

Defence of the Primary Quality View of Colour

By

Jacek Jerzy Brzozowski

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As the candidate's supervisor I have approved this thesis for submission.

Signed: 

Name: S.M. BECK

Date: ...03/12/2001.....

Abstract:

The aim of this thesis is to defend what is known as the primary quality view of colour. It will do this by arguing that this view better meets our conceptual schema than either of its rivals—the subjectivist view or the secondary quality view. In pursuing this project, I highlight the five core beliefs (as identified by Johnston 1992) that make up our colour conceptual schema, identifying the two strongly realist beliefs as making up our prime intuition, and on these grounds I immediately reject the subjectivist stance. I then set out the primary quality view's main rival, the secondary quality view, and show how dispositionalists have argued that this view is best able to accommodate our core beliefs. However, I identify empirical findings that raise problems for the secondary quality view, revealing its inability to satisfy our extended colour concepts as well as an inability to adequately explain certain deviant cases.

The core of my argument against the secondary quality view comes from what I call problems of causation, where I argue that as dispositions are not causes they are unable to meet our prime intuition, and therefore cannot be colours. I therefore set up a version of the primary quality view of colour, identifying colours with microphysical properties (or complexes thereof) and show why this view does not face the same problems of causation as the secondary quality view. I then argue that the secondary quality view does not have the advantage over the primary quality view, when it comes to the rest of our core beliefs, as its supporters would have us believe. I show how a primary quality view is able to fit all these core beliefs into our overarching colour conceptual schema, without having to appeal to the ontological extravagances that dispositionists must bestow upon colour.

Finally, I address two criticisms from commonsense that are laid against the primary quality view, and argue that the primary quality view is able to meet these conceptual demands and thereby conclude that the primary quality view is the better of the putative candidates competing for capturing the ontological status of colour.

The whole of this thesis, unless specifically indicated to the contrary in the text, is my own original work.

Signed:

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Defence of the Primary Quality view of Colour.

Introduction.

The aim of this thesis is to defend what is known as the primary quality view of colour. It will do this by arguing that this view better meets our conceptual schema than either of its rivals—the subjectivist view or (its main rival) the secondary quality view.

The concept of colour has been referred to as a Janus-faced concept. On the one hand we believe that colours are real properties of objects, which exist out in the world independently of us perceiving them. This can be seen in the way that we attribute colour names to objects: we say that rubies *are* red and emeralds *are* green. This is the objectivist face of our colour concept. On the other hand we believe that colours are *coloured*, in the sense that they are presented to us in experience, as red-ness, green-ness, blue-ness, and so on. This is the subjectivist face of our colour concept.

Our commonsense (pre-theoretical) view is a strongly realist view, we see the colours of things as being ‘out there’ (colours as properties of objects), independent of observers. This is the central tenet of the primary quality view of colour. The primary quality view is therefore an objectivist stance and philosophers holding this view identify colours with physical properties of the world.

Since Newton, philosophers have turned away from the primary quality view, arguing that, as we have seen from physics, there is no ‘colour as we experience it’ out in the world. Some have therefore argued that what is central to our concept of the property of colour is not that it is equated with, or supervenient upon, some physical property, but rather that when one speaks of colour one refers to the phenomenological aspects of colour (red, green, blue, etc., as we experience these). These philosophers thus argue that colour is entirely ‘in one’s head’ and therefore the world is coloured only in the sense that one projects colour out onto the world.

The debate is traditionally set up around two conflicting aspects of our commonsense belief about colour: externality (objectivity) and phenomenology (subjectivity). Theories about the nature of colour (its ontological status) have therefore been formulated on either side of this objective-subjective divide, with either externality or phenomenology being given ontological priority, while the other is given up (or at least shifted).

This has led to a third position in the debate. This position, known as the secondary quality view (or dispositionalism), attempts to find a middle ground, saving both externality and phenomenology by arguing that colours are secondary qualities in that they consist in a power or disposition to produce a sensory experience in a perceiver, this power being grounded in primary qualities. This is a relational stance as the identification of colours is dependent on the experiences of the perceiver (or at least to the experiences of what is often referred to as the “normal perceiver”), and if there ceased to be perceivers so too would there cease to be colour.

The question of the nature of colour then comes down to a conceptual one. We are presented with three putative candidates with which colours can be identified: primary qualities, subjective properties, or secondary qualities. “To settle the question, we need to discover which way of conceptualising color allows us to account for both pre-theoretical intuitions regarding color and the wide range of color phenomena” (Hilbert: 1987: 16). We need to (in Jackson’s terms: 1998a) ‘locate’ colour, and the first step is to define the subject at hand, discovering what we mean when speaking of ‘colour’. We therefore must analyse our conceptual schema, identifying the various concepts that fall under this schema as well as how these stand in relation to our other concepts, looking at which concepts are central and which are more peripheral. We then must look to which of our colour candidates best satisfy our colour conceptual schema (our commonsense view of what colour *is*, and our use of colour terms) as well as how they stand up to various empirical findings and deviant cases (brought to light through the use of thought experiments).

In pursuing this project, I will proceed as follows. In Section 1 I will highlight the five core beliefs (as identified by Johnston 1992) that make up our colour conceptual schema. On these grounds I will immediately reject the subjectivist stance, and then set out how

dispositionalists have argued that the secondary quality view is best able to accommodate these core beliefs.

In Section 2 I will show how empirical findings raise problems for the secondary quality view, revealing its inability to satisfy our extended colour concepts as well as an inability to adequately explain certain deviant cases.

