hence the intuitive support for biconditionals like (i) may not be such as to ground a vindication of colour experience.

In order for the dispositionalist biconditionals to vindicate colour experience, they must mean, not just that convention dictates describing objects in terms of the colours that they appear to have under standard conditions, but also that objects actually have the properties that they thereby appear to have. And we see no reason for regarding this stronger claim as an a priori truth.

Applying the biconditionals as content-specifications

Another way of arguing from dispositionalist biconditionals to the veridicality of colour experience is to interpret the biconditionals as specifying the content of that experience. This argument proceeds as follows.

The first premiss of the argument says that the property that objects are represented as having when they look red is just this: a disposition to look red under standard conditions. The second premiss says that many objects are in fact disposed to look red under standard conditions, and that these are the objects that are generally seen as red. These premisses yield the conclusion that the experience of red is generally veridical, since it represents an object as having a disposition that it probably has—namely, a disposition to look red under standard conditions.

The first premiss of this argument corresponds to a biconditional of the following form:

- | | | | |
|---|----------------------------|-------|-------------------------|
| (iii) <i>Red</i> [i.e., the property that | objects are seen as having | = def | a disposition to appear |
| when they look red] | | | red under standard |
| | | | conditions |

The right side of biconditional (iii) can be interpreted in two different ways, however; and so there are two different versions of the associated argument.

Two versions of content-dispositionalism

The first version of the argument interprets the phrase ‘a disposition to look red’ on the assumption that the embedded phrase ‘to look red’ has its usual semantic structure. The entire phrase is therefore taken to mean ‘a disposition to give the visual appearance of being red’.⁷ The second

⁷ See John McDowell, ‘Values and Secondary Qualities’, in *Morality and Objectivity; a Tribute to J. L. Mackie*, ed. Ted Honderich, Routledge & Kegan Paul, London, 1985, pp. 110–29; David Wiggins, ‘A Sensible Subjectivism?’, in *Needs, Values, Truth*, Basil Blackwell, Oxford, 1987, pp. 185–214, p. 189; Gareth Evans, ‘Things Without the Mind—A Commentary Upon Chapter Two of Strawson’s *Individuals*’, in *Philosophical Subjects; Essays Presented to P. F. Strawson*, ed. Zak van Straaten, Clarendon Press, Oxford, 1980, pp. 76–116, see pp. 94–100, esp. n. 30.

Wiggins and McDowell favour a similar strategy for vindicating our perceptions of other qualities such as the comic and perhaps even the good. See McDowell’s Lindley Lecture, ‘Projection and Truth in Ethics’.

version interprets the phrase on the assumption that ‘to look red’ has a somewhat unusual structure. The predicate following ‘look’ is interpreted as expressing, not a property that a thing is disposed to give the appearance of having, but rather an intrinsic property of the visual appearance that it is disposed to give. The phrase ‘a disposition to look red’ is therefore taken to mean something like ‘a disposition to cause reddish visual appearances’.⁸

Under these two interpretations, (iii) assigns two different contents to colour experience. Under one interpretation, the property that things are seen as having when they look red is defined as a disposition to give the visual appearance of being red; under the other, the property that things are seen as having is defined as a disposition to cause reddish visual appearances. In either case, the content of colour experience is claimed to be true, on the grounds that objects seen as red do have the appropriate disposition.

We regard both versions of the argument as faulty. In the next section, we shall raise an objection that militates against both versions equally. In subsequent sections, we shall consider each version in its own right.

A general problem in content-dispositionalism

Both versions of the present argument are to be faulted, in our opinion, for misdescribing the experience of colour. In assigning colour experience a dispositionalist content, they get the content of that experience wrong.

When one enters a dark room and switches on a light, the colours of surrounding objects look as if they have been revealed, not as if they have been activated. That is, the dispelling of darkness looks like the drawing of a curtain from the colours of objects no less than from the objects themselves. If colours looked like dispositions, however, then they would seem to *come on* when illuminated, just as a lamp comes on when its switch is flipped. Turning on the light would seem, simultaneously, like turning on the colours; or perhaps it would seem like waking up the colours, just as it is seen to startle the cat. Conversely, when the light was extinguished, the colours would not look as if they were being concealed or shrouded in the ensuing darkness: rather, they would look as if they were becoming dormant, like the cat returning to sleep. But colours do not look like that; or not, at least, to us.

More seriously, both versions of (iii) also have trouble describing the way in which colours figure in particular experiences, such as after-images. The colours that one sees when experiencing an after-image are precisely the qualities that one sees as belonging to external objects. When red spots float before one’s eyes, one sees the same colour quality that fire-hydrants

⁸ Peacocke, ‘Color Concepts and Color Experience’.

and maraschino cherries normally appear to have.⁹ The problem is that dispositionalist accounts of colour experience must analyse the appearance of colour in after-images as the appearance of a disposition to look red under standard conditions; and after-images simply cannot appear to have such a dispositional property.

