

Color Relationalism^{*}

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It is when I struggle to be brief that I become obscure.
— Horace, *Ars Poetica*, l. 25.

1 What is it?: Exposition

Color relationalism is the view that colors are constituted in terms of relations to perceiving subjects and perceptual circumstances.

It may be useful to compare this proposal about color against less controversial relationalist views about other properties. Relationalism about *being a teacher* is the (plausible) view that things bear the latter property not by virtue of their intrinsic makeups, but by standing in the right (viz., pedagogical) sort of relation to relata (viz., students).¹ Or, again, relationalism about *being humorous* is the (plausible) view that things bear the latter property not in virtue of their intrinsic makeups, but by standing in the right sort of relation (viz., the relation of bringing about in the relata certain kinds of amusement reactions) to relata (viz., appropriately equipped sentient beings). So, too, relationalism about color is the view that things bear the latter not by virtue of their intrinsic makeups, but by standing in the right sort of relations to (the right sorts of) perceivers and (the right sorts of) perceptual circumstances.²

So exactly what, for a relationalist, counts as the right — i.e., color constitutive — sorts of relations, perceivers, and circumstances? Because there is a wide range of answers to these questions, about which reasonable relationalists will disagree, it is probably best to think of relationalism as a view family, rather than a single specific view. Perhaps the most historically important form of color relationalism, sometimes associated (controversially) with great moderns including Galileo, Boyle, Newton, and

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¹Here I pass over all sorts of complications about the metaphysics of intrinsicness; see, e.g., Weatherson and Marshall (2014).

²One could, of course, consider a more general form of relationalism requiring that colors are constituted in terms of relations, but not that they are constituted in terms of relations to perceivers and circumstances, in particular. I'm formulating relationalism in the more restrictive way so as to make the relationalist/non-relationalist distinction coincide with the most important and historically salient divisions in philosophical space. (On the more general construal, the view that colors are (classes of) surface spectral distributions — which are ways of affecting light — would be no less relationalist than the classical dispositionalist view that colors are (roughly) dispositions to cause certain sensations in normal perceivers in normal circumstances; a taxonomy that lumps these positions together seems like not the most useful way of carving the space of options.)

Locke, holds that the relevant relations are dispositions to cause color sensations, and the relata are normal perceivers in normal circumstances. Contemporary defenders of related views include McGinn (1983); Peacocke (1984) and Johnston (1992). Moreover, a number of philosophers, including Cohen (2003, 2009); Matthen (2005); Thompson (1995); Thompson et al. (1992), have more recently defended a range of non-traditional forms of color relationalism that differ from dispositionalism and from one another largely in just how they understand the color-constitutive relation.³ For present purposes, however, it will be useful to think of relationalism broadly, as there is much that can be said about the strengths and weaknesses of the general view — i.e., the claim that colors are constituted in terms of relations to perceivers and circumstances — independently of the more particular commitments that divide relationalists.

2 Why believe it?: Motivation

The leading motivation for color relationalism, in both its historical and contemporary forms, is a non-deductive argument form concerning perceptual variation. Though this argument form generalizes over a very wide set of intrapersonal, interpersonal, and interspecies phenomena, it is best appreciated, at least initially, in its application to single cases.

Thus, we can begin with a case of intrapersonal variation that involves our perceptual reactions to the central strips in the left and right halves of figure 1. The strips in the two halves of the figure are intrinsically (qualitatively) identical. (Indeed, with scissors and glue, we could generate the same effect with a single strip rather than two qualitatively identical copies.) But if you are like most normally sighted subjects, your visual system will react differently to the strip depending on the background against which it is set: it will look lighter and more greenish against the yellowish background on the left, and darker and more yellowish against the greenish background on the right. There is, then, variation in your perceptual reaction to the one stimulus (the strip) as a function of the circumstances in which you perceive it.

Now, on standard assumptions, each of your variant perceptual reactions is a representation of the strip and its properties — each represents the way the distal object is.⁴ If so, then we can ask: which of the variant reactions is a *veridical* representation of the way the distal object is, and why? This question is intended metaphysically, not epistemically: we are asking not ‘how do we know which is veridical?’ but ‘which of the variant perceptual effects really is veridical, and what makes that the case?’. The logically possible answers (in a case with two variants) are: (i) neither veridical, (ii) one veridical at the expense of the other, (iii) both veridical.

Which of the logically possible answers should we select? The neither veridical option is coherent, but unduly skeptical: the case can be elaborated so as to make it as conducive to veridical visual apprehension of the world as we like without thereby eliminating the possibility of perceptual variation, so choosing this answer is uncomfortably close to holding that no one ever perceives any color veridically. The one right option is also coherent, but objectionably stipulative given the symmetry between variants: every physical or psychological fact that can be cited in a description of either variant can be met by a corresponding physical or psychological fact that can

³For discussion and comparison, see Cohen (2009, ch. 8).

⁴Such standard assumptions are rejected by Smith (2002); Travis (2004), and defended by, e.g., Byrne (2009); Pautz (2010a); Siegel (2010a,b).

be cited in a description of the other, and there's no obvious reason why the facts cited in one of these descriptions (and not others) should make it count as veridical to the exclusion of others. Hence, it's hard to imagine what could count as a non-stipulative, non-question-begging reason for counting any one variant as uniquely veridical.⁵ This leaves the ecumenicist answer, on which both variants are veridical; this answer has the advantage over other answers that it avoids forms of undue skepticism and unmotivated stipulation that, I take it, we should want to avoid.

But accepting this kind of ecumenicism is a short inference to the best explanation away from color relationalism.⁶ Relationalism explains how it could be, in a situation where a given stimulus a brings about different perceptual effects in perceiver S in circumstance C_1 and in S in circumstance C_2 — i.e., a looks red to S in C_1 and does not look red to S in C_2 — that both perceptual effects can veridically represent a . The crucial observation here is that if an object bears relation R to a sequence of relata $\langle r_1, r_2, \dots \rangle$, that says nothing at all about whether it does or does not bear R to some other sequence of relata $\langle r'_1, r'_2, \dots \rangle$, or whether it does or does not bear some different relation R^* to either one of those sequences of relata. Thus, if Aristotle is the teacher of Alexander, this neither requires nor precludes that Aristotle is the teacher of Cleopatra. (Nor, indeed, does it require or preclude that Aristotle bears some other relation to either Alexander or Cleopatra). So, too, if color relationalism is true, and a is red to S in C_1 , this neither requires nor precludes that a is red to S in C_2 . Consequently, relationalists can hold both that (i) a 's effect on S in C_1 is a veridical representation because a is red to S in C_1 , and (ii) a 's effect on S in C_2 is a veridical representation because a is not red to S in C_2 .

