The puzzle of true blue

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Most men and nearly all women have non-defective colour vision, as measured by standard colour tests such as those of Ishihara and Farnsworth. But people vary, according to gender, race and age in their performance in matching experiments. For example, when subjects are shown a screen, one half of which is lit by a mixture of red and green lights and the other by yellow or orange light, and they are asked to adjust the mixture of lights so as to make the two halves of the screen match in colour, they disagree about the location of the match. Where one male subject sees the two sides of the screen as being the same in colour, another female subject may see one side as a little redder or greener. And there are corresponding differences with age and race.

These differences also come out when subjects are shown Munsell chips of minimally different colour. Where one subject, John, sees chip 527 as pure blue – blue not tinged with any other colour – another subject, Jane, sees it as slightly greenish blue. How can this be? How can the chip look pure blue, or true blue, as I shall call it, to John and slightly greenish blue to Jane? On the face of it, at least one of the subjects must have an inaccurate colour experience; for intuitively the Munsell chip cannot be *both* true blue *and* greenish blue. But that, it has been suggested (Block 1999), just isn't plausible: there is no privileged class of *normal* perceivers. To say that the men track true blue accurately and the women do not is sexist. To prefer the young to the old is ageist. To suppose whites get it right and blacks do not is racist.

This problem is sometimes posed as a problem for colour objectivism of a physicalist sort (Hardin 1988; Cohen 2006a, 2006b) or for representationalism about the phenomenal character of colour experience (Block 1999). But the problem is more general than that. Those who respond to the problem by adopting a view of colours as powers to produce colour experiences so that the chip is both true blue for John (in that it is disposed in the given standard lighting conditions to produce in John a true blue experience) and blue tinged with green for Jane (in that it is disposed in the given lighting conditions to produce in her a greenish-blue experience) simply miss the point. Intuitively, the screen *cannot* be both true blue (blue not tinged with any other colour) and greenish blue.

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To accept a view that denies this is to accept a view that is implausible from the start.[1]

An alternative response to the problem is to say that the chip is neither true blue nor greenish blue. Both perceivers are wrong, as are others who view it. More generally, *nothing* that we see is coloured. Colour is something that we erroneously project onto the world. This is a view that has support both in philosophy (Hardin 1988) and in science (Cosmides and Tooby 1995). Nonetheless, it is strongly opposed by common sense. Furthermore, it is not easy to understand. If I am seeing something I take to be red and I experience it as red, nothing in my head is red. So, if the object itself is not red and neither is any other object, then the redness I experience must exist only in the intentional content of my experience. But how can this be? How, in these circumstances, does my experience get to represent *red*? And if nothing really is red, then what would it take for a physical surface (or volume or film) to be red? To respond that not only is nothing red but also no physical surface (or volume or film) *could* be red is to adopt an uncomfortable position; for our concept of red is the concept of a quality of a spatially extended surface (or volume or film). So, conceptually we have no difficulty in grasping how redness *could* be instantiated.

Let us return to John and Jane. If they cannot both be right, as they view the Munsell chip, and they cannot both be wrong, and further it cannot be the case that one of them is right and the other wrong, then we are, it seems, out of alternatives. Herein lies the real puzzle of true blue.

1. Biting the bullet

Consider a thermometer. The height of the mercury column represents the temperature of the surrounding air. As the temperature varies, so does the thermometer height. When the thermometer is used in the sort of setting it was designed to be used in and the thermometer is itself operating as designed (so that, e.g., there is a vacuum in the tube), each height tracks a certain temperature and thereby represents that temperature. If the thermometer is used in an abnormal setting or it is not operating as designed, then misrepresentation can (and typically will) occur.

What is true of thermometers is true of other instruments, e.g. speedometers, compasses and watches. It is also true of natural instruments – ones designed by Mother Nature. In particular, it is true of the visual system and its various components, including the colour detection system. Long ago, Mother Nature equipped humans and many other creatures

[1] The view also faces the threat of circularity, which can be handled by claiming that the term '*F*' in 'an *F* experience' does not mean what it usually means. But this is ad hoc; moreover, I myself have no grasp on what '*F*' supposedly means here.

with a colour detection system because it was adaptive. Creatures with colour vision were better able to identify things that were good to eat via their colours than creatures without it.

Today, those among us who have a Normal colour detection system and who use it in a Normal environment track the colours accurately. To know who such people are, we would need to know much, much more about the evolution of colour vision than we know today (Byrne and Tye forthcoming 2006). Perhaps we will never know the relevant facts. Still, there is a fact of the matter as to who counts as Normal by Mother Nature's lights. So, even though it would indeed be arbitrary for us now to pick out certain humans and say that *they* get the fine-grained colours rights, still there is a clear-cut privileged class of Normal perceivers and no deep problem posed by true blue.

Here is a parallel involving an instrument we created, the speedometer. Imagine that in a country in Latin America after a revolution, car tyres are replaced as they wear out in a haphazard way and that at some given time in this country there are 47 cars travelling on the road, all with replaced tyres, and all going at exactly 30 mph. The speedometers in these cars read different things: some read 30, some read 31, some read 27, and so on. Is there any way of telling which of the 47 speedometers is representing accurately actual car speed just by looking at the speedometer? Of course not. The speedometers were designed for use with tyres of a certain size. They give an accurate read-out of the speed provided that they are operating as they were designed to operate with tyres of the appropriate size. There is, then, a fact of the matter as to which speedometer is correct, but not one that can be ascertained without knowing the appropriate historical facts.