In Section 3 I will argue, from what I will call problems of causation, why dispositions cannot be colours. I will then set up a version of the primary quality view of colour and show why this view does not face the same problems from causation as the secondary quality view.

In Section 4 I will argue that the secondary quality view is not able to meet all the core beliefs as easily as its supporters would claim, and then show how a primary quality view is able to fit all these core beliefs into our overarching colour conceptual schema.

Finally, in Section 5 I will address two criticisms from commonsense that are laid against the primary quality view, and will argue that the primary quality view is able to meet these conceptual demands and thereby conclude that the primary quality view is the better of the putative candidates competing for capturing the ontological status of colour.

Section 1

Section 1.1

Our Core Beliefs

The question of colour has been a source of great anxiety for philosophers, as it is most often divided into two seemingly incompatible positions, both having conceptual appeal, yet neither seeming to wholly satisfy our conceptual schema. The objectivist view appeals to our belief that colours are real properties of objects (either microphysical properties (Jackson: 1998) or surface spectral reflectances (Hilbert: 1987)) in the external world, while the subjectivist view appeals to our experience of colours (colour as red-ness, green-ness, blue-ness, etc.), arguing that as these phenomenological aspects cannot be found in the perceiver-independent world, colour must be a product of our mind.

Johnston (1992) argues that both these views “are each in their own way perfectly true” (Johnston: 1992: 221), depending on how inclusively¹ one talks about colour. His proposed methodology is that we draw out our beliefs about colour, separating out our ‘core’ beliefs (those which we use to define the subject which we are investigating) from the more ‘periphery’ beliefs (those that we hold towards the defined subject, yet can be changed without changing the subject). From this we are able to identify which concepts of colour are central to our colour -beliefs and –practices, thereby identifying those that we are able to give up in pursuit of a coherent theory without changing what we are talking about when we speak of colour.

Johnston (1992: 222-223) identifies what he believes to be five of our core beliefs about colour:

1. *Paradigms*. Some things that we take to be paradigms of a certain colour are that colour. Thereby this is the belief that rubies, which we take as being red, really *are* red, and that emeralds, which we take as being green, really *are* green.

¹ “*Ever so inclusively speaking* the external world is not colored. *More or less inclusively speaking* the external world is colored” (Johnston: 1992: 221).

2. *Explanation.* Something that is a certain colour sometimes causally explains our visual experience of that thing being that colour. Therefore as there are colour properties of objects that typically cause colour-experiences, these colour-experiences can usually be explained as being veridical responses to those colour properties.
3. *Unity.* Every determinate shade of colour has a unique place in a network of colour relations (similarity, difference and exclusion relations). This is usually thought of through the phenomenological relations between hue, saturation and brightness/lightness within colour-experience, whereby certain shades are either grouped together or kept distinct through their phenomenological similarities and differences. An example given in the literature is that canary yellow is not a shade of blue as it is not as similar to the shades of blue as their similarities amongst each other.
4. *Perceptual Availability.* Simply on the basis of visual perceptual, we are justified in believing that certain things are certain colours (provided that you take the viewing conditions as standard and consider yourself a normal perceiver). Therefore when one has a canary yellow colour-experience when looking at a canary, one is justified in claiming ‘that canary is canary yellow’, based solely on the colour-experience (the information from the experience) as well as background beliefs about typical causes of visual experience which inform ordinary perception.
5. *Revelation.* The intrinsic nature of each colour is fully revealed by a visual experience of each of these colours, whereby when you have a colour-experience you know all there is to know about that colour.

One can see the objective-subjective distinction working within these five core beliefs, thereby dividing up our conceptual schema. Paradigms and Explanation appeal to our concept of colour as external and real, thereby as objective properties of objects that typically cause colour-experience. On the other hand, Unity, Perceptual Availability, and Revelation appeal to our concept of colour as phenomenologically presented, thereby as subjective properties of colour-experience². Johnston argues that a coherent account of colour that can preserve most

² Although availability does make a claim to externality, the emphasis lies on the phenomenology: “...if external things are canary yellow we are justified in believing this just on the basis of visual perception and the beliefs which typically inform it” (Johnston: 1992: 222).

of these core beliefs, saving as much of our conceptual schema as possible, is the account that should thus be accepted.

Section 1.2

Dispositionalism

Following this methodology, a number of philosophers (Johnston: 1992; Levin: 2000) have rejected what they see as the two extremes of objectivism and subjectivism- arguing that by accepting either one, one must give up too many of our core beliefs- and embraced a (in some way or another) modified Lockean dispositionalism that they argue allows one to salvage both externality as well as phenomenology.

Lockean dispositionalism stems from Locke's distinction (this distinction was earlier made by Boyle, however Locke gave it the mature form from which dispositionalist theories were created) of primary and secondary qualities, whereby colours (much like taste, sounds; odours, etc.) are taken as secondary qualities in that they consist in a power to produce ideas in a perceiver, this power being grounded in primary (perceiver independent, physical) qualities.

