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COLOUR RESEMBLANCE AND COLOUR REALISM

Abstract

One prominent ambition of theories of colour is to pay full justice to how colours are subjectively given to us; and another to reconcile this first-personal perspective on colours with the third-personal one of the natural sciences. The goal of this article is to question whether we can satisfy the second ambition on the assumption that the first should and can be met. I aim to defend a negative answer to this question by arguing that the various kinds of experienced colour resemblances – notably similarities in hue distance, sameness in superdeterminables, and colour resemblances between surfaces, volumes and illuminants – cannot be accounted for in terms of the mental representation of the scientifically studied properties, which colours are best identified with in response to the second ambition.

1.

Our various theories and conceptions of colours are influenced by the two main perspectives which we have on them. On the one hand, colours are directly given to us, in our conscious perceptual experiences, as features of objects in our environment. As part of these experiences, the colours instantiated by the objects are presented as having certain qualitative and certain categorial properties. Among the sensorily presented *qualitative features* of colours are, first of all, their various internal similarities and differences. Thus, two colours may be experienced as being closer to each other in their hue, their saturation or their brightness than a third colour. Their qualitative features also include the property of being unique (or elemental) or, alternatively, the property of being binary (or compound). While unique shades of hue are experienced as not involving any other colour hues, binary shades of hue are experienced as being qualitatively composed out of the former.

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The property of being instantiated independently of our particular experiences and the property of being instantiated by some actually existing objects are some of the *categorical features*[1], which we non-sensorily experience colour instances as having. That is, the colours which we perceive are given to us as mind-independent properties of real objects. Another relevant aspect – though probably more controversial – may perhaps be that we experience colour instances as determining our perceptions of them. The idea is that, while seeing the colours of objects, we are aware of the fact that, if the colours would have been different (and everything else equal), our experiences of them would have been correspondingly different as well (cf. Dorsch 2010a).

The categorial features are the same for all perceived colours instances that we perceive. The qualitative features, of course, differ relative to which colour we experience. The non-sensory presentation of the categorical features of colour instances and the sensory presentation of the qualitative features of the colours involved both contribute to the subjective character of the relevant colour experiences – to what they are subjectively like. That is, colour experiences are marked in consciousness as presentations of mind-independent and coloured objects (cf. Dorsch and Soldati 2010). Accordingly, the character of our colour experiences shows both *categorical* and *qualitative aspects*: they are experiences of what appear to be mind-independently instantiated properties standing in certain internal relations to other properties of the same kind[2].

On the other hand, the phenomenon of colour is a subject of the natural sciences, notably physics and cognitive science. The empirical investigations concerned focus on many different aspects of colours and colour vision, such as the relevant physical properties of coloured entities, their interaction with light, the effects of light on the retina, or the resulting processing of these stimuli in the visual system of the brain. Some of the corresponding studies have to rely on our subjective access to colours to get their extensions right – for instance, if we want to find out which retinal stimulations are linked to which particular colours. But the knowledge gained is still empirical and third-personal in nature, unlike our first-personal knowledge about the qualitative and categorical features of colours.

One prominent ambition of theories of colour has been to pay full justice to how colours are subjectively given to us; and another to reconcile our insights about colours from the first-personal perspective with those of the third-personal one. The goal of this article is to question whether we can satisfy the second ambition on the assumption that the first should and can be met. That is, I aim

[1] The label is not accidental since the properties at issue correspond to some extent to Kant's categories (cf. the discussion in Dorsch 2010a). It does not matter for what follows that the categorical features pertain to colour instances, while the qualitative features pertain to colours.

[2] In my usage, qualitative or categorial *features* are always properties of perceived objects (e.g., their redness or mind-independence), while qualitative or categorical *aspects* are properties of the character of colour experiences.

to look exclusively at a position which promises to take our colour experiences at face value and to accommodate both their qualitative and their categorical features mentioned above. There are plenty of theories which deny one or the other aspect; and plenty of responses arguing that this disqualifies them as satisfactory accounts of colours[3]. Here, I simply take for granted that the latter are right. Accordingly, colours are understood as properties that stand in certain internal relations to each other and are actually instantiated independently of our experiences of them. The question is then whether these first-personally characterised properties can be identified with third-personally accessible properties[4].

In section II, I specify the two elements needed for an account of colour to be able to fulfil both ambitions – namely *Naive Realism* and *Reductionism* about colours – and illustrate how the resulting view is commited to accounting for the qualitative aspects of colour experiences in terms of the representation of the physical properties identified with colours. Section III introduces types of surface reflectances properties as the best candidates for the identification with surface colours. In section IV, I distinguish two kinds of hue resemblance among surface colours – in respect of shared superdeterminables and in respect of hue distance – and specify how the *Reductive Naive Realism* may account for each of them. My focus is thereby on the view developed by Byrne and Hilbert (cf. Byrne and Hilbert 1997a and 2003), which constitutes perhaps the most detailed and sophisticated version of *Reductive Naive Realism* put forward recently. Section V then tries to show that their best attempt at explaining the experienced similarity concerning shared superdeterminables is bound to fail. The essay closes with section VI by arguing that reductive naive realism does not fare better with regard to an account of the subjective hue resemblances among coloured entities of different substances (i.e., between surface, volume and illuminant colours). My conclusion is therefore that the second ambition is better to be given up, and that – in the case of colours and our experience of them – our first-personal and third-personal perspectives do not concern the same kind of property.

2.

[3] See Hardin 1988 and Byrne and Hilbert 1997b (especially the introduction) for good overviews. See also the detailed discussion in Dorsch 2009. One motivation for trying to satisfy the first ambition is that it seems part of our ordinary colour concepts that they show the qualitative and categorial features listed. Hence, denying that our colour experiences should be taken at face value means also having to accept (and formulate) some error theory concerning our actual colour concepts, and to revise the latter accordingly. And it also means giving up on some or all of the cognitive power of our colour experiences (cf. McDowell 1985 for both points).

[4] My underlying doubts concern not only the claim that the subjectively given colours can be identified with scientifically accessible properties, but also the more general assumption that first-personal elements of experience may be studied from a third-personal point of view. I address the latter issue in Dorsch 2010a, while I focus here on the former.