In short, then, the facts about perceptual variation motivate color relationalism via a pair of non-deductive inferences — the first from the empirical data (plus standard canons of rationality) to ecumenicism, and the second from ecumenicism to relationalism.

As indicated above, this argumentative pattern generalizes widely, and can be applied, in a consistent way, to interspecies, intrapersonal, and interpersonal instances of perceptual variation.

Interspecies: Perceivers of different species differ considerably in their color vision: the chromatic effects that a single stimulus has on these perceivers vary widely as a function of many parameters of their visual systems — retinal cone type

⁵Some authors (e.g. Tye 2006, p. 3, 2012, pp. 2–3; Byrne and Hilbert 2003, p. 17, 2007, pp. 88–89; Byrne 2006, p. 337; Byrne and Hilbert forthcoming, p. 12) disagree, and claim that it is relatively easy to say what makes it the case that a given variant is veridical: it is veridical just in case it (i) represents the color of the stimulus as F , and (ii) the color of the stimulus is indeed F . That does indeed amount to a correct statement of what it means for a variant to be veridical. But it does nothing to explain what makes it the case that one variant meets this condition at the expense of the others, which is the question facing us.

⁶The color pluralism of Mizrahi (2007) and Kalderon (2007, 2015) can be thought of as denying this inference to the best explanation by supplying a non-relationalist way of accepting ecumenicism. Color pluralism is the view that objects have multiple non-relational colors, to different ranges of which different perceivers in different circumstances are selectively responsive. For pluralists, distinct variants selected by different perceivers/circumstances are compatibly veridical because objects indeed compatibly exemplify multiple colors.

Briefly, I worry that this non-relationalist form of ecumenicism is unsuccessful because there remain cases of perceptual variation, grounded in differences in post-receptoral processing, between perceivers who access/are selectively responsive to exactly the same ranges of (what it recognizes as) non-relational colors. The pluralist can't describe such cases of perceptual variation ecumenically, since here the perceivers access the very same ranges of non-relational colors. For discussion, see Pautz (2006, 2008) and Cohen (2009, pp. 78–88).

populations (and population ratios), cone tuning curves, macular and lens pigmentation, and on and on. While there may be principled grounds for saying that some such variants represent the stimulus color erroneously, there remains significant variation between variants in organisms that pass standard comparative psychophysical criteria for normal color vision; as such, it would be objectionably *ad hoc* to treat these variants as systematically misrepresenting the colors of objects. The relationalist holds that all of these variants are veridical, thereby avoiding undue skepticism and *ad hoc* stipulation, by holding that the stimulus exemplifies (simultaneously, all over) one color with respect to perceivers of kind K_1 , another color with respect to perceivers of kind K_2 , and so on.

Interpersonal: Human perceivers differ considerably in their color vision: the chromatic effects of a single stimulus on these viewers vary widely as a function of many parameters of their visual systems — retinal cone populations (and population ratios), cone tuning curves, macular and lens pigmentation, and on and on. While there may be principled grounds for saying that some such variants represent the stimulus color erroneously, there remains significant interpersonal variation among perceivers who pass standard tests for normal color vision; as such, it would be objectionably *ad hoc* to treat these variants as systematically misrepresenting the colors of objects. The relationalist can hold that all of these variants are veridical, thereby avoiding undue skepticism and *ad hoc* stipulation, by holding that the stimulus exemplifies (simultaneously, all over) one color with respect to perceiver S_1 , another color with respect to perceiver S_2 , and so on.

Intrapersonal: The chromatic effects of a single stimulus on a single perceiver vary widely as a function of many parameters of the viewing circumstance — surround, lighting, viewing angle, viewing distance, state of adaptation of the perceiver, and on and on. While there may be principled grounds for saying that some such variants represent the stimulus color erroneously, there remains significant perceptual variation within ecologically normal circumstances; as such, it would be objectionably *ad hoc* to treat these variants as systematically misrepresenting the colors of objects. The relationalist holds that all of these variants are veridical, thereby avoiding both undue skepticism and *ad hoc* stipulation, by holding that the stimulus exemplifies (simultaneously, all over) one color with respect to circumstance C_1 , another color with respect to circumstance C_2 , and so on.

Combining these considerations, and ignoring many niceties (also assuming that each perceiver falls in exactly one relevant perceiver type), leads to the relationalist proposal that colors are constituted in terms of relations to both perceivers and perceptual circumstances — that colors are not monadic properties like *red* or *green*, but rather relational properties like *red for S_1 in C_1* or *green for S_2 in C_2* .

3 No, really?: Objections

3.1 Color representation

There is a mismatch between the relationalist's colors and the form of ordinary linguistic (and, plausibly, mental) representation of color. Ordinary linguistic/mental

color attributions typically don't contain overt specifications of the perceiver and circumstance parameters — and certainly not overt specifications of perceivers or circumstances that are as fine-grained as apparently needed to cope with the observed range of perceptual variation per the relationalist strategy above. So it's not clear how ordinary predications could genuinely (non-gappily) have relationalist's colors as semantic values.

But this problem can be solved by two independently plausible ideas. The first is that ordinary color predicates pick out “coarse-grained colors” — relational properties analogous to the fine-grained colors discussed above, but whose parametric positions are filled by relatively coarse-grained specifications of perceivers and perceptual conditions. This idea allows that the contents expressed by ordinary uses of color predicates need not attain the high levels of determinacy of the fine-grained colors; it simultaneously allows that the contents expressed by ordinary uses of color predicates can be multiply instantiated. The second independently plausible idea needed is a version of semantic contextualism for color language and thought — roughly, that contextual enrichment adds to the information overtly encoded in ordinary color attributions. Combining these two ideas results in the view that the predicate ‘is red’, as uttered/thought in context *K*, expresses the property *red for the perceivers relevant in context K under the perceptual circumstances relevant in context K*.⁷ (Similarly for other color predicates.)⁸

3.2 Disagreement

One might worry that the relationalist's implementation of ecumenicism, which involves the idea that different variants ascribe properties relativized to different parameters, deprives distinct ascriptions of a common subject matter, and so precludes intrapersonal and interpersonal disagreement about color.⁹

But this worry can be answered by appeal to the relationalist's coarse-grained colors. Even if the distinct fine-grained colors *unique yellow for S₁ in C₁*, *greenish-yellow for S₂ in C₂* attributed by S₁'s and S₂'s visual systems are compatible, we can account for the disagreement between S₁ and S₂ by claiming that S₁ verbally/cognitively

⁷Analogy: Ordinary motion attributions don't contain overt specifications of reference frames, so it's not clear how ordinary predications could genuinely have properties constituted in terms of relations to reference frames as their semantic values. But we can reconcile these predications with a relativistic ontology of motion properties by construing the former as making tacit reference to a contextually salient reference frame, holding that ‘is moving at 60 miles per hour’, as uttered/thought in context *K*, expresses the property *moving at 60 miles per hour relative to the reference frame relevant in context K*.