This problem would not arise if after-images were full-blown illusions. That is, if seeing an after-image consisted in seeming to see a material object suspended in physical space, then that object, though in fact illusory, could still appear to have the same colour quality as any other material object. But after-images are not seen as material objects, any more than, say, a ringing in one's ears is heard as a real noise. The items involved in these experiences are not perceived as existing independently of being perceived. On the one hand, the after-image is seen as located before one's eyes, rather than in one's mind, where visual memories are seen; and the ringing is likewise heard as located in one's outer ear, rather than in the inner auditorium of verbal thought and musical memory. But on the other hand, one does not perceive these items as actually existing in the locations to which they are subjectively referred. The ringing is heard as overlaying a silence in one's ears, where there is audibly nothing to hear; and similarly, the after-image is seen as overlaying the thin air before one's eyes, where there is visibly nothing to see. The ringing is thus perceived as a figment or projection of one's ears, the image as a figment or projection of one's eyes: both, in short, are perceived as existing only in so far as one is perceiving them.

Thus, the possibility of a red after-image requires that one see something as simultaneously a figment of one's eyes and red. But how could something that looked like a figment of one's eyes also appear disposed to look a particular way under standard conditions? Because an after-image is seen as the sort of thing that exists only in so far as one is seeing it, it cannot be seen as the sort of thing that others could see nor, indeed, as the sort of thing that one could see again oneself, in the requisite sense. In seeing an after-image as a figment of one's eyes, one sees it as the sort of thing that will cease to exist when no longer seen and that will not be numerically identical to any future after-images, however similar they may be. One does not see it, in other words, as a persisting item that could be reintroduced into anyone's visual experience; and so one cannot see it as having a disposition to present this or any appearance either to others or to oneself on other occasions.

The foregoing, phenomenological problems are common to both versions

⁹ Perhaps the best argument for this claim is that no one who can identify the colours of external objects needs to be taught how to identify the colours of after-images. Once a person can recognize fire hydrants and maraschino cherries as red, he can identify the colour of the spots that float before his eyes after the flash-bulb has fired. He does not need to be taught a second sense of 'red' for the purpose of describing the latter experience.

of the dispositionalist argument currently under consideration. Each version of the argument also has peculiar problems of its own, which we shall now consider in turn. We begin with the first version, which understands a disposition to look red as a disposition to give the visual appearance of having the property red.

Problems in the first version of content-dispositionalism

The problem with this version has to do with the property expressed by the word 'red' in the phrase 'a disposition to appear red under standard conditions'—the phrase constituting the right side of biconditional (iii). Keep in mind that the entire phrase has itself been offered as expressing the property that objects are seen as having when they look red. When things are seen as red, according to the present argument, what they are seen as having is a disposition to appear red under standard conditions. But does the word 'red' here express the same property that the entire phrase purports to express?

Suppose that the answer to our question is no. In that case, what biconditional (iii) says is that the property that things are seen as having when they look red is a disposition to give the appearance of having some *other* property called red. This other property must naturally be a colour, since the property red could hardly be seen as a disposition to appear as having some property that was not a colour. For the sake of clarity, let us call this other property red*.

Now, in order for objects to have the property red that they appear to have, under the present assumption, they must actually be disposed to give the appearance, under standard conditions, of having the property red*; and in order to have that disposition, they must actually give the appearance of having the property red* under standard conditions. Thus, if the property that things are seen as having when they look red is a disposition to appear red*, then the experience of seeing them as red is veridical, as the dispositionalist wishes to prove, only if they also appear red*. And the question then arises whether red* is a property that things ever do or can actually have. The dispositionalist's argument does not show that the appearance of having red* is ever veridical, since that property is admitted to be different from the disposition whose existence the dispositionalist cites in vindicating the appearance of red. The consequence is that there must be colour experiences that the dispositionalist has failed to vindicate.

Suppose, then, that the dispositionalist answers yes to our question. That is, suppose he says that 'red' expresses the same property on the right side of (iii) as it does on the left. In that case, the dispositionalist's account of colour experience is circular, since in attempting to say what property things appear to have when they look red, he invokes the very property that is at issue.

The dispositionalist may refuse to be troubled by this circularity, however.¹⁰ He may point out that a circular account of a property can still be true, and indeed informative, despite its circularity. For instance, to define courage as a disposition to act courageously is to give a circular definition, a definition that cannot convey the concept of courage to anyone who does not already have it. Even so, courage *is* a disposition to act courageously, and this definition may reveal something important about the property—namely that it is a behavioural disposition. The dispositionalist about colour claims that the circularity in his explication of red is similar.

We grant that circularity alone does not necessarily undermine a definitional equivalence. Yet the circularity in biconditional (iii) is significantly different from that in our circular definition of courage. Our definition of courage invokes courage in an ordinary extensional context, whereas the right side of (iii) invokes red in an intentional context expressing the content of a visual experience, an experience that happens to be the very one whose content (iii) purports to explicate. The result is that the visual experience of seeing something as red can satisfy (iii) only if it, too, is circular, and hence only if it is just as uninformative as (iii). Not only does (iii) fail to tell us which colour red is, then; it also precludes visual experience from telling us which colour an object has. The former failure may be harmless, but the latter is not.

Let us illustrate the difference between an unproblematic circular definition and a problematic one by means of an analogy. Suppose that you ask someone who Sam is and are told, 'Sam is the father of Sam's children'. This answer does not tell you who Sam is if you do not already know. But it does tell you something about Sam—namely, that he has children—and, more importantly, it places Sam in a relation to himself that a person can indeed occupy. In order for Sam to satisfy this assertion, he need only be the father of his own children. Now suppose, alternatively, that your question receives the answer 'Sam is the father of Sam's father'. This response also identifies Sam by reference to Sam; but it has a more serious defect. Its defect is that it asserts of Sam that he stands to himself in a relation that is impossible for a person to occupy.