The account of colours to be discussed in this essay endorses *naive realism* about colours. The realist aspect of this endorsement is that the view under consideration assigns colours the status of features that are actually instantiated independently of our particular experiences of them and therefore are open to genuine recognition[5]. And the naive aspect consists in its acceptance that colours possess also the qualitative (as well as any additional) features which they are presented as having. Both aspects together ensure that colours really are as they are subjectively given to us – and thus that the first ambition is satisfied. It is worthwhile to note that naive realism – as understood here – does not exclude the possibility of aspects of the nature of colours which are not revealed to us by our colour experiences (cf. Kalderon 2007).

The view at issue combines this naive realist stance with a *reductionist* approach to colours which identifies them with third-personally accessible – and typically, though not necessarily, physical – properties. This means, among other things, that the subjective presentation of colours in fact amounts to a presentation – or representation, if one prefers – of the properties identified with colours. For instance, it is these properties which are given to us as being similar or different in certain respects, or as instantiated independently of our perception of them. But again, their full objective nature need not be revealed to us in subjective experience.

The presentational link involved may be understood in different ways. According to some positions, it consists in a relation of acquaintance or manifestation of the presented objects and features (cf., e.g., Kalderon 2007). Others treat it as a representational link to be spelled out in causal, informational or teleological terms (cf., e.g., Dretske 1995, Tye 1995 and Tye 2000). And again others take it to be intentional in nature, meaning that the mental episodes concerned are appearances that are subject to a certain kind of norm (e.g., to occur only if the world is a certain way) (cf., e.g., Dorsch 2010b, and Dorsch and Soldati 2010). One important difference between representationality and the other two options concerns their relation to consciousness. The property of being a manifestation or appearance of something is taken to be a constituent of the subjective character of the episodes concerned. Accordingly, only conscious mental states can involve acquaintance or intentionality. Representationality, by contrast, need not necessarily pertain to conscious mental states – other entities, such as non-conscious mental states, photographs or paintings, may be representational as well[6].

For what follows, it does not matter which understanding of the presentational link is endorsed by the proponents of *Reductive Naive Realism* (or *RNR* for short).

[5] See McDowell 1985 for discussion of this notion of objectivity.

[6] Partly for this reason, it seems more natural to claim (if at all) that the representational properties of a mental episode determine, rather than constitute, its subjective character (cf. Tye 1995 for the former, and Dretske 1995 for the latter view). Some philosophers use the term "intentionality" to denote what I mean by "representationality" (cf. Dorsch 2010b for a discussion of the distinction hinted at here).

It suffices to note that they all accept that colours are properties, which are really as they are subjectively given to us, and which we can none the less individuate and study by means of the natural sciences. Their view thus indeed combines the two ambitions introduced above. None the less, reductionism about colours is most naturally combined with a reductionist approach to the subjective presentation of colours. In accordance with this, I give preference in what follows to a representational understanding of the relation between our colour experiences and the third-personal properties identified with colours.

One of the main motivations for adopting *RNR* is that it promises an account of the presentational aspects of the first-personal character of colour experiences (and presumably other episodes) in terms of the represented third-personally accessible properties. Indeed, it is arguable that the provision of such an account is part of the second ambition, and actually its main point. The thought is that how colours are given to us in experience can be elucidated exclusively in terms of how they really are; and that how colours really are is, ultimately, a matter of their third-personally accessible nature. Accordingly, the reflection in experience of the similarities and differences among colours, their unique or binary nature, their mind-independent instantiation, and so on, is said to be explained by reference to properties open to scientific investigation[7].

This idea presupposes that there is a robust correlation between the presentational first-personal aspects of colour experiences, on the one hand, and the relevant third-personal aspects of whichever properties are identified with colours and taken to be represented by those experiences, on the other. That is, how colours are subjectively presented as being should be correlated to how they are from the third-personal perspective. For the latter can explain the former only if the two covary relative to each other.

Accepting *RNR* already comes with assuming such a correlation. The first factor which is relevant here is that *RNR* understands the first-personal presentation of colours in terms of the representation (or relational or intentional presentation) of the third-personally accessible properties identified with colours. The fact that colours are subjectively given as standing in certain similarity and mixture relations amounts therefore to the fact that the relevant physical properties are represented by our colour experiences as standing in those second-order relations. The second important element is that such a representational link presupposes, minimally, a nomological correlation under normal conditions between how

[7] Views, which aim to be reductive not only with respect to colours, but also with respect to conscious experience, typically deny in addition that there are any non-presentational aspects of the characters of our mental episodes (cf., e.g., Dretske 1995 and Tye 1995). But proponents of *RNR* need to be commited to such a strong form of "representationalism". They only have to maintain that the first-personal features, which colours are experienced as having, are determined by some of their third-personal features.

property instances are represented by the respective mental states or episodes and how they really are[8].

Given that all colour experiences subjectively present colours as having the same categorical features, the interesting connection obtains between the variable first-personal presentation of the qualitative features of colours and the respective variable representation of part of the third-personal nature of colours. What we thus get is a rather specific *Correlation Thesis:* two veridical colour perceptions differ in their qualitative aspect if and only if they represent colour properties that differ third-personally in whichever respect is relevant[9].

The direction of explanation runs thereby from right to left: our colour experiences have a certain qualitative aspect they represent their objects as having certain third-personal properties with certain second-order features (i.e., similarity and mixture relations). If the *Correlation Thesis* turns out to be false, the qualitative aspect of colour experiences cannot be adequately accounted for in terms of the representation of the third-personal properties with which colours are identified by *RNR*. This would not only undermine part of the reason for endorsing this view, but also cast more generally doubt on the prospects of fulfilling the second ambition.

3.

The endorsement of *RNR* may therefore be challenged in at least two ways. It may be argued that the *Correlation Thesis* is false – for instance, by pointing out certain counterexamples. And it may be argued that – even assuming that the

[8] See, for instance, Dretske 1995, Tye 1995, Byrne and Hilbert 1997a and Dorsch 2009.

[9] See the *Necessity Thesis* in Byrne and Hilbert 1997a. The restriction to veridical colour perceptions is needed to accommodate the fact that different conceptions of the presentational link may lead to different treatments of non-veridical colour experiences. The latter include colour illusions – as they may occur, for instance, when we are looking at objects in heavily coloured light or in near darkness; and hallucinations of coloured objects – which may be the result, for instance, of having taken some hallucinogenic substance. They do not, however, include perceptual experiences which are veridical with respect to the presented colours and non-veridical with respect to some other perceivable property. Under which conditions colour experiences turn out to be veridical colour perceptions may be difficult to specify in substantial terms, but it is not impossible (cf. Dorsch 2009: ch. 3.3, and Allen 2010b).