⁸Two points about coarse-grained colors are worth noting. First, as defined, they are no less relational than fine-grained colors, so fit into a thoroughly relationalist ontological inventory. Second, though they are designed to serve our conversational/explanatory needs by being relativized to contextually relevant types of perceivers and circumstances, such choices are not therefore metaphysically principled: it would be absurd to attempt to break symmetries between perceptual variants by holding that the variant arising in perceivers/circumstances contextually relevant to us is distinguished from others in any metaphysically significant way. (Analogy: we might be speaking in a context in which having fewer than 100 hairs on one's head makes one count as bald; but it would be absurd to treat this contextual standard as a metaphysically principled distinction between the positive and negative extension of ‘bald’.) So the acceptance of coarse-grained colors is not at odds with relationalist's claim (crucial to her argument from perceptual variation) that perceptual variants are metaphysically symmetric.

⁹What I say here and below applies to both agreement and disagreement.

attributes, while S_2 verbally/cognitively forebears, a common coarse-grained color (viz., one whose perceiver/circumstance parameters are assigned to the very same values). It would seem, then, that relationalism has the capacity to describe individuals as disagreeing about the colors of objects — it is just that the descriptions in question will involve representations of coarse-grained properties at the cognitive/linguistic level rather than representations of the fine-grained properties by the visual system.¹⁰

3.3 Error

It is also possible to worry that the relationalist's embrace of ecumenicism — designed, as it is, to make veridical many different representations of color — leaves her without a way of saying that *any* variant color representation is erroneous, and so without an account of color misrepresentation. But this worry is misplaced: relationalism makes room for several forms of color misrepresentation.

A first involves hallucination. If, in hallucinatory experience, I perceptually represent an elephant exemplifying *pink* (for myself in the circumstances I am in) even though there is no local elephant, I am thereby entertaining a perceptual representation that misascribes a color to an individual. Admittedly, here blame for the representation's non-veridicality lies, in the first instance, with the absence of an individual answering to the subject term, and not with some more limited problem about the color property it attributes — that's what makes the case an instance of hallucination rather than illusion. Notwithstanding this point, it seems fair to describe the case as one in which the perceiver perceptually entertains a non-veridical color representation, viz., a color misrepresentation. And there's no reason a relationalist cannot recognize color misrepresentations of this kind.

A second relationalist-friendly form of color misrepresentation involves deviant causal chains. Thus, to return to a fanciful example from Cohen (2007), if a telekinetic tomato stimulates my visual cortex without affecting my retina, and my subsequently attending to that tomato causes in me the reaction I normally get when looking at ordinary, non-telekinetic, ripe tomatoes, then my perceptual representation of its color is obtained through a deviant causal chain. But if that's so, then even a committed ecumenicist about perceptual variation is within her rights to say that *this* color representation should be excluded rather than treated as veridical. The point

¹⁰Objection: This solution buys the relationalist an account of disagreement in color representation, but it inappropriately precludes *perceptual* disagreement about color (Pautz 2010b; Allen 2011, p. 318, 2012, p. 16; Tye 2012, p. 12; Egan 2012; Brogaard 2010, pp. 13–14, 2012, pp. 317–318, 2014, p. 12).

Response: Evidence of agreement and disagreement in color representation (e.g., matching judgments, verbal attributions) involves contributions from cognitive/linguistic as well as perceptual levels of representation. Hence it shouldn't be taken for granted that we must seek explanations of the phenomena exclusively in terms of perceptual representations. (Analogy: It's reasonable to demand that an adequate overall account of language understanding should predict the unacceptability of strings like those in (1).

(1) a. Le silence vertébral indispose la voile licite. (Tesnière 1959, ch 20)
The vertebral silence indisposes the licit sail.

b. Buffalo buffalo Buffalo buffalo buffalo buffalo Buffalo buffalo. (Pinker 2000, p. 210)

But it's not reasonable to demand that a theory of syntax, in particular, should be the component of the overall account of language understanding from which such predictions are derived.) It's fair game to demand that the explanatory labor get done — but not to insist in advance on a particular theoretical distribution of the labor.

generalizes: while accepting ecumenicism about perceptual variation means treating as veridical whatever color ascriptions can't be set aside for principled and non-question-begging reasons, this is compatible with thinking that there are some variants that *can* be set aside for reasons independent of our commitments about color. There's surely room for disagreement about what counts as deviant, but it's plausible that cases involving telekinetic tomatoes and blunt instrument head trauma fall into this class on anyone's story, and therefore that relationalists can describe the color representations arising in such cases as erroneous, notwithstanding their general ecumenicist sympathies.