These two circular identifications of Sam are analogous to the two circular definitions that we are considering. The definition of courage as a disposition to act courageously is uninformative, but it places courage in a relation to itself that a disposition can occupy. In order to satisfy this definition, courage must simply be the disposition to perform actions that tend to be performed by someone with that very disposition. By contrast, the dispositionalist about colour not only invokes the content of colour

¹⁰ See McGinn, *The Subjective View*, Clarendon Press, Oxford, 1983, pp. 6–8; McDowell, 'Values and Secondary Qualities', n. 6; Wiggins, 'A Sensible Subjectivism?', p. 189; Michael Smith, 'Peacocke on Red and Red', *Synthese*, 1986, pp. 559–76.

experience in explicating that content; he places that content in a relation to itself that is impossible for it to occupy. For his explication says that the content of the visual experience of red must contain, as a proper part, the content of the visual experience of red. To see something as red, according to (iii), is to have an experience whose content is that the thing is disposed to produce visual experiences *with the content that it is red*. The experiential content that something is red is thus embedded within itself, and this is a reflexive relation that no determinate content can occupy. Consequently, (iii) requires that the visual experience of red have an indeterminate content that fails to represent its object as having any particular colour.

Under the terms of (iii), an experience can represent its object as red only by representing it as disposed to produce visual experiences that represent it as red. The problem here is that the experiences that the object is thus represented as disposed to produce must themselves be represented as experiences that represent the object as red, rather than some other colour—lest the object be represented as disposed to appear something other than red. Yet these experiences can be represented as representing the object as red only if they are represented as representing it as disposed to produce experiences that represent it as red. And here the circle gets vicious. In order for an object to appear red rather than blue, it must appear disposed to appear red, rather than disposed to appear blue; and in order to appear disposed to appear red, rather than disposed to appear blue, it must appear disposed to appear disposed to appear red, rather than disposed to appear disposed to appear blue; and so on. Until this regress reaches an end, the object's appearance will not amount to the appearance of one colour rather than another. Unfortunately, the regress never reaches an end.

One might attempt to staunch the regress simply by invoking the relevant colour by name. 'To appear red', one might say, 'is to appear disposed to appear red—and that's the end of the matter.' 'Of course,' one might continue, 'if you don't already know what red is, then you haven't understood what I've said. But that doesn't impugn the truth of my assertion, nor its informativeness, since you have learned at least that the property things appear to have in appearing red is a disposition to produce appearances.'

This reply cannot succeed. Staunching the regress with the word 'red' can work, but only if the word is not understood in the sense defined in biconditional (iii). We readily agree that red things do appear disposed to look red, and that they appear so without requiring the viewer to run an endless gamut of visual appearances. But what they appear disposed to do is to give the appearance of being red in a non-dispositional sense—the appearance of having a non-dispositional redness. And the way they appear disposed to give that appearance is usually just by giving it—that

is, by looking non-dispositionally red.¹¹ Similarly, objects can appear disposed to look square just by looking square, but only because they look square intrinsically and categorically.

As we have seen, however, the dispositionalist cannot admit an intrinsic and categorical sense of the word 'red' into his formulation. For then he would have to acknowledge that objects appear disposed to look red, and do look red, in a non-dispositional sense. And he would then have acknowledged that an object's being disposed to look red does not guarantee that it is as it looks, in respect to colour, since the redness that it is thereby disposed to give the appearance of having is a different property from the disposition that it admittedly has. The dispositionalist must therefore say that although an object looks disposed to look red just by looking red, this looking red does not involve looking anything except disposed to look red. *In short, the object must look disposed to look a particular way without there being any particular way that it looks, or looks disposed to look, other than so disposed.* And that is why the vicious regress gets started.

Note, once again, that the problem created by the regress is not that we are unable to learn what red is from the statement that red is a disposition to look red. The problem is that, under the terms of that statement, the subject of visual experience cannot see what colour an object has. For he cannot see the particular colour of an object except by seeing the particular way the object tends to appear; and he cannot see the way it tends to appear except by seeing the way it tends to appear as tending to appear; and so on, *ad infinitum*. To be sure, a person can see all of these things if he can just see the object as having a colour, to begin with; but under the terms of dispositionalism, he cannot begin to see the object as having a colour except by seeing these dispositions; and so he can never begin to see it as having a colour at all.¹²

The second version of content-dispositionalism

The only way to save dispositionalism from its fatal circularity is to ensure that the disposition with which a colour property is identified is not a disposition to give the appearance of having that very property. Christopher Peacocke has attempted to modify dispositionalism in just this way.

According to Peacocke, the property that an object is seen as having

¹¹ See McDowell, 'Values and Secondary Qualities', p. 112: 'What would one expect it to be like to experience something's being such as to look red, if not to experience the thing in question (in the right circumstances) as looking, precisely, red?'

