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COLOR

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INTRODUCTION

The nature of the colors—what they are like, whether they are instantiated by objects or are projected by our minds, and whether their nature is revealed to us in color perception—has been one of the central topics in philosophy for centuries. Debates over the nature of the colors, as they appear in contemporary philosophical debates influenced by the Moderns, are driven by a concern to find a place for color within a scientifically respectable ontology. This entry focuses on the contemporary philosophical debates over the nature of color. Issues in the anthropology/semantics of color terms and the historical debate about colors will not be dealt with, except in passing.

GENERAL OVERVIEWS

Byrne and Hilbert (1997) outline central debates and positions on color and color perception. Their readings also contain a bibliography of suggested further readings and a glossary of technical terms. Byrne and Hilbert also have a non-annotated but somewhat outdated bibliography of color and philosophy online at: <http://web.mit.edu/philos/www/color-biblio.html>. Chalmers and Bourget have a PhilPapers entry on color at: <http://philpapers.org/browse/color/>. This entry is updated regularly, and in some cases abstracts and full texts are provided. Rubenstein (2006) has an older entry on color in the *Internet Encyclopedia of Philosophy*: <http://www.iep.utm.edu/c/color.htm>. Maund (2008) provides a good overview of the philosophical literature on color, which includes a detailed discussion of objectivist vs. subjectivist theories. Pautz (2009) is an accessible entry on color that includes a discussion of various philosophical theories including color realism and eliminativism. Cohen (2009) offers a comprehensive and up to date overview of the different

positions on color, including physicalism, eliminativism, dispositionalism and primitivism. The first chapter of Cohen (forthcoming) provides criticism of old taxonomies of theories of color and offers a new taxonomy, dividing the various theories into the three main categories 'physicalism', 'dispositionalism' and 'primitivism'.

Byrne, A. and Hilbert, D. R. (1997). *Readings on Color, Vol. I: The Philosophy of Color*, Camb.Mass. : M.I.T Press. [Contains various influential articles on the philosophy of color and color perception from recent years, including papers by Smart and Armstrong defending an older form of physicalism, and Johnston and Peacocke defending dispositional theories. There are two critical papers by Boghossian and Velleman criticizing physicalist and dispositionalist theories, and one by Shoemaker on the nature of color experience. Hardin is critical of ordinary intuitions about spectrum inversions, and Byrne and Hilbert defend reflectance physicalism].

Byrne, A. and Hilbert, D. R. (1997). *Readings on Color, Vol. II: The Science of Color*, Camb. Mass. : M.I.T Press. [Focuses on the science of color: physiology, psychophysics, physics, evolutionary psychology, etc. There is also a [too casual] of material dealing with the color constancy phenomenon.]

Byrne, A. and Hilbert, D. R. (2009). "Bibliography on Color and Philosophy". <http://web.mit.edu/philos/www/color-biblio.html>. [Non-annotated bibliography]

Chalmers, D. and Bourget, D. (2009). "PhilPapers: Color". <http://philpapers.org/browse/color/>. [Bibliography updated regularly.]

Cohen, J. (2009). "Color", In John Symons & P. Calvo (eds.), *Routledge Companion to Philosophy of Psychology*. Routledge. [Good introduction to the contemporary debate, which discusses some of the most popular views about the nature of the colors.]

Cohen, J. (2009). *The Red and the Real: An Essay on Color Ontology*, Oxford: Oxford University Press. [A book-length defense of color relationalism.- would help to define this position, even if just very briefly, as it isn't what one might expect it to be]

Maud, B., (008). "Color", *The Stanford Encyclopedia of Philosophy (Fall 2008 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/fall2008/entries/color/>. [Encyclopedia entry with a good overview of the philosophical literature on color and a detailed clarification of the distinction between objectivist and subjectivist theories of color.]

Pautz, A. 2009. "Philosophical Perspectives on Color", T. Bayne, A. Cleeremans and P. Wilken, *Oxford Companion to Consciousness*, Oxford: Oxford University Press, 150-155. [Accessible overview of various philosophical theories of color, including realism and eliminativism.]

Rubenstein, E. 2006. "Color", The Internet Encyclopedia of Philosophy: <http://www.iep.utm.edu/c/color.htm>. [Accessible overview of the main theories of color.]