“Material things interact with one another in regular causal ways: hence we can say that each thing has various powers. To say that a certain thing has a certain power is just to say that it would affect or be affected by another thing of a certain sort in some specific manner. A power is not the cause of such and such an effect; rather to have the power is to be such as to cause the effect. The cause... will be some set of properties... of the thing that has the power: it will generally be, or at least include, some set of properties of the minute parts of that thing, of the collection of particles of which it is composed... That is, material things have powers to produce sensations and perceptions in us, and these powers, like any others, have grounds or bases in the intrinsic properties of things... *Secondary qualities*... of which he gives examples of ‘colours, sounds, tastes, etc.’, he does identify with powers: they are ‘nothing in the

object themselves, but powers to produce various sensations in us by their primary qualities” (Mackie: 1976: 9-12)

Locke however acknowledged “the possibility that ‘by the different Structure of our Organs’ different ideas of colour should be produced in different minds by the same intrinsic attributes” (Ayers: 1991: 207), thereby if two perceivers, who’s sensory organs were sufficiently different, looked at the same object, it is possible that one could have a yellow colour-experience while the other could have a blue colour-experience. However recognising this problem, “he was careful to make it clear that he did (very reasonably) believe that people’s senses in fact function in similar ways to similar effect” (Ayers: 1991: 209), thereby bringing about a standardisation by dispositionalists of colour perceivers: the standard colour perceiver being any one of us who’s perceptual system functions much like the majority of our perceptual systems function. Through reference to standard perceivers, dispositionalists then avoid criticisms from (imagined) possible cases of inverted colour perception as well as from the more common cases of colour-blind individuals (these being non-standard perceivers).

Secondary quality theories of colour therefore (roughly) hold that the colours of objects are the dispositions (Locke referred to these as ‘powers’) of these objects’ surfaces to produce certain perceptions/experiences (Locke referred to these as ‘ideas’) of colour in standard viewers under standard viewing conditions (standard conditions are those conditions under which objects are usually observed, thereby avoiding problems of colours viewed under darkness or through coloured glasses, and so on). Thereby dispositionalists attempt to incorporate both the causal properties of objects that underlie the disposition, as well as the “ineliminable subjective element in the analysis of colour” (Thompson: 1995: 31).

Modifications of this account therefore tend to vary mainly in where they choose to place emphasis: either on the physical surfaces (thereby more in the objectivist camp; for example Johnston 1992), or on the perceived colours (thereby more in the subjectivist camp; for example Peacocke 1984). However with this general structure underlying most dispositional theories, dispositionalist hold that they are provided with “grounds for speaking of objects’ being “coloured”, meaning that they produce *some perceived colour or other in viewers*” (Harvey: 2000: 138).

Dispositionalism is therefore a relational theory, in that it relies on physical properties of objects, the (standard) circumstances in which perception is taking place, the physical perception mechanisms of (standard) perceivers, as well as the phenomenological (subjective) aspects of the colours perceived. The disposition is then used to unify these separate aspects (to a lesser or greater degree): the physical properties of objects that are coloured play a causal role (reflecting different wavelengths of light) in such and such circumstances, stimulating the physical perception mechanisms (the photosensitive pigments found in the rods and cones, which then have a causal effect on the post-receptoral channels) of such and such perceivers, causing these perceivers to have such and such experiences (through brain stimulation from the perceptual mechanisms) of colour (red-ness, green-ness, purple-ness, etc.). I should admit here that most dispositionalists seem not use the word ‘cause’, but rather refer to the objects ‘disposition to produce’³, though I believe that ‘cause’ is the more accurate word when one looks at the colour vision process, and I will argue (in section 3.1) that it is this causality that shows that the dispositional account’s secondary quality does not deserve the label ‘colour’.

I have left the dispositionalist account above rather general, thereby allowing it to accommodate most dispositional theories. Most alterations to this general structure are responses to various objections, and depend on the dispositionalist’s metaphysical leanings. I will bring to light some of these alterations when looking at the responses that dispositionalists make to charges of their theory violating common sense (our core beliefs), though will ultimately argue that it is this general structure that is inadequate in offering us the ontological status of colour.

³ “Colors, after all, are response-dispositions, that is dispositions to produce experiences of certain sorts in perceivers” (Levin: 2000: 154); “...the colour of an object is determined by its disposition to produce certain “perceived colours” in normal or standard viewers” (Harvey: 2000: 138); although: “There are intrinsic features of x which... would cause R in S under C” (Johnston: 1992: 234).

Section 1.3

Response-Dispositionalism

Johnston (1992) argues that most of the criticisms of dispositionalism are directed at a simplified and inadequate account of dispositionalism that is stated in terms of counterfactual conditionals for objects, whereby: a property is a colour disposition iff that property would look such and such a colour to a standard subject in standard circumstances. He argues that this fails in that its corresponding dispositional conditional -if that object were in such and such circumstances, it would produce such and such a response in such and such a subject- is too simple in that it ignores the effects of extrinsic features on the object that has the response-dispositional colour property. Johnston puts forward an example of one such counter-example to the simple dispositional account. He asks us to imagine a shy and highly intuitive chameleon that is green in the dark, as a result it would intuit when it is about to come into a viewing condition (i.e., a light being turned on) and would therefore instantaneously blush, thereby turning bright red. Therefore even though the chameleon is green in the dark, if viewed it would look red as it would be blushing.

Johnston argues that in this case, which he refers to as altering, the extrinsic property of being the skin of a chameleon that is shy and intuitive, leads to the chameleon blushing and thereby turning red when in viewing conditions. If it were not for the extrinsic property of a shy and intuitive psychology, then the chameleon's skin would look green when placed in viewing conditions. He argues that dispositions are stable properties of objects. Therefore by separating dispositionalism from the dispositional conditional he allows colours to be dispositions even though some objects that have these dispositions do not manifest that object's colour (true colour, i.e., the green of the chameleon) under standard viewing conditions.

