

Color Phenomenology

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Synonyms

[Color experience](#); [Color qualia](#)

Definition

The word “phenomenology” finds its original application in philosophy, and it has two distinct meanings in that discipline. In the first, most substantive meaning it refers to a philosophical tradition originating in the work of G. W. F. Hegel and developed in the work of Edmund Husserl, Martin Heidegger, Jean-Paul Sartre, and others, with the psychologist Franz Brentano as a major influence. In this primordial sense, it refers to a nonpsychological description of the fundamental constituents of experience. It may sound peculiar to call an account of experience “nonpsychological” since experience might be thought of as necessarily psychological. The rationale for the usage is this: one may possibly describe the fundamental constituents of human experience – concepts, ideas, propositions, temporality, mental images, etc. – in a way that captures their generic character and hence their “universality” rather than their specific contents. Such a view articulates, so classical phenomenologists say, the logical or conceptual structure of experience. The second application of the term, the origin of which is equally philosophical and psychological, refers more directly to the *mere* appearance of things. There is no universality attached to such description. It is, rather, a reference to the way things *seem* to perceivers: red looks this way (and perhaps just to an individual), pain feels this way (ditto), dogs bark in a way that sounds as it sounds (again, perhaps just to the individual). This sense of the word “phenomenology” (the word “qualia” is sometimes used) describes the way that many Anglo-American philosophers have deployed the term throughout much of the twentieth century, into the twenty-first. This second sense has clear links to the way experimental psychologists use and have talked about phenomenology, and it is this sense that is of interest here.

Color Phenomenology and Ontology

If the phenomenology of X concerns the way that some X *seems*, is a contrast to the way things *are* implied? The answer is yes. Consider the following example (discussion will now concern examples and issues specific to color phenomenology). As one moves a color stimulus from one illumination source to another, one will notice that it appears to change color, though likely within the bounds of color constancy. This may lead to a question as to its “real color,” and that question may lead in a number of directions. Perhaps its real (object) color is identical with a physical property that does not change across illuminations: surface spectral reflectance, for example. Perhaps the idea of real color should be abandoned and replaced with a conception of color relativized to viewing conditions and observers. Perhaps one could speak of a “normal observer” (as the CIE does) so as to wring some objectivity out of the phenomenology.

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These positions take up different views as to the relation between the way things seem and the way things are for color, and there is a spirited, scientifically informed philosophical literature that covers the many permutations of these views (For a representative sampling, see Ref. [1]).

Epistemological Issues

Questions about real colors are questions about ontology. Does the catalogue of the real include colors? What is a real color, if there is such? As important as these questions are, much of the interest when it comes to color phenomenology is not ontological but epistemological: what can be known, and what are the limitations to what can be known, about color experience? The most famous query along this line comes from John Locke. In the *Enquiry Concerning Human Understanding* (2), Locke proposes that a “spectral inversion” would not be detectable. Subject A and subject B, indistinguishable in terms of their behavior on discrimination tasks, nonetheless have different experiences. A’s experiential color space is “inverted” relative to B’s. For Locke, this meant that A and B use color words the same way, describe their color experiences the same way, discriminate color stimuli in the same way, and yet have distinct color experiences, e.g., A’s green is B’s red, and vice versa, and the same goes for blue and yellow. Thus, the inversion is behaviorally undetectable. Many consequences have been thought to flow from Locke’s proposal, but vision science provides good reason to believe that even if such inversion was possible, it would be detectable. The inverted spectrum proposal depends on a color space that is symmetrical so that one can map discriminable differences one-to-one from, say, the “greens” to the “reds.” This condition is not satisfied for a standard human trichromatic color space, as specified, for instance, in the asymmetrical CIE $L^*a^*b^*$ space. The upshot, in terms of behavior, is that A and B would behave differently – confusing or discriminating different color stimuli. The inversion, with the cleverness of psychophysics, would be detected (see Ref. [2]).

Despite the fact that Locke’s proposal fails, its implications are not easily dispatched. Even if spectral inversion can be detected, the question remains as to what color experience is like. Consider the following thought experiment. What is to be learned from the psychophysics of color? This is a broad question, but broadly the answer would be that one learns correlations between different types of stimuli and different types of behavior. From these correlations, serving as constraints, ideas as to what the properties of the neural substrate of color experience need to be like may be formulated, models constructed, convergence with other areas of physiology and psychology sought. Psychophysics (visual being the concern here) is a mature subdiscipline of psychology, but does it deal with the way things – colored things – look? This sounds an odd question for a science that is based on subjects looking at visual stimuli and responding to them. How could it not deal with this? Yet vision scientists are uneasy about the claim that discrimination data say something reliable about the content of experience. If one asks a subject what red looks like, the subject will revert to demonstrative claims – it looks like *that* – or to relational claims locating a red color presentation in relation to that of other colors: more like orange and yellow, less like blue and green. While these descriptors are often robust for subjects, they do not, or so it is often claimed, get at the subjective nature of color experience. In an influential article, “What is it like to be a bat?” [3] The philosopher Thomas Nagel argued exactly that. Bats, Nagel proposed, have experience – there is something that it is like to be a bat (as opposed to, say, a stone). While one can use the techniques of animal ethology, biology, and bat psychophysics to determine bat discrimination space, the content of the bat’s experience is beyond the grasp of those third-person methods – beyond an objective 3rd person science and its “view from nowhere.” Nagel’s argument really has little to do with bats. They are a useful exemplar since it is easy to imagine (a) that bats have experience and (b) that their experience is distant from human experience. In this sense, the bat is a useful foil to arguments from analogy: one can easily believe that bats have

experience, but there is no analogy to human experience to guide us because echolocation is a different sensory modality than either sight or hearing. That having been said, the central thrust of Nagel's argument concerns subjectivity. There is a subjective view of the world that science, as humans know it, cannot access. Subjectivity, in the end, is just as mysterious from the 3rd person point of view as is the bat's. This is why many psychophysicists are likely to be in agreement with philosophers skeptical as to the knowledge of color phenomenology – why it is that psychophysicists are uneasy about the inference from discrimination to experience – inference to the way colors “look.”

