

The Data Problem for Color Objectivism

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Are colors objective or subjective? Are they properties, processes, or events of the physical world or, instead, of the perceiving subject? This question has been debated at least since the time of Galileo and remains unsettled to this day. Evidence from computational and psychophysical studies of vision has not decided the issue, with both objectivists and subjectivists claiming that the evidence to date is in their favor.

In his article, “The Location Problem for Color Subjectivism,” Peter Ross proposes that color subjectivists make two mistakes, one logical and one empirical (Ross, 2001). The logical mistake is an unwitting commitment to a philosophical assumption he calls the “corresponding category constraint.” The empirical mistake is the failure of any subjectivist theory to properly account for recent data on sensed locations. Ross concludes that color subjectivism is untenable and proposes instead that disjunctive physicalism is the most viable remaining candidate.

Here I argue that the data on sensed locations are different than Ross claims and that once the data are properly understood they pose no obstacle to adverbial-subjectivist theories. Then I argue that disjunctive physicalist accounts of color need the corresponding category constraint no less than subjectivist accounts or else they are devoid of empirical support. Finally I raise an empirical challenge for color subjectivists and a separate empirical challenge for disjunctive physicalists.

Ross raises the problem of sensed locations as an empirical obstacle to acceptance of adverbial-subjectivist theories. According to such theories, sensing is not a relation between a perceiver and sense data or other objects, but rather a nonrelational way that a perceiver is. When a perceiver sees a red square he sees redly and squarely; when he sees a green circle he sees greenly and roundly. Seeing redly, greenly, squarely, and roundly describe kinds of mental processes or events of the perceiver.

The problem with this theory, according to Ross, is that colors have sensed locations, and the theory cannot account for the empirical data on the binding of colors with locations in the visual field. We can, for instance, see a red circle inside a green square and distinguish this from a green square inside a red circle. The adverbialist must provide a nonrelational account of sensed locations to handle such cases, and the most straightforward way is to describe the visual field as an array of repeatable sensory events to which sensory adverbs, such as redly, can apply. Then he can describe one sensory event as redly and roundly and insidely and another as greenly

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and squarely and outsiders and thus resolve the problem of sensed locations. But this account of sensed locations as repeatable sensory events leads to the prediction that the same sensed location can qualify different parts of the visual field, e.g., the prediction that the same sensed location can qualify both a red circle and a green square. In this case, says Ross, we should be able to find disorders where the same sensed location does qualify different parts of the visual field. And, he claims, no such disorders have been identified. Therefore the adverbialist account of sensed location founders on the empirical evidence.

Here I think Ross has the empirical evidence wrong. One need not be disordered to have the same sensed location qualify different parts of the visual field. Indeed, multiple qualification is easily demonstrated with normal perceivers. I can, for instance, create a computer display in which red dots are randomly placed within a disk and green dots randomly placed within a square. I then rigidly translate the two sets of dots past each other, say the green dots moving to the left and the red dots to the right. Normal observers see two transparent shapes, a square and a disk, moving past each other at the same sensed location. Thus the same sensed location qualifies a square moving to the right and a disk moving to the left, no disorders required. And it is straightforward to construct many other examples using perceived transparency. The phenomenon of perceived transparency is exactly what one would predict from the adverbialist theory: One sensed location qualifying multiple parts of the visual field.

One might object that in this example it is not the same sensed location that qualifies both a square and a disk, since the square and disk are usually seen at slightly different depths. In reply, I could note that it is debatable whether they are always seen at slightly different depths. But let us grant the point. We can modify the example by rotating both disk and square about the vertical axis, the disk by $+45^\circ$ and the square by -45° and then have them slide past each other in depth. As they slide they meet in a vertical line of intersection, and along this line the disk and square have the same sensed location, not just in 2D but also in 3D. So this one line qualifies both a square at $+45^\circ$ and a disk at -45° . And once again we have the same sensed location qualifying different parts of the visual field.

I conclude that, whether or not adverbialist theories are correct, they cannot be dismissed on the empirical grounds claimed by Ross. Instead the empirical data on multiple qualification are just as predicted by adverbialists.