¹² When McDowell discusses dispositionalism about the comic, in 'Projection and Truth in Ethics', he tries to make the circularity of the theory into a virtue, by arguing that it blocks a projectivist account of humour. He says, 'The suggestion is that there is no self-contained prior fact of our subjective lives that could enter into a projective account of the relevant way of thinking'—that is, no independently specifiable subjective response that we can be described as projecting onto the world (p. 6). We would argue that the same problem afflicts, not just a projectivist account of the comical, but our very perceptions of things as comical, as McDowell interprets those perceptions.

when it looks red should be identified as a disposition, not to appear red, but rather to appear in a portion of the visual field having an intrinsic property that Peacocke calls red'. Let us call these portions of the visual field *red' patches*. We can then say that looking red, according to Peacocke, is looking disposed to be represented in red' patches under standard conditions—an appearance that can be accomplished by being represented in a red' patch under recognizably standard conditions, of course, but also in other ways as well, such as by being represented in an orange' patch when illuminated by a yellow-looking light. The upshot, in any case, is that objects often are as they look when they look red, because they both look and are just this: disposed to be represented in red' patches under standard conditions.

Peacocke's qualified dispositionalism eliminates circular experiential contents because it says that appearing to have a colour property is appearing disposed to present appearances characterized, not in terms of that very property, but rather in terms of a different quality, a 'primed' colour. Peacocke can also account for the role of red in the experience of seeing a red after-image, because he can say that the experience consists in a red' patch represented, in the content of one's experience, as a figment of one's eyes.

Peacocke's qualified dispositionalism differs from pure dispositionalism in that it introduces a visual field modified by qualities that—to judge by their names, at least—constitute a species of colour. Peacocke thus abandons a significant feature of the theories that we have examined thus far. Those theories assume that visual experience involves colour only to the extent of representing it. They analyse an experience of red as an experience with the content that something is red—an experience that refers to redness. Because the role of colour in experience is restricted by these theories to that of an element in the intentional content of experience, we shall call the theories intentionalist.

Peacocke's theory is not intentionalist, because it says that visual experience involves colour (that is, primed colour) as a property inhering in the visual field, and not just as a property represented in the content of that experience. We have two points to make about Peacocke's anti-intentionalism. We shall first argue that Peacocke is right to abandon intentionalism and to introduce colours as intrinsic properties of the visual field. But we shall then argue that, having introduced such properties, Peacocke is wrong to remain a dispositionalist about the colours that visual experience attributes to external objects. Peacocke's modification of dispositionalism is unstable, we believe, in that it ultimately undermines dispositionalism altogether.

The case against intentionalism

Peacocke has argued elsewhere, and on independent grounds, for the need

to speak about a sensory field modified by intrinsic sensational qualities.¹³ We should like to add some arguments of our own.

Our first argument rests on the possibility, noted above, of seeing an after-image without illusion. Consider such an experience, in which an after-image appears to you *as* an after-image—say, as a red spot obscuring the face of a person who has just taken your photograph. Since you suffer no illusion about the nature of this spot, you do not see it as something actually existing in front of the photographer's face. In what sense, then, do you see it as occupying that location at all? The answer is that you see it as merely appearing in that location: you see it as a spot that appears in front of the photographer's face without actually being there. Now, in order for you to see the spot as appearing somewhere, it must certainly appear there. Yet it must appear there without appearing actually to be there, since you are not under the illusion that the spot actually occupies the space in question. The after-image must therefore be described as *appearing in* a location without *appearing to be in* that location; and this description is not within the capacity of any intentionalist theory. An intentionalist theory will analyse the visual appearance of location as the attribution of location to something, in the intentional content of your visual experience. But the intentional content of your visual experience is that there is nothing at all between you and the photographer.

The only way to describe the after-image as appearing in front of the photographer without appearing to be in front of the photographer is to talk about the location that it occupies in your visual field. In your visual field, we say, the after-image overlays the image of the photographer's face, but nothing is thereby represented as actually being over the photographer's face. The after-image is thus like a coffee-stain on a picture, a feature that occupies a location on the picture without representing anything as occupying any location. Similarly, an adequate description of the after-image requires reference to two kinds of location—location as an intrinsic property of features in the visual field, and location as represented by the resulting visual experience.

One might think that this argument cannot be applied to the after-image's colour, since you may see the after-image not only as appearing red but also as actually *being* red. But then intentionalism will have trouble explaining what exactly your experience represents as being red, given that the experience is veridical. Your experience cannot represent some external object as being red, on pain of being illusory. And if it represents an image as being red, then its truth will entail that colour can enter into visual experience as an intrinsic property of images, which is precisely what intentionalism denies. Hence there would seem to be nothing that

¹³ *Sense and Content; Experience, Thought, and their Relations*, Clarendon Press, Oxford, 1983, ch. 1. Other arguments are provided by Sydney Shoemaker in 'Qualities and Qualia: What's in the Mind?'

the experience can veridically represent as being red, according to intentionalism. And if the experience represented something as merely appearing red, then our foregoing argument would once again apply. For how could you have a veridical experience that something appeared red unless something so appeared? And if something did so appear, it would have to appear *to be* red, according to intentionalism, which would be an illusion in the present case, unless images can be red.¹⁴

There are other, more familiar cases that refute intentionalism in a similar way. These, too, are cases in which something is seen without being represented in the content of experience as intentionalism would require. If you press the side of one eyeball, you can see this line of type twice without seeing the page as bearing two identical lines of type. Indeed, you cannot even force the resulting experience into representing the existence of two lines, even if you try. Similarly, you can see nearby objects double by focusing on distant objects behind them, and yet you cannot get yourself to see the number of nearby objects as doubling. And by unfocusing your eyes, you can see objects blurrily without being able to see them as being blurry. None of these experiences can be adequately described solely in terms of their intentional content. Their description requires reference to areas of colour in a visual field, areas that split in two or become blurry without anything's being represented to you as doing so.