Besides, what holds in the case of non-veridical colour experiences depends on which account of the presentational link is endorsed. Intentionalists and representationists agree that such experiences possess the same nature as veridical ones and, consequently, involve the same qualitative aspect and present us with the same colours as their veridical counterparts. Accordingly, the restriction to veridical experiences may be dropped from the *Correlation Thesis*, and the thesis be extended to all colour experiences. By contrast, if the presentation of colours consists in the acquaintance with, or manifestation of, colour instances, non-veridical colour experiences do not present colours at all, given that they are not so related to some colour instances. This means, in particular, that they do not present us with qualitative features of colours. As a consequence for such views, the *Correlation Thesis* has no application to non-veridical colour experiences, but only to genuine perceptions of colour instances. See Dorsch 2010b for a discussion of the two ways of understanding presentation.

Correlation Thesis is true – the qualitative aspect of colour experiences cannot be accounted for in terms of the representation of third-personally accessible properties. But proponents of *RNR* have been very resourceful in adapting their views to such objections or counterexamples. One of their main strategies has thereby been to vary the nature and number of the properties, which they claim colours to be identical with[10].

Colour science shows that the best candidates for the third-personally accessible properties, which are correlated with subjectively individuated types of experience of surface colour and may be identified with the latter, are certain reflectance properties[11]. The basic *spectral reflectance of a surface* (i.e., its *SSR*) is identical with the disposition of that surface, relative to each wavelength of the visible spectrum, to reflect a certain proportion of the incident light and to absorb the rest (cf. Byrne and Hilbert 1997a and 2003, and Kalderon 2007).

One well-noted problem with identifying colours with *SSRs*, however, is that colour experiences of the same type can be elicited by different *SSRs* (cf. Byrne and Hilbert 2003: 10f.). That is, very different *SSRs* may elicit an experience of the object concerned as, say, yellow. Consequently, it cannot be the *SSRs* that are identical with the colours presented by our perceptions. This fact about *SSRs* has constituted the first challenge to shape the formulation of *RNR*, given that it has played a significant role in the identification of colours, not with *SSRs*, but with certain types of them[12]. Such *types of spectral surface reflectances* (abbreviated as *SSR*-types) group together *SSRs* which elicit, under normal viewing conditions, experiences of the same colour. The colours are then identified, not with particular *SSRs*, but with *SSR*-types. Here is how Kalderon describes the resulting position to be found in the writings of Byrne and Hilbert:

> A surface spectral reflectance is an object's disposition to reflect a certain percentage of light at each of the wavelengths of the visible spectrum. While an object could only have a single determinate reflectance, perceived colors are not determinate reflectances, but determinable reflectances, or reflectance types, that can be represented by sets of determinate reflectances (see Hilbert, 1987). (Kalderon 2007: 578)

The description of *SSR*-types in terms of their extension has its limits, though. There is no restricton (apart from pragmatic ones) to the fine-grainedness of the scientific specification of *SSRs*, given that for any particular subdivision of the spectrum of relevant wavelengths or of the scale of percentages of reflected light

[10] Incidentally, many of the variations can be found over the years in the writings of David Hilbert. See, for instance, the development from Hilbert 1987 to Byrne and Hilbert 1997a and Byrne and Hilbert 2003.

[11] See Hardin 1988, Byrne and Hilbert 1997b and Dorsch 2009. It should be noted that reference to these properties may help to account only for surface colours, but not for the colours of light or film. I address this issue and the problems that it raises for *RNR* in section VI.

[12] See Byrne and Hilbert 1997a: 265f., and also Broackes «ways of changing light» in Broackes 1992: 454ff. and 459.

at each of these wavelengths, there is a more detailed one to be had. This means that *SSRs* can be differentiated as minutely as desired (and given the required measurement tools). We cannot therefore list all the *SSRs* which form the extension of a given *SSR*-type: there are always some more to be listed.

It is more useful to describe *SSR*-types in relation to their impact on the receptors in the human retina (cf. Hilbert 1987: 100, Tolliver 1994: 417). What the various *SSRs* grouped together in an *SSR*-type have in common is that they give rise, under normal conditions, to the same integrated sum of intensities in each of the three spectral bands – long-wave *L*, middlewave *M* and shortwave *S* – that correspond to each of the three types of receptors in the eye of normal human beings as they actually are. *SSR*-types are thus dispositions to bring about, under normal conditions, specific triples of retinal stimulation in actual human beings.

What is important to note about *SSR*-types is that they can be fully described in third-personal terms, that is, without making any reference to subjective experience. Hence, although *SSR*-types are anthropocentric properties in that they are to be specified by reference to the human visual system, they can still count as mind-independent properties of actually existing objects[13].

The proposed view should have no difficulties to account for the categorical features of colours and their presentation as part of our colour experiences. After all, *SSR*-types show the same categorical features which colours are given as having in our experiences of them. But problems seem to arise as soon as we move to the explanation of the qualitative aspects of colours and colour experience[14].

As already mentioned above, one way of arguing against *RNR* is to question the truth of the *Correlation Thesis*. If it can be shown that there is no robust correlation between subjectively individuated types of colour experience and objectively investigated *SSR*-types even under normal conditions, the two perspectives on colours cannot be reconciled with each other. However, as long as the relationship between mind and brain is not satisfactorily elucidated, it is difficult to assess the truth of the *Correlation Thesis*. Notably, the (seeming) conceivability of cases where one and the same retinal stimulation leads to subjectively different colour experiences, or where different stimulations lead to one and the same experience, need not entail their logical possibility. And the absence of good reason to assume that such cases are impossible need not necessarily undermine the *Correlation Thesis*, either. It appears that the burden of proof lies with the opponents of *RNR*.

[13] Whether an account of colours as *SSR*-types should still count as a genuinely physicalist position is another matter (cf. Kalderon 2007: 13), which need not be resolved here, since the anthropentricity of *SSR*-types does not undermine their status as third-personally accessible properties.

[14] For more general discussion of, and possible physicalist answers to, problems related to the naturalisation of phenomenal consciousness in general, see, for instance, Dretske 1995, Tye 1995 and 2000, and Lycan 1996.