He proposes that colour be taken as a constituted response-disposition, which he defines "*as a higher-order property of having some intrinsic properties which, oddities aside [i.e., altering], would cause the manifestation of the disposition in the circumstances of manifestation*" (Johnston: 1992: 234). Therefore an object has intrinsic properties, which are the constituting basis of its disposition to produce a mental response in such and such a subject under such and such circumstances.

Section 1.4

Prime Intuition

Dispositionalism can be seen as an attempt to consolidate (what Jackson refers to as) our prime intuition that the external world is coloured, with the subjectivist's accusation that science has shown us that the external world does not have the features that correspond to our experience of colour.

Our prime intuition stems from our pre-theoretical realist belief that the external world is coloured, that "'red' denotes the property of an object putatively presented in visual experience when that object looks red" (Jackson: 1998a: 89). As Paradigms and Explanation show our conception of colour to be a conception of real properties out in the world, these make up our prime intuition. Taken together they reflect that we believe that some things in the external world that we see as red *are* red, and that this perception of red can be explained as a red property of that thing causing the red-experience, thereby adhering to our prime intuition. I believe that one is justified in claiming that this is our prime intuition as this is the way that we talk about colour: we refer to objects in the world as either *being* red, or *being* green, or *being* blue, etc. Our use of colour terms is not in reference to the natures of our colour-experiences, but rather to features of objects that we take as causing these experiences (the feature which our colour-experiences represent), where "[t]he evidence for this is that we look at the objects; we do not introspect... [and further] we take it for granted that it is a good idea to look carefully, and in good light, and that others may be in a better position to rule on the object's color than we are" (Jackson: 2000: 153-154). By denying this intuition, thereby accepting a subjective stance, one would have to claim that the world is invisible, or at least that we do not *see* the objects, as we see objects by seeing them as coloured (as having a colour-property that causes us to have a visual experience). As our pre-theoretical colour terms are based upon the assumption that the world is coloured, a denial of our prime intuition would therefore involve a radical change in our colour language. When undertaking conceptual analysis in defining a subject it is important to go where our conceptual language (hence ways of conceptualising a subject) takes us. Small changes in conceptual language are however permissible, this being when we discover that we have certain incompatible concepts, both being referred to through the use of the same term/word, or when we uncover a certain (circumstantial) bias motivating our term usage. As Jackson (1998a) points out:

“There is nothing sacrosanct about folk theory. It has served us well but not so well that it would be irrational to make changes to it in light of reflection on exactly what it involves, and in the light of one or another empirical discovery about us and our world” (Jackson: 1998a: 44). These changes however must ensure that they remain within the overarching conceptual schema, and do not in themselves appeal to extravagances that are not part of our common sense view (thereby amount to changing the subject). Change is thus justified when used to provide clarification, separating out and ordering those intuitions that are sometimes mistakenly conflated, thereby offering us a better way to speak about what we actually mean when we speak of such and such a subject (such as colour). As the consequences of denying our prime intuition are deeply counter-intuitive and highly undesirable, this justifies my claim concerning the importance of our prime intuition. The subjectivist position, arguing for phenomenology over externality, is however incompatible with our prime intuition. As the price of denying our prime intuition is so high, I believe this is reason enough to reject subjectivist properties as a candidate for the ontological status of colour.

Therefore, those that hold a primary quality view of colour and those that hold a secondary quality view both appeal to the two core beliefs of Paradigms and Explanation that make up our prime intuition. Explanation is often seen as the core belief that gives one reason to choose the primary quality view over dispositionalism, as when one looks for the explanatory causal property of a colour perception, it is the most basic cause that should be given preference, and this most basic cause is that given by the primary quality account, it is the intrinsic properties (the constituting basis) that make up the disposition/higher order property⁴.

“I grant that *if* the best candidate to be that to which we are responding were the disposition, it might be reasonable to lower our standards and allow that when something looks red, that to which we are putatively responding is the disposition to look red. But there is no need to lower our standards. There is a better candidate to be that to which we are responding, namely, the (primary quality) causal basis of the disposition” (Jackson: 1998b: 87)

⁴ I will expand on this in section 3.

Johnston argues that when it comes to explanation, if one looks at what the defenders of the primary quality account are actually claiming, one sees that the primary and secondary quality accounts are equally basic. He puts forward an account of Zinka the canary and a lifelike photograph of her, arguing that the experience of canary yellow when looking at Zinka is caused by a physical property (P_1) that is very different to the physical property (P_2) that caused the canary yellow experience when looking at a photograph of Zinka. What the primary quality theorist therefore must say is that canary yellow is a disjunctive property consisting of the disjuncts P_1 , P_2 , as well as all the other different physical properties that cause the experience of canary yellow. He thereby argues that whether one follows the secondary quality view and refers to Zinka's colour as the higher-order property of having lower-order intrinsic properties which would cause the appearance as of a canary yellow thing, or the primary quality view and refers to Zinka's colour as the disjunction of lower-order physical properties, one merely chooses between two views that are both one removed from the property P_1 . Arguing that we "get from P_1 to the Primary Quality of canary yellow by moving, as it were, sideways to the disjunction. We get from P_1 to the Secondary Quality of canary yellow by moving, as it were, upwards to disposition" (Johnston: 1992: 236).