The case against Peacocke's dispositionalism

We therefore endorse Peacocke's decision to posit a visual field with intrinsic sensational qualities. What we question, however, is his insistence that the colours of external objects are still seen as dispositions. We believe that once one posits a visual field bearing properties such as red', one is eventually forced to conclude that objects presented in red' areas of that field are seen as red' rather than as possessing some other, dispositional quality.

The reason is that visual experience does not ordinarily distinguish between qualities of a 'field' representing objects and qualities of the objects represented. Visual experience is ordinarily naïvely realistic, in the sense that the qualities presented in it are represented as qualities of the external world. According to Peacocke, however, the aspects of visual experience in which external objects are represented have qualities—and, indeed, colour qualities—that are never attributed by that experience to

¹⁴ Intentionalism cannot characterize the experience in question as being similar to, or representing itself as being similar to, the experience you have when you see redness as attaching to a material object. Such an experience would have a different content from the one you are now having, and so it would not be like your present experience in any respect that the intentionalist can identify. Of course, once we abandon intentionalism, we can say that your present experience and the experience of seeing a red material object are alike in their intrinsic qualities. But such qualities are denied by intentionalism.

the objects themselves. Peacocke thus gets the phenomenology of visual experience wrong.

Try to imagine what visual experience would be like if it conformed to Peacocke's model. The visual field would have the sensational qualities red', blue', green', and so on, and would represent various external objects; but it would not represent those qualities as belonging to those objects. Where, then, would the qualities appear to reside? What would they appear to be qualities of? They would have to float free, as if detached from the objects being represented, so as not to appear as qualities of those objects. Or perhaps they would seem to lie on top of the objects, overlaying the objects' own colours—which would be seen, remember, as different, dispositional qualities. The result, in any case, would be that visual experience was not naïvely realistic, but quite the reverse. A veil of colours—like Locke's veil of ideas—would seem to stand before or lie upon the scene being viewed. But one does not continually see this veil of colours; and so visual experience must not conform to Peacocke's model.

The failure of Peacocke's model to fit the experience of colour can be seen most clearly, perhaps, in the fact that the model is a perfect fit for the experience of pain. When one pricks one's finger on a pin, pain appears in one's tactual 'field', but it is not perceived as a quality of the pin. Rather, the pin is perceived as having a disposition—namely, the disposition to cause pain, and hence to be presented in areas of the tactual field bearing the quality currently being felt. The ordinary way of describing the experience would be to say that by having an experience of pain one perceives the pin as disposed to cause pain. But this description can easily be transposed into Peacocke's notation, in which it would say that one perceives the pin as painful by perceiving it in a painful' patch.

Peacocke's theory is thus ideally suited to describing the experience of pain. Yet the experience of pain is notoriously different from the experience of colour. Indeed, the difference between pain experience and colour experience has always been accepted as an uncontroversial datum for the discussion of secondary qualities. The difference is precisely that pain is never felt as a quality of its apparent cause, whereas colour usually is: the pain caused by the pin is felt as being in the finger, whereas the pin's silvery colour is seen as being in the pin. Hence Peacocke's model, which fits pain experience so well, cannot simultaneously fit colour experience. When applied to colour, that model would suggest that the experience of seeing a rose contains both the flower's redness and the visual field's red'-ness, just as the experience of being pricked by a pin contains both the pin's painfulness and the finger's pain.

One might respond that our objection to Peacocke is undermined by an example that we previously deployed against intentionalism. For we have already argued that seeing something blurrily involves a blurriness that is not attributed to what is seen. Have we not already admitted, then,

that visual experience contains qualities that it does not attribute to objects, and hence that it is not always naïve?

We have indeed admitted that visual experience is not always naïve, but that admission is consistent with the claim that visual experience is naïve most of the time, or in most respects. Seeing blurrily is, after all, unusual, in that it involves seeing, as it were, ‘through’ a blurry image to a visibly sharp-edged object. It is an experience in which the visual field becomes more salient than usual, precisely because its blurriness is not referred to the objects seen. Peacocke’s theory does manage to improve on intentionalism by explaining how one can blurrily see an object as being sharp-edged. But Peacocke goes too far, by analysing all visual experience on the model of this unusual case. He says that every perception of colour has this dual structure, in which the colours that are attributed to objects are seen through colour qualities that are not attributed to them. According to Peacocke, then, the redness of external objects is always seen through a haze of redness, just as the sharp edges of an object are sometimes seen through a blur.

The Projectivist Account

We have argued, first, that visual experience cannot be adequately described without reference to intrinsic sensational qualities of a visual field; and second, that intrinsic colour properties of the visual field are the properties that objects are seen as having when they look coloured. We have thus arrived at the traditional projectivist account of colour experience. The projection posited by this account has the result that the intentional content of visual experience represents external objects as possessing colour qualities that belong, in fact, only to regions of the visual field. By ‘gilding or staining all natural objects with the colours borrowed from internal sentiment’, as Hume puts it, the mind ‘raises in a manner a new creation’.¹⁵

Talk of a visual field and its intrinsic qualities may seem to involve a commitment to the existence of mental particulars. But we regard the projectivist view of colour experience as potentially neutral on the metaphysics of mind. The visual field may or may not supervene on neural structures; it may or may not be describable by means of adverbs modifying mental verbs rather than by substantives denoting mental items. All we claim is that, no matter how the metaphysical underpinnings of sense experience are ultimately arranged, they must support reference to colours as qualities of a visual field that are represented as inhering in external objects.

