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The truth about true blue

Michael Tye

Cohen, Hardin, and McLaughlin (2006) complain that my solution to the puzzle of true blue (Tye 2006) depends upon my assuming that 'all variation in colour experience among standard perceivers in standard circumstances is at the level of fine-grained hues (4)'. That assumption, they say, is false: 'there is in fact variation in colour experience among

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standard perceivers even for colours at the level of grain of blue, purple, orange, and the like (••)'.[1]

The scientific study Cohen et al. cite (see Malkoc et al. 2005) shows that there are surfaces that look blue to some standard perceivers in standard circumstances but look purple to others. Similarly, there are surfaces that look yellow to some standard perceivers in standard circumstances but look orange to others. Cohen et al. comment:

> The only responses to this result that are available to Tye are either to appeal to a level of grain that is even coarser than that of blue (purple, yellow, orange, etc) or else abandon his suggested alternative position altogether. We maintain that the first option is deeply implausible and entirely ad hoc (••).

Cohen et al. are mistaken. The purpose of this note is to explain why.

1. *Unitary and binary colours*

Some hues are unitary: in particular, red, yellow, green, blue. Others are binary: for example, orange, purple, lime. Binary colours are always mixes of other colours. Orange is reddish yellow, lime is yellowish green, purple is bluish red. Unitary colours have shades that are not mixes of other colours. Blue, for example, has a hue that is not a combination of any other hues. This is unique blue or true blue.

In saying that orange is a mix or combination of other hues, whereas true blue is not, what is meant intuitively is that orange is a colour such that something in being orange is reddish and also yellowish; moreover, any given object, in being reddish and yellowish in the same surface regions is orange in those regions. Orange, thus, is naturally taken to be a conjunctive property, reddishness and yellowishness. That, it seems to me, is the common-sense view. And that provides the basis for the most straightforward and direct way of understanding the unitary/binary distinction. Binary chromatic colours are conjunctive properties whose conjuncts are exactly two of the following: reddishness, yellowishness, bluishness and greenishness. Unitary chromatic colours are colours for each of which there is a hue that is not conjunctive in this way (Byrne and Hilbert 1997).

[1] The solution to the puzzle of true blue preferred by Cohen and McLaughlin (though not by Hardin) is to say that one and the same surface is true blue for one perceiver (John) and that it is also blue tinged with green for another (Jane). Thus, both perceivers veridically represent the fine-grained surface hue. In my view, this simply isn't plausible (and indeed it is not clearly intelligible either). One might as well take the view that when a surface looks round to John and looks oval to Jane, they are both right. The surface is round for John and oval for Jane

There is one concern that might be raised for this way of drawing the unitary/binary distinction. A subject who experiences red with a tinge of yellow may very well still classify the perceived surface as red rather than as orange. This, I suggest, is because such a subject is not prepared to count a surface that is just a little orange as orange *simpliciter*. The classification in this case goes with the predominant experienced hue. Likewise for the other binary colours.

2. The two clocks again

In my example of the clocks, I supposed that there are two clocks, each of which is designed so as to keep accurate time to within one minute for the first five years of use. The clocks are digital and they each have two different numerical representations of the time on their faces – one gives the hour, minutes and seconds and the other gives just the hour and minutes. So, for example, when the actual time is 1:08 exactly, one clock reads 1:07:52, and 1:08 say, and the other reads 1:08:08 and 1:08. The two clocks are at odds with respect to the exact time; but the fine-grained times they represent are always within one minute of the actual time for the five year period. So, each is operating as designed and each gives an accurate representation of the hour/minute or 'coarse-grained' time in the above case.

Human beings, I suggested, are a bit like such clocks. They have colour detection systems, designed by Mother Nature, for the detection of coarse-grained colours such as red rather than for the detection of individual, fine-grained hues (such as pure red or true blue). One natural way to elaborate this proposal further is to suppose that there are detectors for reddishness, greenishness, yellowishness and bluishness. Via the activation of two such detectors at the same time, the human colour detection system is also designed to detect orange and the other binary colours.

