

## **TRANSPARENCY VS. REVELATION IN COLOR PERCEPTION**

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What knowledge of the colors does perception of the colors provide? My first aim in this essay is to characterize the way in which color experience seems to provide knowledge of colors. This in turn tells us something about what it takes for there to be colors.

Color experience provides knowledge of the aspect of the world that is being acted on when we, or some external force, act on the color of an object and thus make a difference to the experiences of people looking at it. It is in this sense that the nature of the colors is transparent to us. For there to be colors is for there to be the qualitative categorical properties that we encounter in perception, action on which affects the color experiences of observers.

This line of thought contrasts with the idea that color experience reveals the colors to us, in the sense that it provides knowledge of a number of necessary truths about the colors. In a recent paper, Alex Byrne and David Hilbert provide a careful exposition and critique of this way of developing the idea of color experience as revelatory of the colors. In this paper my main aim is simply to contrast the idea that experience makes the colors transparent to us, with the idea that color experience provides us with knowledge of truths relating to the essences of the colors.

### **1. Transparency**

Suppose you are ill. You have a big job interview coming up, but you look terrible. Catching sight of yourself in a mirror, you think, ‘They won’t give me the post looking like that.’ You slap your cheeks to improve the skin coloration. The striking points about this story have to do with its social aspects. No one would think twice about the very idea that there is such a thing as affecting the color of an object, in order to affect other outcomes. But intentionally affecting the color of an object, in order to affect other outcomes, is a distinctively human capacity. In fact, I will suggest, it illustrates what is distinctive of the capacity to have conceptual thought about colors; to have the concept of color.

We typically, as in the above story, regard color as a sign of some internal condition of the object, and we don’t think that the internal condition is affected by manipulating the color. It would be a very unusual person who thought they had cured an illness by slapping their cheeks. We think of the colors of foods as indicators of their freshness and health; and food manufacturers notoriously manipulate food colors in order to affect our perception of them. But again, it wouldn’t occur to anyone to think you might actually have made the lettuce fresher by coloring it, or that you might have made the soup have a higher meat content by darkening it. Principally, we think of manipulations of color as affecting people’s perceptions of the object, and in particular, their perceptions of the underlying conditions of which the color is a symptom.

There are artificial uses of color that are not intended to affect people’s judgments about the underlying natural causes of color, but rather have conventional significance: the colors of traffic lights, of electrical cables and so on. Colors are particularly suited

for use in this way, as Alison Gopnik once pointed out, because, in general, manipulating colors affects, in the first instance, only the perceptions of observers. We go in extensively for coding by color. There would be practical difficulties about going in as extensively for coding by shape or electrical charge, just because they characteristically affect outcomes other than by way of affecting the perceptions of observers.

When we manipulate the colors of objects, do we, ordinarily, know which property we are manipulating? We ordinarily suppose that we do; it is not as though we are fumbling in the dark with our paints, doing something that, in some as yet unknown way, seems to make some difference or other to perceptions of observers. We take it that our experience of the colors provides us with knowledge of which properties are intervened on when colors are intervened on. This is the idea I will call ‘Transparency’. There is such a thing as acting on a variable to produce a given outcome, without having much idea which variable you are acting on. For example, suppose you have an ancient and temperamental TV set. Occasionally the volume suddenly booms out much more loudly than it should. You can fix this by banging the side of the set; but it’s an inconstant business, you have to vary just how you bang the side of the set from time to time, and sometimes it actually works better to strike the set from behind, just below the top corner. When you correct the volume in this way, you take it that there is some hidden variable on which you are acting, to make a difference to the volume. But you have no idea what that hidden variable is. The case of color seems quite different. When you manipulate the color of part of a painting, in order to affect the perceptions of people who look at it, you do not seem to be acting in a hit or miss way on some hidden variable or other – a presumed underlying molecular structure, for example. The variable on

which you are acting, in order to affect those perceptions, is staring you in the face – it is the manifest color of the thing. Your perception of the color provides you with knowledge of which variable you are acting on – there is nothing hidden about it. But what does it come to, that perception provides you with this knowledge of the color?

