YELLOW IS NOT A COLOR

Christopher A. Shrock
Oklahoma School of Science and Mathematics

Thomas Reid claims that color is "the disposition of bodies to reflect a particular kind of light" (Reid, EIP 204). This is by no means an original or surprising claim. But Reid's approach to color is unusual. In this paper, I explain how a Reidian take on color yields an unexpected response to the problem of *metamerism*, which is the curious fact that objects with different spectral reflectances may present the same types of color appearances. Two objects may both appear yellow (under the same lighting conditions) even though they have different reflectances. It seems that the objects are the same color—yellow—despite their having different spectral reflectances. Thus, if we suppose that Reid means that colors are something like spectral reflectances, he appears to be wrong, because same-colored objects often have different reflectances. In Reid's works, I find the resources to answer this problem by denying that objects with similar color appearances necessarily share the same color quality.

I

Reid's starting point for his theory of color seems wholly mundane. He takes that colors to be objects of perception. But this commonplace beginning develops saliency as we consider Reid's account of perception. Reid is what A. D. Smith calls a direct realist, holding that the objects of awareness in sense perceptions are real, external, and physical (as opposed to mythical, mental, spiritual, internal, and/or perceiver-dependent) (Smith 8). If colors lack these attributes, then by definition they are not objects of perception but hallucinations or illusions (Reid, EIP 22). For Reid, "perception" is a success term.

Reid analyzes the mental act of perception in terms of three additional features—two constitutive and one restrictive. First, every perception partially

consists of a *con*ception of the object perceived. That is, the perceiver must apprehend the object by means of some conceptual apparatus. The second is a belief in the existence of the object. And, finally, the restrictive element is that the conviction and belief do not come by way of inference but are the immediate results of other mental event(s) (Reid, EIP 96).

For Reid, perceptions—non-inferential conception-and-beliefs—are prompted by "sensations." Sensations are simple mental acts that take no objects, also called feelings or, in the case of sight, appearances. He offers pain as an example of sensation (Reid, EIP 36-39). Into these sensations, Reid incorporates all the phenomenological elements missing from his account of perceptions. Reid acknowledges sensations, but they are not essential parts of perceptions. Rather, they serve as "natural signs," triggering devices for perceptions (Reid, IHM 58-61). That is, the sensation somehow signals the mind to conceive of and believe in the sensation's external cause, the object of perception. And this is where it can be easy to misunderstand Reid's account. Reid holds that, in humans, sensations prompt perceptions of all sorts—not merely of colors and smells, but also of weights, heights, and solidities. The perception accompanies the sensation, but the two are not identical.

Consider a sense experience involving heat or cold—perhaps touching the cool surface of tabletop. Upon touching one's hand to the object, one has a cool-type sensation. And it is on the basis of this sensation that one ascribes the quality of coolness to the object. What is the nature of the quality of coolness? It is not apparent from the sensation alone. What we do know is that the quality of coolness causes the cool-type sensation. After all, that is how we discovered the quality in the first place. The coolness itself could be virtually anything—a lack of (the mythical heat element) caloric, relatively slow moving molecules, or ice fairies manipulating our sense experiences. Eventually we discover that the coolness is the second of these, but only after spending a great deal of time in the laboratory and in discussion with others.[1] The quality of coolness is something distinct from the sensation or feeling it causes.

In addition to motivating the distinction between sensation and perception, this exercise illustrates another important aspect of Reid's theory of perception—the referential and descriptive contents of perceptual conceptions. In perceiving the cool tabletop, we see that the coolness of the table is something different from the sensation it causes. We know the sensation well, but it takes some real effort to discover the nature of the quality, that slow molecular vibration. The sense experience alone fails to make most non-chemists think anything like "Oh! Slow-moving molecules!" But, this does not mean that non-physicists and non-chemists fail to perceive the table's coolness when they touch it. They certainly believe that the table is cool, even if they wrongly think that this means it lacks caloric. Since Reid makes conceptions partially constitutive of perceptions, he needs to explain how the non-physicist conceptualizes the coolness.