TEXTBOOKS

The most well known textbook on color in philosophy is Hardin's highly praised *Color for Philosophers: Unweaving the Rainbow*. It was awarded the 1986 Johnsonian Prize. While taking a stance on several of the philosophical issues, Hardin also makes a good case for taking empirical color science seriously in philosophical theory construction. There are several good anthologies on color. Among these is Byrne and Hilbert 1997 (see *General Overviews). (Backhaus et al., 1998) is a good introduction to the science of color vision but is not suitable as an introduction to the philosophical issues. Another good anthology on color science is Gegenfurtner and Sharpe's 1999 *Color vision: from genes to perception*, which deals with the molecular genetics of the human cone photopigment genes, the color processing of complex scenes and high-level information, cone spectral sensitivity and color processing in the retina and cortex, visual psychophysics, intracellular and extracellular physiological recordings, and functional magnetic resonance imaging. Davis (2000) has put together a collection with articles on various topics ranging from the evolutionary origin of color vision to color painting and the inverted spectrum. Hardin and Maffi (1997) have put together a collection that focuses on the issue of the cross-cultural variation in color naming. There are several papers defending color universalism—i.e. the view that there are a fixed number of color categories in all cultures but a variant number of color names in different languages. A couple of papers are critical of the methodology underlying the research that has gone into defending color universalism.

Backhaus, W. G. K., Gliegl, R., and Werner, J. S., eds. (1998). *Color Vision: Perspectives From Different Disciplines*. Walter de Gruyter. [Text book for introductory courses at the graduate level and an overview for scientists. It is not aimed specifically at philosophy students. Most of the papers are on the physiology of color vision and color psychophysics. There are also a couple of papers on basic color terms and color computer graphics. The book is packed with fancy color pictures but is quite costly.]

Davis, S. (2000). *Color Perception*, New York: Oxford University Press. [12 articles discussing, among other things, the evolutionary origin of color vision, color painting, color as a carrier of information, computational uses of color, color constancy, and the inverted spectrum. Contributors include: J. D. Mollon, Sanford Wurmfeld, Steven A. Shafer, Bruce A. Maxwell, Brian Funt, Vlad Cardei, John J. McCann, Graham D. Finlayson, Robert J. Woodham, Michael H. Brill, Frank Jackson, Evan Thompson, David R. Hilbert, Mark Eli Kalderon, Kathleen Akins, and Martin Hahn.]

Gegenfurtner, K. R. and Sharpe, L. T. eds. (1999), *Color vision: from Genes to Perception*, New York: Cambridge University Press. [Large collection of 20 review articles discussing the molecular genetics of the human cone photopigment genes, color perception, the color processing of complex information, cone spectral sensitivity, color processing in the retina and cortex, visual psychophysics, intracellular and extracellular physiological recordings, and functional magnetic resonance imaging.]

Hardin, C. L. (1993), *Color for Philosophers: Unweaving the Rainbow*, Indianapolis, Ind.: Hackett. [Good introduction to the fundamental issues concerning color and color perception. First published in 1988. Hardin defends a non-dispositionalist subjectivist theory of color. The 1993 edition contains a new chapter, 'Further Thoughts: 1993', in which Hardin discusses the dispute between color objectivists and subjectivists from the perspective of the ecology, genetics, the evolution of color vision, and new data on variability in color perception.]

Hardin, C. L. and Maffi, L., eds. (1997). *Color Categories in Thought and Language*. Cambridge University Press, New York. [Organized into four parts. Part I focuses on color naming across languages and cross-linguistic research. Part II is devoted to essays by visual scientists. Part III concerns anthropology and linguistics. Part IV offers a couple of articles critical of color naming research. There is also a good introduction to the issue of color naming.]

CATEGORY SCHEME

Theories of color can be divided into two major categories: realism and irrealism. Realism is the view that objects have colors. Irrealism is the view that they do not. Some hold that colors of one kind are instantiated by objects whereas colors of a different kind are not (Locke and Descartes arguably held this view, and Chalmers currently holds it). Irrealists sometimes hold a semantic thesis to the effect that our ordinary color terms do not pick out properties which physical objects actually possess. That is, in setting out their metaphysical view about colors, they also recommend a way of understanding color terms, as applied to physical objects. Realism can be divided into the categories: relational and non-relational theories. Non-relational theories hold that the colors are the properties that best satisfy a certain pre-specified role. Relational theories hold that the colors are role properties (e.g. dispositions to cause certain phenomenal effects in normal perceivers in normal viewing conditions, the categorical grounds of these dispositions or relational properties that build in a perceiver and a viewing condition). The non-relational theories can be divided into the categories: physicalism and primitivism. The relational theories can be divided into the categories: color relationalism,

dispositionalism, categorical ground theories, and ecological dispositionalism. In what follows I will look at the categories: physicalism, primitivism, dispositionalism, color relationalism, categorical ground theories, ecological dispositionalism and irrealism.

