

In: *Physicalism, Consciousness, and Modality: Essays in the Philosophy of Mind*, Sten Lindström and Pär Sundström (eds.), (Umeå: Department of Philosophy and Linguistics), 2002, 65-94.

AN ARGUMENT AGAINST SPECTRUM INVERSION

Pär Sundström

Suppose you and I belong to the same linguistic community and express in our public behaviour just the same colour discriminations and comparisons. Could you and I still have inverted colour experiences? Some philosophers think so.¹

In recent years, those who have doubted this have often appealed to the various "asymmetries" between colours as we perceive them. The argument has been roughly this: The relevant inversion requires that our colour experiences could differ with respect to their *intrinsic qualities* while having the same *structure* or *form*. But a close consideration of colours as we see them shows that this is not possible. For example, orange is perceived as a mix of yellow and red but red is not perceived as a mix of any two colours. A significantly darkened blue still looks blue while a significantly darkened yellow does not look yellow. Again, red is generally perceived as a warm colour while green is perceived as a cool colour. Because of these and many other differences, the intrinsic qualities of our experiences could not differ systematically while having the same structure.²

However, the existence of such asymmetries is not the only difficulty for the view that you and I could be spectrum inverted while expressing the same colour discriminations and comparisons. Nor, I think, is it the main difficulty. I shall argue that the main difficulty is instead to give a satisfactory account of what you and I would *believe* and *say* on such a scenario. This problem is independent of any consideration regarding asymmetries. And as far as I am aware, nobody has to this day made plausible that it can be solved.

In section 1, I specify the scenario I will consider. In section 2, I present an argument for its impossibility. In section 3, I consider some recent accounts of spectrum inversion. I try to illustrate, here, that contemporary defenders of the view that spectrum inversion is possible have yet to find a satisfactory answer to

¹ E.g. Lycan 1973, Shoemaker 1982, Chalmers 1996, Tye 1995 and 2000.

² Harrison (1967, 1973) is supposed to have been the first one to suggest such an argument. It has recently been pursued by, e.g., Hardin (1993), (1991), (1997).

the problem posed by the argument. In section 4, I discuss asymmetry arguments against spectrum inversion.

1. The scenario

There is not one single spectrum inversion scenario under discussion in philosophy. Scenarios differ both with respect to what they assume to be the *same* between individuals (or between one individual at different times) and with respect to how individuals are (or how one individual at different times is) supposed to *differ*. Here are the respects in which I shall take you and me to be the same, and the respects in which I shall consider whether we may differ:

1.1 The assumed sameness

I shall suppose that you and I are the same with respect to:

- (i) how we are disposed to apply predicates for colour hues, saturation and brightness;
- (ii) how we are disposed to combine these predicates with words like 'same', 'different', 'similar' and 'dissimilar';
- (iii) how we are disposed to combine the predicates in (i) and (ii) with words like 'appears', 'looks' and 'seems';
- (iv) how we perform on non-verbal matching tasks where instructions are given in terms of the predicates in (i)-(iii);
- (v) which language community we belong to.

This is to suppose that, for example, in any situation where I am disposed to apply 'is green', so are you; in any situation where am disposed to apply 'is brighter than', so are you; where I am disposed to apply 'looks brown but is green', so are you; where I am disposed to apply 'has the colour it appears to have', so are you; and where I hesitate to apply such predicates, so do you; and all these verbal dispositions match with non-verbal dispositions as specified in (iv).^{3,4}

³ Apparently, such agreement is empirically extraordinary. It is reported that when it comes down to fine detail, we generally differ both in what we say about colours and how we match them non-verbally. For example, test subjects who satisfy standards for normality diverge remarkably in which stimuli they identify as pure hues: what one subject identify as, say, pure green (that is, green that has no blue or yellow in it), most others identify as either bluish-green or yellowish-green. Each subject, however, tends to make fairly consistent judgments

I will try to make vivid our agreement in behaviour – and in particular our crucial similarity with respect to (iii) – by contrasting it with a more limited agreement which we would have with a third character, whom I call *Carl* – *The Calibrating Invertee*.

Carl grew up in our midst. He used to experience colours just like we do, and he learned to use the predicates of (i)-(iii) like we do. But things changed for Carl. He had a neurosurgery, and when he woke up, he experienced things differently. Ripe tomatoes suddenly looked green, the sky looked yellow, and so on. But Carl kept hearing other people going on calling tomatoes 'red' and lemons 'yellow'. This, together with the knowledge of the surgery, convinced him that the change had been in him and not in the things outside. To be able to communicate with others, Carl started to calibrate his experiences. He learned that things that in most circumstances look blue to him are yellow; things that look green are red, and so on. At present, therefore, Carl is disposed, just like we are, to apply 'is red' to a ripe tomato. But as the truthful man he is, he is not disposed to apply 'appears red' to them.⁵ Green things look red to him, and that is what he is disposed to say, and often says.

The respects in which you and I are the same go beyond the respects in which each of us is the same as Carl. We are disposed to apply in the same way, not just predicates like 'is red' but also predicates like 'appears red'.

over time. (See Hardin 1993, 39, 79-80.) Again, subjects are reported to vary systematically in whether they judge two surfaces to match in colour or not. (See Block 1999.)

This means that my argument will, strictly speaking, allow that many pairs of actual individuals are spectrum inverted relative to one another; perhaps even that any two individuals are. I am confident that this does not make the argument insignificant. The argument could be adjusted to say the right things about individuals who differ in the cited ways. But I shall not try to do so here.

⁴ This assumed sameness does not imply that you and I are functional (let alone physical) twins. It allows that you and I differ in all kinds of ways functionally. We may even differ with respect to many things that we say about colours. The assumed sameness allows, for example, that you say that green is a *warm* colour while I say that it is a *cool* colour. Thus, I am assuming less sameness between us than is assumed in many asymmetry arguments against spectrum inversion. (See, e.g., Hardin, 1993, 134ff.)

⁵ There could be exceptions to this. In some situations, Carl could truthfully apply 'looks red' to a ripe tomato. He could do so to state what colour he thinks the tomato has, and use the 'looks' to express some uncertainty about this judgment. But even then, Carl will be disposed to say that, although the object in one sense looks red – that is, looks as if it is red – in another sense it looks to him green. In the terminology of Jackson (1977, chapter 2) and Chisholm (1957, chapter 4), Carl would in these cases say that a tomato looks red in the *epistemic* sense of 'looks', but looks green in the *phenomenal* sense of the term. For a brief presentation and discussion of the different senses of 'looks', see section 2 below.

1.2 *The difference(s) under consideration*

To repeat, I shall consider whether you and I could, given the specified agreement, have inverted colour experiences. There are at least two ways of spelling out what it is to have "inverted colour experiences", namely:

- (a) that you and I are inverted with respect to *what it is like* for us to see colour – so that what it is like for me to see the colour of a ripe tomato is what it is like for you to see the colour of grass; or
- (b) that you and I are inverted with respect to what colours things visually *appear* to us to have are – so that ripe tomatoes visually appear to you to have the colour that grass visually appears to me to have.

Philosophical discussions of spectrum inversion sometimes take the former formulation, sometimes the latter, and sometimes a mix of them. I have no serious complaint about that, because I doubt that anything important depends on the distinction.⁶ My argument will at any rate be that you and I, given the agreement specified in (i)-(v), could not have inverted colour experiences in either sense (a) or sense (b).