Now I turn to argue that disjunctive physicalist accounts of color need the corresponding category constraint no less than subjectivist accounts, or else they are devoid of empirical support. According to Ross, the corresponding category constraint is the following: "colors are identified with a range of properties which corresponds with and explains our ordinary color categories." Ross observes that many subjectivists tacitly assume the corresponding category constraint in their arguments for subjectivism. This constraint, he claims, should be rejected, along with the arguments for subjectivism that it supports. Instead he endorses the view that colors are disjunctive physical properties. They must be disjunctive because the existence of metamers shows that widely different physical situations are experienced as the same sensed color.

Here is my argument:

Premise 1: (Denial of corresponding category constraint). Colors are not identified with a range of properties which corresponds with and explains our ordinary color categories.

Premise 2: (Ross's definition of ordinary color categories). Ordinary color categories are the categories by which we classify colors as qualitatively identical or different and qualitatively similar or dissimilar.

Premise 3: (Disjunctive physicalism). Colors are identified with disjunctive physical properties.

Conclusion 1: The disjunctive physical properties that are identified with colors do not explain the categories by which we classify colors as qualitatively identical or different and qualitatively similar or dissimilar.

Premise 4: If theory A makes no claim to explain data set B, then data set B does not constrain theory A.

Conclusion 2: The disjunctive physical properties identified with colors are not constrained by judgements of color similarity or identity.

The question naturally arises: What empirical data do constrain the disjunctive physical properties? One possible answer is: none. But no one is interested in a theory with no empirical constraints. Another possible answer is: serial search experiments, attention experiments, . . . , but not experiments using judgements of similarity or identity. But this is ad hoc. Why should some psychophysical evidence be admitted and some not? What are the principled grounds for deciding which psychophysical evidence to admit, while rejecting judgements of similarity and identity. There are none. A third possible answer is: No psychophysical data constrain the disjunctive physical properties, but data from other sciences, such as physics and chemistry, do constrain them. This answer is desperate and ad hoc. What principle guides the choice of constraining data? None.

I do not conclude from this that disjunctive physicalism is untenable. I simply conclude that if one wants to buy disjunctive physicalism, then one had better also buy the corresponding category constraint or else be left with no plausible empirical support. The subjectivists and disjunctive physicalists have this in common: They both equally need the corresponding category constraint to support their theories.

Now I raise a challenge for color subjectivists. Many subjectivists conclude that physical objects are colorless. They support this claim in part by noting the existence of metamers, which cannot be explained by physical categories but probably can be explained by neural processes. Now "metamers" occur not just for colors, but also for shapes, motions, textures, positions, and a host of other visual properties. There are countless different stimuli that can lead one to see the same 3D shape (Hoffman, 1998), just as there are countless different metamers. Similarly there are countless different stimuli that lead one to see the same motion, or texture, or position. If one concludes from the existence of color metamers that physical objects are colorless, then consistency demands that one also conclude that physical objects are also without position, shape, motion, or texture. I do not view this as an argument against color subjectivism. It is simply an argument that if one opts for color subjectivism, then one should be prepared to go all the way with all other visual properties as well.

Finally I raise a challenge for disjunctive physicalists, whom I now take to embrace the corresponding category constraint. The empirical data on color that must be ac-

counted for by a disjunction of physical properties is enormous and diverse. It includes the fact that, simply rearranging the relative positions of colored squares can make them appear entirely different colors (Hoffman, 1998, p. 112); that observers can be induced to see a white patch of paper as any other color by using the technique of neon color spreading (Hoffman, 1998, p. 135); that, colors can be seen in regions of space devoid of any tangible objects (Hoffman, 1998, p. 138); and that observers can be induced to see a white patch of computer screen as any other color by using the technique of color from motion (<http://aris.ss.uci.edu>). Disjunctive physicalism cannot be accepted simply because the alternative, color subjectivism, is claimed to be implausible. To be taken seriously, disjunctive physicalism must propose specific disjunctions of physical properties that do justice to the plethora of color data just mentioned and more besides. To date I have seen no proposed disjunction that is even remotely plausible.

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