A third way in which relationalism makes room for erroneous color representation involves errors in the representation of the coarse-grained colors described above. Suppose you encounter *a* when it is illuminated in an unusual way you are not aware of — say, in the psychophysics lab, or, as happens frequently around my university, in parking lots with low pressure sodium vapor lamps, and that you (veridically) perceptually represent *a* as exemplifying the fine-grained color *gray for you in the circumstance you are in*. You have no reason to believe that there is anything odd about the spectral composition of the illumination, and so hold rational but false beliefs about what sorts of perceiver you are/what sort of perceptual circumstance you are in. Thus, the perceiver and circumstance types relevant in your context *K* are the ordinary ones you take yourself to exemplify and occupy, rather than the unusual ones you in fact exemplify and occupy. Consequently, you infer/compute, in the ordinary way, from your veridical perceptual representation that *a* bears the fine-grained color *gray for you in the circumstance you are in* to the erroneous conclusion that *a* bears the coarse-grained color *gray for the perceivers relevant in context K under the perceptual circumstances relevant in K*. In so doing, you misrepresent *a*'s color.¹¹

3.4 Color constancy

As we have seen, color relationalism takes differences in color perception very seriously, and indeed (to a first approximation) treats differences in color perception as strong evidence of differences in color properties. But one might object that this treatment ignores a kind of stability that comes out in garden-variety instances of color constancy, such as that depicted in figure 2, where a materially uniform coffee cup is partially illuminated by direct sunlight and partially shaded (there is a luminance edge on its facing surface). Though there's much that is puzzling and controversial about such cases, it surely seems natural to say that there's some good sense in which patches of the cup on opposite sides of the luminance edge are alike in color. Of course, relationalists will want to say that there is perceptual variation, hence a color difference, across the luminance edge: the patch on one side looks and is lighter white to perceiver *S*₁ in its condition involving direct sunlight illumination, while the patch on the other side looks and is darker white to perceiver *S*₁ in its condition involving indirect illumination. Are relationalists, therefore, unable to account for the phenomenon of color constancy?

They are not. Recall that, for relationalists, objects (including surface patches) simultaneously exemplify multiple colors. In particular, relationalists will say that a patch of the coffee cup exemplifies not only the color that it is occurrently manifesting

¹¹Objection: This third route to error locates the error at cognitive/linguistic levels, so doesn't make room for specifically *perceptual* color misrepresentations.

Response: As noted, relationalists have other resources for describing perceptual misrepresentations of color, in case that is wanted. Moreover, and once again, while I agree we should want an account of color that makes room for misrepresentation, I also think it should be potentially up for grabs just what kind of theoretical descriptions of misrepresentation we offer (cf. note 10).

(to S_1 in C_1), but also colors that it is not occurrently manifesting. Thus, the relationalist can hold that the occurrently darker patch of the cup now in C_1 exemplifies the non-manifest color *brighter white* to S_1 in C_2 . Of course, she will say that that is the very color the lighter patch of the cup both exemplifies and occurrently manifests. Therefore, she can acknowledge a color property that is constant/shared between the two patches, even though (she will say) it is a color that only one of them occurrently manifests.¹² And she can describe mechanisms of color constancy as delivering verdicts about whether patches occurrently manifesting different colors would match visually if, counterfactually, the two were presented under the conditions that one of them is occurrently in.¹³

3.5 Visual access to fine-grained colors

Though this will depend on the broadly empirical question of which differences in visual systems and perceptual circumstances result in faultless psychophysical variation, it seems that the relationalist's fine-grained colors are likely to be quite fine-grained indeed. Some have worried that, consequently, such colors will be inaccessible to vision or visual representation, or otherwise unsuited to the purposes color vision serves in creatures like us.

Thus, [Byrne and Hilbert \(forthcoming\)](#) object that the properties in question are both too determinate to be recovered by visual systems and ecologically insignificant because too fine-grained to stand in even local correlations with ecologically/adaptively useful object properties (say, being tasty, being nutritious, etc.).¹⁴ [Pautz \(2010b\)](#) builds on this

¹²Objection:

...if ... the perceptually distinguishable regions ... manifest different colors, then, on Cohen's account of color, they actually *look* different colors. According to Cohen, then, there isn't color constancy (in the relevant sense). This seems wrong to me and to miss the point. I take color constancy for the purposes of this objection to be constancy in how things *look* color-wise through different lighting conditions. It isn't constancy, period. Cohen fixes up something that gets the latter but he doesn't get the former ([Tye 2012](#), p. 303).

Response: Why assume that an adequate description of color constancy must allow that what is shared is manifested color? That is a theoretical assumption that goes far beyond the matching data that motivates taking there to be a shared/constant property, and that the relationalist description of constancy clearly respects. Relationalism may not respect the theoretical description of the phenomenon that Tye prefers; but he owes us an argument for thinking that's a shortcoming of the view. (I'd add that relationalists can also allow that the two regions share any number of occurrently manifested properties that are not colors; hence even if, counterfactually, we had a reason to believe that what is shared in the cases under dispute must include an occurrently manifest property, this still wouldn't threaten the relationalist's characterization of them. For further discussion of these and related issues, see [Cohen \(2012\)](#); [Gert \(2012\)](#).)

¹³The counterfactual condition at issue is neither (i) that they would match if presented under some or other condition (that is too weak), nor (ii) that they would match if presented under every condition (that is too strong). It is that they would match if presented under the very condition that one of them is occurrently presented in.

¹⁴[Byrne and Hilbert \(forthcoming\)](#) make the further criticism that, because the relationalist's fine-grained colors are so fine-grained as to be rarely if ever repeated, they are incapable of explaining intrasubjective color matches in how things look (e.g., in standard psychophysical experiments). But the explanation of color constancy in §3.4 extends directly to a general relationalist explanation of intrasubjective color matching. On this story, matches in how things look reflect not a representation of identity between distinct fine-grained colors, but representation that the distinct fine-grained colors are appropriately related to one another given the way in which

criticism by objecting that the fine-grained colors fit poorly with standard views of the psychosemantics of sensory representation (e.g. [Dretske 1995](#); [Millikan 1984](#); [Tye 1995, 2000](#)), on which (roughly) state-types are assigned as content whatever they have the functional role of indicating among the general population under optimal conditions. The problem, Pautz urges, is that it's hard to see how any state type could have the function of indicating in the general population under optimal circumstances such extremely finely individuated, non-recurring, and ecologically insignificant properties as the relationalist's fine-grained colors. If so, such standard psychosemantic views would entail that no visual state type has any fine-grained color as its content.

I believe relationalism withstands these worries.

It's unclear what to make of Byrne's and Hilbert's worry about the unrecoverability of the fine-grained properties. For, while the relationalist's fine-grained properties will plausibly depend on many parameters of the perceiver and circumstance, relationalists won't take any parameter to individuate colors without empirical evidence that visual systems are sensitive to its value. Of course, the computational techniques visual systems employ to estimate such values are quite complicated, highly interactive, dependent on endogenously fixed assumptions about the world ([Shepard 2001](#)), and as yet imperfectly understood. But this is no reason for supposing that these parameters are beyond the reach of visual systems.