Moreover, it is easy for opponents of *RNR* to miss their target by not appreciating in sufficient detail the nature of those properties (i.e., the *SSR*-types) which *RNR* identifies colours with. As a result, many cases put forward as alleged counter-examples to the *Correlation Thesis* lack force (cf. Tye 1992, Tye 1995 and Lycan 1996: ch. 6). This is in particular true of all thought experiments (including many cases of qualia inversion or absence) that hypothesise alterations in the viewing conditions, the nature of the human visual system, the physical laws governing the causal effect of surfaces on light and of light on our receptors, or the represented *SSR*-types. For in all these cases, changes in the qualitative aspect of colour experiences can, against the objector's opinions, be explained by reference to corresponding changes in their representationality. This point becomes particularly evident if the identification of colours with *SSR*-types is made explicit in the formulation of the *Correlation Thesis:* two veridical colour experiences differ in their qualitative aspect if and only if they represent *SSR*-types that differ in which specific triple of retinal stimulation they are dispositions to elicit under normal conditions in actual human beings. Any deviation from normal conditions or actual human cognition disqualifies the respective cases from being counterexamples to the *Correlation Thesis*.

But granting that there is a strict correlation between types of veridical colour experiences and *SSR*-types does not mean accepting *RNR*. In addition to the correlation, *RNR* also assumes an explanatory link between the two elements. In particular, the qualitative aspects of colour experience are said to be determined solely by the representation of *SSR*-types (and perhaps related third-personal aspects of the world). But it may be doubted whether *RNR* is successful in explaining why differences in representationality give rise to differences in qualitative character. A central issue here is whether the *SSR*-types can be said to possess the qualitative features – for instance, the second-order properties of standing in the same resemblance relations and showing either a unique or a binary nature – which we experience colours as having[15].

Proponents of *RNR* may arrange *SSR*-types in a way isomorphic to the circular order of hues. The close resemblance of yellow and orange is thus matched by a close resemblance between the two respective *SSR*-types, and the difference between unique and binary colours is paralleled by a corresponding difference among *SSR*-types (cf. Hilbert 1987). This arrangement is possible because *SSR*-types can be ordered in relation to how much they affect the three kinds of cones in the human eye[16].

[15] Another important issue is whether *RNR* can accommodate the variations in the subjective location of the four unique hues. See Allen 2010a, and the references to relevant selectionist approaches provided in footnote 17 below.

[16] Further below, I present a formula which can be used to measure the kind of "physical distance" between different classes of *SSRs*, which corresponds to the "hue distance" among the correlated colours. And although the formula does not make reference to total intensities in the three wavelength bands *L*, *M* and *S*, a respective reformulation should be possible.

Indeed, *SSR*-types – or the respective classes of *SSRs* – stand in many different resemblance relations concerning their impact on light-sensitive receptors of varying ranges of receptivity. This has led some proponents of *RNR* to a selectionist approach to colours (cf., e.g., Hilbert and Kalderon 2000). The central thought is that there are many different ways in which *SSRs* can be grouped together into types standing in certain similarities relations. The human visual system has evolved in such a way as to be sensitive to one particular grouping of *SSRs* (i.e., the particular *SSR*-types discussed so far), while other actual or possible beings with light receptors of a different number and different sensitivity ranges track different groupings. This means, in accordance with *RNR*, that there are many colours in the world which humans are unable to recognise or discriminate. Our visual system is, so to speak, selective about which colours it lets us see[17].

A complete reductionist account of colours and our experiences of them might therefore have to involve some ecological considerations concerning why the human visual system has evolved in the way that it has done – that is, why it tracks these specific *SSR*-types, as well as these particular similarities among them, and not others. But this is, arguably, the task of the cognitive and biological sciences, and not of philosophy. What proponents of *RNR* should be expected to do from the philosophical perspective, however, is to identify the second-order properties of *SSR*-types which are to be identified with the qualitative features of colours, and the representation of which explains the corresponding qualitative aspects of colour experiences. My contention is that this constitutes a challenge for adherents of *Reductive Naive Realism* which they are unlikely to be able to meet.

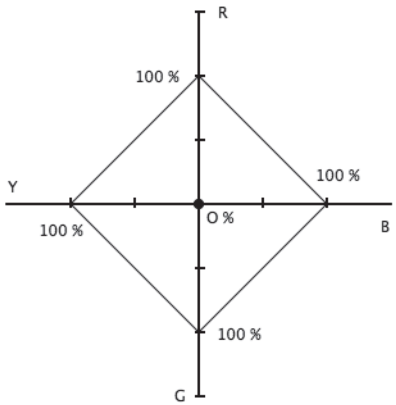
4.

In order to be able to account for the experienced similarity (and mixture) relations among colours in representational terms, Byrne and Hilbert assume that our colour experiences represent hue magnitudes in addition to *SSR*-types[18]. More specifically, each particular colour experience represents objects as having colours with a certain proportion of the four hue magnitudes – *R*, *G*, *Y* and *B*. The represented values of the hue magnitudes are proportinal values or percentages,

[17] It should not be seen as problematic that different species are sensitive to different sets of colours – especially in the light of the fact that there are great inter-species differences in the number and sensitivity of the relevant light receptors (cf. Allen 2009). But some selectionists aim to extend their view to inter- and intrasubjective variations in how we experience the world as coloured – for instance, to account for differences in which objects are taken to be instances of unique colours (cf. Kalderon 2007 for an application to inter-subjective and Mizrahi 2006 for an application to intra-subjective variation). This is much more troublesome since it threatens to undermine our general assumption that there is one common set of colours that human beings talk about, refer to, and so on. A defense of the idea that different humans may be sensitive to different colours thus needs to show how it can be squared with the fact that we can successfully communicate about the colours of objects (cf. Allen 2009).

[18] See Byrne and Hilbert 2003 and Byrne 2003, on both of which I rely in what follows).

and their sum is for each colour instance 100 %. Moreover, each represented proportion involves two or three hue magnitudes with a value of 0 %, and only one or two with a positive percentage[19]. Thus, a colour experience may represent an object as having a hue with an *R*-value of 100 %, or as having a hue with an *R*-value of 37 % and a *Y*-value of 63 % – but no positive proportion of three or all four hue magnitudes. This is due to the fact that the four hue magnitudes form two pairs of opposites, such that in each case only one of each pair can be represented as having a positive quotient. If some object's colour is represented as having an *R*-value, it cannot also be represented as having a *G*-value; and vice versa. The same is true of the *Y*- and the *B*-magnitude. If we understand each pair of opposing hue magnitudes – that is, magnitudes of which only one can have a positive value – as forming together one axis of a coordinate system, we can give the following graphical representation of the possible values that can be represented by our colour experiences:



The space of hue magnitudes

Each point on the regular diamond stands for a combination of positive values of hue magnitudes that a colour experience can represent[20]. The four "super-determinables" – which Byrne and Hilbert have introduced in an earlier text (Byrne and Hilbert 1997a) – are identical with the property of having a positive

[19] It is interesting to ask whether the other two or three magnitudes are represented as having the relative magnitude of 0 %, or whether there are not represented at all. The hue magnitudes may thus differ in this respect from, say, the three spatial dimensions which are always represented as having some value or another. Byrne and Hilbert seem to assume that only positive magnitudes are represented (cf. the quote in the main text further below), so they presumably thing the same about the representation of hue magnitudes. But this issue need not be settled here.