Dispositionalists thereby argue that as both the primary quality view and the secondary quality view are on equal footing when it comes to our prime intuition, one must turn to our other core beliefs to settle the dispute. They go about addressing Unity, Availability and Revelation, arguing a secondary quality view is able to account for these, while the primary quality view leads one into inconsistency, having to give up at least two of our core beliefs, this being too high a price to pay. They therefore argue that as their view is able to maintain our prime intuition while better maintaining our other core beliefs, one should accept secondary qualities as the better of the two possible properties that deserve the label 'colour'.

Section 1.5

The Demands of Revelation

“The hardest of these beliefs to explicate is Revelation” (Johnston: 1992: 223)

Johnston finds revelation to be the truly problematic belief for the dispositionalist position⁵. This worry stems from Russell’s claim that through acquaintance (experience) with colour one knows the colour itself perfectly and completely, and though one can learn further truths about the colour, these truths would not add anything to one’s knowledge of the colour itself.

“...knowledge by acquaintance, is essentially simpler than any knowledge of truths... we have acquaintance with anything of which we are directly aware, without the intermediary of any process of inference or any knowledge of truths... The particular shade of colour that I am seeing may have many things said about it... But such statements, though they make me know truths about the colour, do not make me know the colour itself any better than I did before: so far as concerns knowledge of the colour itself, as opposed to knowledge of truths about it, I know the colour perfectly and completely when I see it, and no further knowledge of it is even theoretically possible” (Russell: 1912: 25)

Russell thus holds that according to our commonsense understanding of colour, visual experience of a colour fully reveals that colour’s intrinsic nature. Strawson (1989) takes up this worry and argues further that “color words are *words for properties which are such a kind that their whole and essential nature as properties can and is fully revealed in sensory-quality experience given only the qualitative character that that experience has*” (Strawson: 1989: 224), thereby arguing that if we deny that colour-experience is transparent in this way, then we are no longer speaking about colour.

⁵ The extent of this worry is shown in Johnston 1996 where he rejects his earlier dispositionalism on the grounds of its failure to accommodate revelation.

Johnston admits that we are “inclined to feel the pull of Revelation” (Johnston: 1992: 224), though he does not believe that this means that dispositions are not colours. He argues that the nature of certain dispositions (he gives the example of the disposition of an apricot to produce a feeling/response of nausea in him) may be revealed through the manifestation of that disposition, as “it is plausible to hold that if one has an experience of the kind in question, and takes that experience to be a manifestation of the disposition in question, one thereby knows the complete intrinsic nature of the property which is the disposition” (Johnston: 1992: 225). The disposition is then, much in the same way, revealed in what are known as un-steady colours (or highlights), which are those colours that alter with changes in light and perceiver positioning (such as the colours on the back of compact discs), in that these un-steady colours look relational. The problem from Revelation that remains however, is that the steady colour (these are most of the colours that we speak about) do not look relational, therefore do not *look* like dispositions to look coloured. Experience therefore does not reveal steady colours as intrinsically relational, as is demanded by Revelation. As Boghossian and Velleman (1989) emphasize, there is therefore a disparity between our concept of these steady colours-as-commonsense-presents-them and colours-as-dispositions. A similar worry is raised by McGinn⁶ when he argues that “... we do not *see* colors as dispositions to cause experiences” (McGinn: 1996: 538).

Johnston’s reply is to argue that, from psychophysics, we have only three options as to the causes of colour experience: 1. non-dispositional microphysical properties; 2. light-dispositions; or 3. psychological dispositions (this being what am I referring to as dispositionalism or the secondary quality view). Non-dispositional microphysical properties and light-dispositions are both not revealed through colour experience, as one needs to turn to science to find these, therefore they defy Revelation. He argues further that even though one can take the manifestation of a disposition to reveal the nature of the disposition to look a certain way (if the subject takes the experience to be the manifestation of a disposition), steady colours are not revealed as dispositions in colour experience, therefore experience cannot reveal the intrinsic nature ‘fully/wholly’. He thus concludes that as none of the external causes given to us from psychophysics can be revealed fully through colour experience, Revelation (in the strong sense that forms part of our core belief of Revelation) is incompatible with Explanation (Explanation, we have already noted is part of our prime

⁶ McGinn (1983), like Johnston (1992), supported dispositionalism, and like Johnston (1996) later (McGinn 1996) rejected it on the grounds of revelation.

intuition and therefore should not be given up). He therefore argues that Revelation is too great a demand for our concept of colour, and therefore we should accept that “our visual experience is the occasion of our making a cognitive error, the error of taking features of our experience to transparently reveal the nature of certain external features” (Johnston: 1992: 224).

He argues, that one need not however follow Russell’s restrictive demand upon acquaintance, in that one may take acquaintance as a matter of degree, arguing that through acquaintance with properties one may know various similarity and difference relations, thereby “we do not need a complete revelation of the nature of a property to be acquainted with the property. Vision can thus acquaint us with the response dispositions that are the colors of the Secondary Quality account, even though vision fails to represent them as dispositions” (Johnston: 1992: 254-255). This acquaintance that dispositionalism allows is what Johnston views as one of the most important advantages that constituted response-dispositionalism holds over the primary quality account, as when one conceives of a colour of an object as the constituted disposition to produce such and such a visual response in a subject, and one finds oneself responding in such and such a way, then one knows all there is to know about the essential nature of the dispositional property that is that colour, though the constituting bases that underlie these dispositions are not revealed. One is thus acquainted with the dispositions (the secondary qualities) but not the constituting bases (the primary qualities), therefore he argues that if one holds the primary quality view one is forced to accept the counter-intuitive consequence that we are not acquainted with colours.