Let me also say a word about the term 'inversion'. I will use this term in a liberal sense. I count any systematic difference between your colour experiences and mine as an inversion of our experiences. In this sense, there are many different inversion scenarios to consider. One may consider whether you and I could be red-green inverted only.⁷ Or one may consider whether we could be both red-green and yellow-blue inverted. Again, one may consider whether coloured objects could in general appear to you a shade brighter than they appeared to me. One could even consider whether colours might appear to you in ways that I wouldn't even recognise as colour appearances. The argument I'm about to provide applies to all such scenarios.

⁶ But we will see that this distinction comes to the foreground in Shoemaker's account of spectrum inversion. On Shoemaker's account, you and I can be spectrum inverted in sense (a), but not exactly in sense (b).

⁷ This is to consider whether we could be inverted with respect to red and green *and* in all the ways implied by being so inverted but not in any further way. Thus, since orange is a reddish-yellow, one of us would in this scenario perceive orange the way the other perceives greenish-yellow. But we would not be inverted with respect to pure yellow and pure blue, nor with respect to white and black or light grey and dark grey.

2. *The argument*

I shall now present an argument with the conclusion that you and I could not, given the assumed sameness, have inverted colour experiences. Arguments similar to the one I shall present have been given or discussed before, e.g. in Harman (1990) and Shoemaker (1982). Still, I think the argument is worth putting forth. The argument is not identical to any previous argument that I'm aware of. And it brings out a clear problem for the view that you and I could be spectrum inverted despite the described sameness. To my knowledge, nobody has shown how – or that – this problem can be solved.

The argument will have this form: I will formulate four premises. Three of them I take to be true, given what I have supposed about you and me. The fourth is that you and I are inverted experientially. I will then argue that these premises imply a claim that could not be true. Therefore, we may conclude that you and I could not agree with respect to (i)-(v) and yet have inverted colour experiences.

I will mainly explain the premises of the argument. I will be able to defend them only to a limited degree. For now I take them to be highly appealing, though not indisputable. I will to some degree discuss the prospects of contesting them in section 3.

The first premise is this:

- (P1) What you say (and are disposed to say) when you use the predicates in (i)-(iii) is the same as what I say (and am disposed to say) when I use these predicates.

For example, what you say with phrases like 'this is green', 'this is the same colour as that', 'this looks brown but is green', 'this both looks brown and is brown' is what I say with such phrases. This is, at least, a highly natural assumption to make given that you and I belong to the same linguistic community and are perfectly identical in how we are disposed to both use and react to these phrases.⁸

⁸ This is perhaps the place to explain the role of specification (v) in the agreement between you and I: This specification is meant to block an "inverted earth" based objection to my argument. Inverted earth is a place that differs from earth in two respects. First, things have the complementary colours of the colours of the same thing on earth: the sky is yellow, grass is red, and so on. Second, the colour vocabulary is the complementary of ours: the colour of the sky – yellow – is called 'blue', and so on. (This imaginary place has been explored by Block 1990 and Harman 1987). Now suppose someone is moved from inverted earth to earth while at the same time being secretly equipped with colour inverting lenses. This newcomer will say of the colour of our sky: 'it is blue'. But, arguably, what the person thereby says is that the sky is yellow. That is how the sky looks to him, and this is what colour he (falsely)

What is it that I say when I apply the predicate 'is green'? A trivial answer is: I say of something *that it is green*. But this is compatible with different and conflicting accounts of a more ambitious sort: One such account is that I ascribe a categorial, physical property; an alternative view is that I ascribe a disposition to affect normal perceivers in a certain way; yet another view is that I ascribe a non-reducible "phenomenal" property.

As far as I can see, my argument assumes no more than that the trivial answer is true; it does not assume that any particular one of the more ambitious accounts is true, nor does it rule any of these out.

There is a reservation and a clarification to make about (P1): When I apply 'looks green' to an object, I often mean that it looks green *to me* specifically. And sometimes this is what I explicitly say. But obviously, what I say when I apply 'looks green to me' cannot be exactly what you say when you apply this predicate. What I say is that it looks green *to me* while what you say is that it looks green *to you*.

The claim of (P1) is that you and I nevertheless say the same thing by 'looks green' when each of us applies 'looks green to me'. While 'me' in these phrases is indexical, 'looks green' isn't. Let me cite some evidence for this being true:

Compare the following two dialogues:

Dialogue *D1*:

You: 'Grass looks green to me'.

I: 'Grass looks green to me'.

You: 'Then grass looks green to both of us'.

Dialogue *D2*:

You: 'I saw grass here'.

I: 'I saw grass here'.

You: 'Then we both saw grass here'.

The former inference preserves truth only if 'looks green' has the same content in the first utterance and in the second. Similarly, the second inference preserves truth only if 'here' has the same content in the first and second utterances. Now it is obvious that even if you and I belong to the same linguistic community and are disposed to use the relevant words in just the same ways, this by itself does not guarantee that 'here' has the same content in the first and second utterances of *D2*. If our reports are true, there is a chance we have seen grass in the same place, but there is also a chance we have seen it in different places. So, unless

believes it to have. So, if *you* were a newcomer to earth from inverted earth, there would be that reason to doubt (P1). That reason is absent given specification (v).

we have some further evidence, the inference in *D2* is clearly irrational, and one we normally have no inclination to make. In contrast, if you and I belong to the same linguistic community and are disposed to use the relevant words in just the same ways, and if we both report that grass 'looks green' to us, then we find it rational, even without further evidence, to conclude that grass looks (colour-wise) to me the way it looks to you. Such inferences we normally make without blinking.

So there is at least evidence that *we treat* 'looks green to me' as if the 'looks green' component in it were nonindexical. And if we do, then the expression *is* nonindexical so long as its meaning is a function of how we treat it.

Notice finally that this claim – that you and I say the same by 'looks green' – does not by itself preclude the possibility of spectrum inversion. The claim is only about *what we say*, not about whether what we say is *true*.

Second premise:

(P2) For each of us, and in general: What we say (and are disposed to say) using the predicates in (i)-(iii) is what we think, believe, judge.

That is: what I say when I say that this cup is green is what I think or believe or judge to be the case; what I say when I say that this cup looks green and is green is what I think or believe or judge to be the case; and what I say when I say that this cup looks brown but is green is again what I think or believe or judge to be the case; and similarly for you.

I emphasise that I can perfectly well judge that something seems brown, and also that something both seems brown and is green. This is obvious, but the fact may get clouded by some ordinary ways of using expressions: We often *contrast* how things look or seem or appear with how we think or believe or judge that they are. But this does not mean that we cannot also form beliefs and thoughts and judgments *about how things look* to us. If something looks brown to me, I can nevertheless believe that it is green, but I can simultaneously believe that it looks brown to me.

I emphasise specifically that I can form beliefs or judgments about how things look in all the various senses of that term. Consider the three different senses of 'looks' identified by Jackson's (1977, chapter 2): the epistemic sense, the comparative sense and the phenomenal sense.⁹ In brief summary, Jackson says that statements where 'looks' is used in the epistemic sense have or can naturally be cast in the form 'it looks as if p', where p is a proposition; for example: 'it looks as if it is going to rain'. Statements where 'looks' is used in the comparative

⁹ Jackson took a clue – or more than that – from Chisholm 1957, chapter 4.

sense have or can naturally be cast in the form 'X looks like an F'; for example: X looks like a cow. The phenomenal sense of 'looks', finally, is according to Jackson, "characterized by being explicitly tied to terms for colour, shape, and/or distance: 'It looks *blue* to me', 'It looks *triangular*', 'The tree looks closer *than* the house'" (33). Jackson argues that the three senses are distinct. In particular, he is concerned to argue that statements where 'looks' is used in the phenomenal sense cannot be analysed in terms of statements where it is used in only non-phenomenal senses. Suppose that is right. Would anything follow about what I can and cannot form judgments about? Surely not. I can judge that p; but also that it looks to me as if p; that something looks like an F to me; and, finally, that something looks F to me. (I don't think Jackson contradicts any of this.)

