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(Q013)

Colour, Theories of

The world as perceived by human beings is full of colour. The world as described by physical scientists is composed of colourless particles and fields. Philosophical theories of colour since the scientific revolution have been primarily driven by a desire to harmonize these two apparently conflicting pictures of the world. Any adequate theory of colour has to be consistent with the characteristics of colour as perceived without contradicting the deliverances of the physical sciences.

Given this conception of the aim of a theory of colour, there are three possibilities for resolving the apparent conflict between the scientific and perceptual facts. The first possibility is to deny that physical objects have colours. Theories of this kind admit that objects appear coloured but maintain that these appearances are misleading. The conflict is resolved by removing colour from the external world. Second, it might be that colour is a relational property. For an object to possess a particular colour it must be related in the right way to a perceiver. One common version of this view analyzes colour as a disposition to cause particular kinds of perceptual experiences in a human being. Since the physical sciences deal only with the intrinsic properties of physical objects and their relations to other physical objects and not their relations to perceiving subjects, the possibility of conflict is removed. A third possible response to the conflict is to maintain that colour really is a property of external objects and that the conflict is merely apparent. Some theories of this form maintain that colour is identical to a physical property of objects. Others maintain that colour is a property that physical objects possess over and above all their physical

properties. Philosophical discussions of colour typically take the form of either elaborating on one of these three possibilities or attempting to show more generally that one of these three types of responses is to be preferred to the others.

1. **Eliminativist theories of colour**
2. **Relational theories of colour**
3. **Realist theories of colour**

1. **Eliminativist theories of colour**

The association between atomistic metaphysics and the denial that colour has any place in the external world is both ancient and common. It can be found in authors as widely separated in time and other views as Democritus and Galileo. Although the metaphysics is no longer atomistic in a strict sense, many contemporary scientists hold similar views about the absence of a colour from the external world. Many later colour scientists and neurobiologists have been as convinced that science shows that colour cannot be a property of external objects as were Democritus and Galileo. Colours as perceived are commonly seen by those acquainted with scientific metaphysics to have features that preclude all attempts at the identification of colour with a physical property of external objects.

Once colour has been excluded from the external world there still remains the question of what, if any, objects possess colour. One possible answer to this question is to maintain that colours are genuine properties of some perceptual experiences. This view is a kind of phenomenalism with regard to colour. Although colour phenomenologists maintain that no tomato is red, strictly

speaking, it may be that the visual experience obtained by looking at a ripe tomato in good light does genuinely possess the property of being red. (See Jackson, Perception) Something like this answer combined with a reductive account of mental properties may explain the repeated claims by visual scientists of the last two centuries that colours are properties of the brain. This form of subjectivism requires a commitment to the existence of qualia or sense-data: in other words of intrinsic properties of visual experience to which we have unmediated conscious access.

Alternatively, it may be argued that nothing, including visual experience, has colour. In an influential book, C. L. Hardin has argued first that there are essential properties of colour as perceived that no physical property possesses, then further that there are no mental items which could be the bearers of colour. The upshot of the argument is that although there are objects which appear coloured, there is nothing that is coloured.

The main difficulties faced by the various forms of colour eliminativism all derive from its failure to produce an adequate resolution of the apparent conflict between the scientific world and the perceptual world. Our visual experience is experience of coloured objects. The external focus of our visual experience is also reflected in much of our thought and talk about colour. All forms of colour subjectivism are forced to maintain that our visual experience is profoundly misleading and that most of our talk and thought about colour, if taken literally, is profoundly confused. Colour subjectivism removes any possibility of conflict between perception and science by either moving the location or denying the reality of the world as we perceive it. Colours are properties of visual experience mistakenly projected in perception and thought onto external objects. The main motivation for attributing such wide-spread confusion to our ordinary thought and language is the failure of any less radical

account to successfully accommodate all the relevant facts.