I accept Byrne's and Hilbert's additional point that the relationalist's fine-grained colors may lack ecological significance (when considered on their own). On the other hand, and as they note (pp. 16–17) there's no reason to doubt that the relevant ecologically salient properties are locally correlated with the coarse-grained colors relationalists already have reason to recognize (cf. [Cohen 2009](#), pp. 126–127): ripe fruits exemplifying different fine-grained colors plausibly share the property *crimson for the perceivers relevant in context K under the perceptual circumstances relevant in K* for a suitable choice of *K*. So long as our theory of color allows (as relationalism does) that organisms can be responsive to ecologically significant properties or their local correlates in one way or another, the fact of this responsiveness presents no obstacle for that theory.¹⁵

Pautz's psychosemantic concern can be answered as well. It should be uncontroversial to parties in this dispute that there is *mental* representation of relational properties (say, *humorousness*) and of fine-grained relational properties (say, *nutritious to a creature with narrowly specified metabolism type M, conspecific to a creature with narrowly specified reproductive type R, and even red for creature with a narrowly specified visual system type S in narrowly specified perceptual circumstances C*). But if so, then it's open to relationalists to hold that whatever accounts for the mental representation of such properties can also serve as an account of states of the visual system represent the very same properties. Now, one might insist that the story about the mental representation of fine-grained relational properties won't extend to sensory representation — that, though such properties can be mentally represented, they can't be represented by sensory systems. But why accept that insistence? Surely not simply because standard psychosemantic theories don't extend to fine-grained relational properties. For one thing, the mental

perceptual circumstances vary — i.e., that the objects *would* exemplify the same fine-grained color were they both presented in a circumstance that in fact only one of them occupies.

¹⁵Nor does accounting for this responsiveness in terms of representations of coarse-grained colors undercut our motivation for believing in fine-grained colors or their representation; the argument for accepting such representations (viz., that this allows for a non-stipulative, non-skeptical and general response to cases of perceptual variation with respect to color) remains as strong or as weak as before.

representability of such properties already shows that the theories in question can't be the whole story about mental representation (*a fortiori*, about representation in general); so it is up for grabs that whatever amounts to the rest of the story for mental representation (some extension of current theories? some completely different theory?) is applicable to sensory representation as well. For another, the psychosemantic theories at issue are themselves beset with serious difficulties even with respect to the simple non-relational properties they typically use as starting places (Cohen 2004); as such, it would seem inadvisable to treat compatibility with these theories as an adequacy condition for anything.¹⁶

3.6 Determinables without determinates?

As we have seen, the principal motivation for relationalism is to allow us to accept as veridical the multiple ways objects look in respect of their colors; hence, its proponents will accept instances of the schema (R):

(R) a is F to perceiver S in circumstance C iff a looks (/is disposed to look) F to S in C

(where ' F ' is the name of a color). Cutter (2018) urges that this principle (which is naturally understood as nothing more than an expression of the relationalist's ecumenicism) is problematic when applied to cases of peripheral color perception. Because the density of retinal cone cells mainly responsible for color vision drops off significantly outside the fovea, color perception in the periphery of the visual field is much less determinate than in foveal regions. Consequently, subjects often report that stimuli presented in the periphery look (as it might be) reddish without looking any determinate shade of red. Taking these reports at face value, the relationalist's commitment to (R) would seem to entail that peripherally seen objects bear determinable properties without bearing any of their determinates.

Cutter objects that this conclusion clashes with a traditional view about the metaphysics of determination (henceforth, "Determination") — the principle that, necessarily, nothing can have a determinable without having one of its determinates (cf. Funkhouser 2006; Johnson 1921; Prior 1949). Indeed, as he points out, many have rejected sense data accounts because their description of our perception of Ryle's famous speckled hen, involving a sense datum that has many speckles but no determinate number of speckles, offends against Determination (Armstrong 1968). If the clash with Determination is a reason for rejecting sense data views, Cutter suggests, it should likewise be a reason for rejecting color relationalism.

But this objection is unpersuasive.

First, as remarked in §3.3, while the relationalist's ecumenicism about perceptual variation requires her to accept as veridical whatever color ascriptions can't be set aside for principled and non-question-begging reasons, this is compatible with holding that

¹⁶I myself am already committed to denying that standard psychosemantic theories are fully adequate accounts of sensory representation for reasons having to do with the possibility of representational differences in creatures selectively responsive to exactly the same range of stimuli (see note 6). Moreover, similar commitments attend competing views. Thus, as Pautz points out (p.c.), it's unobvious that standard psychosemantic theories allow for the representation of disjunctions of reflectances (Byrne and Hilbert 2004; Tye 2000) either, since such theories typically require contents to cause the tokens that represent them, and since many have thought that disjunctions (as opposed to their disjuncts) are acausal. However, and quite apart from these perhaps idiosyncratic commitments, it's fair to say that no current psychosemantic view is fully satisfactory.

some variants *can* be set aside given appropriately principled reasons. Much will turn on what reasons one is prepared to accept, but one can surely imagine that, for some relationalists, the abundant evidence of the anomalous character of peripheral color vision amounts to sufficient theory-independent reason for setting aside — for not treating as veridical — variants arising in peripheral vision. The point here is not that peripheral color vision is statistically infrequent or ecologically contrived (it is neither). Rather, it is that peripheral perception is anomalous in important psychophysical respects: e.g., in the periphery discrimination is poorer and more sensitive to contrast (Strasburger et al. 2011), cortical projections fewer in number (Gattass et al. 1997), flicker fusion thresholds lower (Hartmann et al. 1979), illusory conjunctions more common (Prinzmetal et al. 1995), and crowding more frequent (Levi and Carney 2009). (Peripheral perception's exceptional status presumably explains why (i) it would be misleading to answer questions about the limits on human visual discrimination or flicker fusion by providing data about the periphery, and (ii) perceivers nearly always preferentially employ foveal vision when stakes are high.) To the extent that one takes these considerations as principled reasons for setting aside such variants (I take no official stand on this question), the relationalist is within her rights to regard them as falling outside the scope of (R). If so, these variants will not lead to conflict with Determination.