Section 1.6

Meeting the Demands of Revelation

Levin (2000) supports Johnston’s response-dispositionalism, and moreover believes that response-dispositionalism *can* meet the demands of Revelation. In reply to McGinn’s objection that dispositional properties are only inferred properties, and thus that we do not actually see dispositions, Levin puts forward the example of the fragility of an intact crystal goblet, arguing that a subject’s mental state when seeing the goblet has an equally good explanatory causal/informational relation to that object’s fragility as to its shape and size.

Levin admits the fragility is only perceived through seeing certain manifest properties of the object (such as the object actually breaking, or through the characteristic ‘look’ of fragile objects such as seeing thinness), however argues that this perception is no less direct than say, perceiving that there is a pin in one’s pocket by feeling it jab into one’s hip. She argues further that in the case of colours it is even more plausible that we do see dispositions directly in that colours “are *response*-dispositions, that is, dispositions to produce experiences of certain sorts in perceivers... [therefore] dispositionalists need not argue that we see colors by *seeing* some manifest property, but only that we see them by *having* the experiences that colours are taken to be dispositions to produce” (Levin: 2000: 154). Therefore, having the (appropriate) experience of colour when one looks at a coloured object *is* what it is to perceive the disposition (colour property) directly.

Levin then moves onto McGinn’s (and Johnston’s, as seen above) second worry that colours do not *look* like dispositions (like relations). Revelation, it is argued, demands that if colours are response-dispositions, then we should see them to be response-dispositions, as commonsense dictates that colour perception reveals the nature of colours fully/wholly. Johnston (1992) argues that if steady colours were to look like dispositions they would have to look like the unsteady colours (i.e., highlights), therefore appearing dependant upon perceiver and viewing conditions. However as steady colours are not revealed through perception as perceiver-relative, they do not look like dispositions. As seen above, this is what caused Johnston to call for a weakening of Revelation, and finally to the abandonment of dispositionalism.

Levin’s reply is that Revelation is neutral as to whether colours are response-dispositions or some monadic property of objects. She argues that one can plausibly hold that steady colours do look like a disposition, though this disposition is different to the unsteady colour disposition. Both are perceiver-dependant, though the former is the disposition to look steady to standard perceivers in standard viewing conditions and therefore should not be expected to change when position and lighting are altered, thereby not looking relational through producing different responses in the subjects when these variables are altered. The latter, however, is the disposition to look unsteady, thereby being perceived as relational by virtue of producing different responses depending upon the aforementioned variables being altered. She argues that steady colours could be explained as looking either like steady response-

dispositions, or like monadic properties, therefore ordinary perceptual experience is not able to offer definitive proof of one having ontological preference over the other.

Levin turns to appeals to indirect phenomenological evidence that attempt to decide the issue. It is most often pointed out that phenomenologically, perception of colour is more like perception of shape (which is held as a primary quality) than perception of dispositions such as the disposition to cause nausea. It is argued that there is a distinct phenomenological difference between the experience of nausea and that of colour. In the former we become aware of the effects of something nauseating as sensations, while in the latter we see through the experience to the objects and properties. Therefore when experiencing nausea this is taken as our nausea, while when experiencing a colour of an object one takes this as the object's colour. Levin admits that if dispositions such as nausea were best cases of response-dispositions, then one may have to concede that colours are monadic properties. However, she argues that the attribution of 'nauseating' to an object as a dispositional property is done so only through courtesy, and that when one does this one does not actually believe that they are attributing a property to the object at all. She argues that if one looks to real paradigm response-dispositional properties such as 'sexy', which are properties of objects, here too, as in colour perception, one sees through the perception to the object itself. We here see the object as having the property of being sexy. Levin therefore concludes that as the "perception of ... sexiness seems just as "outer-directed" or "diaphanous" as the perception of colour... the most that can be convincingly claimed on indirect phenomenological grounds is that ordinary perception reveals that *colors and shapes have the same status*" (Levin: 2000: 158), showing that indirect perceptual evidence only tells us that both colours and shapes are either both monadic or both response-dispositional, and therefore cannot offer evidence either way. She argues that these can however, in principle, be taken apart through further evidence, thereby revealing the phenomenological parity between shape and colour as fragile. As seen in the case of sexiness, which could also at times seem to hold phenomenological parity with shape, through changes in our standards of identification of sexy-properties one realises that sexiness is in fact a response-disposition. She thereby argues the same could hold for the phenomenological parity between colour and shape.

This fragility seems to be revealed when one turns to intuitions that originally motivated philosophers to separate out primary from secondary properties.

“Now I say that whenever I conceive any material or corporeal substance, I immediately feel the need to think of it as bounded, and as having this or that shape; as being large or small in relation to other things... From these relations I cannot separate such a substance by any stretch of the imagination. But that it must be white or red, bitter or sweet... my mind does not feel compelled to bring in as necessary accompaniments. Without the senses as our guides, reason or imagination unaided would probably never arrive at qualities like these” (Galileo: 1623/1957: 274)

Levin argues that through the use of thought experiments one is able to separate out our concept of perception of colour from our concept of perception of shape: if one imagines a possible world whose inhabitants see green where we see red (etc.), and see squares where we see circles, we would say that these inhabitants are mistaken about their perception of the shape of objects, however, we would not take them to be mistaken about the objects colour; or if we were to eliminate all perceivers, the objects in the world would cease to have colour, but would not cease to have shape. She argues that as these thought experiments rely upon judgements on counterfactual perceptual situation, it thus justifies taking these judgements as extensions of our perception. As these judgements reveal an asymmetry between shape and colour, revealing colour, and not shape, as relational one can conclude that the phenomenological parity between shape and colour can be defeated. Thereby arguing that it is possible to conceive of colour being revealed as dispositional, therefore able to meet the demands of Revelation.