¹⁵ David Hume, *Enquiry Concerning the Principles of Morals*, ed. L. A. Selby-Bigge, Oxford University Press, Oxford, 1975, Appendix 1. Of course, this passage is literally about the projection of value, not colour. But surely, Hume chose colour as his metaphor for value, in this context, because he regarded projectivism about colour as an intuitively natural view.

Pros and cons

The projectivist account of colour experience is, in our opinion, the one that occurs naturally to anyone who learns the rudimentary facts about light and vision. It seemed obvious to Galileo, as it did to Newton and Locke as well.¹⁶

The principle of charity as applied to visual experience

Given the intuitive appeal that the projectivist account holds for anyone who knows about the nature of light and vision, the question arises why some philosophers go to such lengths in defence of alternative accounts. The reason, as we have suggested, is that these philosophers are moved by a perceived requirement of charity in the interpretation of representational content. External objects do not actually have the colour qualities that projectivism interprets visual experience as attributing to them. The projectivist account thus interprets visual experience as having a content that would be systematically erroneous. And it therefore strikes some as violating a basic principle of interpretation.

In our opinion, however, applying a principle of charity in this way would be questionable, for two reasons. First, a principle of charity applies primarily to a language, or other representational system, *taken as a whole*; and so, when rightly understood, such a principle is perfectly consistent with the possibility that large regions of the language should rest on widespread and systematic error. Second, what a principle of charity recommends is, not that we should avoid attributing widespread error at all costs, but that we should avoid attributing inexplicable error. And the error that a Galilean view of colour entails is not inexplicable; it can be explained precisely as an error committed through projection—that is, through the misrepresentation of qualities that inhere in the visual field as inhering in the objects that are therein represented.

We therefore think that the usual motives for resisting projectivism are misguided, on quite general grounds. Nevertheless, some philosophers have criticized projectivism for being uncharitable to visual experience in rather specific ways; and we think that these more specific charges deserve to be answered. We devote the remainder of this section to three of these criticisms.

¹⁶ Isaac Newton, *Opticks*, Dover Publications, New York, 1979, Book I, part i, definition; John Locke, *An Essay Concerning Human Understanding*, ed. Peter H. Nidditch, Clarendon Press, Oxford, 1975, Book II, ch. viii. Jonathan Bennett has interpreted Locke as a dispositionalist about colour (*Locke, Berkeley, Hume; Central Themes*, Clarendon Press, Oxford, 1971, ch. IV). But the textual evidence is overwhelming that Locke believed colour experience to be guilty of an error, and a projectivist error, at that. Locke was a dispositionalist, in our opinion, only about the properties of objects that actually cause colour experience, not about the properties that such experience represents objects as having.

Colours as visibilia

One argument in this vein comes from the dispositionalists. They contend that failing to see colours as dispositions to look coloured would entail failing to see them as essentially connected with vision, as *visibilia*.¹⁷ But nothing can be seen as a colour without being seen as essentially connected with vision, the dispositionalists continue, and so colours cannot possibly be misrepresented in visual experience.

This version of the argument from charity relies on the assumption that the only way to see colours as essentially connected with vision is to see them as dispositions to cause visual perceptions. We reply that colours can be seen as essentially connected with vision without being seen as dispositions at all. In particular, they can be seen as essentially connected with vision if they are seen as the qualities directly presented in visual experience, arrayed on the visual field. The experience of seeing red is unmistakably an experience of a quality that could not be experienced other than visually. Consequently, red is seen as essentially visual without being seen as a disposition to cause visual perceptions.

A Berkeleyan objection

Another version of the argument from charity begins with the premiss that qualities of the visual field cannot be imagined except as being seen, and hence that they cannot be imagined as intrinsic and categorical qualities of material objects—qualities belonging to the objects in themselves, whether they are seen or not. This premiss is taken to imply that visual experience cannot possibly commit the error of representing colour *qualia* to be intrinsic and categorical qualities of objects, as projectivism charges, simply because it cannot represent the unimaginable.¹⁸

Our reply to this argument is that its premiss is false. The colour qualities that modify the visual field can indeed be imagined as unseen. Of course, one cannot imagine a colour as unseen while instantiated in the visual field itself, since to imagine a quality as in the visual field is to imagine that it is seen. But one can imagine a colour as instantiated elsewhere without being seen—by imagining, for example, an ordinary red-rubber ball, whose surface is red not only on the visible, near side but also on the unseen, far side.

What exponents of the present objection are pointing out, of course, is that one cannot imagine the unseen side of the ball as red by means of a mental image whose features include a red area corresponding to that side

¹⁷ See McDowell, 'Values and Secondary Qualities', pp. 113–15.