Second, even for relationalists prepared to accept variant color representations arising in peripheral vision as veridical, there is reason, stemming from the same psychophysical considerations just adduced, for regarding the consequent violations of Determination as far less objectionable than those to which sense data theorists are committed, and not reasons for rejecting the view. What makes the sense data theorist's description of the speckled hen so odd is (in part) that the property she thinks violates Determination (viz., the sense datum's number of speckles) is free-standing and non-visual-system-involving. Ordinary visual-system-independent properties plausibly obey Determination, and there's no motivated reason for thinking that the property at issue should be an exception. By contrast, given color relationalism, there *is* a reason for expecting that peripherally perceived colors will behave quite differently from ordinary visual-system-independent properties. Again, even granting the current assumption that visual states arising in peripheral color vision are veridical, we still have reasons (see above) for regarding the latter as oddly behaved (relative to our expectations about foveal visual perception). But if these visual states are unusual, it's unsurprising (even predictable) that relations built from such oddly behaved relata are themselves odd: if you put visual systems in unusual states, it's unsurprising that the relations constituted partly by them will be similarly unusual (relative to our expectations about relations to visual systems engaged in foveal perception). To be sure, failing to conform to generalizations about determinable-determinate structure (even if formed from reflection on ordinary cases of properties not constituted in terms of relations to visual systems) goes against standard expectations. But since the nomologically necessary facts about the case under consideration provide theory-independent reasons for expecting that the relational properties arising here are likely to behave exceptionally, the discovery that they do is not, by itself, a reason to reject the identification between them and the colors.¹⁷

¹⁷NB: the suggestion here is not that relational properties *tout court*, or relational properties constituted in terms of relations to visual systems *tout court*, should be excepted from metaphysical generalizations like Determination. It is, rather, that we can expect such odd behavior from relations to *visual systems*, in cases where those visual systems are in states we have independent reason to regard as exceptional.

3.7 Phenomenology

For many, phenomenology is relationalism's "Achilles' heel" (Maund 2010) — a source of evidence that runs directly counter to the view. Many have held that, with notable exceptions such as the colors of holograms and glossy or shimmering materials (e.g., the backs of CDs), colors just do not look the way that relationalism says they are. Here is one especially direct expression of this idea:¹⁸

...when we see an object as red we see it as having a simple, monadic, local property of the object's surface. The color is perceived as intrinsic to the object, in much the way that shape and size are perceived as intrinsic. No relation to perceivers enters into how the color appears; the color is perceived as wholly *on* the object, not as somehow straddling the gap between it and the perceiver. Being seen as red is not like being seen as larger than or to the left of. The "color envelope" that delimits an object stops at the object's spatial boundaries. So if color were inherently relational, ... then perception of color would misrepresent its structure — we would be under the illusion that a relational property is nonrelational. Contraposing, given that perception is generally veridical as to color, colors are not relational (McGinn 1996, pp. 541–542).

This objection is at least initially puzzling, since it is not immediately obvious whether and how phenomenology might provide evidence about the relationality or non-relationality (or any other aspect of the metaphysics) of the properties whose instances we perceptually experience. Indeed, the very idea that phenomenology is potentially informative about the metaphysics of, say, *being water* or *being a tiger* is surprising. So we should ask: just why does the proponent of the objection we are considering believe that phenomenology bears on the metaphysics of color in particular?¹⁹

A clue comes from consideration of the notable exceptions mentioned earlier and allowed by the objectors — the colors of holograms and the backs of CDs, which, according to the critics, *do* look relational. The distinguishing feature of such objects is that the color phenomenology they generate is (intrapersonally) unusually fragile: even very slight and involuntary changes in viewing angle of a sort that are almost impossible to avoid in ordinary circumstances alter the resulting color phenomenology dramatically. So it would seem that proponents of the phenomenological objection against relationalism are treating the colors of these (according to them, exceptional) objects as looking relational on the grounds that we all have (indeed, cannot avoid having when visually attending to them) evidence of intrapersonal variation in the phenomenology they occasion. Whereas, in contrast, says the objector, we lack

¹⁸For similar sentiments, see Dancy 1986, p. 181; Armstrong 1987, p. 36; Boghossian and Velleman 1989, p. 85; Averill 1992, p. 556; Johnston 1992, pp. 226–227; Yablo 1995, pp. 489–490; Tye 2000, pp. 152–153; Chalmers 2006, p. 56; Gibbard 2006, p. 10; Hazlett and Averill 2010; Allen 2011; Brogaard 2010.

A further phenomenological objection to relationalism, which I leave unaddressed here for reasons of space, contends that relationalism cannot be combined coherently with a plausible metaphysics of conscious experience (Boghossian and Velleman 1989; McGinn 1996; Sellars 1956; Stroud 2000). For further discussion and response, see Cohen (2009, pp. 163–174).

¹⁹I ask this question not in order to motivate rejecting the relevance of phenomenology for the metaphysics of color (after all, I myself made heavy appeal to color phenomenology in motivating color relationalism in §2), but because I hope that answering it will assist us in understanding and assessing the objection at hand.

analogous evidence of intrapersonal phenomenal variation when visually attending to the steady colors of ordinary matte objects.

The explanation just contemplated has in its favor both that it begins to make sense of how phenomenology might bear on the relationality of colors, and that it initially seems to distinguish the exceptions from the non-exceptions in the way intended.

But on second thought, the latter distinction appears not to survive scrutiny. For if evidence of phenomenal variation counts as support for the relationality of unsteady/shimmering colors, then, presumably, phenomenal variation, if it exists, should likewise count in favor of the relationality of the steady colors of matte objects. And there *is* phenomenal variation — both intrapersonally and interpersonally — with respect to the steady colors of matte objects: as we saw in §2, color phenomenology varies dramatically along a large number of parameters of the perceiver and the viewing condition (including, *inter alia*, the viewing angle parameter cited in support of the relationality of unsteady colors).

If there is a difference between the forms of phenomenal variation accepted as evidence of relationality by the critics (viz., intrapersonal variation as a function of viewing angle for unsteady colors) and the rest, it appears to be a difference only in obviousness. Intrapersonal phenomenal variation across changes in viewing angle is hard *not* to observe with unsteady colors, while it takes somewhat more effort (how much varies between cases) to catalog the intrapersonal variation present with steady colors. Interpersonal phenomenal variation is ordinarily even less obvious to single observers without access to psychophysics labs, though, as we have seen, no less real. In short, once we accept that phenomenal variation gives a way of understanding how phenomenology can speak to questions about relationality at all, we have reason for treating the wide range of evidence of interpersonal and intrapersonal phenomenal variation with respect to color perception, whether obvious or not, as evidence of the relationality of colors.