(P2) contains a simplification: It is not in general true that what I say is what I believe. There are exceptions for lies and slips-of-tongue, for example. But it is hard to see that a defender of the spectrum inversion possibility could be helped by these exceptions. So I will let the simplification pass, since it will make the argument slightly more transparent.

Third premise:

(P3) You and I nevertheless have inverted colour experiences.

This is the premise that I will eventually claim is incompatible with the others.

I repeat that (P3) can be spelled out in two different ways, namely:

(P3a) You and I are inverted with respect to *what it is like* for us to see colour, or

(P3b) You and I are inverted with respect to what colours things visually *appear* to us to have.

I will run the argument against both formulations.

To run the argument against (P3a), I need a fourth and final premise:

(P4) There is a difference with respect to what it is like for two subjects to see the colour of a thing only if there is a difference with respect to what colour the thing visually appears to them to have.

This premise is not needed to run the argument against (P3b). With this premise, one can argue against (P3a) by arguing against (P3b). That is how I shall proceed.

(P4) is not undisputed. Along with similar claims, it has been a matter of extensive debate in the philosophies of mind and perception in recent years. But right now, I am content to notice that (P4) has at least some *prima facie* appeal:

Focus your gaze on a coloured thing. Now try to imagine that there were a difference with respect to *what it is like* to see the colour of that object without there being any difference in what colour the thing *visually appears* to have. That is not easy to imagine.¹⁰

Now here are two conclusions that we can draw from the above premises:

(C1) For any x: what colour x visually appears to me to have \neq what colour x visually appears to you to have.¹¹

This is but a translation of (P3b). And it is implied by (P3a) together with (P4).

(C2) For any x: what colour I judge that x appears to me to have = what colour you judge that x appears to you to have.

This is a consequence of (P1) and (P2). By (P1), what I say when I apply 'it looks green' is what you say when you use this phrase. (What we both say is *that it looks green.*) By (P2), what I say is what I believe or judge, and what you say is what you believe or judge. By substitutions, it follows that what I judge or believe is what you judge or believe. (What we both judge or believe is, again, *that it looks green.*)

¹⁰ The debate about claims like (P4) has often taken this form: An opponent of the claim has submitted an alleged counter-example. In reply, a proponent has urged that the submitted case is not a counter-example after all. Here is one representative example of this dialectic: If you look at a white paper through a green glass, the paper appears white. If you remove the glass, the paper again looks white. Yet there is a difference in what it is like to look at the paper through a green glass, and what it is like to look at it not through a green glass. So this might seem to be a case where there is a difference in what it is like to experience the colour of a thing without there being any difference in what colour the thing visually appears to have. In reply, however, one may urge that when looking at the paper through a green glass, the scene in front of you looks as if it is illuminated by green light. Hence, it is not quite true that "the thing" in front of you looks just the same colour-wise in the two cases. Even granting that the piece of paper looks just the same colour-wise, the scene as a whole does not. The case with the green glass is suggested by a remark of Peacocke's (1997, 59). The reply is roughly borrowed from Byrne and Hilbert (1997, 282). For further discussion about claims like (P4), see e.g., Peacocke (1983, chapter 1), Harman (1990), Block (1990) and (1996), Dretske (1995), Shoemaker (1994), Tye (1995) and (2000), and Thau (2002, chapter 1).

¹¹ Here too, I am allowing myself a simplification. On most inversion scenarios, there will be *some* objects that seem the same colour-wise to invertees. Suppose for example that you and I were green-red inverted but not inverted in any way not implied by being red-green inverted. If so, most objects with chromatic colour would seem different to us colour-wise. But pure yellow and pure blue would be unaffected, and so would white, black and the shades of grey. Indeed, even if we should be red-green, yellow-blue *and* white-black inverted, there should be one shade of grey that would look the same to both of us. But again, I can't see that such facts could contribute to a case for the possibility of spectrum inversion. So the simplification is innocent in this context.

But (C1) and (C2) imply that, for any object, it can be true *for at most one of us* that what colour the object is *judged to appear* to have = what colour the object visually *appears* to have. To see this, assume that this is true of you and some random object o:

(Assumption) What colour o visually appears to you to have = what colour you judge that o appears to have.

Now from (Assumption) and (C2) it follows that:

(First consequence under (Assumption)) What colour o visually appears to you to have = what colour I judge that o appears to me to have.

And from this and (C1) it follows:

(Second consequence under (Assumption)) What colour I judge that o appears to me to have \neq what colour o visually appears to me to have.

So in general:

(C3) For any x, either you are, or I am (or both are) "unfortunate", in this sense: what colour x visually appears to the unfortunate to have \neq what colour the unfortunate judges that x appears to him to have.

This conclusion surely seems odd. Could things really be so? Suppose that I were in general the unfortunate one.¹² Then whenever I focused my gaze on a coloured object and formed a belief (verbalised or not verbalised) about what colour the object looked to me to have, I would be wrong. If we were inverted in ways that philosophers have most often considered, I would even be dramatically wrong: while believing that the object visually appeared to me to have one colour, it would in fact visually appear to me to have the *complementary* colour of the one I believed that it visually appeared to me to have.

To suggest that this is possible is to go far beyond the claim that I am *fallible* with respect to how things visually seem to me. To suppose that I could be thus unfortunate is to suppose that I could be *universally* mistaken – in fact (on most construals of inversion) universally dramatically mistaken – about how things visually seemed to me. That is, even in cases where I patiently and carefully attend to the colour an object looks to me to have, the object could visually seem to *me* very differently from how *I* believe that it visually seems to me.

¹² (C3) does not demand either that I am in general the unfortunate one, or that you are. It allows that we take turns being unfortunate. However, I cannot see that the defender of the spectrum inversion possibility could gain anything from exploiting this possibility. So I'm allowing myself to consider whether one of us could be generally unfortunate.

I suggest that (C3) is unacceptable: What it says could not be the case. But since (C3) is a consequence of the conjunction of (P1)-(P4), what that conjunction says could not be the case. Now that conjunction is, I submit, a consequence of the assumption that you and I are the same in the specified respects and yet have inverted colour experiences. Thus, my conclusion is that you and I could not have inverted colour experiences, given that supposed sameness.

That is the argument. It presents the defender of spectrum inversion with a clear and, I believe, difficult choice: He or she must either hold that (despite the supposed sameness between you and me) (C3) could be true, (P4) could be false, (P2) could be false or (P1) could be false.

In the next section, I shall look at what three recent defenders of the spectrum inversion possibility – Chalmers, Tye and Shoemaker – have had to say about this difficulty. I believe these accounts illustrate that defenders of spectrum inversion have yet to find a satisfactory solution to it.

3. *Three recent accounts of spectrum inversion*

3.1 *Chalmers' view*

Chalmers thinks that functional and physical twins could be inverted experientially (1996, chapter 3). What is his account of what such twins would believe and say? It is not quite clear.

As far as I understand him, Chalmers holds that if you and I were inverted experientially, we would at least not have the same *beliefs* about how things *visually appears* to us. Says Chalmers in considering an inversion scenario:

This clearly provides a case where the content of our concepts and beliefs is constituted by something over and above our physical and functional structure. ... My inverted twin and I might be physically identical, but our corresponding qualitative concepts are distinct, not just in reference but in primary intension. Here ... is a case where the content of a phenomenal belief is constituted by phenomenology itself. (1996, 207)

The view is repeated in the following more general statement:

Phenomenal realists often hold that while the phenomenal is conceptually irreducible to the physical and functional, the intentional can be analyzed in functional terms. But if what I have said here is correct, then this irreducibility cannot be quarantined in this way. If the phenomenal is conceptually irreducible to the physical and functional, so too is at least one aspect of the intentional: the content of phenomenal beliefs. (2001, section 2.2.)