Section 1.7

Support from Availability and Unity

Ian Gold (2000) points out that the subjectivist’s accusation consists in two separate issues: 1. An empirical issue, whereby it is argued that science is not able to discover any physical property in the world that would explain why colours have those features that they do; 2. A conceptual issue, whereby “science *could* not discover features of color that violate central facts of our experience of color” (Gold: 2000: 27). The first being an issue of finding a

property in the world that would in some appropriate way correspond to experience, while the second being that our experience has some special access to colour, revealing certain qualitative features and perceptual relations between colours, whereby new discoveries in science would not be able to show these as wrong, without forcing us to give up some of our core beliefs. He argues that it is the conceptual issue to which Johnston appeals when referring to our core beliefs of Availability and Unity. Johnston argued that showing that dispositionalism is able to meet this conceptual requirement, while showing how the primary account fails to do so, will justify one choosing a secondary quality, over a primary quality, account of colour.

Johnston's claim is thus that colours are available to us in our colour experience, through perception, in a way that exposes their various qualitative features and unity relations. He argues that canary yellow is perceptually available to us as a colour experience that can qualitatively be said to be less similar to blue than the shades of blue are amongst each other, arguing that this is not a matter of scientific discovery, but rather that simply through visual experience, and a grasp of colour language, we are able to identify these similarity and difference principles of colour: "No one had to wait until the end of the second millennium A.D. to find out whether or not canary yellow is a shade of blue" (Johnston: 1992: 237). He argues that if it were to be shown that we could be mistaken about these difference and similarity relations, then we would have to give up our core belief of Unity, and thereafter our core belief of Availability, as it would then be shown that colours may not be perceptually available in the way that corresponds to our core belief.

Johnston argues that this is what one is forced to do by accepting the primary quality account. If one takes colours to be disjunctive properties then if science were to show us that the canary yellow disjuncts shared a greater similarity with disjuncts of blue than with those of yellow it would be possible that canary yellow could be a shade of blue. The primary quality theorist could reply that this is not possible as it is an a priori constraint that certain unity principles must hold for certain colour shades to fall under a family colour name. Therefore arguing that the disjuncts of canary yellow must share similarities with other shades that fall under the colour yellow. Johnston argues however that one then holds that it is up to science to first discover which of the disjuncts stand in the appropriate relations to other disjuncts, sharing some natural similarity, in order to be counted as such and such a disjunctive property and falling under such and such a family name. According to the primary quality account it is

an open question, answerable only by science and irrespective of visual perception, as to whether canary yellow is more similar to blue than the shades of blue are amongst each other. He argues that if one maintains this view then one could not be justified in holding that one sees such and such a colour unless one first knows from science that “among the causes of our experiences of color are physical properties which stand in certain complex similarity and difference relations” (Johnston: 1992: 238). He argues that if the primary quality theorists attempt to save Unity as above, then they must surrender Availability, as one would no longer be justified solely on the basis of perception and background beliefs, as to the colour of objects, as further scientific evidence would be necessary.

He argues that response-dispositionalism faces no such problems. As colours are the dispositions of objects that are manifested as colour experiences in perceivers, canary yellow is manifested as an experience of canary yellow, while the blues are manifested as experiences of blue. Therefore, by including the manifestation of colour into the account, response-dispositionalists are able to claim that as colour properties are dispositions and, through experience, one is able to know that the appearance of canary yellow is different from the appearances of two shades of blue (the two shades of blue appearing similar to each other while canary yellow appearing different), one knows that the canary yellow is different from the blues. Further, Johnston argues that the response-dispositional theory gives the necessary tools for one to be justified in holding the belief that an object is such and such a colour from such and such a colour perception. By having such and such an appearance, in such and such circumstances, and employing various background beliefs (beliefs that appearances are a combination of the effects of our perceptual system, the circumstances, as well as the intrinsic properties of things) one is “justified in believing that the object perceived has some intrinsic properties [whatever these may be] which would typically cause the appearance in the circumstances” (Johnston: 1992: 242). Even though one does not know which intrinsic properties (the primary qualities) the object has, one does know the constituted disposition (the secondary quality) that the object has. Therefore even though discoveries in science may give us new information about which intrinsic properties constitute which colours, this would not amount to a revision in the features of colours (the dispositions), as these are perceptually available through colour experience. It thus seems that the secondary quality account succeeds where the primary quality account failed, in preserving our core beliefs of Unity and Availability.

Section 1.8

Summing up

Our colour concept is made up of five core beliefs that reveal the objective-subjective distinction in our colour conceptual schema. On the one hand Paradigms and Explanation tell us that colours are properties of objects that typically cause our colour-experience, and thereby makeup our prime intuition that colours are real external objective properties, while on the other hand Unity, Perceptual Availability, and Revelation appeal to the phenomenological aspects of colour-experience. As giving up our prime intuition would result in having to give up the way we speak about and act towards colour, and as the subjectivist position is incompatible with our prime intuition, we rejected subjective properties as candidates for the status of colour, leaving primary qualities and secondary qualities as the two remaining contenders.

Dispositionalists argue that the secondary quality view is superior to that of the primary quality view in that they are able to save all five of our core beliefs by claiming that colours are constituted response-dispositions, whereby objects have intrinsic properties (primary qualities) which are the constituting basis of their disposition (secondary quality) to produce mental responses in standard perceivers under standard conditions.