¹⁸ See Evans, 'Things Without the Mind', pp. 99–100. Berkeley carried this argument farther, by claiming that unperceived qualities, being unimaginable, were also inconceivable and hence impossible. Berkeley's willingness to equate imagination with conception was due to his theory of ideas, which equated concepts with mental pictures.

of the ball. Here they may be correct.¹⁹ To form an image containing a coloured area corresponding to the unseen side of the ball would be to imagine seeing it, and hence not to imagine it as unseen, after all. But one's imagination is not confined to representing things by means of corresponding features in one's mental image. If it were, then one would be unable to imagine any object as being both opaque and three-dimensional; one would be reduced to imagining the world as a maze of backless façades, all artfully turned in one's direction. In actuality, one imagines the world as comprising objects in the round, whose unseen sides are represented in one's image indirectly and, so to speak, by implication. One can therefore imagine unseen colours, despite limitations on how one's imagination can represent them.

Visual experience has the same representational capacity, despite similar limitations. That is, although one cannot visually catch colours in the act of being unseen, one nevertheless sees the world as containing unseen colours—on the far sides of objects, in areas obscured by shadow, and so on. Just as one sees one's fellow human beings as having hair at the back, skin up their sleeves, and eyeballs even when they blink, so one sees them as possessing these unseen features in their usual colours. Thus, one has no trouble seeing colours as intrinsic and categorical properties that exist even when unseen.

Can experience commit category errors?

A third version of the argument from charity alleges that according to projectivism, visual experience commits not just a mistake but a *category* mistake, by representing external, material objects as having properties that can occur only within the mental realm.²⁰ Such a mistake is thought too gross for visual experience to commit.

It is not clear whether it is a necessary or merely contingent fact that external objects do not possess the sorts of property we understand colours to be; hence, it is not clear whether the mistake projectivism attributes to visual experience is categorial or merely systematic. But even if it were a category mistake, why should this necessarily be considered a difficulty for projectivism?

The assumption underlying the objection is that it is somehow extremely difficult to see how experience could commit a category mistake. But as the following remark of Wittgenstein suggests, just the opposite seems true.

Let us imagine the following: The surfaces of the things around us (stones, plants, etc.) have patches and regions which produce pain in our skin when we touch

¹⁹ We grant this point for the sake of argument; but we think that it, too, underestimates the representational powers of the imagination. For surely one can form a mental image that contains a 'cut-away' view, showing how the far side of the ball looks while implying that it is, in reality, unseen.

²⁰ See Shoemaker, 'Qualities and Qualia: What's In The Mind?', p. 10.

them. (Perhaps through the chemical composition of these surfaces. But we need not know that.) In this case we should speak of pain-patches just as at present we speak of red patches.²¹

In the normal experience of pain, pain is not perceived as a quality of its cause. As Wittgenstein remarks, however, this seems to be thanks only to the fact that the normal causes of pain constitute such a heterogeneous class. Were pain to be caused solely, say, by certain specific patches on the surfaces of plants, we might well experience pain as being in the plant, much as we now experience its colour. Far from being unimaginable, then, it would seem that nothing but a purely contingent fact about our experience of pain stands between us and a category mistake just like the one that projectivism portrays us as committing about colour.

Interpreting Colour Discourse

Thus far we have discussed colour concepts as they are exercised in the representational content of colour experience. Let us turn, somewhat more briefly, to the content of ordinary discourse about colour.

We assume that ordinary discourse about colour reports the contents of visual experience. The most plausible hypothesis about what someone means when he calls something red, in an everyday context, is that he is reporting what his eyes tell him. And according to our account, what his eyes tell him is that the thing has a particular visual quality, a quality that does not actually inhere in external objects but is a quality of his visual field. We therefore conclude that when someone calls something red, in an everyday context, he is asserting a falsehood. Indeed, our account of colour experience, when joined with the plausible hypothesis that colour discourse reports the contents of colour experience, yields the consequence that all statements attributing colours to external objects are false.

One would be justified in wondering how we can accept this consequence, for two related reasons. First, we will clearly want to retain a distinction between 'correct' and 'incorrect' colour judgements, distinguishing between the judgement that a fire-hydrant is blue and the judgement that it is red. And it seems a serious question what point we error theorists could see in such a distinction. Second, it seems perfectly obvious that colour discourse will continue to play an indispensable role in our everyday cognitive transactions. Yet how are we error theorists to explain this indispensability, consistently with our claim that the discourse in question is systematically false? We shall begin with the second question.

The point of colour-talk

Consider one of the many harmless falsehoods that we tolerate in everyday discourse: the statement that the sun rises. When someone says that the

²¹ *Philosophical Investigations*, Blackwell, Oxford, 1974, section 312. We do not necessarily claim that the use to which we should like to put this passage coincides with Wittgenstein's.

sun rises, his remark has the same content as the visual experience that one has when watching the horizon at an appropriately early hour. That is, the sun actually looks like it is moving, and that the sun moves in this manner is what most people mean when talking about sunrise. So interpreted, of course, talk about sunrise is systematically false. When someone says that the sun rises, he is wrong; and he usually knows that he is wrong, but he says it anyway. Why?