My interpretation is that Chalmers in these statements says that invertees have different beliefs about how things *visually appear* to them. The interpretation

rests on this assumption: that a belief that something visually appears a certain way to me is a "phenomenal belief", in Chalmers' sense. It is worth observing that this is an assumption, given that Chalmers rarely uses terms like 'looks', 'seems' and 'appears' to describe the contents of phenomenal beliefs. Instead, he uses expressions like 'red experience' and 'blue experience' in these contexts. In Chalmers' terminology, I often believe *that I have a red experience*, for example. I think it is plausible to assume that the belief thus described is the belief that something visually appears red to me. And this assumption is encouraged by at least parts of Chalmers' texts.¹³

Beyond this, however, there are at least two unclarities in Chalmers' position. First (1) it is unclear what position he takes on what invertees *say* about what colours things appear to have. Second (2) it is unclear what position he takes on what invertees believe (and say) about what colours things *have* (as opposed to appear to have).

(1) Chalmers has some inclination, it seems, to think that invertees will *say* different things about how things visually appear to them. He grants that "there may be a loose sense" in which I say something true of my inverted functional twin when I say of him that he has a 'red experience' as he looks at a ripe tomato. But it is more "natural", Chalmers suggests, to understand my remark as false. On this more natural construal, 'red', as it figures in 'red experience', is an *indexical* concept: it picks out one colour quality when uttered by me, and another colour quality when uttered by you. One consequence of this is that "your remark 'Grass gives me green experiences' might be true, even though my remark 'Grass gives you green experiences' is false" (1996, 205).

However, his commitment to this view is not wholehearted. Immediately after suggesting it, he adds: "If one wants to avoid this sort of thing, the more 'public' concept ... is always available" (*idem*). And in other places, the indexical concept is even further from consideration. Thus, later in the text Chalmers considers the case of Joe, who is functionally like anyone of us but whose qualia are fading. At the basketball game, Joe utters remarks about the glaring bright red-and-yellow uniforms of the basketball players. However, "Joe is not having bright red and yellow experiences at all. Instead, perhaps he is experiencing tepid pink and murky brown" (256). Says Chalmers about this case:

The crucial feature here is that Joe is systematically *wrong* about everything that he experiences. He certainly *says* that he is having bright red and yellow experiences, but he is merely experiencing tepid pink" (*idem*; emphases in original).

¹³ For example, when Chalmers lists instances of specific phenomenal judgments, he says: "One can note that one is experiencing a particularly vivid shade of purple" (176).

My main point about this is that Chalmers declines to embrace a position on the question what you and I would *say* if we were inverted functional twins. On the one hand, he at least sometimes finds it "natural" to think that you and I would say different things about our experiences in this situation. On the other hand, he thinks an alternative view is "always available", if one wants to avoid the consequences of the former. But to make clear which views are available is not to choose between them.

In declining to take a position on this, Chalmers also fails to work either position out. And this is unsatisfactory since neither view seems very appealing given his other commitments.

The view that we say different things about our experiences seems to fly in the face of observations about how we treat phrases like 'looks red'. As I tried to illustrate above,¹⁴ it seems that we in fact do not treat 'red' as indexical in such contexts. (And since we don't our functional and physical twins don't either.) Chalmers suggestion seems to be that 'red', in such contexts, is indexical nevertheless, but he does no work towards justifying that claim.¹⁵

The other view – that we say the same things in applying 'looks red' – accords with observations about how such predicates are used. But it is still not a view that is easy for Chalmers to adopt. Because this view is hard to combine with the claim, which he apparently embraces, that you and I, in a scenario where we are inverted, would *believe* different things about how things look to us. If you and I

¹⁴ Section 2, the discussion of (P1).

¹⁵ I have assumed in this discussion that Chalmers' remark: "If one wants to avoid this sort of thing, the more 'public' concept ... is always available" is a remark about what's available to the *theorist*. On this reading, it is the theorist who has available two concepts, one indexical and one more public, when he or she tries to ascribe content to the utterances of functionally identical invertees. I think this reading is strongly encouraged, to the point of being demanded by the passage where the remark occurs. But there is another possible view, namely that it is the *speakers* who have available to them two concepts. On this reading, speakers possess two concepts of 'red', one indexical and the other not, and can intend an utterance like 'this looks red to me' in two different ways. Other passages of Chalmers' indicate that he may be sympathetic to such a view. (See e.g. 2001, section 2.1.) On this view, there is one familiar sense of 'it looks red to me' such that the inference:

You: 'It looks red to me',
 I: 'It looks red to me',
 You: 'Then it looks red to both of us',

is warranted simply on basis of knowledge about what community the speakers belong to, and what speech dispositions they have, and another familiar sense such that the inference is not warranted by that knowledge alone. If this were right, inverted functional twins would *sometimes* say the same thing when applying 'looks red' and *sometimes* different things. Even if this should be Chalmers' view, however, I think he would have some work to do. I think it is far from clear that we even *sometimes* treat 'red', in 'it looks red to me', as an indexical.

believe different things about how things look but *say the same things*, then at least one of us will be unfortunate in the sense that 'it looks red to me' will fail to express what the unfortunate believes about how the object looks to him. (Indeed, assuming that an object can have only one colour all over, the phrase will express, in the unfortunate's mouth, something that is *incompatible* with what the unfortunate believes.)¹⁶ So even if this view is available to most of us – and even plausible taken by itself – it seems Chalmers has some work to do to show that it is available *to him*.

(2) It is also unclear what Chalmers thinks invertees will say and believe about what colours things *have* (as opposed to *appear* to have). In *The Conscious Mind*, he adopts the view that invertees would say (and perhaps also believe) the *same* things about what colours things have. In a footnote to the passage where he claims that 'green', as it figures in 'green experience' is an indexical concept, he says:

This sort of relativism does not occur with *external* color concepts, such as redness as a property of *objects* rather than experiences ... someone with an inverted spectrum would use 'red things' to refer to the same things as I do, even if his term 'red experiences' picks out something different (380-1).

Again, while this is a plausible view taken by itself, it is not clear that it is easy for Chalmers to adopt it. Suppose I am making the following two inferences:

Inference A:

It looks red to me.

It is red.

Hence it has the colour it looks to me to have.

Inference B:

It looks to me to be here.

¹⁶ The oddness of this consequence is perhaps most clearly brought out by considering cases where I am talking to myself only; for example, a case where I repeat to myself 'it looks red to me, looks red to me, looks red to me...' in order to make sure I don't forget. If it were the case that my inverted functional twin and I generally believed different things about how things look but generally said the same things, then the unfortunate one of us would even in this case express something different from, and incompatible with, what the unfortunate believed and was trying to remember. This can hardly be the best story a defender of spectrum inversion can come up with. One possible improvement would be to admit that my functional twin and I shared *some* beliefs about how things look, and differed only in some. This would amount to saying that each of us has two sets of beliefs about how things look to us; one set of beliefs that we are disposed to express and another set of beliefs that we are not disposed to express in behaviour. I will discuss such a view below, when I consider Tye's account.

It is in Trafalgar Square.

Hence it is where it looks to me to be.