[20] That the geometry is not circular – like in the case of the circle of shades of colour – is due to the fact that the values of the hue magnitudes are assumed to denote relative percentages with a constant total sum of 100 %.

percentage of one of the hue magnitudes. That is, each of them is a determinable of one of the four hue magnitudes. Byrne and Hilbert call the superdeterminables "reddish", "greenish", "yellowish" and "bluish", and I will follow them in this. But it should be kept in mind that these expressions may denote two different kinds of properties (which are, of course, identified by *RNR*): the respective first-personally accessible qualitative features of colours (e.g., their being experienced as reddish or bluish), and the third-personally accessible determinables of the individual hue magnitudes. But the context should always suffice to clarify in which way they are used.

The relationship between hue magnitudes and colours – or, in this case, *SSR*-types – is a bit more complex. Given the nature of human colour vision, each particular shade of colour that we may perceive objects as having corresponds actually one-to-one to a specific proportion of the hue magnitudes. For instance, pure red is correlated to an *R*-value of 100 %, while the shade of orange exactly in the middle between pure red and pure yellow is linked to the combination of an *R*-value of 50 % and a *Y*-value of 50 %. But this means that there is also a strict correlation between proportions of hue magnitudes and *SSR*-types, assuming that the latter are identical with colours. That is, according to *RNR*, the two anthropocentrically defined classes of properties stand actually in a bijective relation to each other.

The proponents of *RNR* should furthermore expect that this fact can be accounted for in terms of the nature of the human visual system. As noted above, *SSR*-types are dispositions to elicit under normal conditions certain inputs in the human visual system, namely retinal stimulations specified in terms of the total intensities brought about within the three wavelength ranges *L*, *M* and *S* that humans are sensitive to. Having a hue with a certain proportions of the four hue magnitudes may then correspondingly be understood as the disposition to produce under normal conditions a certain output of human visual processing describable in terms of the *R*-, *G*-, *Y*- and *B*-values. This presupposes that the three-dimensional retinal inputs actually lead to respective four-dimensional outputs of relative hue magnitudes, and that this aspect of the human mind can be captured by empirical theories. *Reductive Naive Realism* should indeed assume that such an actual connection between the two kinds of dispositional properties of objects can be discovered[21]. If not, the experienced resemblance relations, which are accounted for in terms of the represented proportions of hue magnitudes, cannot be linked to the *SSR*-types identified with colours. That is, colours could not be said any more to possess the qualitative features given in colour experience, and naive realism would have to be given up. Hence, propo-

[21] One possible – though not uncontroversial – interpretation of the visual system, that – if adequate – would establish the desired connection, makes use of the idea of opponent processing applied to the case of colours. In fact, Byrne and Hilbert 2003 use it to illustrate the possibility of linking *SSR*-types and hue magnitudes, without endorsing opponent processing as the best interpretation of what is going on in our brains.

nents of *RNR* aiming to explain subjective aspects of experience by reference to proportions of hue magnitudes as well as *SSR*-types should accept, not only that there is a strict correlation between the two kinds of properties, but also that it is due to the actual way in which human visual processing works.

The two kinds of dispositions are not identical, however – which is precisely why Byrne and Hilbert are able to introduce hue magnitudes and superdeterminables as additions to *SSR*-types. To some extent, the dispositions are the same since they possess the same sets of *SSRs* as their categorial bases[22]. But they still differ in which parts of the human visual system they are relative to or depend on. While *SSR*-types are defined solely in terms of the human light receptors and their sensitivities, the specification of the proportions of hue magnitudes has also to make reference to later stages in human visual processing – notably to the fact that the three-dimensional retinal input is transformed into a four-dimensional hue output. Because of this difference in dependence on the nature of the human mind, the two kinds of disposition would be differently mapped to each other or even completely diverge if our visual processing would alter. In a similar way, the precise correlation between the disposition of an object to cause a sensor in a digital camera to register a certain distribution of photons and the different disposition of that very same object to produce a certain image on the screen of the camera depends on how the electronics in the camera are working. If the latter would be altered, the two dispositions would go apart, despite having the same categorial bases and actually being co-extensional.

Now, how are hue magnitudes supposed to help proponents of *RNR* to account for the subjective resemblance relations among colours? Here is what Byrne and Hilbert write about how to explain the fact that blue is subjectively more similar to purple than to green:

> Objects that appear blue are represented as having a high proportion of *B* (and a lower proportion of either *G* or *R*); objects that appear purple are represented as having a roughly equal proportion of *B* and *R*, and objects that appear green are represented as having a high proportion of *G* (and a lower proportion of either *Y* or *B*). There is therefore a perceptually obvious respect in which blue is more similar to purple than to green. Namely, there is a hue-magnitude (*B*) that all blue-appearing objects and purple-appearing objects, but not all green-appearing objects, are represented as having. (Byrne and Hilbert 2003: 15)

What is remarkable about this passage is that the explanatory work is in fact assigned to the property of having a positive percentage of the *B*-value – or, in other words, of exemplifying the superdeterminable of being bluish. This explanation therefore corresponds exactly to the one that Byrne and Hilbert's gave in

[22] Because of this, the property of having a hue with a certain proportion of the hue magnitudes may be understood as being a type of *SSRs* as well. But to avoid confusion, I reserve the label "SSR-type" for the dispositions to produce certain *L*-, *M*- and *S*-stimulations.

their earlier text where they introduced just superdeterminables, but not yet the more quantitative hue magnitudes (cf. Byrne and Hilbert 1997a). The introduction of the latter is therefore not warranted by explanations of this kind. This is not surprising if we have a look at the nature of what has in fact been explained: the similarities and differences among the hues in respect of whether they realise the same determinable property, namely that of being bluish. The situation is different if cases of distance resemblances are concerned. They normally are not to be accounted for in terms of some shared superdeterminable, but instead in terms of the values of the hue magnitudes in question.