COLOR PHYSICALISM: DEFENSES

Defenses of earlier versions of physicalism, which took the colors to be microphysical constitutions of objects, can be found in Armstrong (1968) and Smart (1975). Lewis's (1997) view has close affinities with the older physicalist views. Tye (2000) and Byrne and Hilbert (2003) are two well-read works defending reflectance physicalism, the currently most popular version of color physicalism. On this view, the colors are dispositions to reflect certain proportions of the incident light, or equivalence classes of these. Tye (2000) and Byrne and Hilbert (2003) address various worries about reflectance physicalism, among other things, color incompatibilities, the problem of color metamers and color constancy cases in which objects are seen to have the same color in varying illumination conditions. Jackson and Pargetter (1987) (see *Categorical Grounds Theories*), Campbell (1993) (see *Categorical Grounds Theories*), Jackson (1996) (see *Categorical Grounds Theories*), and McLaughlin (2003) (see *Categorical Grounds Theories*) defend the view that the colors are the categorical grounds of dispositions (see below). See also Jackson (2000). Campbell's version of this latter view is arguably best construed as a kind of primitivism.

Armstrong, D. (1968). *A Materialist Theory of the Mind*, Routledge, London. [Defends the older version of color physicalism, according to which the colors are microphysical constitutions of objects.]

Byrne, A and Hilbert D. R. (2003). "Color Realism and Color Science", *Behavioral and Brain Sciences* 26: 3-21. [Offers a thorough defense of reflectance physicalism, followed by responses from philosophers and scientists.]

Jackson, F. (2000). "Philosophizing about Color", S. David, ed. *Color Perception*: New York: Oxford University Press, 152-162. [A Defense of color physicalism.]

Lewis, D. (1997). "Naming the Colors", *Australasian Journal of Philosophy* 75: 325-342. [Defends a physicalist view which has close affinities with Smart's and Armstrong's older physicalist views. Also addresses the circularity problem that threatens treatments of colors in terms of color experience.]

Smart, J. J. C. (1975). "On some criticisms of a physicalist theory of colors". In C. Cheng, ed., *Philosophical Aspects of the Mind-Body Problem*. University Press of Hawaii,

Honolulu. Reprinted in Byrne and Hilbert (1997), 1–10. [Defends the older version of color physicalism.]

Tye, M. (2000). *Consciousness, Color, and Content*, Cambridge, MA: MIT Press. [Defends reflectance physicalism and representational theories of color perception.]

COLOR PHYSICALISM: DEBATE

Tye (2000: 147f) (see *Color Physicalism: Defenses*), Byrne and Hilbert (2003) (see *Color Physicalism: Defenses*) and Hilbert (1987: 65) argue that color constancy and other related phenomena indicate that the colors do not depend on perceivers but are intimately tied to invariant surface properties. For rebuttals see e.g. Hardin (1993) (see *Textbooks*), Cohen (2006), Thompson (2000) and Thompson (2006). Chalmers (2006) defends the view that objects possess imperfect physical colors. The imperfect colors are the properties that normally cause the corresponding phenomenal experiences. This view allows for a kind of perceiver-dependence. Challenges for color physicalism include that of accounting for the structural features of the colors (see Hardin 1993) (see *Textbooks*). E.g. red is more similar to orange than it is to green, no shade of blue is a shade of yellow, etc. One can at least partially account for the structural relations among the colors by taking the colors to be similarity classes of reflectances. This problem is addressed in e.g. Cohen (2003), Pautz (2006), and Byrne (2007) and Ross (2009).

Byrne, A. 2007. "Color and Similarity", *Philosophy and Phenomenological Research*, 66: 641-665. [Addresses the issue of how the colors are visually represented, and offers a response to the claim that similarity claims about the colors, for instance that red is more similar to orange than to green, presents a serious problem for color physicalism.]

Cohen, J. 2003. "On the structural properties of the colors", *Australasian Journal of Philosophy* 81: 78-95. [Addresses the issue of whether the assumption that the colors bear certain structural relations to each other is incompatible with the thesis that the colors can be primary qualities (i.e., intrinsic, objective, mind-independent properties of external objects, like size and shape).]

Cohen, J. 2006. "Color Constancy as Counterfactual", *Australasian Journal of Philosophy*. [Argues that standard descriptions of color constancy are inadequate and that color constancy cases cannot be taken to be illumination-independent phenomena. Then defends an alternative counterfactual account of color constancy.]

Hilbert, D. R. 1987. *Color and Color Perception: A Study in Anthropocentric Realism*. CSLI, Stanford. [Defends a version of reflectance physicalism to the effect that the colors are dispositions to reflect light and argues that this account of the colors is preferable to subjectivist rivals. Human color vision is limited in its abilities to perceive the color properties of objects. But, it is argued, this limitation is consistent with reflectance physicalism.]

Pautz, A. 2006. "Can the Physicalist Explain Color Structure in Terms of Colour Experience?", *Australasian Journal of Philosophy* 84:535-564. [Offers a rejoinder to the standard physicalist response (in terms of color experience) to the argument that color physicalism cannot accommodate facts about colour structure, for instance, that red is a unary color while purple is a binary color, that red is more similar to orange than to green, etc.]