Inference B can be rational, but only on one obvious condition, namely that I am confident that *here* = *Trafalgar Square*. This is a condition that anyone who made this inference would immediately recognise. In contrast, inference A is one we draw without making any similar assumption. Or so we normally think. But on Chalmers' (1996) view, this is not so. To rationally make inference A, I need to be confident that *experience-red* = *object-red*. And this is, on Chalmers' account, an assumption just as substantial as the assumption that *here* = *Trafalgar Square*. But nobody who draws inference A would normally recognise this as such. Again, one would think that Chalmers had some work to do here, to reconcile his views that (i) invertees definitely believe (and perhaps also say) *different* things about what colours things *visually seem* to have but (ii) say (and perhaps believe) the *same* things about what colours things *have*. But this work is left undone.

In a later writing (2001, section 5), Chalmers is more guarded about the view of colour concepts as applied to objects. Here he decides to not adjudicate the matter, but expresses some sympathy with the view that perceptual concepts, such as concepts of "external colour", are in part constituted by the quality of the experience of the individual who uses them. I don't think taking the route he considers here would necessarily reduce his problems. If it is implausible to hold that 'red' in 'looks red to me' is indexical, it is even less plausible to hold that it is indexical in 'Manchester United wears red'. But at any rate, in declining to adjudicate the matter, Chalmers leaves us without a clear statement of what invertees would say and believe about what colours objects *have*.

In sum, I think Chalmers has not adopted a clear position on what functionally or physically identical invertees would believe and say about what colours things have and appear to have. In some places, he seems prepared to accept that such invertees would believe and say different things both about what colours things have and about what colours they appear to have. But in other places, he seems to balk at the revolutionary implications of these claims. Thus, no position is wholeheartedly embraced, let alone worked out.

3.2 Tye's view

Tye has discussed spectrum inversion in several places (see Tye 1992, 1994, 1995, section 7.5 and 2000, section 5.2). Here I shall consider the account given in his recent book *Consciousness, Color and Content* (2000).

Tye supposes that "you and I agree in the color discriminations we make ... [and] produce the same nonverbal behavior in sorting tests" (105). Nevertheless, he suggests, we could be inverted in the sense that our experiences represented objects as having different colours. For example, it could be the case that one of us visually represented ripe tomatoes as red while the other represented them as green.

Tye gives two different statements of how we should conceive of this scenario. A rough statement is given in the main text, and a more qualified one in an appended footnote. The text statement is this:

Given that basic experience is nonconceptual, this [i.e., the inversion scenario] is not obviously incoherent. Prima facie, visual experiences might be inverted with respect to their nonconceptual contents while eliciting the same cognitive reactions (105).

The footnoted qualification says:

Here I oversimplify. On my account of phenomenal concepts, experiences that are inverted with respect to their nonconceptual contents will elicit different *purely phenomenal judgements*. These judgments, however, will themselves play the same functional roles with respect to nonphenomenal color judgments and behavior. The phenomenally inverted experiences will therefore produce the same pattern of discriminatory responses notwithstanding their different contents (114).

How we understand this account depends on how we understand the term 'purely phenomenal judgment'. I will suppose that no judgment other than judgments about how things experientially look or seem or appear can qualify as "purely phenomenal". But this still leaves us with two choices. Either (a) purely phenomenal judgments are the judgments about how things experientially seem that we express or are disposed to express in verbal or nonverbal behaviour. Or (b) the class of purely phenomenal judgments is a class of judgments that is distinct from any judgment or belief that we express or are disposed to express in verbal and nonverbal behaviour. On interpretation (a), Tye's view is that you and I, in the inversion scenario under consideration, simply believe different things about what colour ripe tomatoes visually seem to us to have. On interpretation (b), his view is more complicated. On this interpretation, you and I would have two sets of beliefs about what colour ripe tomatoes visually seem to us to have. If we were both to look at a ripe tomato, you would believe that it visually seemed red to you, and I would believe that it visually seemed red to me, and 'red' in these two instances would designate the same colour. To that extent, we would make the same "phenomenal judgments". But each of us would make an additional phenomenal judgment about what colour the tomato seemed to us to have: a *purely* phenomenal judgment. And with respect to these

judgments, we would differ. Supposedly, one of us would make the purely phenomenal judgment that the tomato visually seems red, while the other would make the purely phenomenal judgment that it visually seems green.¹⁷

I shall not have very much to say about interpretation (a). On this interpretation, Tye's view is the same as the one I ascribed to Chalmers above, and it gives rise to the same questions and difficulties: If you and I *believe* different things about how things visually seem to us, what is Tye's view of what we *say*? Do we say the same things about how things visually seem, or do we say different things? If the former, it seems Tye owes us an account of the *relation* between what we say and what we believe, because that relation now seems odd. If the latter, what does he have to say about the observation that we seem to treat expressions like 'looks red' as if their contents are independent of who utters them? Further, the quoted passage clearly expresses the view that you and I, in the inversion scenario, believe the same things about what colours objects *have*. But then, it seems Tye has to do some work to explain the relation between my beliefs about how things visually seem to me and my beliefs about how things are. I have elaborated above on the difficulties these questions raise, and I don't repeat them here.

In view of these difficulties, interpretation (b) may seem to offer a more appealing account of spectrum inversion. However, this account is not unproblematic either. It faces at least a couple of difficulties.

To begin with, it is far from clear that we *at all* make any purely phenomenal judgments, as those are understood on interpretation (b).

If I now focus my gaze on a ripe tomato, I form or can form beliefs about what colour it looks to me to have. I can express these beliefs, verbally and nonverbally. I can say, for example, that the tomato looks red to me. Or I can say that, more specifically, it looks to me to have a hue that is rather close to

¹⁷ A point of clarification about these interpretations: I think it is *clear* that, according to Tye, you and I would share *some* beliefs about how things seem, in the scenario under consideration. We would share beliefs about how things seem in the *epistemic* as well as in the *comparative* sense of 'seems'. (For the different senses of 'seems', see section 2 above.) This is not in question, and not disputed by either interpretation (a) or (b). What is in question is Tye's view on what beliefs you and I would have about how things seem in the *phenomenal* sense. Interpretation (a) is that we have different beliefs about how things seem in this sense: If I believe that ripe tomatoes phenomenally seem red to me, you believe that they phenomenally seem green to you. Interpretation (b) is that, *in addition* to the beliefs we have about how things seem in the epistemic and comparative senses, we have *two* sets of beliefs about how things seem in the *phenomenal* sense. On this interpretation, I believe that ripe tomatoes phenomenally seem red to me, and you believe that they phenomenally seem red to you. But in addition, one of us has a purely phenomenal belief that ripe tomatoes phenomenally seem red, and the other a purely phenomenal belief that they phenomenally seem green.

pure red, has a rather high degree of saturation, and is not too bright, but also not very dark. In nonverbal tasks, I could express even more specific beliefs about what colour the tomato looks to me to have.

I am confident that I have or can have all *these* beliefs about what colours ripe tomatoes visually seem to me to have. But do I ever have any further beliefs on this topic? Do I ever have any belief about what colour a ripe tomato visually seems to me to have that is *distinct* from the beliefs I am disposed to express verbally and nonverbally? I sort of doubt it. Notice that this is a doubt that can reasonably be entertained in the *first person*. I do doubt that you have such beliefs. But I also doubt that *I* have them.