The sense in which we know which properties the colors are needs careful glossing. First, the idea of ‘knowing which’ here had implications for modal knowledge: knowledge of what can happen in the world with regard to a particular property. To know the color of an object is to know something about what difference it makes that the object has that property. And this idea of ‘knowing what difference it makes that the object has that property’ has modal content. In effect, it has the modal content I began spelling out above. It has implications for what would happen to various outcomes, principally, the perceptions of observers, if the object’s color were manipulated. And there will also be knowledge of what the factors are, manipulating which could affect the color of the object. Thinking of the color of the object in this way is thinking of it as the categorical ground of those various possibilities.

We are not thinking of the color merely as ‘whatever it is that underlies all these various possibilities, we take it that in ordinary color experience we are confronted with the underlying categorical color property itself; and it is this categorical property that is manipulated when color is manipulated. How are we to characterize this further step? Russell helpfully distinguished two sorts of knowledge: knowledge of truths, and knowledge of things:

Knowledge of things, when it is of the kind we call knowledge by *acquaintance*, is essentially simpler than any knowledge of truths, and logically independent of knowledge of truths, though it would be rash to assume that human beings ever, in fact, have acquaintance with things without at the same time knowing some truth about them.

(Russell 1912, 25)

On this account, the sense in which you have knowledge of the variable on which you acting when you change the color of an object is this: color vision provides you with knowledge of that thing. This knowledge is not to be explained as a type of propositional knowledge. Rather, your knowledge of truths about the colors depends on this kind of non-propositional knowledge of the colors themselves.

In developing this kind of view, it is a substantive question whether this knowledge of the colors should be taken to be prior to grasp of the idea that they are capable of being manipulated. That is, should we take it that perception of the colors provides one with grasp of color as a variable, which might or might not turn out to have any causal significance? Of course it depends on what constraints there are on the idea of 'grasp of color as a variable', what work this notion is doing for us. So far, I have explained this only in terms of the idea that sometimes when one variable is manipulated so as to make a difference to another, we know which variable is being manipulated, and sometimes we do not. So far, then, the notion of 'grasp of color as a variable' makes sense only in the context of talk about grasp of the causal significance of the variable.

We can press this point a little further. We might identify knowledge of which variable is being manipulated with a ‘grasp of the concept of color’ that has to do with grasp of the idea of color as a property of objects; a property that they may have independently of whether one is currently observing them. Grasp of the concept of color is grasp of the idea that propositions ascribing color to objects are true or false independently of one’s current reactions to those objects. So ‘grasp of the concept of color’ in this sense cannot be merely a matter of one’s own tendencies to react differently to differently colored objects. What cognitive skills does one need to go beyond this differential sensitivity to color? What does it come to, that one has this capacity to think of color as a property that objects have, independently of one’s current reactions to them? I suggest that what lifts color out, as a property of the object, is one’s perception of it as a property of the object that can be selectively manipulated, to affect a variety of outcomes other than one’s own perceptions. It is the capacity to see the property in this way that grounds one’s possession of the concept of color, so that one has a conception of the truth or falsity of propositions about color, independent of one’s current reactions.

The example with which I began was slapping one’s cheeks to affect the coloration of one’s skin, so as to make a difference to the perceptions of other people. In one way this is not the best example to take: most of us would think that in this case we are affecting the color of the skin by affecting something else, blood circulation or something like that. But when we consider the use of paints or inks or dyes to change the color of an object, we think of them as affecting the color of the object directly, rather than by affecting some other variable. And these agents are designed so as to have large, specific and systematic effects on the color of the object. So far as the designers can

manage, these agents don't affect other characteristics of the object but they do have a big impact specifically on its color. Of course, to perceive the color of an object as a dimension of it that can be selectively manipulated, you don't need to know exactly how you would go about doing that. All you need is the idea that this is something that is in principle possible.

## 2. Transparency vs. Revelation

In their instructive recent paper, Alex Byrne and David Hilbert discuss a doctrine they call 'Revelation', which they treat as equivalent to the conjunction of two theses. The first thesis is 'Self-Intimation', the second thesis is 'Infallibility'. Here they are:

### SELF-INTIMATION

If it is in the nature of the colors that  $p$ , then after careful reflection on color experience it seems to be in the nature of the colors that  $p$ .