Ross, P. W. 2009. "Fitting Color into the Physical World", Ms, Department of Philosophy, Cal Poly, Pomona. [Argues that descriptions of visual experience of color are reference-fixing descriptions which pick out disjunctive physical color properties.]

Thompson, B. 2006. "Colour Constancy and Russellian Representationalism", *Australasian Journal of Philosophy* 84: 75–94. [Argues that standard Russellianism, the view that the properties represented by perceptual experiences are mind-independent physical properties, is inconsistent with color constancy phenomena.]

Thompson, E. (2000). "Comparative Color Vision: Quality Space and Visual Ecology", in S. David, ed. *Color Perception*, New York: Oxford University Press, 163-186. [Critical of physical theories of color and defense of ecological approach.]

COLOR PRIMITIVISM

Primitivism takes the colors to be the primitive purely qualitative color properties directly revealed in color perception. For example, red is that primitive color property that appears in the phenomenal content of the red experiences of normal perceivers in normal circumstances. Versions of primitivism have been defended by e.g. Westphal (1987, 2005), Campbell (1993) (see *Categorical Grounds Theories), Yablo (1995), McGinn (1996), Watkins (2002, 2005), and Brogaard (2009a and 2009b). The view is discussed and criticized in Byrne and Hilbert (2007). Primitivism is compatible with the view that the colors are physical properties but does not entail it. Likewise, primitivism is compatible with the view that the objects do not possess color properties. Chalmers (2006) (see *Color Irrealism), for example, defends the view that the content of color perception contains primitive perfect color properties (or 'edenic properties', as he calls them). But on his view, objects do not actually possess these properties. This view is discussed in Brogaard (2009b). Some versions of primitivism face permuted earth problems. Byrne and Hilbert (2007) argue that primitivists cannot rule out a priori sceptical scenarios on

which everything looks to the perceivers just as it actually does but in which the objects that typically look red have been primitively green all along. However, not all versions of primitivism are committed to this consequence. Brogaard (2009a) defends a version of primitivism that takes the colors to supervene on physical and phenomenal facts. If the permuted earth scenario is conceivable, this brand of primitivism will need to posit strong necessities (i.e., necessary, semantically neutral truths which are conceivably false). However, it is also possible to hold that it is inconceivable that all physical and phenomenal facts are as they actually are but somehow objects do not have the primitive colors they actually have (Brogaard 2009a). Some primitivists motivate their view by the thought that we should be able to figure out various actual structural relations among the colors by reflecting on past color experience (e.g. that red is more similar to orange than to green). This constraint is sometimes called 'Revelation'. Others motivate their view by the thought that color experience normally reveals the colors to us. The world cannot have some intrinsic color nature that goes well beyond what is normally grasped in experience. The color that is revealed in color experience is not functionally specifiable but is categorical or primitive. This constraint is sometimes called 'Revelation' and sometimes 'transparency' (Campbell 2005) (see *Categorical Grounds Theories). Byrne and Hilbert (2007) offer an analysis of the concept of revelation in the former sense. Campbell (2005) (see *Categorical Grounds Theories) contrasts the two concepts. Byrne and Hilbert (2007) and Brogaard (2009a) argue that if primitivist systematic illusions are possible in physical-phenomenal replicas of the actual world, then, for all we know, primitive red is more similar, e.g. protophenomenally though not visually, to primitive green than to primitive orange in the actual world; hence Revelation (in the former sense) must be rejected. Byrne and Hilbert (2007) also object to color primitivism that there are animals (e.g. goldfish) which can visually detect surface properties which human beings fail to visually detect (e.g. dispositions to reflect light in the near-ultraviolet range). Primitivism, they say, cannot account for goldfish colors because primitivists adhere to Revelation, which rests on human color experience. Campbell (2005) (See *Categorical Grounds Theories) replies that the primitivist is not committed to the claim that the human colors exhaust color space.

Brogaard, B. 2009a. "Perspectival Truth and Color Primitivism", *New Waves in Truth*, C. Wright and N. Pedersen, in press. [Argues that the colors are primitive color properties which supervene on physical and phenomenal facts. The objection from color variability is blocked by allowing that property instantiation in some cases may take place only relative to perceivers.]

Brogaard, B. 2009b. "Centered Worlds and the Content of Perception", *Blackwell Companion to Relativism*, Steven Hales, ed., in press. [Offers four arguments for centered-worlds content several of which focus on color perception.]