A thought-experiment may help to illustrate this doubt. On Tye's account, as presently understood, inverted purely phenomenal judgments – e.g., my judgment that a tomato visually seems red and your judgment that it visually seems green – can play the same functional role with respect to other judgment, including other (non-pure) phenomenal judgments such as our shared phenomenal judgment that the tomato visually seems red. But then it seems the following should be a possibility: that my purely phenomenal judgments suddenly changed, but that their functional roles changed simultaneously, so that all my other judgment, including my non-pure phenomenal judgments remained the same. This would be a case: for a period of time – say, a minute – I am looking at a ripe tomato. At some point during this period, my purely phenomenal judgments suddenly inverts. But as they do, their functional roles change as well. As a consequence, I remain the same, for the entire period, with respect to all the judgments I am disposed to express. Now, could I notice such a change in my purely phenomenal judgments? I don't see how I could. If I were to notice such a change, it seems I would be at least disposed to give some expression to it. At a minimum, I should be disposed to utter something like: "Hey, there was some kind of change!", or some equivalent nonverbal expression. But by hypothesis, I am not so disposed. Thus, it seems this would be a change I would not notice. What this seems to illustrate is that what matters to me, from my first-person perspective, are the phenomenal judgments that I am disposed to express in some way or other in my behaviour. Phenomenal judgments that I am to no degree disposed to express would make no noticeable difference to me. But if they don't make any difference to *me*, what reason could *anyone* have for thinking I am making them?¹⁸

¹⁸ The scenario considered here bears some resemblance to Chalmers' "dancing qualia" scenario (1996, section 7.5), though Chalmers discusses the relation between qualia and functional constitution whereas the present scenario concerns the relation between two

So, there is reason to doubt that we at all make purely phenomenal judgments, as those are understood on interpretation (b). But that is not the only problem with Tye's account, as presently understood. For even if we should grant the existence (or even the possible existence) of purely phenomenal judgments, the account of spectrum inversion they can be used to construct is not all that appealing after all.

On the present interpretation, to repeat, you believe that a ripe tomato looks red to you, and I believe that a ripe tomato looks red to me, even if we are inverted experientially. It is important to emphasise this. The claim is not just that we both *utter* 'a ripe tomato looks red to me'. Nor is the claim just that that we both *say* that ripe tomatoes look red to us. No, the claim is that we both really *believe* that ripe tomatoes visually seem red. This is *the* claim that distinguishes interpretation (a) and interpretation (b). On interpretation (a), the claim is that we do not share beliefs about what colour ripe tomatoes visually seem to have. On interpretation (b), the claim is that we do share such a belief.

So, the present story is that we believe the same things about how tomatoes visually seem. However, we are supposed to differ with respect to our purely phenomenal judgment about how tomatoes visually seem. But this implies that one of us will again be unfortunate, this time in the following sense: the unfortunate will hold *incompatible* beliefs about what colour a ripe tomato visually seems to the unfortunate to have. The unfortunate one of us will judge *both* that the tomato visually seems red, and that the tomato visually seems green.

My conclusion of this is that Tye has some difficult questions to answer – whether interpretation (a) or interpretation (b) is the correct understanding of his position. On either interpretation, he has so far not given us a satisfactory account of what you and I would believe and say in a scenario where we agree in our colour discriminations but are inverted experientially.

3.3 Shoemaker's view

Shoemaker has for many years defended the claim that functional twins could be inverted experientially. He has returned to the topic several times (see e.g.

(alleged) sorts of phenomenal belief. There is also some resemblance to Dennett's discussion of qualia inversion (1991, section 12.4). Chalmers has suggested a reply to the difficulty this scenario raises for the view that there are purely phenomenal judgments, as understood on interpretation (b). The suggestion is that I may make different purely phenomenal judgments about how things seem to me before and after the change, even though I at no point make a purely phenomenal judgment *about the change* (see Chalmers 1999, 495-6). I find the suggestion ingenuous. But it does not convince that I am in fact making any purely phenomenal judgments, in the present sense.

Shoemaker 1975, 1982, 1994, 1996a, 1996c, 1996d, 1996e, 1996f, 2000 and 2002), discussing it in more detail than perhaps any other philosopher.

Shoemaker has ended up with an ingenuous and surprising suggestion about how a spectrum inversion scenario should be understood. The suggestion falls out from a number of desiderata that Shoemaker thinks any adequate description of such a scenario must meet: First, to say that two subjects, Jack and Jill, are spectrum inverted relative to one another is to say that there is a difference in *what it is like* for them to see the colours of objects; or, in Shoemaker's terminology, that there is a difference in the *phenomenal character* of their colour experiences. Second, if there is such a difference, there must be a difference in what properties their respective colour experiences represent objects as having. For the phenomenal character of an experience is according to Shoemaker determined by what the experience represents. But third, if Jack and Jill both are normal as far as their colour discriminations go, we are bound to admit that the visual experiences of both of them represent tomatoes as red:

When both are looking at a ripe tomato, their experiences will be markedly different in phenomenal character, and so in one sense different in representational content – given that phenomenal character is determined by representational content. Yet I would want to say ... that the experience of both represent the tomato, and represent it correctly, as being red (1996f, 252).

Thus, if Jack and Jill make the same colour discriminations but are spectrum inverted relative to one another, their experiences of objects must differ in what they represent, but cannot differ in what *colours* they represent. It follows that Jack and Jill must experience objects to differ in some property *other* than colour. In his most recent writing on the topic, Shoemaker expresses the conclusion thus:

It falls out that the properties represented by their color experiences include properties that are not colors, that their experiences differ in which of these properties they represent, and that the difference in the phenomenal character of their color experiences consists in this difference in their representational content (2002, Lecture two).

Shoemaker now calls these properties 'appearance properties'. (He used to call them 'phenomenal properties'; see e.g. 1994, 1996a, 1996f, 2000.) These properties are obviously closely related to colours. On Shoemaker's view, we perceive colours *by* perceiving appearance properties.

Since how something looks, phenomenally, determines, in normal circumstances, what color one perceives it to have, one could be said to perceive the colors of things by perceiving properties of this sort (ibid.).

Is this a satisfactory account of spectrum inversion? Well, it certainly appears to have some nice features. In the present context, the following stands out: Shoemaker's account appears to protect all the important intuitions and theoretical commitments that were brought to bear in the argument of section 2. According to Shoemaker, tomatoes look red to both Jack and Jill – even though they are inverted both with respect to what it is like for them to see the colours of things, and with respect to how things visually seem to them. Consequently, both Jack and Jill can believe and say that tomatoes look red without either of them being wrong. All of this is gained by insisting on two seemingly minor adjustments to the assumptions of the argument. The first adjustment is to deny that invertees of the relevant kind can differ with respect to what *colours* things seem to them to have, and instead insist that they can differ in what *properties* things seem to them to have. The second, related adjustment is to deny that there is a difference with respect to what it is like to see the colour of an object only if there is a difference with respect to what *colour* the object visually seems to have, and insist, instead, that there is a difference with respect to what it is like to see the colour of an object only if there is a difference with respect to what *properties* the objects visually seems to have.

However, it seems to me that there are problems working the account out. I'm not sure I have fully understood Shoemaker's view. So there is a fair chance that what I have to say below misses the mark, at least in part. But I will articulate what I perceive as problematic in the account.

Obviously, the account requires an explanation of what appearance properties are. Shoemaker says that there are two kinds of appearance property, viz.:

occurrent appearance properties, which things have when they are actually appearing certain ways to perceivers, and dispositional appearance properties, which things have in virtue of being disposed to appear certain ways to perceivers of one or more sorts (ibid.).

But what are the "certain ways" in which objects appear to perceivers when they have appearance properties? I don't find that easy to understand.