When one understands why talk about sunrise is false, one also understands that its falsity makes no difference in everyday life. We do not mean that nothing in everyday life would, in fact, be different if the sun revolved around the earth, as it seems to. No doubt, the tides and the phases of the moon and various other phenomena would be other than they actually are. But those differences are not missed by the ordinary person, who does not know and has no reason to consider precisely how the tides and phases of the moon are generated. Consequently, someone who has a normal background of beliefs will find no evidence in everyday life to controvert his belief that the sun revolves around the earth. That belief will not mislead him about any of the phenomena he normally encounters; and it will in fact give him correct guidance about many such phenomena. His judgements about the time of day, the weather, the best placement of crops, the location of glare and of shadows at noon, will all be correct despite being derived from premisses about a stationary earth and a revolving sun. Indeed, he is likely to derive more true conclusions from his belief in a revolving sun than he would from a belief in a rotating earth, for the simple reason that the consequences for earthlings of the former state of affairs are easier to visualize than those of the latter, even though those consequences would be the same, for everyday purposes. Talking about horizon-fall rather than sunrise would thus be downright misleading, even though it would be more truthful. Only an undue fascination with the truth could lead someone to reform ordinary discourse about the sun.

Talk about colours is just like talk about sunrise in these respects. That is, life goes on as if objects are coloured in the way that they appear to be. Experience refutes few if any of the conclusions derived from beliefs about objects' colours; and many true conclusions are derived from such beliefs. Most of those true conclusions, of course, are about how objects will look to various people under various circumstances. And these conclusions are extremely useful in everyday life, since one's ability to communicate with others and with one's future selves about the external world depends on the ability to describe how various parts of that world appear. The point is that such conclusions are more easily and more reliably drawn from the familiar false picture of colours than they would be—by the ordinary person, at least—from the true picture of wavelengths

and spectral-reflectance curves. Why, then, should one replace such a useful false picture with a true but misleading one?

Correct vs. incorrect colour-talk

The case of colour differs from that of sunrise in one important respect. The sun never seems to do anything but move in a regular arc across the heavens, whereas objects often seem to have different colours in different circumstances. The ordinary speaker therefore finds himself drawing a distinction between the colours that objects really have and the colours that they only seem to have on some occasions. How can we countenance this distinction between real and illusory colours, given that our theory brands all colours as illusory?²²

The answer is that classifying an object by the colour that it appears to have under so-called standard conditions is the most reliable and most informative way of classifying it, for the purposes of drawing useful conclusions about how the object will appear under conditions of any kind. Obviously, classifying an object by how it appears in the dark is not at all informative, since all objects appear equally black in the dark, even though they appear to have different colours in the light. Hence one can extrapolate an object's appearance in the dark from its appearance in the light, but not vice versa. The same is true—though to a lesser degree, of course—for other non-standard conditions. For instance, distance tends to lend a similar appearance to objects that look different at close range; coloured light tends to lend a similar appearance to objects that look different in daylight; and so on. The common-sense calculus of colour addition and subtraction therefore enables one to infer an object's appearance under non-standard conditions from its appearance under standard conditions, but not its appearance under standard conditions from that under non-standard conditions. That is why one set of conditions, and the accompanying colour-illusion, are privileged in everyday life.

There are notable exceptions to our claim about the varying informativeness of various colour appearances. But these exceptions actually support our explanation of why particular colour-illusions are privileged in ordinary

²² We should point out that a similar question will confront those who adopt a dispositionalist interpretation of colour discourse. For according to dispositionalism, the colours of objects are their dispositions to present the appearance of colour; and objects are disposed to present the appearance of different colours under different circumstances. Corresponding to every colour that an object ever appears or would appear to have, there is a disposition of the object to give that appearance under the circumstances then prevailing. Now, dispositionalism denominates only one of these innumerable dispositions as the object's real colour, and it does so by defining the object's colour to be that disposition which is manifested under conditions specified as standard. But surely, dispositionalism should have to justify its selection of dispositions—or, what amounts to the same thing, its selection of standard conditions. For if colour is nothing but a disposition to produce colour appearances, one wants to know why a particular disposition to produce colour appearances should be privileged over other such dispositions. And this is, in effect, the same question as why one colour-illusion should be privileged over other colour-illusions, given the assumption that all colours are illusory.

discourse, because consideration of them leads the ordinary speaker to reconsider the distinction between true and illusory colour.

Some pairs of objects that appear to have the same colour in daylight—say, green—can appear to have different colours under incandescent lighting, where one may appear green and the other brown.²³ In these cases, how an object appears in daylight is not an indication of how it will appear under other less standard conditions.

Yet in these cases, one begins to wonder whether the object has a 'true' or standard colour at all. If an object's apparent colour does not vary, from one set of conditions to the next, in the same way as the apparent colour of objects that share its apparent colour in daylight, then one is tempted to say that the object does not have any one colour at all. Consider the object that looks green in daylight but brown in incandescent light, where most other objects that look green in daylight still look green. Is the object really green? really brown? Does it have any single 'real' colour at all?²⁴ Here intuitions diverge and ultimately give out. The reason, we think, is precisely that the common-sense notion of an object's real colour presupposes that it is the one apparent colour from which all its other apparent colours can be extrapolated, by fairly familiar rules of colour mixing. When that assumption is threatened, so is the notion of real colour.

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²³ This phenomenon is called metamerism. See C. L. Hardin, *Color for Philosophers; Unweaving the Rainbow*, Hackett, Indianapolis, 1988, pp. 28, 45 ff.

²⁴ People who spend much time considering these cases have been known to give up the notion of true colour entirely. We once asked a scientist who performs research on colour vision why people think that most opaque objects have a real colour. His answer was, 'They do? How odd.'