Byrne, A and Hilbert, D. R. 2007. "Color Primitivism", *Erkenntnis* 66: 73-105. [Offers a concise analysis of the principle of revelation; then provides several reasons to reject color primitivism. For a reply see Campbell 2005]

McGinn, C. 1996. "Another look at color", *The Journal of Philosophy* 93: 537-553. [Defends a version of color primitivism. The visual field of perceivers preclude certain color appearances, e.g. that an object looks simultaneously to be red and green all over. Facts like these ground the nature of the colors. The colors are primitive color properties that supervene on the phenomenal facts about experience but, it is argued, they are not identical to dispositional properties.]

Watkins, M. 2002. *Rediscovering Colors: A Study in Pollyanna Realism*. Dordrecht, Boston. [Argues that the colors are simple, non-reducible, non-epiphenomenal properties that supervene on physical properties.]

Watkins, M. 2005. "Seeing Red: The Metaphysics of Colour without the Physics", *Australasian Journal of Philosophy* 83: 33-52. [Offers a solution to the problem of causal overdetermination. This problem, it is argued, arises for any view that treats the colors as irreducible, intrinsic properties of objects and at the same time holds that the colors are causally responsible for color experiences and are revealed to us in color experience.]

Westphal, J. 1987. *Colour: Some Philosophical Problems from Wittgenstein*, Blackwell, Oxford. [Addresses, among other things, Wittgenstein's problem "there can be a blueish green but not a reddish green." If the novel binary hue reddish-green is to be a possible hue, then it must have a location in color space (a conceptual truth), which it does not. What grounds this conceptual truth, it is argued, is color phenomenalism—a version of primitivism.]

Westphal, J. 2005. "Conflicting Appearances, Necessity and the Irreducibility of Propositions about Colours", *Proceedings of the Aristotelian Society*, 105(2), 235-251. [Offers color phenomenalism as a response to the argument from conflicting appearances (i.e. objects look differently colored in different illumination conditions) and Wittgenstein's puzzle propositions about color.]

Yablo, S. 1995. "Singling Out Properties", *Philosophical Perspectives* 9, J. Tomberlin, ed., *AI, Connectionism, and Philosophical Psychology*, 477-502. [The colors are objective properties but one can understand their nature only through their subjective impressions. This view is consistent with, and is plausibly a version of, primitivism. Red is said to be "an intrinsic nondispositional *sui generis* color property" (489) but Revelation is not obviously endorsed.]

COLOR DISPOSITIONALISM

Dispositionalism is a range of views of the colors according to which the colors are dispositions to give rise to certain visual phenomenal effects in perceivers with normal visual systems in normal viewing conditions. Versions of dispositionalism have been said to be held by modern philosophers such as Galileo, Boyle, Newton, and Locke. Contemporary versions have been defended by e.g. McGinn (1983), McDowell (1985), and Johnston (1992). Thompson (1995) (see *Ecological dispositionalism) and Noë (2005) (see *Ecological dispositionalism) defend the view that the colors are ecological dispositions (see below). Cohen (2004) defends the view that the colors are relational properties (see below). Cohen's view is consistent with the view that colors are dispositions to cause certain phenomenal effects in perceivers but does not entail dispositionalism. Dispositionalism seems suitable for explaining why we get perceptual variation in color vision across different groups of perceivers and in different viewing conditions (real shifted spectrum cases). McGinn (1983) and Cohen (2004) (see *Color Relationalism) offer versions of this reason for accepting versions of dispositionalism. Another motivation for dispositionalism is that it allows us to say that objects instantiate colors without thereby committing ourselves to the view that colors are physical properties of the surfaces of objects. The virtues of this consequence, which is also compatible with various non-dispositionalist views of colors, are discussed in e.g. Jackson and Pargetter (1987) (see *Categorical Grounds Theories), McLaughlin (2003) (see *Categorical Grounds Theories), Cohen (2004) (see *Color Relationalism), and Matthen (2005) (see *Ecological Dispositionalism). There have also been a number of criticisms of dispositionalism. It is notoriously difficult to offer a proper account of what a normal viewing system and a normal viewing condition is. Hardin (1993) (see *Textbooks) argues that there is no particular type of viewing condition that is normal. For example, owing to color constancy bright sun light isn't required to perceive a mailbox as red. Harvey (2000) addresses this problem for dispositionalism. Dispositionalism also faces the worry of circularity, as it takes the colors to be dispositions to give rise to certain phenomenal effects in perceivers. This problem is discussed in e.g. Boghossian and Velleman (1989), Lewis (1997) (see *Color Physicalism: Defenses), Peacocke (1984), Harman (1990), and McLaughlin (2003) (see *Categorical Grounds Theories). Finally, dispositionalism has been criticized for being phenomenally inadequate. Red objects do not look as if they are disposed to cause red experiences, they just look red. This sort of criticism can be found in Boghossian and Velleman (1989) and McGinn (1996). For a response see e.g. McDowell (1985).