Things appear to me in a number of ways. Tomatoes, for example, appear coloured.¹⁹ Sometimes a tomato appears red in both the epistemic and in the phenomenal sense. On other occasions – for example in poor lightning condi

¹⁹ This much is, I think, granted by Shoemaker, at least. It is not undisputed, however. Thau has recently suggested an account of spectrum inversion that is in some respects similar to Shoemaker's but according to which things do not appear to us coloured. The property you see a tomato to have and that you normally take to be the property redness is not the property redness, according to Thau. (See Thau 2002, chapter 1, especially sections 10 and 11.) I have not found the time to consider Thau's suggestion at length in this paper.

tions – it can appear grey in the phenomenal sense while nevertheless appearing red in the epistemic sense. In such cases it is often fair to say that it appears red in the epistemic sense *by* appearing grey in the phenomenal sense. But do tomatoes appear to me in other ways as well? Well, yes. Tomatoes often appear roundish and smallish; they can appear to be in motion or at rest. But we are obviously not interested in these appearances. The question is: Is there any way a tomato looks, *in addition* to looking grey or red or some other colour, such that it is by perceiving that it looks that way that I perceive what colour is has? I think that is what Shoemaker suggests, and what I find doubtful.

The issue can be illustrated by returning to Carl – the calibrating inverttee – from section 1 above. To repeat, Carl believes that tomatoes are red, but they look green to him. At least, they look green in the phenomenal sense of 'looks'. In the epistemic sense, they normally look red.

Now I think it is not in dispute that Carl at this stage differs from the rest of us with respect to what *colours* things seem to him to have. I think it is also not in dispute that Carl at this stage differs from the rest of us with respect to what *appearance properties* things seem to him to have. But how do these differences between Carl and us relate to one another? Does Carl differ from us in one respect or in two respects, according to Shoemaker?

To determine this, suppose that Carl gradually adjusts, and becomes increasingly like us with respect to what he says and thinks about colours and their appearances. After completed adjustment, he no longer says or thinks that tomatoes in any sense look green. According to Shoemaker, he may still differ from us with respect to how tomatoes visually seem. So let's assume he does. Shoemaker suggests that Carl, at this post-adjustment stage, no longer differs from the rest of us with respect to what *colours* tomatoes (phenomenally) look to have.²⁰ Instead, he differs from the rest of us with respect to what *appearance properties* tomatoes look to have.

This account seems to imply that at the pre-adjustment stage, Carl differs from us in *two* different respects: with respect to what *colours* tomatoes look (in the phenomenal sense) to have and in addition with respect to what *appearance properties* tomatoes look to have. At the pre-adjustment stage, Carl differs from us with respect to what colours tomatoes (phenomenally) look to have, but at the post-adjustment stage he does not differ from us in this respect. In contrast, Carl

²⁰ Says Shoemaker about Jack and Jill, who make the same colour discriminations but have inverted colour experiences: "if Jack and Jill are both accurate perceivers of the colors of things, it can't be that the difference in how things look to them is a difference in what *colors* things look to them, even if "looks" is used in the phenomenal sense" (ibid.).

differs from us at the pre-adjustment stage with respect to what appearance properties tomatoes look to have and still differs from us in that respect at the post-adjustment stage. And from that it seems to follow that at the pre-adjustment stage he differs from us in two independent – if related – respects.

But this suggestion seems to me problematic. Carl will be confident that there has been *one* change in him, namely a change with respect to what *colours* things phenomenally look to have. (He has not undergone a change with respect to what colours things *epistemically* look to have.) But *he* will hardly think that there has been a *further* change, namely with respect to what appearance properties tomatoes look to him to have? And if he won't think so, what reason could anyone have for thinking so?

I doubt, then, that we perceive any "appearance properties", in Shoemaker's sense. To repeat, it is not in dispute that we perceive both real and apparent colours of objects. But Shoemaker's view seems to be that we perceive appearance properties *in addition* to that. Prima facie, that seems implausible. And I don't see that Shoemaker has made it more plausible than it seems prima facie. Thus, while Shoemaker's account of spectrum inversion protects all important intuitions and theoretical commitments about what invertees would say and believe, it does so by invoking what seems to me an implausible view of perception.

4. *Asymmetry arguments*

So far, I hope to have shown this much: if you think you and I could be experientially inverted despite expressing in our behaviour the same colour discriminations and comparisons, you ought to worry about what we would *believe* and *say* in such a scenario. I also hope to have illustrated that this problem has been slightly out of focus in recent discussions about spectrum inversion. Some recent defenders of spectrum inversion seem to not even have adopted a clear view on this issue, much less worked one out.

What has been in focus in many or most recent discussions is, instead, various asymmetries concerning colours as we experience them. Some have suggested that the existence of such symmetries and asymmetries is *the* issue to resolve in order to determine whether colour experience inversion is possible. Thus for example, Stephen Palmer asserts that:

whether there exist any undetectable color-to-color transformations can be recast into the simple question of whether an empirically accurate model of human color experience contains any symmetries (1999, 924).

I believe this diagnosis is incorrect. Questions about asymmetries are not the only questions to resolve in order to determine whether colour experience inversion is possible. Another question is whether any satisfactory account can be given of what individuals on such a scenario would believe and say. In fact, I think the latter problem is a harder nut to crack for those who think spectrum inversion of one kind or another is possible. Defenders of inversion scenarios have available to them a number of replies to asymmetry arguments.

My remarks in this section are somewhat tentative. (I hope to expand and improve on this material at some later point.) I shall distinguish between two kinds of asymmetry and asymmetry argument against spectrum inversion. Then I shall list a number of replies to these considerations that I think are available to those who think spectrum inversion in one form or another is possible.

4.1 Two kinds of asymmetry and asymmetry argument

Asymmetry arguments against spectrum inversion take, roughly, this general form: For our colour experiences to be inverted while we express the same colour discriminations and comparisons, the inversion must preserve a number of connections that we find concerning colours. But inversions cannot preserve these connections given the asymmetries that our colour experiences display.

Now I believe one can distinguish between two kinds of asymmetry between colours as we experience them, and, relatedly, two different kinds of asymmetry argument against spectrum inversion.

Let's stipulate that there are three and only three kinds of "colour property", namely hue properties, saturation properties and brightness properties. This is an imprecise formulation. I don't know how to improve on it right now, but let me at least provide some examples. I mean to say that we ascribe colour properties to objects when we say that they are white, black, red, green, orange, pink, bright, dark, dull and so on. We do not ascribe colour properties, in the stipulated sense, when we say that objects have *rare* colours, *pretty* colours, *warm* colours or – as we did when I was a kid – *girl* colours (those included yellow, red and pink) and *boy* colours (those included blue, green and brown).

One kind of asymmetry between colours has to do with relations between colour properties. Let us call this kind of asymmetry 'intra-colour asymmetry'. I mentioned two examples of such asymmetries earlier: Orange is perceived as a mix of red and yellow, while red is not perceived as a mix of any two colours. Again, a significantly darkened yellow does not look yellow while a significantly darkened blue looks blue.

Another kind of asymmetry has to do with relations between colour properties and non-colour properties. Let us call this kind of asymmetry 'extra-colour asymmetry'. I mentioned an example of one such asymmetry earlier: red is generally perceived to be a warm colour, while green is generally perceived to be a cool colour. Thus, red and green bear different relations to the (non-colour) properties warmth and coolness.

Corresponding to these two kinds of asymmetry, there are two different kinds of asymmetry argument against spectrum inversion. Let us say that arguments that purport to show that spectrum inversion (in one form or another) is ruled out because of relations between colour properties are *intra-colour asymmetry arguments*. And let us say that arguments that purport to show that spectrum inversion (in one form or another) is ruled out because of relations between colour properties and non-colour properties are *extra-colour asymmetry arguments*. (Of course, it is possible for one philosopher to use arguments of both kinds to show that some spectrum inversion scenario is possible. This is often done.)