### INFALLIBILITY

If after careful reflection on color experience it seems to be in the nature of the colors that  $p$ , then it is in the nature of the colors that  $p$ .

As Byrne and Hilbert remark, Self-Intimation is a very strong thesis:

It implies that colors are *not* reflectance types, for instance. If they are reflectances, then it is in the nature of the colors that they are reflectance types. And if it is in the nature of the colors that they are reflectance types then, by Self-Intimation, this fact is apparent from careful reflection on color experience, which it isn't. By the same token, if Self-Intimation is true, colors are not dispositions to affect perceivers, microphysical properties, chemical properties, ectoplasmic properties, and so on. The only nature or essence of the colors apparent from reflection on color experience is chromatic through and through.

(ms. P. 7)

By a 'purely chromatic' sentence, they mean one that is solely composed of topic neutral and color vocabulary. For example: 'Every shade of orange is reddish', 'Canary yellow is not a shade of blue', 'Canary yellow is a shade of blue', 'Purple is more similar to red than to yellow'. 'Brown is blackened orange', and so on (ms. pp. 8-9). They remark that Infallibility is widely thought to be true: if these chromatic sentences seem true after careful reflection, then they are true. And they are all that we can have to characterize the natures of the colors, if Revelation is true.

From Revelation, then, it follows that colors are not identical to physical properties (such as surface reflectances). This is what Byrne and Hilbert call 'Minimal Primitivism'. 'Realist' Primitivism adds that objects often do have the colors we take them to, and colors of objects often figure in causal explanations, in particular, that they figure in causal explanations of why things look to have the colors they do.



In its own terms, the argument that if Revelation, then (at least) Minimal Primitivism here is careful and persuasive. But it is hard not to feel that this argument is fumbling a much more intuitive point about the role color experience plays in providing us with out conception of the colors. I began this essay by trying to indicate the intuitive sense in which we take color experience to acquaint us with the variable on which we are acting, when we manipulate the color of an object in order to affect the experiences of observers. The intuitive sense in which we take color experience to provide us with knowledge of the colors simply does not have to do with our learning a whole set of chromatic truths. It is not obvious that one does learn chromatic truths on the basis of color experience. And the knowledge of the colors that we seem have on the basis of experience certainly is not exhausted by our knowledge of chromatic truths.

Consider someone who is intelligent and possessed of color vision, but who has no color vocabulary, though perhaps a quite extensive grasp of language otherwise. We can teach her quite a lot about the use of color words without making any connection to color vision. We can teach her which forms of words express chromatic truths and which do not: we could present her, for example, with the list from Byrne and Hilbert above. So long as the connection to color vision has not been made, all this is in some sense just empty talk; she as yet has no idea what we are talking about. But suppose now we do make the connection to color vision. Perhaps we produce a box of paints and change the colors of things before her eyes, saying, for instance, 'This was red and now it's black'. What does she learn from the connection to color experience?

The intuitive answer is not that she now learns which chromatic propositions are true. The intuitive answer is that she learns which particular quality redness is, for

instance: for each color name, she learns what it stands for. There is a sense in which the totality of chromatic sentences articulates the structure of the colors, how they are all organized and related to one another. But the role of experience is not immediately to provide one with this knowledge of the structure of the colors. It is, rather, to provide one with knowledge, for each color, of which particular property it is – the qualitative characters of the colors. That is the intuitive idea behind Revelation: that color experience reveals the color itself to one. That intuitive idea, whether it is right or wrong, is not captured by the thesis that experience provides one with knowledge of a collection of chromatic propositions.

Here is another way to put the point. Ordinary speakers do not typically have an articulated grasp of some massive collection of chromatic propositions. Nonetheless, there does seem to be a sense in which their grasp of color vocabulary can be characterized as involving an implicit grasp of chromatic propositions. We can think of the chromatic propositions as describing the inferential rules that people observe in their use of color vocabulary. For example, from ‘x is canary yellow’ to infer, ‘x is not blue’, and so on. Just as the inference rules for the classical logical constants are explained by the availability of truth tables for them, we can regard these inference rules for the use of names of colors as explained by what colors the names stand for; and experience reveals to us what the color names stand for.