Boghossian, P. A. and Velleman, J. D. 1989. "Colour as a Secondary Quality", *Mind* 98: 81-103. [Contains excellent criticism of dispositionalism and defends a version of irrealism according to which the colors are instantiated in a visual array]

Harman, G. 1990. "The Intrinsic Quality of Experience". volume 4, pp. 31-52.

Ridgeview Publishing Company, Atascadero, California. [Introduces and defends the transparency thesis for color experience: The colors one experiences when one has a color experience are experienced as features of the objects of one's experience, not as intrinsic features of the experience itself.]

Harvey, J. 2000. "Colour-Dispositionalism and Its Recent Critics", *Philosophy and Phenomenological Research* 61: 137-155. [Responds to arguments against dispositionalism and offers a plausible account of what a normal viewing condition is.]

Johnston, M. 1992. "How to Speak of the Colors", *Philosophical Studies* 68: 221-63. [Argues that the primary quality account of the colors does not satisfy any reasonable formulation of the principle of revelation (i.e., that the structural relations between the colors are revealed to us in experience). Furthermore argues that the primary quality account cannot account for how we are acquainted with the colors. So, a version of dispositionalism (the secondary quality account) is to be preferred.]

McDowell, J. 1985. "Values and Secondary Qualities", *Morality and Objectivity*, T. Honderich, ed., London: Routledge and Kegan Paul, 100-29. [Defends realism about values by analogy to the colors as secondary qualities (dispositionalism); also addresses the issue of what it is to look colored.]

McGinn, C. 1983. *The Subjective View: Secondary Qualities and Indexical Thoughts*, Oxford: Oxford University Press. [Defends the secondary quality account of the colors, and offers interesting analogies between secondary qualities and indexical thoughts, which, it is held, cannot be reduced to non-indexical thought.]

Peacocke, C. 1984. "Colour Concepts and Colour Experiences". *Synthese* 58: 365-82. [Addresses the issue that the dispositional account of the colors might be circular with respect to how we come to master color concepts, e.g. red. The paper argues that one must draw a careful distinction between definitional priority and cognitive priority in addressing this worry. For example, one might hold that perceived red is definitionally prior to red, though cognitively posterior to it. This sort of response, of course, requires that one can have an internally qualitatively red experience without already possessing the concept of perceived-red. Otherwise, circularity with respect to how we come to acquire the concept of red threatens.]

COLOR RELATIONALISM

Cohen (2004) and Cohen (2006) offer a view of the colors according to which the colors are relational properties that integrate perceivers and viewing conditions. No object is simply red, though it may be red-relative-to-me-and-my-current-viewing-condition. The view is consistent with dispositionalism, but is different from the standard secondary quality account of the colors. On the standard secondary quality account, the colors are dispositions to cause certain phenomenal experiences in normal perceivers in normal viewing conditions. Cohen does not treat the colors as dispositions and does not relativize to normal perceivers and normal viewing conditions, except in certain uses of generic color discourse. Cohen's view has a certain affinity with McLaughlin's (2003) (see *Categorical Grounds Theories) and Jackson's (1996) (see *Categorical Grounds Theories) views to the effect that physical properties of objects count as colors only relative to perceivers. Relationalism is, according to Cohen, the best way to deal with the problem of color variability. Cohen also has a forthcoming book defending the view (see *General Overviews). Thompson (1995), Noë (2005) and Pautz (2006) (see *Color Physicalism: Debate) give further arguments and provide empirical evidence in favor of the thesis that color experience is relational, and argue that philosophical theories of color should be informed by this. Brogaard (2009a) (see *Color Primitivism) offers objections to Cohen's version of color relationalism. Further discussion of the problem of color variability, with a discussion of the evidence from cognitive science can be found in Brogaard (2009).

Brogaard, B. (2009). "Color in the Theory of Colors? Or: Are Philosophers' Colors All White?", *The Center Must Not Hold: White Women on The Whiteness of Philosophy*, George Yancy, ed. In press. [Critical of the classical focus on color perception in Western white cultures. Discusses evidence of differences in the nature of color perception across Western white cultures and non-Western non-white cultures. Also provides philosophical arguments against color universalism about color categories and color terms and discusses its relation to color physicalism.]

Cohen, J. (2004). "Color Properties and Color Ascriptions: A Relationalist Manifesto", *The Philosophical Review*, 113: 451-506. [Introduces color relationalism and argues that it is probably the best way to deal with the problem of color variability.]

Cohen, J. (2006). "A Relationalist's Guide to Error about Color Perception", *Noûs* 41 (2):335–353. [Offers a response to the objection to color relationalism to the effect that it lacks resources for accounting for errors of color perception.]