2. Relational theories of colour

One motivation for adopting the eliminativism about colour described above is the obvious dependence of perceived colour on the characteristics of our visual system. Organisms whose visual systems differ from ours will divide the spectrum in different ways. Objects that look the same in colour to us may look very different in colour to organisms whose sensory apparatus differs in certain way from ours. In general, neither the categories nor the similarity relations that arise from human colour vision (or the colour vision of any other organism) map in a straightforward way onto any physical property. Two coloured surfaces that are exact perceptual matches can be physically very different and in general, similarity in perceived colour (of whatever degree) is no reliable guide to similarity in any interesting physical property. Eliminativism is not, however, the only possible theory of colour capable of accommodating these facts. Rather than eliminating colour from the world, relational theories of colour take colour to consist in a relation between the external, physical object and the perceiving subject.

The most common form of relational theory has taken colours to be dispositions or powers to cause characteristic kinds of perceptual experiences. Dispositional theories of colour date back at least to the seventeenth century and continue to have widespread currency among philosophers. The most famous early exponent of this view of colour is John Locke. According to a theory of this kind, an object is red, for example, if and only if it has the power or disposition to cause a characteristic kind of experience in an appropriately situated human being.

Colours are to be thought of, according to relational theories, as analogous

in important respects to physical properties like solubility and more precisely to qualities like nutritiousness or poisonousness. A substance is poisonous, for example, if it causes degradation in bodily function if ingested or otherwise taken into the body. Whether or not a substance is poisonous depends on what kind of organism is under consideration. Some substances cause bodily harm to some organisms while they are harmless or even beneficial to other organisms. Thus the very same substance can be poisonous to one kind of organism and nutritious to another. Whether or not a substance brings about degradation in bodily function can also depend on the circumstances in which it is ingested. Substances that are harmless if taken by themselves can be poisonous if taken in conjunction with other substances. According to relational views of colour, an object can be red for one kind of perceiver and green to another in virtue of possessing exactly the same intrinsic physical characteristics. What matters is the kind of causal effect the object has on the perceiver which depends in turn on the characteristics of the perceiver's visual system. The kind of effect an object has on a perceiver can also vary with changes in the viewing conditions, notoriously the character of the illumination, and consequently the colour of an object can change with viewing conditions. According to relational views of colour no object has any particular colour if considered independently of how it is related to perceiving organisms.

One difficulty with relational views of colour is that they seem on the surface to be incompatible with the way we ordinarily talk about colours. We often make claims like, 'That tomato is red', without offering any further explanation of who it is red for and in which circumstances it is red. In addition, if someone were to claim of a beautiful ripe tomato hanging from the vine that it is black the ordinary response would be denial or puzzlement in spite of the fact that there are clearly viewing conditions under which the tomato would produce

the characteristic effect that are associated with black things. The typical response of adherents of relational views of colour to this kind of difficulty is to claim that ordinary colour claims contain an implicit reference to a particular class of perceivers and a particular kind of viewing condition. To say that a tomato is red without qualification is to say that it produces the effect characteristic of red things on normal (human) perceivers in normal (for humans) viewing conditions. If we fix one term of the relation, then we can talk about colour as if it were an intrinsic property of the object being described.

The main problems that relational views of colour face fall into two categories. As we have seen, the theory attempts to account for ordinary colour talk by making use of the notions of a normal perceiver and normal conditions. There are serious questions, however, about whether a suitable conception of normality actually exists. It is possible to specify precisely the characteristics of a normal perceiver, but then it follows from the substantial variation in human colour vision that there will be extremely few normal perceivers. Thus most people will not be in a position to determine visually the colours of objects. If we offer a looser standard for who counts as a normal perceiver, then there will be variation in the effects of objects within the class of normal perceivers, and the determinacy in colour attribution that the appeal to normal perceivers was supposed to provide will be lost. Similar problems arise in trying to specify which viewing conditions count as normal. The other main difficulty facing relational theories of colour arises from the necessity of describing the characteristics the production of which gives an object its colour. In ordinary talk we use words like 'red' indiscriminately to describe both the external property and the perceptual experience with which it is associated. Relational theories of colour must find some way of independently characterizing perceptual experiences while avoiding circularity and vacuity.