Earlier I contrasted banging a TV set in order to modify the volume, with painting a square of paper in order to affect the experiences people will have on looking at it. In the case of the TV set, I said, we take ourselves to be acting on some underlying variable, but have no idea what it is. In the case of painting an object, though, it seems perfectly

manifest what property we are acting on, and this knowledge of what property we are acting on is provided by our experience of color. We can round out this contrast into a generalization. In the case of the TV set we are acting on a property of which we have only a functional characterization. We know something about how to affect this variable, and about the implications of it being affected. But we have only the functional characterization. In contrast, when we act on the color of a thing to affect the perceptions of those who observe, we do not ordinarily suppose that we have only a functional characterization of the property. We take it that experience is confronting us with the categorical color property itself. We suppose that it is because we are manipulating this categorical property there are differences in the color experiences of observers.

This role for experience in providing us with the conception of colors as categorical properties of objects, in virtue of which they affect the color experiences of observers, seems quite different to the role that Revelation accords to experience, on Byrne and Hilbert's reading of it. It is not a matter merely of experience making available a collection of chromatic propositions; it is not a matter of propositional knowledge at all. As Russell put it, what we have here is not knowledge of truths, but knowledge of things. It is confrontation with the very variable action on which affects the experiences of observers. So we can contrast what Byrne and Hilbert call Revelation with what I earlier called Transparency:

#### TRANSPARENCY

Experience of color provides knowledge of the categorical color property intervention on which changes the experiences of observers.

You might argue that this confrontation with the variable itself yields, on the basis of reflection alone, knowledge of chromatic propositions; but you might also argue that this is not so, that further empirical work is needed. So far as Transparency itself goes, experience of the categorical properties might be an atomistic matter, with further empirical work needed to articulate the structure of the colors.

Byrne and Hilbert had argued that Revelation, on their interpretation of it, implies Primitivism about colors; minimally, that colors are not identical to physical properties. The argument was that by Revelation, the natures of the colors are exhausted by a collection of chromatic propositions; but no physical property has its nature exhausted by a collection of chromatic propositions. Does Transparency, as I have explained it, imply that colors are not physical properties of objects? It does raise a problem for the idea that color properties are physical properties, but it is a different problem to the one raised by Revelation. The problem is to understand how a high-level categorical property like color can be identified with a lower-level physical property. How can the qualitative property with which the experience of redness confronts you be a physical property? The kind of problem that Transparency raises for physicalism about the colors echoes a problem that Joseph Levine raised for physicalism about qualia in a classic article some time ago:

Let's call the physical story for seeing red 'R' and the physical story for seeing green 'G'. My claim is this. When we consider the qualitative character of our visual experiences when looking at ripe McIntosh apples, as opposed to looking at

ripe cucumbers, the difference is not explained by appeal to G and R. For R doesn't really explain why I have the one kind of qualitative experience – the kind I have when looking at McIntosh apples – and not the other.

(Levine 2002, 356)

Just so, suppose we call any physical account of what it is for an object to be red 'R' and the physical account of what it is for an object to be green 'G'. Then, arguing from Transparency, the Primitivist may say: When we consider the qualitative character of the color of ripe McIntosh apples (the categorical property that color experience provides knowledge of), as opposed to the color of ripe cucumbers (the categorical property that experience provides knowledge of), the difference is not explained by appeal to G and R. For R doesn't really explain why McIntosh apples have the one categorical property and not the other.