CATEGORICAL GROUNDS THEORIES

Campbell (1993), Campbell (2005), Jackson (1996), McLaughlin (2003) and Cohen (2003) defend the view that the colors are the categorical grounds of dispositions to cause certain phenomenal effects in perceivers. That is, the colors are not the dispositions themselves, but

the properties (e.g. primitive properties or physical properties) that confer on their bearers the dispositions to look colored to certain perceivers in certain viewing conditions. Categorical ground theorists typically treat the color terms as non-rigid. For example, 'red' is a non-rigid term, which can pick out one physical property in this world but a different physical property in a different world. Categorical ground theories are in some cases best treated as relational views, though in some cases they are perhaps better treated as versions of physicalism or primitivism. How the view is best classified will depend on whether the colors-qua-categorical grounds are thought to be role properties or realizers. Cohen (2005) offers a defense of the colors as role properties.

Cohen, J. 2003. "Color: A Functionalist Proposal," *Philosophical Studies* 112: 1–42. [Defends a version of role functionalism.]

Cohen, J. 2005. "Colors, Functions, Realizers, and Roles," *Philosophical Topics* 33: 117-140. [Defends role functionalism, viz. the view that the colors are the entities that play certain roles in relation to us.]

Campbell, J. 1993. "A Simple View of Colour", *Reality Representation, Projection*, J. Haldane and C. Wright, ed. Oxford: Oxford University Press, 257-68. [May be read as a defense of color primitivism, but as Byrne and Hilbert (2007) point out, Campbell argues that the colors are the grounds of the dispositions to produce certain phenomenal experiences in us. Thus, the view could be considered a special version of physicalism. What distinguishes Campbell's view from physicalism, presumably, is that he adheres to some version of the principle of Revelation.]

Campbell, J. 2005. "Transparency vs. Revelation in Color Perception", *Philosophical Topics* 33: 105-115. [Argues that the colors are underlying categorical color properties, which we normally are directly acquainted with. Revelation in Byrne and Hilbert's sense is less important than the principle that color experience reveals the colors to us. Emphasizes that this principle, which he calls 'transparency', is in tension with reflectance physicalism, because it implies that what is revealed to us in color experience is not a functional concept which picks out a low-level realizer but a 'high-level categorical property'.]

Jackson, F. 1996. "The Primary Quality View of Color", *Philosophical Perspectives* 10, ed. J. Tomberlin, Cambridge, MA: Blackwell. [Expands on his earlier defense of a version of reductive physicalism. Argues that the view can accommodate some of the intuitions that were originally thought to motivate dispositionalism or subjectivism about the colors, for instance, the fact that the perceived colors do not look like reflectances.]

Jackson, J. and Pargetter, R. 1987. "An objectivist's guide to subjectivism about color", in: A. Byrne and D. R. Hilbert, Editors, *Readings on Color. Vol. 1: The philosophy of Color*, MIT Press, Cambridge, 1997: 67–79. [Defend the view that the colors are physical color properties which constitute the ground of dispositions to look colored.]

McLaughlin, B. P. 2003. "The Place of Color in Nature", *Color Perception: Mind and the Physical World*, ed. R. Mausfeld and D. Heyer, Oxford: Oxford University Press, 475-505. [Defends the view that physical properties are colors only relative to a perceiver in one type of circumstance. So, property P may be unique green for one type of perceiver in one type of viewing condition, and bluish-green for another type of perceiver in the same viewing condition. So, neither perceiver is misperceiving the color of the surface.]

ECOLOGICAL DISPOSITIONALISM

Ecological dispositionalism (also sometimes called 'color enactivism') is a natural extension of enactivism to colors. Thompson (1995) argues that perceivers should be understood as actively exploring animals rather than passive spectators. Thompson develops a dispositional account of the colors which rests on the idea that colors indicate what the environment affords for the animal and what the animal can affect in its environment. Noë (2005) likewise argues that 'perception is not something that happens to us, or in us' but 'something we do'. Vision is touch-like. Perception should be understood as an encounter with the world or, what he calls, "an episode of skill-based access to the world". The most basic kinds of skills that give us access to the world are sensorimotor skills: abilities to move around an object, turn the object in our hands, or perceive the colors of the object in different illumination conditions. Noë argues that it is not possible to see every aspect of an object's color all at once. So, in that sense color perception is like tactile perception. We need to move relative to the object to fully perceive the object's color. Like Thompson, Noë defends a view of the colors as dispositions. However, colors are not dispositions in the traditional sense; rather, they are ways in which objects are disposed to change their appearance as the viewing conditions change. Other defences of the ecological approach to color include Thompson (2000) and Matthen (2005).