Not all philosophers, and certainly not all scientists, vision or otherwise, accept the view that subjective experience – including color experience – is mysterious from a third-person perspective. But disagreement over this issue is profound. One might argue that a good model of an individual's discrimination space for color is as good as the human behavioral sciences get. If, for example, a subject fails to discriminate images in some set of pseudo-isochromatic color plates, then one can make predictions about their future discriminatory behavior and also explain that behavior. Such tests do more than identify types of “color blindness”; they identify the axes on which colors are confused and may correlate such confusion with genetic differences in opsin expression at the retinal level. What more could one want? It seems that there are two things: (1) an account of *what* the subjective point of view is like, as opposed to a third-person take on subjective experience – this is Nagel's concern, and (2) an account of *how* subjective experience is generated (how it fits in with the ontological “catalogue of the real”) – this is a concern most closely identified with the Australian philosopher David Chalmers [4].

Chalmers writes mainly about consciousness, but his views on that subject have clear implications for color phenomenology. Unlike Nagel, who makes a case for the subjectivity of experience and is concerned with how that experience might be understood objectively, Chalmers argues that the real problem with experience is that science has no idea as to how subjective experience is generated by a physical system (and, more radically, *why* there should be experience in the first place). Chalmers is not denying there is subjective experience. He is claiming that its causal story is incomplete. Suppose one could understand color perception “all the way up”: from stimulus presentation, to photon-absorption at the retinal level, to retinal and LGN opponent processing, to cortical processing in the visual areas of the brain, to integrative processing in the executive areas, to the output of discrimination-based behavior which is a function of this whole process. While vision science understands some elements of this causal story quite well, and others not as well, even *perfect* understanding of it might leave science in the dark as to how color experience is generated. At what point do the biological properties of brains cause or constitute experiences of color, and how? Chalmers argues that the science of consciousness, such as it is, has no idea how to even address, let alone answer this so-called hard question – “hard” not in virtue of the difficulty of the science (as with the molecular biology of vision, say) but “hard” in the sense that science offers *no advice* on how to bridge the gap between its cognitive-neurobiological accounts of the brain and the brain's generation of experience. On the basis of this and related concerns, Chalmers has drawn a number of unusual conclusions: that some form of mind-brain dualism is true and that consciousness is both an emergent property of brains *and* a fundamental property of the universe.

These are very controversial claims. Critics of Chalmers have typically adopted one of two approaches (see the commentaries reprinted in Ref. [4]): (1) argue that Chalmers assumes the limitations of current brain science are permanent (this involves the positive claim that problems that look hard at a given point in time may become easier with new developments in theory and practice) and (2) argue that early progress has, even now, been made on a complete theory of conscious experience.

With respect to the first strategy, one can quite agree that, in the future, science is likely to succeed in areas currently unimagined. Yet (1) does not address the request for a way forward on the problem of brains generating experience but merely points out that science will almost certainly find new ways of addressing (or disposing of) the problem. This may be true, but the argument is not substantive, given the

claim that the nature of experience and its origin is a different sort of problem. If one, further, (1) assumes that the development of science will be sufficient to explain conscious experience at some point in time, then one is simply denying Chalmers' claim and that, arguably, assumes what it should demonstrate. As for (2), the view that progress has been made on the explanation of consciousness, Chalmers has pointed out that contemporary empirical theories of conscious experience (a) shift the problem of experience and how it is caused or constituted to accounts wholly within cognitive neuroscience and biology – an account of attention, say, or an account of neural opponent processing for the case of color. As a consequence (b), such accounts will provide, at best, accounts of the “neural correlates” of conscious experience rather than an account of how conscious experience is generated by neurobiological function. This, however, may not be such a bad thing nor is it quite the limitation that, at first glance, it appears to be.

Color Phenomenology and the Structure of Color Experience

Claims that science does not understand how phenomenological experience arises or is constituted from neurobiological function or that a complete understanding of human phenomenology surpasses what can be known from a third-person scientific perspective sound dire: as if experience is not understood at all. And yet it is remarkable how much about the phenomenology of color can be known “from the outside” – and from a position of ignorance as to the ultimate causes of that phenomenology. As noted in paragraph 3, psychophysics would be able to identify the spectral inversion that has troubled philosophers. Such detection really is no different, in principle, than the detection of different forms of dichromacy: protanopia, deutanopia, tritanopia – all involving failure to discriminate among stimuli that a normal trichromat would discriminate. Each of these deficiencies (relative to trichromacy) is a consequence of the lack of one or another of the three typical photoreceptors. They are physiologically based effects that can be identified through behavioral tests, and, moreover, vision science can explain the relevant deficiencies and their fine-grained differences at physiological and genetic levels. Color science has, in other words, a good grasp of the *structure* of human (primate) color experience, as well as its causes, even if the precise, personal, subjective nature of that experience remains epistemically problematic.

References

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