To get clearer about the distinction between the two kinds of resemblance, consider the ambiguity of the statement that blue is subjectively more like purple than green. It may mean that blue is experienced as being closer to purple than to green on the circle (or diamond) of hues; or it may mean that blue shares the property of being a reddish hue with purple, but not green. That these are two independent ways of resembling each other is indicated by the fact that the former can occur without the latter. A yellowish red ($Y = 20$ % and $R = 80$ %) is subjectively closer to a greenish yellow ($Y = 80$ % and $G = 20$ %) than to a yellowish green ($Y = 20$ % and $G = 80$ %), despite the fact that the first hue shares exactly the same superdeterminable with each of the latter two, namely that of being yellowish. Something similar is true of the case in which we compare a pure red, say, with two different shades of slightly greenish blue. The independence of the two kinds of resemblance is also supported by the fact that a relative difference in shared superdeterminables can occur without a relative difference in hue distance. Purple is subjectively equally close to orange and to bluish-green (or greenish-blue) when their positions on the circle of hues are concerned. But it resembles only orange in being reddish.

Compare the analogy of three player positioned on a football pitch. Their locations may be compared relative to their distance to one of the goallines, or relative to their distances from each other. Whether they are (experienced as) being more or less similar to each other in one respect is at least to some extent independent of whether they are (experienced as) being more or less similar in the other. For instance, they may be positioned on the same line parallel to the goalline, or their positions may form an equilateral triangle. In both cases, the possibility of two kinds of similarity relations is due to the fact that the respective magnitudes are more than one: the pitch possesses two spatial dimensions, while hues show four dimensions which effectively (i.e., geometrically) come down to two as well (i.e., the reddish/greenish dimension and the yellowish/bluish dimension). Consequently, the specific points in the resulting two-dimensional space may be compared relative to both dimensions taken together, or instead relative to only one of the dimensions. This is the reason why subjective resemblance in hue distance is a different phenomenon from subjective resemblance in the sharing of a superdeterminable. The first may be accounted for in terms of represented hue magnitudes. But the explanation of the latter requires instead reference to represented superdeterminables.

Of course, closeness in hue can be construed as the property of sharing a relatively determinate colour determinable. But this does not undermine the distinctness of the two kinds of similarity. Sharing some determinable colour is not the same as sharing some superdeterminable, since the latter are not among the determinable colour properties: they are merely determinables of colours. One way of being coloured, for instance, might be to have a hue with an *B*-magnitude of 93 % and a *G*-magnitude of 7 % – or, alternatively, to be disposed to produce under normal conditions the respective output in the human visual system. But the distinct property of having a hue with a positive *B*-value, or with an *B*-value of 93 %, is not a colour property. It is not a full determination of the property of having a colour since there are two ways in which a particular shade of colour can realise this *B*-value: either by additionally having an *R*-value of 7 %, or by additionally having a *G*-value of 7 %. And this is in tension with the standard logic of determinables, which requires that maximally specific determinants can specify only one determinable on each level of determinacy (cf. Armstrong 1997: 48f.). Hence, while having one of the possible combinations of hue magnitudes may count as a colour property, having a specific hue magnitude cannot. Consequently, the respective superdeterminables are not colour properties, either[23]. They concern only one dimension of the hue space, while the experienced closeness or distance between two shades is measured along two dimensions.

Now, the latter may be understood more precisely in terms of the hue distance of the respective combinations of hue magnitudes. According to the graphical representation above, the latter can again be understood as being proportional to the distance of the shorter of the two paths on the outline of the diamond between the two corresponding points. This distance can in fact be calculated by means of the following complex formula[24]:

$$d = 400 - |R_1 + R_2 - G_1 - G_2 + B_1 + B_2 - Y_1 - Y_2| - |R_1 + R_2 + G_1 + G_2 + B_1 + B_2 + Y_1 + Y_2|$$

With the help of this formula, the subjectively accessible distance relations between hues may be explained in terms of all four hue magnitudes. Consider again Byrne and Hilbert's own example – this time read as an example of distance similarity. Blue seems subjectively to be closer to purple than to green because

[23] But of course, colours – or *SSR*-types – may still be said to be determinations of each of the hue magnitudes taken individually.

[24] One way of arriving at this formula is to rotate the coordinate system ($x = R - G + B - Y$; $y = R + G + B + Y$) and then to use the formula for the distance between two points on a square ($d = 400 - |x_1 + x_2| - |y_1 + y_2|$). The choice of 400 as the maximal value is due to the fact that each magnitude can, by stipulation, take 100 as their maximum value.

the respective experiences represent, for each of the three colours, specific values of the four hue magnitudes such that the distance value *D* for the first two colours is smaller than that for the first and the third colour. The mathematics involved is as follows. Pure blue corresponds to a *B*-value of 100 %, pure green to a *G*-value of 100 %, and a well-balanced purple to *B*- and *R*-values of 50 % each (while all other values amount to 0 %). The resulting value for the hue distance between blue and purple is 100, while the value for the hue distance between blue and green is 200. Accordingly, blue and purple indeed turn out to be less distant to each other than blue and green. And even the fact that the distance between the first pair of hues is experienced to be about half as much as that between the second pair can be predicted.

This example shows that certain particular shades of hues are ordered in the same way both relative to how they resemble each other in distance, and relative to whether they possess a common superdeterminable. The respective similarity statements may therefore be ambigious between the two kinds of resemblance. This may perhaps explain why Byrne and Hilbert did not pay attention to the fact that they used superdeterminables instead of hue magnitudes to account for the similarity relations that were meant to illustrate the applicability of the latter, and not the former.

5.

So far, so good. There are two kinds of subjective resemblance between hues. And while one is taken to be explained in terms of represented combinations of hue magnitudes, the other is assumed to be accounted for in terms of represented superdeterminables. There is no principle difficulty attached to such a multitude of resemblances and their explanations. But each of the two proposed accounts is none the less problematic.

The explanation of experienced similarities and differences in hue distance by reference to hue magnitudes is superfluous, even on *RNR's* terms. Given the actual correlation between *SSR*-types and proportions of hue magnitudes under normal conditions, the distance between two hues should also be calculable in terms of a formula mentioning the three wavelenght range dimensions *S*, *M* and *L* of the *SSR*-types instead of the proportions of the four hue magnitudes. That is, subjective resemblance in distance should already be explainable in terms of *SSR*-types (even though the mathematics might be more complex). Reference to represented proportions of hue magnitudes is not needed, especially given that the *SSR*-types are already assumed to be represented. There is thus no reason to think that proportions of hue magnitudes are represented as well.