The required explanation comes in two parts. First, if one is to have a concept *of* something, then the conception is intentional—it takes an object. And

the object of the conception is the same as the object of the perception. One interpreter of Reid, J. Todd Buras, has called this object the conception's "referential contents". So, in the non-physicist's perception of the coolness of the tabletop, the referential content of the conception (and thus the perception) is the coolness of the tabletop, the physical bodily quality. But conception, by its very name, involves the deployment of concepts. To conceptualize an object is to think of it *as* something, to construe it. Buras' term for this conceptual apparatus is "descriptive contents."[2]

Just as one might use language to describe the same object in many different ways, one might also develop a variety of conceptions, all with the same referential contents but differing in their descriptive contents. The chemist may have a conception of the tabletop's coolness with descriptive contents of slow molecular motion. But the naïve observer adopts a less scientific conception—perhaps thinking of the tabletop as the thing cause of the cool-type sensation. And, according to Reid, this is a natural descriptive content given to coolness in naïve perceptions—the cause of the cool-type sensation (Reid, IHM 54-55). Of course, the chemist's learning does not prevent her from considering the coolness as the cause of her sensation. Rather, it opens up a new possibility for understanding the coolness in a way that is hidden to the naïve perceiver.

Naïve color perceptions work similarly on Reid's account. Consider a perceiver's perception of the color of the tabletop. The color, a physical quality, stimulates the nervous system via the eyes, causing the perceiver to experience a sensation. That sensation then prompts a conception of and belief in the property. Just as in the coolness case, the conception of the color has two types of contents—referential and descriptive. The referential content is obvious. It is just the object of the perception, the color of the tabletop, whatever caused the sensation. And, what about the descriptive contents? For Reid, color perceptions are akin to perceptions of coolness. Although the naïve human perceiver is intimately familiar with the nature of the sensation (the visual experience that accompanies the perception) the physical quality remains something of a mystery. Reid takes it that the color of the tabletop might ultimately be understood on intrinsic terms, without reference to a perceiver, just as coolness can be understood as a relatively slow molecular vibration. But this sort of understanding comes by way of rigorous scientific investigation, not merely looking at the color of the tabletop in good light. To the naïve perceiver, who has not spent any time investigating or studying the theories of those who have, the color perception's descriptive contents remain of the quality in the table that caused the sensation, and little else.

The short version of Reid's story about one's conceptual development from thinking of a color as the cause of a sensation to thinking about it as a disposition to reflect certain kinds of light centers on Reid's doctrine of original and acquired perceptions. There are a few privileged experiences that give human perceivers conceptions of qualities as they are intrinsically. These are original, tactile perceptions of what Reid calls "primary" qualities—e.g., solidity, hardness, extension, or motion (Reid, EIP 234-241). Acquired perceptions are ca-

pacities, or skills, that human beings develop naturally as they learn from their perceptions, various reasonings, and conversations with one another. Among these are the ability to discern that a ball of uniform color is of uniform color despite the variations of its appearance due to lighting conditions and the ability to visually perceive in three dimensions (Reid, EIP 236). In some cases, acquired perceptions become quite specialized, as in a butcher's ability to perceive the weight of an animal without making any inferences or taking any measurements or the farmer's to see the amount of grain in a heap (Reid, IHM 172).

The naïve perception gives us that the color of the object causes our sensation of it. But, if a perceiver leads a relatively normal life, he notices other things about colors as well. Making the long story short, Reid claims that human beings naturally come to believe the following about colors:

> By colour, all men, who have not been tutored by modern philosophy, understand not a sensation of the mind, which can have no existence when it is not perceived, but a quality or modification of bodies, which continues to be the same, whether it is seen or not. The scarlet-rose, which is before me, is still a scarlet-rose when I shut my eyes, and was so at midnight when no eye saw it. The colour remains when the appearance ceases: it remains the same when the appearance changes. For when I view this scarlet-rose through a pair of green spectacles, the appearance is changed, but I do not conceive the colour of the rose changed. To a person in the jaundice, it has still another appearance; but he is easily convinced, that the change is in his eye, and not in the colour of the object. Every different degree of light makes it have a different appearance, and total darkness takes away all appearance, but makes not the least change in the colour of the body. (Reid, IHM 85)

These are what Reid takes to be the common sense facts of color. And, having identified sounds with vibrations and smells with tiny particles, he analogously asserts of color, "The disposition of bodies to reflect a particular kind of light occasions the sensation of colour" (Reid, EIP 204).