3. **Realist theories of colour**

Realist theories of colour hold that colour is a genuine property of physical objects and that objects possess this property independently of their relation to perceiving subjects. Realist theories can be divided into two categories depending on whether or not they take colour to be reducible to physical properties. Physicalist theories of colour hold that colour is a physical property, possibly a complicated one, and that to see the colour of an object is to see that it has a physical property. Physicalist theories of colour bear some analogy to materialist theories of mind and share some of the same advantages and problems. In spite of the resemblance in logical structure between the two types of theory, there is no logical connection between materialist theories of mind and physicalist theories of colour, and it is possible to consistently maintain every combination of affirming and denying the two theories.

The early defenders of physicalist theories of colour were somewhat vague about exactly what physical property they took colour to be identical with and largely confined their attention to defending the possibility that there could be some physical property identical with colour. It is obvious, however, that the relevant physical property must be one that has to do with light, or the reflection of light since these are the prominent elements in the causal chain leading to the perception of colour. The most suitable candidate, as has been argued by D. R. Hilbert, is the way in which objects reflect light. This property, surface spectral reflectance, is relatively stable property of the surfaces of objects that does not vary with changes in the illumination. Unlike its reflectance the light reaching the eye from an object varies with changes in the illumination in ways that match neither our perceptual judgments of object colour nor our inclination to attribute stable colour properties to objects.

The main problems facing physicalistic theories revolve around two connected questions: how is the content of colour experience determined and what is the structure of our colour concepts? Armstrong clearly saw that any very rich concept of colour is incompatible with physicalism. Most people who use and apply colour concepts are ignorant of the relevant physical and physiological facts. If we build in a large amount of colour lore and phenomenology into the concept of colour then there will be no physical property which will fit the bill. Many of the arguments against physicalistic theories of colour consist of arguing that some part of our concept of colour is incompatible with the empirical facts. The physicalist's only response to these kinds of arguments is to show that either the empirical facts are misrepresented or that the claimed necessary truth about colour is not really necessary at all. Physicalist theories of colour require that colour perception not be transparent in the sense that any colour perceiver necessarily knows all there is to know about colour. The easiest way to avoid this kind of difficulty is to adopt an externalist theory of content. Externalist theories of content have the effect of breaking any necessary connection between internal perceptual states and what they represent and thereby provide the resources for defense of physicalism against a class of objections drawn from the assumption of transparency.

Not all colour realists are physicalists, and there have been some philosophers who have claimed that colours are intrinsic properties of physical objects that cannot be identified with any physical property. There are two possibilities available to the defender of such a theory. Either colours are properties over and above all the physical properties and bearing no necessary connection to them or colours are properties that supervene on physical properties but cannot be reduced to them. These two views bear obvious analogies to dualism and non-reductive materialism in the philosophy of mind.

The main difficulty the dualist theory faces is that colours, as it conceives them, will have no place in the causal chain leading to the perception of colour which leads to serious epistemological problems as to how we could ever know the colour of an object. Taking colour to supervene on the physical properties of objects avoids this difficulty and has the virtue of avoiding many of the other difficulties faced by the theories of colour discussed above. The main difficulties facing the theory of colours as supervenient properties are the general difficulties of understanding the relation of supervenience and what kind of evidence could ever support a conclusion of this kind.

References and further reading

Campbell, John (1993) 'A Simple View of Colour', in Reality, Representation, and Projection, ed. by John Haldane and Crispin Wright, Oxford University Press. (Defends a version of non-physicalist realism about color.)

* Hardin, C.L. (1988) Color for Philosophers, Indianapolis: Hackett. (Referred to in §1. Argues for eliminativist theory of color. Also presents useful introduction to color science.)

* Hilbert, D. R. (1987) Color and Color Perception, Stanford: CSLI. (Referred to in §3. Defends physicalist theory of color.)

* Jackson, Frank (1977) Perception, Cambridge: Cambridge University Press. (Referred to in §1. Defends phenomenalist theory of color in the context of a general theory of perception.)

Johnston, Mark (1992) 'How to Speak of the Colors', Philosophical Studies 68, pp. 221-63. (Defends a version of dispositionalism and contains a discussion of the features common-sense attributes to color.)

Peacocke, Christopher (1984) 'Colour Concepts and Colour Experience', Synthese 58, pp. 365-381. (Defends a version of dispositionalism and worries about the problem of circularity that faces dispositional theories.)