Why, then, have so many thought that phenomenology is at odds with a relationalist metaphysics for steady colors? Plausibly, this is because the very fragility of intrapersonal phenomenology for unsteady colors hides the fact, emphasized by Levin (2000, p. 157), that intrapersonal phenomenology bears on questions about relationality only when we engage in comparisons between multiple phenomenal episodes, together with reflective ratiocination on those comparisons — and not just the application of introspection to individual, punctate phenomenal glances. Unsteady colors, by their very unsteadiness, make phenomenal comparison so automatic that it is easy to lose sight of the need for comparison and ratiocination, and to believe falsely that relationality must reveal itself in the non-comparative, unreflective phenomenology of punctate glances. Critics are correct to observe that non-comparative, unreflective phenomenology does not reveal the relationality of steady colors. The mistake, fostered by the false belief at issue, is to treat this absence of evidence as evidence of absence.²⁰

²⁰This mistake appears to underlie the quotation above from McGinn (1996), as well as this oft-quoted passage:

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 (Boghossian and Velleman 1989, p. 85).

In sum, it appears that phenomenology is not the decisive obstacle to relationalism that many have supposed it to be. So long as we remain careful to use phenomenology in a way that allows it to speak to the question of relationality, it turns out that phenomenological evidence supports, rather than detracts from, the case for color relationalism.

4 Conclusion

Color relationalism merits philosophical interest not only because of its continuity with historically important positions, but because it attempts to respect and to reconcile the deliverances of two of our most important pictures of the world: that supplied by our best broadly scientific theories, and that supplied by our manifest experience. Moreover, as I have argued, several of the most pressing objections against the view can be answered. There is, of course, much more to be said about color relationalism, about the many different more specific forms it can take, and about their respective virtues and vices. However, I hope to have made the case that relationalism is a view, or family of views, worth taking seriously.²¹

References

- Allen, Keith (2011), "The Red and the Real: An Essay on Color Ontology, By Jonathan Cohen," *European Journal of Philosophy*, 19, 2, pp. 315-318.
- (2012), "Colour, Contextualism, and Self-Locating Contents," *Croatian Journal of Philosophy*, 12, 3, pp. 331-350.
- Armstrong, David (1968), *A Materialist Theory of the Mind*, Routledge, London.
- (1987), "Smart and the Secondary Qualities," in *Metaphysics and Morality: Essays in Honour of J. J. C. Smart*, ed. by Philip Pettit, R. Sylvan, and J. Norman, Reprinted in [Byrne and Hilbert 1997](#), 33-46, Basil Blackwell, Oxford.
- Averill, Edward Wilson (1992), "The Relational Nature of Color," *The Philosophical Review*, 101, 3, pp. 551-588.
- Boghossian, Paul A. and J. David Velleman (1989), "Colour as a Secondary Quality," *Mind*, 98, Reprinted in [Byrne and Hilbert 1997](#), 81-103., pp. 81-103.
- Brogaard, Berit (2010), "Perspectival Truth and Color Primitivism," in *New Waves in Truth*, ed. by Cory D. Wright and Nikolaj J. L. L. Pedersen, Palgrave Macmillan.
- (2012), "Color Eliminativism or Color Relativism?" *Philosophical Papers*, 41, 2, pp. 305-321.
- (2014), "The Self-Locating Property Theory of Color," *Minds and Machines*.
- Byrne, Alex (2006), "Comments," *dialectica*, 60, pp. 337-340.
- (2009), "Experience and Content," *Philosophical Quarterly*, 59, 236, pp. 429-451.

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- Byrne, Alex and David R. Hilbert (eds.) (1997), *Readings on Color, Volume 1: The Philosophy of Color*, MIT Press, Cambridge, Massachusetts.
- (2003), “Color Realism and Color Science,” *Behavioral and Brain Sciences*, 26, 1, pp. 3-64.
 - (2004), “Hardin, Tye, and Color Physicalism,” *The Journal of Philosophy*, CI, 1, pp. 37-43.
 - (2007), “Truest Blue,” *Analysis*, 67, 293, pp. 87-92.
 - (forthcoming), “Color Relationalism and Relativism,” *Topics in Cognitive Science*.
- Chalmers, David (2006), “Perception and the Fall From Eden,” in *Perceptual Experience*, ed. by Tamar Szabó Gendler and John Hawthorne, Oxford University Press, New York, pp. 49-125.
- Cohen, Jonathan (2003), “Color: A Functionalist Proposal,” *Philosophical Studies*, 112, 3, pp. 1-42.
- (2004), “Information and Content,” in *Blackwell Guide to the Philosophy of Information and Computing*, ed. by Luciano Floridi, Basil Blackwell, New York, pp. 215-227.
 - (2007), “A Relationalist’s Guide to Error About Color Perception,” *Noûs*, 41, 2, pp. 335-353.
 - (2009), *The Red and The Real: An Essay on Color Ontology*, Oxford University Press, Oxford.
 - (2012), “Redness, Reality, and Relationalism,” *Croatian Journal of Philosophy*, 12, 3, pp. 351-378.
- Cutter, Brian (2018), “Indeterminate Perception and Color Relationism,” *Analysis*, forthcoming.
- Dancy, Jonathan (1986), “Two Conceptions of Moral Realism,” *Proceedings of the Aristotelian Society*, Supplementary Volume 60, pp. 167-187.
- Dretske, Fred (1995), *Naturalizing the Mind*, Originally delivered as the 1994 Jean Nicod Lectures, MIT Press, Cambridge, Massachusetts.
- Egan, Andy (2012), “Comments on Jonathan Cohen’s *The Red and the Real*,” *Analytic Philosophy*, 53, 3, pp. 306-312.
- Funkhouser, Eric (2006), “The Determinable-Determinate Relation,” *Noûs*, 40, 3, pp. 548-569.
- Gattass, Rocardo, Aglai P. B. Sousa, Mortimer Mishkin, and Leslie G. Ungerleider (1997), “Cortical Projections of Area V2 in the Macaque,” *Cerebral Cortex*, 7, pp. 110-129.
- Gert, Joshua (2012), “Crazy Relations,” *Croatian Journal of Philosophy*, 12, 3, pp. 315-330.
- Gibbard, Allan (2006), “Moral Feelings and Moral Concepts,” in *Oxford Studies in Metaethics*, 1, ed. by Russ Schafer-Landau, Clarendon Press, Oxford, pp. 195-215.
- Hartmann, E., B. Lachenmayr, and H. Brettel (1979), “The peripheral critical flicker frequency,” *Vision Research*, 19, 9, pp. 1019-1023, DOI: [https://doi.org/10.1016/0042-6989\(79\)90227-X](https://doi.org/10.1016/0042-6989(79)90227-X).