Similarly, in the case of colour. The colour experience system in the brain was designed by evolution for use with (among other things) an optic nerve and retina meeting certain further conditions. There is no way of telling who, among present-day actual colour perceivers, has the retinal apparatus and optic nerve meeting the historical design specifications (Dretske 1995; Byrne and Hilbert 2003, 2004). But whoever does and whoever has the other aspects of the colour detection system operating in the right way in the right environment represents the colours accurately.

2. *Can the bullet be swallowed?*

It may be that such a story is correct. Conceivably, not just coarse-grained colour discriminations, such as that between blue and red, for example, but even fine-grained ones are of adaptive significance. Conceivably, those of our ancestors who experienced the most delicious fruits (blueberries, say) as pure blue were better able to pick them out from their backgrounds than those who experienced them as blue tinged with green. But this is not very plausible; for surely there is no one specific determinate background and no one specific determinate set of lighting conditions against which colour vision evolved. And with the variability in background and variability in lighting conditions, all within the range of the Normal setting, objects do not always look the same determinate shade of colour.

Consider the case of grass. Grass looks green and it does so in a wide variety of lighting conditions – early in the morning, in shade, in the midday sun. But grass does not look *exactly* the same shade of green in all these conditions. There is constancy in general colour (green) but not constancy in determinate hue (green_{19}). To suppose that Mother Nature picked *one* of these daylight lighting conditions as the Normal setting seems far-fetched. In this respect, the situation seems different from that which obtains in the speedometer case described in the last section. The bullet is difficult to swallow.

3. An alternative solution

Let us look at the situation from the perspective of Mother Nature. As she considered our distant ancestors, she noted that among them, those who were sensitive to the coarse-grained colours of things were better able to re-identify them in a variety of settings and thereby engage in behaviour that increased their chances of survival. However, she did not note any adaptive benefits associated with the discrimination of determinate shades of colour among these creatures (or so it seems plausible to suppose). In such cases, where the creatures differed, no benefits or harm typically accrued to one creature over another so long as there was coarse-grained colour agreement between them. So, she decided to formulate instructions for equipping the descendants of these creatures with a system for reliably detecting the *coarse-grained* colours of things. These instructions concerned the design of this system. Her over-riding concern was that the system be such that, when operating as designed with respect to the detection of coarse-grained colours in the right kind of environment, it enable its users to be as successful as the most successful of their ancestors.

Now consider again the two subjects with whom we started, John and Jane. They are both perceivers, whose colour vision systems are operating as designed, let us agree. They are, then, more or less equally good at detecting bluish things but, as to the very fine-grained colours, they often disagree. In particular, although the Munsell chip they are viewing (chip

527) looks bluish to both of them, it looks true blue to John and greenish blue to Jane.

How can this difference be accounted for? Consider two clocks, each of which is designed so as to keep accurate time to within one minute for the first five years of use. These clocks are digital in character and they each have two different numerical representations of the time on their faces. One of these representations gives the hour, minutes and seconds. The other, in much larger numerals in the center of the face, gives just the hour and minutes. The latter representation is generated by a mechanism that depends upon the processes that generate the hour/minute/second representation and rounds the represented minutes and seconds out to the nearest minute. Thus, 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 disagree as 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 (and in the vast majority of others). In the case just described, both clocks are wrong as to the precise time. But the case could have been one in which one clock happened to be right as to the precise time and the other wrong.

John and Jane are like such clocks. Each has a colour detection system that gives an accurate 'read-out' as to the coarse-grained colour in typical cases and each is operating as Mother Nature designed. So, each accurately represents the colour of chip 527 as bluish. Further, since the chip is bluish, it must have a determinate shade of blue. John's colour detection system 'says' that the shade is true blue. Jane's 'says' that it is blue tinged with green. But it would be an accident if *either* system were accurate at this level of precision.

Neither of our two perceivers was designed to get the determinate hue just right. To suppose that chip 527 really is exactly as it looks to either John or Jane is akin to supposing that one of the clocks in our example gets the time exactly right. That is something that *could* happen; but if it did, it would be by luck. For neither clock is designed for such precision.

Of course, as we increase the number of human perceivers who are viewing chip 527, the odds go up that *someone* among them has a colour experience that accurately represents its determinate hue (so that the chip really is *just* as it looks to someone or other in the group). But our inability to say now just which perceiver this is should not concern us.

God knows precisely which hue chip 527 has, but we may very well never know. Our only access to the colours of things is via a single sense and the colour detectors nature has endowed us with are limited. We do not suppose that objects do not have precise lengths because of the limitations of our measuring equipment. Why suppose that the situation is fundamentally any different for the case of colour?[2]

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[2] There is no obvious difficulty in adopting the proposed view in conjunction with an account of the representational content of the experience as of something's looking true blue in terms of the experience being of the sort that would causally co-vary with the presence of true blue, were optimal conditions to obtain. In the case of biological organisms, the relevant optimal conditions for perceptual experiences of fine-grained hues are naturally taken to require that the perceiver's visual system be operating as it was designed to operate with respect to the detection of such hues. On this understanding of optimal perceptual conditions it is not true, then, that John, as he views Munsell chip 527, is in optimal conditions for the perception of fine-grained hues. For his colour detection system was designed to detect coarse-grained colours. But equally it is not false that he is in such optimal conditions, since it is not true that his visual system is operating in a way *different* from the way it was designed to operate with respect to the detection of fine-grained shades of colour. So, it is neither true nor false that John is in the relevant optimal conditions. This result is compatible both with John's having an experience that is accurate with respect to fine-grained hue in the actual conditions that obtain as he views chip 527 and with his having an experience that is inaccurate at this level. Thus, representationalism about phenomenal character of the sort which I advocate (Tye 1995, 2000) is not threatened by the proposed solution to the puzzle of true blue.