Noë, A. 2005. *Action in Perception*, Cambridge, MA: MIT Press. [Argues that the "picture theory" of perception is misguided, and that perception should be understood as an encounter with the world or, what he calls, "an episode of skill-based access to the world". The most basic kind of skills that give us access to the world are sensorimotor skills: abilities to move around an object, turn the object in our hands, or perceive the colors of the object in different illumination conditions.]

Matthen, M. 2005. *Seeing, Doing, Knowing*, Oxford: Clarendon Press. [Proposes to understand intentionality in terms of biological function.]

Thompson, E. 1995. *Colour Vision: A Study in Cognitive Science and the Philosophy of Perception*. Routledge, New York. [Accessible overview of the current scientific and philosophical debates about the colors and color vision. Defends a dispositional account of the colors which rests on the idea that colors indicate what the environment affords for the animal and what the animal can affect in its environment. Also emphasizes the importance of the Gibsonian idea of perceivers as actively exploring animals rather than passive spectators.]

Thompson, E. 2000. "Comparative Color Vision: Quality Space and Visual Ecology", in S. David, ed. *Color Perception*, Oxford: Oxford University Press, 163-186. [Defends and develops on the ecological approach to color.]

COLOR IRREALISM

Irrealist theories (also sometimes called 'eliminativist theories' or 'subjectivist theories') are committed to an error-theory about colors. Strictly speaking, objects are not colored. Colors partially constitute the content of color perception (Chalmers 2004, 2006), or are instantiated in a visual array (Velleman and Boghossian 1989). Several reasons have been offered in favor of irrealism. Byrne and Hilbert (2007) point out that the colors are not among the properties our best physical theories commit us to. Hardin (1993) (see *Textbooks), Hardin (2008), Maund (1995) and Pautz (2006b) argue that no realist account satisfies empirically evident constraints about the nature of the colors. As for arguments against, Ross (2001) argues that irrealism fails to offer an adequate account of how sensed or mental colors are experienced as spatially located. Brogaard (2009a) (see *Color Primitivism) argues that irrealism collapses into a form of imperfect realism. Even though irrealists reject the idea that human color vision detects colors instantiated in external objects, they need to account for the difference between cases in which perception is falsidical yet normal and cases where perception is falsidical yet abnormal. Chalmers (2006) accounts for this difference by allowing experiences to be falsidical yet imperfectly veridical. One consequence of this proposal is that irrealism about sensed colors must be accompanied by a kind of imperfect realism about physical color properties. Kalderon (2007) defends an alternative to color irrealism which he calls 'color pluralism'. This is the view that objects are multiply colored. This view, he says, is compatible with physicalism and primitivism.

Boghossian, P. A. and Velleman, J. D. 1989. "Colour as a Secondary Quality", *Mind* 98: 81-103. [Contains excellent criticism of dispositionalism and defends a version of irrealism according to which the colors are instantiated in a visual array]

Byrne, A and Hilbert, D. R. 2007. "Color Primitivism", *Erkenntnis* 66: 73-105. [Offers a concise analysis of the principle of relevation; then provides several reasons to reject color primitivism. For a reply see Campbell 2005 (*Color Primitivism)]

Chalmers, D. 2006. "Perception and the Fall from Eden", in *Perceptual Experience*, ed. T. Gendler and J. Hawthorne, Oxford: Clarendon Press: 49-125. [A long and rich defense of irrealist primitivism: Perfect colors are primitive, non-instantiated property correlates of phenomenal properties. Also defends a version of reflectance physicalism with respect to the imperfect (non-primitive) colors. Then argues that non-primitive colors are the most likely candidates to be the properties attributed in ordinary color discourse.]

Hardin, C. L. (2008). "Color Qualities and the Physical World", in *The Case for Qualia*, ed. E. Wright, 143-154, Camb. Mass: MIT. [Defense and development of Hardin's irrealist position.]

Kalderon, M. E. 2007. "Color Pluralism", *Philosophical Review* 116: 563-601. [Defends the view that colors are multiply colored. Tomatoes are green all over and orange all over. But different perceivers perceive difference colors in different viewing conditions.]

Maud, B. 1995. *Colours: Their Nature and Representation*, Cambridge University Press, New York. [Defends the view that physical objects do not have the colours we experience them as having.]

Pautz, A. 2006. "Color Eliminativism". Ms., University of Texas, Austin. [A defense of color eliminativism. According to Pautz, the colors are primitive properties not instantiated by objects. Along the way the paper surveys and criticizes a number of alternative realist primitivist positions.]

Ross, P. W. 2001. "The Location Problem for Color Subjectivism", *Consciousness and Cognition* 10: 42-58. [Looks at different versions of irrealism and concludes that none of them can account for how sensed colors are experienced as spatially located.]

ACKNOWLEDGEMENTS

I am grateful to an anonymous referee, David Chalmers, Jonathan Cohen, Adam Pautz and Peter Ross for their helpful comments on this entry.