- Hazlett, Allan and Edward Wilson Averill (2010), "A Problem For Relational Theories of Color," *Philosophy and Phenomenological Research*, 81, 1, pp. 140-145.
- Johnson, W. E. (1921), *Logic, Part 1*, Cambridge University Press.
- Johnston, Mark (1992), "How to Speak of the Colors," *Philosophical Studies*, 68, pp. 221-263.
- Kalderon, Mark Eli (2007), "Color Pluralism," *The Philosophical Review*, 116, 4, pp. 563-601.
- (2015), "Pluralism," in *The Routledge Handbook of Philosophy of Colour*, ed. by Derek Brown and Fiona Macpherson, Routledge, chap. 13.
- Levi, Dennis M. and Thom Carney (2009), "Crowding in peripheral vision: why bigger is better," *Current Biology*, 19, 23, pp. 1988-1993.
- Levin, Janet (2000), "Dispositional Theories of Color and the Claims of Common Sense," *Philosophical Studies*, 100, pp. 151-174.
- Matthen, Mohan (2005), *Seeing, Doing, and Knowing: A Philosophical Theory of Sense Perception*, Oxford University Press, Oxford.
- Maund, Barry (2010), "The Red and The Real," *Australasian Journal of Philosophy*, 88, 4, pp. 755-756.
- McGinn, Colin (1983), *The Subjective View: Secondary Qualities and Indexical Thoughts*, Oxford University Press, Oxford.
- (1996), "Another Look at Color," *The Journal of Philosophy*, 93, 11, pp. 537-553.
- Millikan, Ruth Garrett (1984), *Language, Thought, and Other Biological Categories: New Foundations for Realism*, MIT Press, Cambridge, Massachusetts.
- Mizrahi, Vivian (2007), "Color Objectivism and Color Pluralism," *dialectica*, 60, 3, pp. 283-306.
- Pautz, Adam (2006), "Sensory Awareness Is not a Wide Physical Relation: An Empirical Argument Against Externalist Intentionalism," *Noûs*, 40, 2, pp. 205-240.
- (2008), "A Simple View of Consciousness," in *The Waning of Materialism*, ed. by George Bealer and Robert Koons, Oxford University Press, Oxford.
- (2010a), "An Argument for the Intentional View of Visual Experience," in *Perceiving the World*, ed. by Bence Nanay, Oxford University Press, New York.
- (2010b), "Review of Jonathan Cohen, *The Red and the Real*," *Notre Dame Philosophical Reviews*.
- Peacocke, Christopher (1984), "Colour Concepts and Colour Experiences," *Synthese*, 58, 3, Reprinted in [Rosenthal 1991](#), 408-416, pp. 365-381.
- Pinker, Steven (2000), *The Language Instinct: How the Mind Creates Language*, Harper Perennial Modern Classics, New York.
- Prinzmetal, William, Deborah Henderson, and Richard Ivry (1995), "Loosening the Constraints on Illusory Conjunctions: Assessing the Roles of Exposure Duration and Attention," *Journal of Experimental Psychology: Human Perception and Performance*, 21, 6, pp. 1362-1375.
- Prior, A. N. (1949), "Determinables, Determinates and Determinants: I," *Mind*, 58, 229, pp. 1-20.

- Rosenthal, David (1991), *The Nature of Mind*, Oxford University Press, New York.
- Sellars, Wilfrid (1956), "Empiricism and the Philosophy of Mind," in *Minnesota Studies in the Philosophy of Science*, ed. by Herbert Feigl and Michael Scriven, University of Minnesota Press, Minneapolis, vol. 1, pp. 253-329.
- Shepard, Roger N. (2001), "Perceptual-Cognitive Universals as Reflections of the World," *Behavioral and Brain Sciences*, 24, pp. 581-601.
- Siegel, Susanna (2010a), "Do Experiences Have Contents," in *Perceiving the World*, ed. by Bence Nanay, Oxford University Press, New York.
- (2010b), *The Contents of Visual Experience*, Oxford University Press, New York.
- Smith, A. D. (2002), *The Problem of Perception*, Harvard University Press, Cambridge, Massachusetts.
- Strasburger, Hans, Ingo Rentschler, and Martin Jüttner (2011), "Peripheral vision and pattern recognition: A review," *Journal of Vision*, 11, 5, p. 13, DOI: [10.1167/11.5.13](https://doi.org/10.1167/11.5.13).
- Stroud, Barry (2000), *The Quest for Reality: Subjectivism and the Metaphysics of Colour*, Oxford University Press, New York.
- Tesnière, Lucien (1959), *Éléments de syntaxe structurale*, Éditions Klincksieck, Paris.
- Thompson, Evan (1995), *Colour Vision: A Study in Cognitive Science and the Philosophy of Perception*, Routledge, New York.
- Thompson, Evan, Adrian Palacios, and Francisco Varela (1992), "Ways of Coloring: Comparative Color Vision as a Case Study for Cognitive Science," *Behavioral and Brain Sciences*, 15, pp. 1-74.
- Travis, Charles (2004), "The Silence of the Senses," *Mind*, 113, 449, pp. 57-94.
- Tye, Michael (1995), *Ten Problems of Consciousness: A Representational Theory of the Phenomenal Mind*, MIT Press, Cambridge, Massachusetts.
- (2000), *Consciousness, Color, and Content*, MIT Press, Cambridge, Massachusetts.
- (2006), "The Puzzle of True Blue," *Analysis*, 66, 291, pp. 173-178.
- (2012), "Cohen on Color Relationalism," *Analytic Philosophy*, 53, 3, pp. 297-305.
- Weatherson, Brian and Dan Marshall (2014), "Intrinsic vs. Extrinsic Properties," in *The Stanford Encyclopedia of Philosophy*, ed. by Edward N. Zalta, Spring 2014.
- Yablo, Stephen (1995), "Singling Out Properties," *Philosophical Perspectives*, 9, pp. 477-502.



Figure 2: Canonical instance of color constancy.