3. Explaining the Malkoc results

The study perfomed by Malkoc et al. (2005) shows that human perceivers viewing the same surfaces under perfectly standard viewing conditions vary with respect to their coarse-grained colour experiences. The variation in colour experience they note corresponds to a variation of roughly forty-five degrees around the hue circle. Thus, a given surface that looks red to me may look orange to you; another surface that looks purple to me may look red to you; a third surface that looks blue to someone else may look blue-green to a further person, and so on.

Why should this be? One answer, which is consistent with the story I told about true blue and the two clocks, is that many of today's human perceivers are not Normal. Their colour detection systems are not operating as Mother Nature originally designed. Genetic mutations have resulted in a shift in such humans' colour experiences. So, where some stimulus looks red to me and orange to you, for example, one of us is subject to a normal error or misperception, that is, an error or misperception occurring under everyday viewing conditions in a human perceiver who passes the usual perceptual tests for normality.

Consider the case of inverted spectra. On my account of the inverted spectrum (Tye 2000), red objects look green to inverts. The inverts are normal (they function as well as the rest of us), but they are not Normal. Genetic mutations have caused their visual systems to misrepresent. So, the inverts are subject to normal misperceptions. Such misperception could be widespread, since inverted spectra could be widespread. Of course, this is just a possible case of normal misperception. But there are many actual examples, perhaps the best known of which is provided by the Müller-Lyer.[2]

One explanation, then, of the results of Malkoc's experiment is that many normal perceivers misperceive the coarse-grained colours of certain stimuli. In this respect, they are like the inverts mentioned above who function just as well as the rest of us but who misrepresent the colours of things.

There is a second answer which requires no appeal to misperception. Suppose that today's normal human colour perceivers are (nearly all) Normal. Suppose further that two Normal perceivers, John and Jane, perceive a surface, *S*, in standard viewing conditions. *S* looks orange to John and *S* looks red to Jane. How can this be, if there is no misperception? Well, *S*, in looking red to Jane, looks reddish to her. *S*, in looking orange to John, looks reddish to him and it also looks yellowish. Moreover, if *S* looks sufficiently orange to John for him to count *S* as orange simpliciter (going by its looks), *S* looks sufficiently reddish and sufficiently yellowish for him to make such a classification. So, on the assumption that *S* is orange, that is, reddish and yellowish, John's colour experience is veridical. But then so is Jane's. Jane does not *mis*represent the colour of surface *S*. She *under*-represents it. Jane's yellowishness detector, unlike John's, is not sufficiently activated by the colour of *S* for Jane to count *S* as orange (on the basis of its colour appearance).

This needs further explanation, of course. But the general explanation is easy to provide. Just as some Normal perceivers have a little less sensitive depth detectors than others, so too Jane's yellowishness detector is a little less sensitive that John's even though both fall within the Normal range.

[2] For a discussion of the Müller-Lyer and my psycho-semantics for colour experiences, see my reply to Alex Byrne in the web symposium at http://host.uniroma3/progetti//kant/field/tyesymp.htm.

The upshot is that there is nothing in the Malkoc results that requires the admission that there is error at the level of coarse-grained colour experience for *Normal* perceivers under design conditions. Error arises, (as noted in Tye 2006), at the level of very fine-grained hue experiences such as that of true blue. Where at least one of John and Jane *must* be wrong is at the level of their experiences of different, determinate, fine-grained hues; for *S* cannot have both the determinate, fine-grained hue John experiences it as having and the determinate fine-grained hue Jane experiences.

The truth about true blue and other determinate hues at its level of grain is that Mother Nature did not bother to design us so as to detect *them*. There was no point in Her doing so. No selectional advantage would have accrued. Thus, even when everything is working as it should, still sometimes a surface can look true blue and not be. This did not worry Mother Nature; and it should not worry us either.

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