Someone who accepts Transparency might still argue that this argument can be met; that colors are indeed high-level categorical properties of objects but that this does not of itself constitute an insurmountable obstacle to identifying colors with physical properties. Someone taking this line has some difficult ground to cover, just because our only model for understanding the identification of a high-level property with a property identified in lower-level terms is provided by the idea that a high-level property can be defined functionally, and the lower-level property displayed as the realizer of that functional role. When the high-level property is categorical, and not to be defined in functional terms, we do not as yet have any model for how to understand the identity claim. But the provision of some such model is not evidently impossible. And the case

here is in some ways more tractable than it is in Levine's case of color qualia. In thinking about the colors of the objects themselves and their relation to their physical base, we do not yet have to be concerned about phenomena such as the unity of consciousness or the subjectivity of experience; we are concerned only with the relation of high-level qualitative character to the physical. And this is quite a general problem: so long as we think there are macroscopic properties that cannot be analysed in functionalist terms, we will have the problem of explaining their relation to physical properties. (At this point it is, indeed, natural to wonder whether Levine's article did not mislocate the fundamental point of contact between the qualitative and the physical. The more fundamental, and more tractable, problem is to understand the relation between the qualitative color property of the object and its physical basis. It is only with that accomplished that we should move to understand the relation between experience of color and the physical basis of such experiences.)

### **3. Alien Color as a Criticism of Revelation and Transparency**

I have said that on an approach in terms of Transparency, color experience provides us with knowledge of categorical color properties. Color experience does not acquaint one merely with some functional characterization of a property, whose further specification is a matter for conjecture. Color experience acquaints one with the categorical colors themselves, on this view.

On an approach in terms of Revelation, in contrast, color experience provides one with knowledge of truths about the essences of the colors, and it is in that sense only that color experience ‘reveals’ the colors to us. One mark of the difference between the two views is that for Transparency, experience of the colors is needed to relate one to those properties, to give one this ‘knowledge of things’. For Revelation, in contrast, it is quite difficult to understand why color experience would be needed for knowledge of the colors. Knowledge of the chromatic propositions such as ‘every shade of orange is reddish’ could equally be provided by the testimony of others; so it is not obvious that your color experience is, for Revelation, essential to your knowledge of the colors.

One problem Byrne and Hilbert raise for Revelation is the problem of non-human animals with color vision. Consider, they say, the common goldfish (*Carassius auratus*). There are many similarities between human color vision and goldfish color vision. There are also differences. Goldfish color vision may discriminate between objects that to human color vision are indistinguishable. According to Byrne and Hilbert,

One natural and well-motivated description is that goldfish really are responding to colors, albeit not those that human beings can detect .... [but] the claim that goldfish are responding to colors is in some tension with Revelation. If there are goldfish colors, then presumably they have some nature in common with the human variety. The nature of the human colors, then, should somehow make room for goldfish colors. But careful reflection on (human) color experience seems, if anything, to *exclude* the possibility of colors that are not located within the familiar color solid. That is, if the nature of the human colors is revealed to us

by color experience, as Revelation claims, then (arguably) goldfish colors do not exist.

(ms. p. 29)

Revelation explains the sense in which color vision reveals the colors to us as a matter of our having knowledge of a collection of chromatic propositions. The suggestion here is that this collection of chromatic propositions carries with it an implicit claim to exhaust color space. You cannot both accept that implicit claim yet acknowledge that there are 'goldfish colors', not located in the familiar color solid.

The point I want to make here is that this argument does not tell against Transparency, conceived as the claim that color experience reveals to us the qualitative characters of high-level categorical properties. On this view, color experience is providing us with knowledge of things (the colors) not knowledge of truths. And there may be something atomistic about it: how the relations between these individually given qualitative characters are specified is a further question, and there may be no implicit claim that they exhaust color space.

You might wonder whether goldfish color vision does not anyhow raise a real problem for Transparency. If there have to be high-level color properties for human color vision to be experience of, will there not have to be high-level color properties for goldfish experience to be experience of? When we consider the range and variety of animal color vision, will there not then be an undesirable explosion in the number of high-level color properties we have to recognize as coordinate with those visual systems?



Even if we let it go through, the force of this argument is questionable. There is no very evident problem in finding that there are many more high-level properties out there than we would have realized had we stuck to the immediate deliverances of our own senses. The undesirability of the ‘undesirable explosion’ is not evident.

There are however, interesting difficulties with this argument in its own terms. Notice first that high-level categorical color properties were being used to characterize our experience of color – experience of color is a relation to such a high-level property. For it to be an empirical fact that Transparency requires us to acknowledge a wider range of color properties than we realized, we need to be considering conscious subjects with various types of visual system. It is not obvious that goldfish are conscious at all, let alone conscious of the colors.