The proposed account of the experienced sameness or difference in superdeterminables, on the other hand, is bound to fail because there is no independent motivation to accept that superdeterminables are in fact represented by our colour experiences. The only reason given so far is that it promises to explain the qualitative aspects of colour experience in representational terms. But what is fundamentally at stake is precisely whether such an account of the subjective character of colour experience is in fact to be had. Hence, we still need to be given a good reason for assuming that our colour experiences represent superdeterminables.

It cannot be the idea that there are no good alternative explanation of the subjective resemblance in shared hue superdeterminables. Both the rejection of naive realism and the rejection of reductionism (or the underlying physicalism) offer plenty of initially plausible possibilities to account for the qualitative character of our colour experience – whether, for instance, in terms of subjective modes of presentation of objective properties (cf. Shoemaker 1990 and Dorsch 2009), or indeed in terms of some projectivist account (cf. Boghossian and Velleman 1989 and 1991).

Nor does it seem possible to appeal to other aspects of our behaviour or our discriminatory abilities – over and above the already mentioned qualitative elements of our colour experiences – which cannot be explained other than by reference to the representation of superdeterminables. For instance, we do not in our daily lives individuate or classify objects according to their being either bluish or yellowish. Nor is there to be expected any biological or socio-cultural importance in distinguishing – or being able to distinguish – bluish from yellowish things. The reason for this is that the extension of the superdeterminables includes all hues located on one side of the circle between two opposite unique hues. Accordingly, nearly every other coloured object is experienced as, say, bluish. And, in contrast to hue magnitudes, superdeterminables do not come in grades: an object is either bluish or not. As a result, it is not surprising that coming to know about the instantiation of a certain superdeterminable has not any specific cognitive or behavioural significance for us: this piece of knowledge is just too indiscriminatory. Superdeterminables differ in this respect from more determinate properties – such as being vermilion – which are crucial, for instance, for the differentiation of objects (cf. Thompson 1995: 113).

Identifying colours with the dispositions to produce certain proportions of hue magnitudes, rather than with the distinct *SSR*-types, might help to solve the problem of the representation of superdeterminables. For representing the property of having a hue with specific positive percentages of one or two hue magnitudes would involve representing the more general property of having some positive percentage or another of these magnitudes. But it would also render colours too dependent on the nature of the human visual system.

Consider the possibility of a future change in which *SSR*-types give rise in the human mind to which proportions of hue magnitudes. The future humans would still discriminate objects in respect of their different *SSR*-types, but they might represent these objects as standing in different third-personally accessible similarity or mixture relations[25]. For instance, which *SSR*-types would be correlated to a value of 100 \% in a single magnitude might be changed. Following the spirit of the selectionist idea introduced above, the most natural interpretation of this case for a proponent of *RNR* is that the future subjects still perceive the same colours as we do, but pick up on different qualitative features of them than we do. The underlying selectionist thought is that – just as objects possess infinitely many colours only some of which subjects of a certain type are sensitive to – colours stand in many different similarity and mixture relations to each other only some which those subjects are able to recognise. For there is no good argument to the effect that, from the point of view of *RNR*, the physical properties identified with colours, which subjects of a certain type are perceptually sensitive to, resemble each other only in one way, or count as unique only in one sense. But in the absence of such an argument, colours should not be identified with the dispositions to produce proportions of hue magnitudes, since this would require without any good reason to understand the future humans as being sensitive to different colours than us, and not merely to different qualitative aspects of the same colours.

This preference for *SSR*-types as colours is reflected by the fact that, while it is essential to colour perception that it involves and requires sensitivity to the intensity of light at different wavelengths, the same is not true of visual processing resulting in the representation of proportions of four hue magnitudes. If the detection of certain properties does not happen by means of sensitivity to light, the properties concerned should not count as colours. But if their recognition does not involve the specification of the relative values for four hue magnitudes (in the same way as in the human mind), this does not suffice to doubt their status as colour properties.

Consequently, if colours are to be identified with certain reflectance properties at all, these should be *SSR*-types, rather than dispositions to produce certain proportions of hue magnitudes. But this also means that *RNR* cannot properly motivate its claim that our colour experiences represent the superdeterminables in addition to determinate and determinable colour properties. Hence, the experienced similarities and differences in superdeterminables cannot be properly accounted for by the reductive version of *Naive Realism* about colours.

The preceding considerations have also consequences for Byrne and Hilbert's – as well as Allen's – suggested solution to the so-called location problem. It is a well-noted fact that human subjects differ substantially in which objects they take to possess unique hues under normal viewing conditions (cf. Hardin 1988 and Allen 2010a). Assuming that there is a determinate answer to this issue, the majority of these ascriptions have to be false. But this widespread occurrence

[25] It is important to note that what is at issue here are not conditions on how colours are subjectively given to us in colour experience, but rather conditions on how colour processing in the brain works.

of systematic error threatens the idea that uniqueness is a mind-independent feature of objects out there to be recognised by us. That some of us get it right looks just like an accident in the light of the fact that most of us get it wrong.

In response, Byrne and Hilbert (in their 1997) argue – and Allen (in his 2010a) follows them in this – that our respective colour experiences should still count as veridical on the level of determinable colour properties, despite being largely erroneous about the status of the most determinate ones (i.e., whether they are unique or not). For our experiences can still be said to correctly represent objects as exempliflying more determinable properties. Accordingly, Allen contends that people may disagree and err about whether this or that object is, say, of a purely green shade, while still recognising correctly and in agreement that they are both "greenish" (Allen 2010a: ***). On the assumption that our colour experiences do not represent any of the superdeterminables, this solution to the location problem should, strictly speaking, be understood as meaning that the veridically represented determinable properties are certain colour determinables (e.g., being green), instead of the superdeterminables (e.g., being greenish)[26].

6.

The proponents of *RNR* face a second difficulty in relation to the elucidation of colour resemblance. For similarities and differences between coloured surfaces are not the only instances of hue resemblance that we experience. We also see fluids or gases in glass bottles, volumes of transparent plastic or glass, films, foils and, of course, also light and its sources as coloured. And the respective colour experiences do not only show the same categorial and qualitative aspects as those of coloured surfaces, but also reveal subjective resemblance relations – in particular, cross-substance ones. The hue of *Campari* looks roughly the same as the hue of a red traffic light, or that of the football shirts of *Manchester United*. And they are all experienced by us as standing in the same similarity and mixture relations with other colour hues, independently of whatever material or non-material substance instantiates them.