II

There are several important objections to colors as dispositions to reflect certain kinds of light, especially one that identifies such dispositions with spectral reflectances.[3] C. L. Hardin has an especially nice collection of such objections in his "A Spectral Reflectance Doth Not a Color Make." But the most important objection is the problem of metamerism.

Metamerism is the curious phenomenon that two items with different spectral reflectances (i.e., dispositions to reflect different kinds of light that differ in the kinds of light they reflect) may occasion indistinguishable sensations in a perceiver. The problem arises because the cones in our eyes come only in three

types, each of which is sensitive to a relatively narrow band of light—roughly blue (~450 nm), green (~510 nm), and red (~650 nm). But the information carried along the optic nerve (and hence to the brain and the mind) consists of only two color signals: one that represents the difference in the stimulation of the green and the red cones and another that corresponds to the difference between the blue cones and the other types (Berns, et al.). (There is also a third signal that carries information about lightness and darkness.) Suppose that, under typical daytime lighting conditions, we look at an object that is reflecting nothing but 575 nm light. It has a bright yellow appearance since the red and green cones are about equally stimulated and the blues hardly at all. Now consider an object that reflects equal amounts of 510 and 650 nm light. Again, the green and red cones are equal, and the blue cones are left out. Assuming that we have about the same concentration of green and red cones, this object will also appear bright yellow. And if conditions are just right, the two objects will have indistinguishable color appearances—two spectral reflectances, two dispositions, but only one color. Thus, says the objector, the color is not identical to the spectral reflectance.

I think Reid has a response handy for this objection. He is a nominalist about universals, declaring that "universals have no real existence" (Reid, EIP 393). Although he notes that we use universals, "general words," to express things about the attributes of subjects (Reid, EIP 356), Reid clearly distinguishes between the individual attribute of a subject (e.g., a quality of a body) and its generalization:

> To this I answer, that the whiteness of this sheet is one thing, whiteness is another; the conceptions signified by these two forms of speech are as different as the expressions: The first signifies an individual quality really existing, and is not a general conception, though it be an abstract one: The second signifies a general conception, which implies no existence, but may be predicated of everything that is white, and in the same sense. On this account, if one should say that the whiteness of this sheet is the whiteness of another sheet, every man perceives this to be absurd; but when he says both sheets are white, this is true and perfectly understood. (Reid, EIP 367)

The yellowness of the first object in our example, then, is not the same as the yellowness of the second. And neither yellowness is identical to yellow the universal, although perhaps we might truthfully predicate yellowness of both.

Colors are objects of perception. Which, then, is perceivable—the color of the first object or yellow in general? The answer seems obvious. If the objects of perception are, loosely speaking, causal qualities of physical bodies, then they cannot be generalizations. So even if yellowness is appropriately predicated of the first object, it is not identical to yellow the universal. Yellow in itself is not a quality of any body, and therefore *not* an object of perception, and therefore *not* a color. The color of the first object is whatever accounts for

the sensation we have when we look at it—the disposition to reflect 575 nm light. Thus, it is reasonable to assume that this is (identity) its color.

But what of yellow? Are we wrong to say that both objects are yellow? In one sense, I answer, we are not, if by "yellow" we mean that the object causes yellow-type sensations. They just have different ways of doing so. But if we mean that the objects possess the same intrinsic qualities, it appears that we are just wrong. I also suspect that this later sense is the one more often used.

Fortunately, there seems to be a good story to tell about the origin of this error. We have generalized too hastily. Suppose that my two-year-old daughter decides to organize my library. Unable to read and having no formal knowledge of philosophy, theology, or literature, she looks for other signs of the books' contents, perhaps assuming that the book's cover reflects more about its contents than is warranted. So Plato's *Five Dialogues* winds up next to the *Meditations* of Marcus Aurelius and Augustine's *On Free Choice of the Will*, since my Hackett editions of these all have similar covers—not too bad. But Plato's *Complete Works*, a larger book with a cloth cover, gets shelved next to an ancient copy of H. W. Hanson's *History of Art* and a German dictionary. The basic writings of Nietzsche go with those of Machiavelli and Martin Luther. And Ernest Sosa's *A Virtue Epistemology* sits alongside Robert Baden-Powell's *Scouting for Boys*—total pandemonium.