One question that one could raise about asymmetry arguments is how they get from the claim that colour experience displays asymmetry to the claim that invertees must differ behaviourally. Supposedly, asymmetries of experience imply that if two subjects are colour inverted, then they will in some sense differ in the "structure" of their colour experience. For one subject, a given colour property – say, the colour of the sky – will be connected to another colour property – say, darkness – in a way that the same colour is not for the other subject. But there is still a question why such differences in the structure of experience must show up in behaviour. I shall not press this question though. I shall grant that differences in the structure of the experience of two subjects must show up in their behaviour or dispositions to behaviour.

Even by-passing this question, it seems to me that those who think spectrum inversion (of one kind or another) is possible have at their disposal several replies to asymmetry arguments. I shall list two replies that are available to asymmetry arguments in general, one further reply that is available to intra-colour asymmetry arguments specifically, and one further reply that is available to extra-colour asymmetry arguments specifically.

4.2 Two replies to asymmetry arguments in general

First, even if our colour experiences (and non-colour experiences) should have asymmetries that rule out inversion in one form or another, asymmetries need not be essential to experience as such. There may still be creatures that have

symmetrical and therefore invertible experiences. And even if there are in fact no such creatures, there could have been. Thus, the general possibility of inverted experiences remains even if it should turn out that all our experiences, or even all existing experiences are asymmetrical in ways that prevents them from one form or another of inversion.²¹

Second, even if asymmetries in experiences should make literal *inversion* impossible, it does not make experiential *differences* impossible. It could be, for example, that what we both called 'blue', 'yellow', 'white' and so on, would appear to you in ways that I wouldn't even recognise as *colour* appearance, but both of us would find a greater similarity between what we both called 'yellow' and 'white' than we found between what we both called 'blue' and 'white'.²²

4.3 One further reply to intra-colour asymmetry arguments

Some defenders of spectrum inversion have conceded that, because of intra-colour asymmetries, our colour experiences could not be in any way systematically different from what they are and yet display the same internal connections.²³ But this concession just may be unnecessary. Even though there are intra-colour asymmetries between colour properties as we experience them, it is not clear that these asymmetries rule out *all* spectrum inversion possibilities. Thus, Palmer argues that uncontroversial intra-colour asymmetries – including the orange-red and yellow-blue asymmetries – allow for three ways in which your colour experiences could be inverted relative to mine without this showing up in our behaviour. As far as these asymmetries go, we could be (i) red-green

²¹ For this reply, see e.g. Shoemaker (1982, 367). Against this reply, some philosophers have argued that asymmetries are, after all, essential to experience as such. Thus, Hilbert and Kalderon claim: "In order for an experience to have a distinctive phenomenal character, and indeed to have a phenomenal character at all, the associated quality space *must* be asymmetrical" (2000, 204). Their view echoes Dennett's: "What *anchors* our naive sense that there are such properties as qualia are the multiple, asymmetrical, interdependent set of reactive dispositions by which we acquaint ourselves with the sensible world. Our sense that the color red has, as it were, an identity, a 'personality' all its own is *due to* the host of *different* associations that go with each color. Shoemaker's envisaged creatures, lacking all such reactive landmarks in their dispositional make-up, would not think they had qualia at all – what it was like to have one sort of experience would not differ at all from what it was like to have a different one!" (1993, 927). I will not enter into this dispute here.

²² For this reply, see again Shoemaker (1982, 368). For an answer to Shoemaker's reply, see Hardin (1993, 142ff.). I also believe that the arguments of Dennett and of Hilbert and Kalderon (see previous footnote) are meant to answer – or at least could be employed to answer – this suggestion as well.

²³ See e.g. Shoemaker (2002, lecture one).

inverted only; (ii) blue-yellow inverted and white-black inverted; and finally (iii) red-green inverted, blue-yellow inverted and white-black inverted.²⁴

4.4 *One further reply to extra-colour asymmetry arguments*

It seems to me that there is a difference between intra-colour asymmetries and extra-colour asymmetries that affects the force of intra-colour asymmetry arguments and extra-colour asymmetry arguments respectively. I shall try to articulate it.

Suppose you were orange-red inverted relative to me as I am now. Then you would experience a ripe orange to have the hue that I experience a ripe tomato to have, and vice versa. I now perceive a ripe orange to have a hue that is a mix of two other hues, red and yellow. In contrast, I perceive a ripe tomato to have a hue that is not a mix between any two other hues. Now how would it be for you in the inversion scenario under consideration? One possibility is that you would perceive a ripe tomato to have a hue that is a mix of two other hues, and an orange to have a hue that is not a mix of any two other hues. Is there any other possibility? Could you be orange-red inverted relative to me as I am now and yet perceive a ripe tomato to have a hue that is not a mix of two other hues, and a ripe orange to have a hue that is? That is hard to imagine; it seems to be impossible in any sense. Plausibly, for something to look as the hue that I now perceive a ripe orange to have *is* to look as a mix of two other hues. And plausibly, for something to look as the hue that I now perceive a ripe tomato to have *is* to look as *not* a mix of two other hues.

These facts give force to the (intra-colour asymmetry) argument that you and I could not be orange-red inverted and yet have experiences with the same structure. Such an inversion would seem to necessarily imply that one of us perceived a ripe orange to have a hue that is a mix of two other hues while the other would not perceive it that way.

Now suppose that you were red-green inverted relative to me as I am now. Then you would experience a ripe tomato to have the hue that I experience a ripe cucumber to have, and vice versa. I now perceive a ripe tomato to have a warm hue, and a cucumber to have a cool hue. Now, how would it be for you under the inversion scenario under consideration? One possibility is that you would perceive the tomato to have a cool hue, and the cucumber to have a warm

²⁴ Levine (1991) promotes the same general conclusion, without going into the same detail: "For every new discovery that apparently introduces a structural asymmetry into phenomenal quality space, there is almost always (or, better, for all we know there may be) some new, more complicated way of mapping qualia onto each other that preserves the essential relational properties".

hue. Is there any other possibility in this case? Could you, despite the inversion, perceive the tomato to have warm hue, and the cucumber to have a cool hue? Well, it's a bit hard to say, but perhaps. It may well *not* be essential to the colour of the tomato as I now see it that it be perceived as warm. And it may well not be essential to the colour of the cucumber as I now see it that it be perceived as cool.²⁵

But if this tentative assessment is right, then there is not much force to the (extra-colour asymmetry) argument that you and I could not be red-green inverted and yet have experiences with the same structure. For if the assessment is right, then you and I could be inverted with respect to what hues we perceive red and green objects to have while being *simultaneously* inverted with respect to whether we perceive these hues to be warm or cool.

Possibly, this kind of reply may be fruitfully applied to extra-colour asymmetry arguments in general. In general, it seems somewhat plausible that relations between perceived colour properties are constitutive of these properties, but less plausible that these properties' relations to non-colour properties should be so constitutive. And for that reason, extra-colour asymmetry arguments seem to have less force than intra-colour asymmetry arguments.

So, it seems to me that those who think you and I could be inverted experientially despite expressing the same colour discriminations and comparisons in our behaviour have some resources for responding to asymmetry arguments against their view. It is less clear to me that there are *any* prospects for giving a satisfactory account of what you and I would *say* and *believe* on such a scenario.²⁶

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²⁵ For an exchange on this difficult question, see Hardin (1993, 134-9), Levine (1991) and Hardin (1991). There is also a more general argument in Campbell (2000) for the view that colours as we see them are partly constituted by our affective reactions to them.

²⁶ I thank Sydney Shoemaker for providing me with his latest work on spectrum inversion, and for trying to clarify his views to me in personal correspondence. (That correspondence is ongoing as this paper goes to press.) For other helpful comments, I thank the contributors to this volume, and Bertil Strömberg.

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