RNR needs to be able to explain subjective cross-substance resemblances as well, in order to count as providing an adequate theory of colours and our first-personal experience of them. The obvious problem is that transparent objects or light sources do not – or not merely – reflect light: the transmission and emission of light is of importance as well. Byrne and Hilbert (in their 2003) tackle this issue by introducing productances, which are characterised in terms of how much light leaves a coloured object which is illuminated in a certain

[26] Perhaps this is the reading preferred by Byrne and Hilbert, and Allen, as well. The properties of being green and of being greenish differ not the least in their extensions. For example, a yellow object with a slightly greenish tinge (i.e., a greenish-yellow object) is greenish, but not green. Instead of the latter, it is yellow. Compare also Tye (2000: 169) who argues that uniquely yellow objects do not appear to be yellowish.

way. Accordingly, productances are dispositions of coloured entities to produce a certain proportion of light for each wavelength of the visible spectrum, and relative to the incident light. Different entities produce light in one or more of the three different ways already mentioned: by reflecting or transmitting incident light, or by emitting light themselves. *SSRs* are a special case of productances, given that they are identical with the productances of objects which do not transmit or emit light.

Productances can then be grouped together in types of productances which are – analogously to *SSR*-types – specified in terms of the integrated sum of intensities in the three bands of the spectrum *L*, *M* and *S*. These types of productances may then be identified with colours, and it may be attempted to trace back the qualitative aspects of colour experience to the representation of productances types in the way suggested with respect to our experiences of surface colours. But apart from the problems already raised with respect to the more special case, the introduction of productances to account for cross-substance resemblances faces a dilemma concerning the identification of the most determinate colour properties of entities.

Surface spectral reflectances are determinations of productances. One way of having a certain productance is to possess a certain *SSR*. Similarly, *SSR*-types are determinations of types of productances. But instantiating a certain *SSR*-type is not the only way of instantiating a specific type of productances. The latter can also be realised by a suitable combination of a reflectance and a transmission property (e.g., exemplified by a coloured window), or by a suitable combination of a reflectance and an emission property (e.g., exemplified by a working lamp). Types of productances are therefore less determinate than – and not identical to – *SSR*-types. This raises the issue of which of the two constitute most determinate shades of colour.

If it is really the productances which are identified with colours, we get the desired result that the variety of different material or non-material entities listed above can indeed instantiate one and the same colour properties. But, in the case of experiences of surface colours, it remains still true that they are sensitive to and nomologically correlated to *SSR*-types. The colours that we are experiencing are given to us as surface, volume or illuminant colours. That is, we see the difference between them, despite their shared qualitative features[27]. As a consequence, a proponent of *RNR* should say that our colour experiences represent, and discriminate between, not only the types of productances, but also the more determinate *SSR*-types. But it then becomes entirely ad hoc to exclude the latter from being colour properties as well: they do not seem to differ in any relevant respect from the former, apart from their determinacy and their restriction to non-transparent and non-emitting surfaces.

[27] The property of being a surface, volume or illuminant colour is thus perhaps better understood as one of the categorical features of colours.

If, on the other hand, the *SSR*-types are taken to be the most determinate colour properties of such surfaces, being of a particular hue becomes a disjunctive property. For in the case of volumes, films, light rays and light sources, very different determinants of types of productances – which also involve types or transmission or emission properties – are to be identified with their most specific colours. Moreover, this disjunctiveness of colours turns up again on levels of less determinacy. If having a certain *SSR*-type is already a way of being coloured, then less specific *SSR*-types – such as those shared by all vermilion or red objects – are ways of being coloured, too. And the same is true for the respective properties of volumes and illuminants, so that the properties of being, say, vermilion or red become disjunctive as well. That is, there is surface-vermilion, volume-vermilion and illuminant-vermilion. But this is not only in tension with the proposed explanation of cross-substance resemblance, given that one thing to be explained is the fact that different entities can possess exactly the same colour properties, independently of whether they are surfaces, volumes or illuminants. It also goes against our ordinary practice to not draw these distinctions when categorising objects in accordance with their colour properties[28].

To conclude, the preceding considerations have suggested that *Reductive Naive Realism* cannot accommodate two important aspects of our experiences of colours as similar to, or different from, each other. First, it has difficulties to account for subjective resemblances concerning the presence or absence of superdeterminables because it cannot satisfactorily motivate its assumption that our colour experiences represent such superdeterminables. And second, in its attempt to elucidate the cross-substance similarities in hue, it faces the dilemma of either accepting that the most basic properties, which our colour experiences allow us to discriminate, are not colours, or maintaining that, despite appearances, different substances instantiate different sets of colour properties. Both resemblance-related objections cast serious doubt on the truth of *Reductive Naive Realism*.

As a consequence, the two sides of colours and colour experiences turn out to be more separate than perhaps hoped for. On the one side, there is our first-personal access to experienced hue properties and to their categorical and qualitative features. And, on the other side, there is our third-personal access to the nomologically correlated reflectance properties with their types and second-order features. If the arguments presented in this essay are on the right track, then these two sides cannot be reconciled with each other by means of an identification of the two kinds of properties concerned. That is, the second ambition described at the beginning should be given up. This does not mean that the two perspectives have turned out to be incompatible with each other. It just means that they are not concerned with one and the same kind of property.

[28] There may also be more general problems with the assumption of disjunctive properties (cf., e.g., Armstrong 1997: 26ff.).

Should we then identify colours with the first-personally or the third-personally accessible properties? The first option amounts to a dismissal of reductionism and, presumably, also of the representational understanding of the link between colour experiences and colours. But what many find problematic about this is the refusal to see the need to identify a place for the qualitative aspects of experience within our scientific picture of the world. The second alternative, on the other hand, constitutes a rejection of naive realism and, therefore, also gives up any hope of being able to live up to the first ambition of taking colour experiences at face value. But this is often taken to be unattractive because it requires the adoption of an error theory about how things seem to us from our subjective perspective[29]. Both choices are therefore rather stark. Which is to be preferred, however, has to be addressed on another occasion[30].

[29] Broackes 1992, Campbell 1993, McDowell 2004 and Allen 2004, for instance, argue for endorsing the first option, while Hardin 1988, Boghossian and Velleman 1989 and 1991, Armstrong 1997 and Dorsch 2009 defend the second. I am now less convinced than I was in the past whether the second option is really preferable over the first.

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