On Reid's account, perhaps something analogous goes on in color taxonomies. We perceive the color of the tabletop. That color causes a very different sort of visual sensation than the chair next to it. We (rightly) assume that there must be some important difference in the colors that explains the difference in the sensations. Likewise, when we perceive the color of the tabletop and notice that the sensation involved is quite similar to the sensation we have when we see the door, we assume that whatever type of color caused this sort of sensation in the case of the tabletop may have also been involved in our perception of the door. This is not an unreasonable assumption—it is all we have to go on before we begin our scientific investigations. But it is risky, a bit like judging a book by its cover. We assign names to the colors as we group them by the sorts of sensations that they cause—red, green, yellow—unaware of our hastiness. Our perceptions did not tell us that this color is the same as that one. We assumed that it was because we needed a way to group the colors and a better way did not present itself. But we were wrong.

There are still many objections to Thomas Reid's account of color that space will not allow me to address. But Metamerism-ism does not seem to be problems for colors as dispositions to reflect certain kinds of light, or even spectral reflectances. Colors are the objects of perception, not their types.

Notes

1. Compare Reid, IHM 54-55.

2. These terms are repeated in "Three Grades of Immediate Perception: Thomas Reid's Distinctions," and "The Function of Sensations in Reid."

3. E.g., see Michael Tye, *Consciousness, Color, and Content*. Identifying light with spectral reflectances is slightly more specific than Reid's theory. Reid never says that the relevant

kinds of light are designated by frequency and/or wavelength. For a theory that appeals to other possible categories, see Huemer.

Works Cited

Berns, Roy S., Fred W. Billmeyer and Max Saltzman. *Billmeyer and Saltzman's Principles of Color Technology*. 3rd ed. New York: John Wiley & Sons, 2000.

Buras, J. Todd. "The Problem with Thomas Reid's direct realism." *The Philosophy of Thomas Reid: A Collection of Essays*. Ed. John Haldane and Stephen Read. Malden, MA: Blackwell, 2003. 44-64.

———. "Three Grades of Immediate Perception: Thomas Reid's Distinctions." *Philosophy and Phenomenological Research* 76: 3 (2008): 603-632.

———. "The Function of Sensations in Reid." *Journal of the History of Philosophy* 47: 3 (2009): 329-355.

Byrne, Alex and David R. Hilbert. "Are Colors Secondary Qualities?" L. Nolan, ed. *Primary and Secondary Qualities*. New York: Oxford University Press, 2011.

Hardin, C. L. "A spectral reflectance doth not a color make." *The Journal of Philosophy* 100 (2003): 191-202.

Huemer, Michael. *Skepticism and the Veil of Perception.* Lanham: Rowman & Littlefield, 2001.

Jackson, Frank. "The Primary Quality View of Color." *Nous* 30 (1996): 199-219.

Johnston, Mark. "How to Speak of the Colors." *Readings on Color, Volume 1: The Philosophy of Color*. Ed. Alex Byrne and David R. Hilbert. Cambridge, MA: The MIT Press, 1997. 137-176.

Reid, Thomas. *An Inquiry into the Human Mind on the Principles of Common Sense*. Ed. Derek R. Brookes. University Park, PA: Penn State Press, 1997.

———. *Essays on the Active Powers of Man*. Ed. William Hamilton. 7th. Vol. 2. Edinburgh: MacLachlan and Stewart, 1872. 2 vols.

———. *Essays on the Intellectual Powers of Man*. Ed. Derek R. Brookes. University Park, PA: Penn State Press, 2002.

Smith, A. D. *The Problem of Perception*. Cambridge, MA: Harvard University Press, 2002.

Tye, Michael. *Consciousness, Color, and Content*. Cambridge, MA: The MIT Press, 2000.