Moreover, merely finding a conscious subject with a visual system different to our own is not enough to establish the existence of alien colors. If there are alien colors, they are properties of objects that are selectively manipulable; properties on which selective intervention is in principle possible. A creature could have a visual system sensitive to spectral reflectances without there being any such high-level colors in its environment. You could have a visual system capable of what is broadly called ‘color vision’ – one sensitive to spectral reflectances – without having any capacity to attend to color as an aspect of an object on which intervention is selectively possible. This is presumably the case of young children, who have color vision in place, and can use color vision to differentiate objects from their backgrounds, long before they exhibit any capacity to attend specifically to the colors of things. It also seems to be the case of all

non-human animals. So it is not easy to frame an empirical argument from animal vision to the conclusion that Transparency demands a plethora of alien colors.

To have the concept of color, I have suggested, is to have experience of the colors provide you with knowledge of the colors as a dimension of the object on which intervention is selectively possible. If this is correct, then some grasp of the practical possibility of manipulating color will presumably play an important role in motivating our possession of color concepts. For we do not, in general, have a great interest in ‘in principle’ possibilities of intervention that are never realized. In a recent article, Kay and Maffi (1999) discuss the idea of a lexical partition of the color space – that is, the presence in a language of the handful of basic color terms that jointly partition the whole color space. How does it come about that there is such a partition in a language in the first place? And what are the forces that drive the refinement of the initial partition? They say:

As the colors of artifacts become increasingly subject to deliberate manipulation, color becomes an increasingly important dimension for distinguishing things and hence for distinguishing them in discourse. As technology develops, the increased importance of color as a distinguishing property of objects appears to be an important factor in causing languages to add basic color terms, i.e., to refine the lexical partition of the color domain ....

The same process provides a plausible reason for the transition from non-partition to partition languages. Specifically, non-partition languages, like early-stage languages, may be spoken in societies where color is of relatively low

cultural salience. If we assume that cultural salience is promoted by increased functional load in communication, we expect a rise in technological complexity to both push a non-partition language toward full partition status and cause a language that already has a full partition of the color space to refine that partition, that is, to move further along the (partially ordered) universal evolutionary trajectory. On this view, both the evolution *of* basic color term systems and the evolution *toward* basic color term systems result in large measure from increasing technological control of color: as technological control of color increases, its manipulation in the manufacture of everyday artifacts causes it to bear an increasingly greater functional load in everyday linguistic communication and thereby to achieve greater cultural salience. Greater cultural salience of color induces partition of the color space where it does not already exist and leads to increasingly finer partitions of the color space where a partition already exists. This process may still be going on ....

(Kay and Maffi 1999, 1.1 p. 6)

To sum up. Byrne and Hilbert had raised the possibility of animal color vision as a problem for Revelation, understood as the idea that color experience provides comprehensive knowledge of chromatic truths. I have suggested that Revelation does not properly articulate the intuition that color experience discloses the colors to us. I have suggested that the intuition is better articulated by Transparency, the idea that color experience provides knowledge of color as a variable on which intervention is selectively possible. I have further proposed that it is this conception of color experience that we

need to characterize our grasp of color concepts: to have the concepts of the color properties is to have the conception of color as a property of objects on which intervention is selectively possible. This proposal, I suggest, is consonant with the remarks by Kay and Maffi above.

**REFERENCES**

Byrne, Alex, and David R. Hilbert. In press. 'Color Primitivism'. In Ralph Schumacher, (ed.), *Perception and the Status of Secondary Qualities*. (Dordrecht: Kluwer).

Campbell, John. 2006. 'Manipulating Colours: Pounding an Almond', in Tamar Szabo Gendler and John O'Leary Hawthorne (eds.), *Perceptual Experience* (New York: Oxford University Press).

Kay, Paul and Luisa Maffi. 1999. 'Color Appearance and the Emergence and Evolution of Basic Color Lexicons'. *American Anthropologist* 101 pp. 743-760