Section 2

Section 2.1

Metamers

A problem, raised by Hilbert (1987), for the secondary quality view, is that from colour metamers. Hilbert argues that colours should be identified with spectral reflectances of an object's surface (this is a view inspired by Land's Retinex theory of colour (Land: 1977)). A surface spectral reflectance of an object is a dispositional property, in that an object's surface will reflect different amounts of light at different wavelengths. The percentage of this incident light reflected over the entire visible spectrum (at each wavelength) therefore gives one the object's surface spectral reflectance. These surface spectral reflectances are perceiver-independent as they concern the percentage of incident light reflected at the surface of the object, irrespective of the effects these have on any perceiver or whether there are any perceivers at all. Therefore even though the property Hilbert identifies with colour is a dispositional property, it is a primary, "intrinsic, illumination independent, property of the surface of the object" (Hilbert: 1987: 65), and should not be confused with the dispositions appealed to by the secondary quality view (and therefore is not included in the view that I refer to as the dispositionalist view).

The eye of the human visual system contains photoreceptors (rod and cone cells), with each cone cell containing one of three different types of pigments, each having a different maximum sensitivity (445nm, 535nm, 570nm) to light stimulation of different wavelengths. These photoreceptors play a large part in the production of colour experience⁷ as the colour experience that is had by a subject depends largely on their overall stimulation by light reaching the eye (this light is a function of illumination and spectral reflectance). Any objects in certain circumstances (under certain illuminations) that then cause a particular overall stimulation will result in the perceiver experiencing these objects as having the same colour. The phenomenon of metamers is that in certain circumstances 'C₁' (under certain illuminations, these can even be circumstances which are usually referred to as 'normal circumstances') two objects with different surface spectral reflectances can manifest the same

⁷ Though one needs to take into account the post-receptoral as well as cortical systems (as well as possible intermediary systems), each playing a large role in the production of the final experience.

colour experience. However, under different circumstances 'C₂' (under a different illumination), these two objects will manifest different colour experiences from each other.

Now, as the dispositionalist holds the view that the colours of objects are the (constituted) dispositions of these objects' surfaces to produce certain experiences of colour in standard viewers under standard viewing conditions, Hilbert argues that the dispositionalist must hold that in C₁ we see the real colours of the objects, while in C₂ we see an illusion (only see apparent colours), and therefore the colours in C₂ are the same colour, this being something we would see if the circumstances were normal (i.e., C₁). If this is so then "[t]here appears to be a difference in colour between objects that are the same colour" (Hilbert: 1987: 89). This seems an odd position to hold, in that one is saying that if object A and object B are both under the same illumination (one that is held as non-standard) and A looks different to B, then A and B are the same colour, as long as A and B looked the same under a different (standard) illumination.

This position has far too many problems. First, one must note that it is far more difficult to specify what a 'normal perceiver' and 'normal circumstances' would be than originally thought. There are slight differences in perception amongst most perceivers and therefore what is taken as the colours attributed to a standard perceiver (such as the Commission Internationale de l'Eclairage (CIE) standard observer which is often cited by dispositionalists as an example of a standard perceiver) is "an average based on the visual responses of a large number of normal observers" (Thompson: 1995: 109). Therefore no single one of these normal observers (these are human observers who are not colour blind) would be a CIE standard observer. Further, there is great disagreement amongst philosophers about what standard conditions would be. Most attempts at standardization are very strict and therefore offer conditions under which colours are not usually observed, therefore going against the initial motivation of dispositionalism to capture our phenomenological acquaintance with colour. Therefore dispositionalists often refer to standard conditions as everyday natural viewing conditions. These conditions are however hardly standard, as conditions depend upon what kind of a day it is as well as what time of day it is (in the sense that it is usually brighter at midday than in the late afternoon), and therefore the dispositionalist would have to choose one from amongst the many legitimate choices.

Secondly, (and more importantly) as, through the changes from C_1 to C_2 , we see that the two objects differ in their surface spectral reflectance, if we are to hold a dispositionalist view “we are committed to saying that we can see a real difference between the dispositions of objects to reflect light by suffering from illusion as to their color... [therefore] see that the objects are physically different by mistakenly seeing them as different in color” (Hilbert: 1987: 90). I would have to agree with Hilbert that this is ‘highly counter-intuitive’ and ‘very odd’. This view does not at all fit well with our other concepts of perception. It would seem strange to claim that through the misperception of two identical shapes we would be able to see a real physical difference between these two shapes. For a position that is claiming to fit well with our commonsense concepts (as the dispositionalists are claiming) this is a bitter pill to swallow.

Section 2.2

Anthropocentric Dispositionalism

Harvey (2000) suggests that the problem from metamers reveals the dispositionalist view as stated above is inadequate. However, he does not see this as a reason enough to give up a secondary quality account, instead he sets up a revisionary account of dispositionalism (which he refers to as Anthropocentric dispositionalism) that he believes is free of the problems from metamers.

Harvey argues that we need to separate out what he calls present colours from what he calls official colours. A present colour is the colour of an object that a standard observer experiences in the circumstances that the object is in at the time of observation. Therefore as the object will have different present colours as the lighting changes, no present colour of an object will have epistemological priority over any of the object’s other present colours, “since no small set of perceived colours has any intrinsic connection with the object being viewed” (Harvey: 2000: 142). The official colour of an object on the other hand “is a matter of non-arbitrary convention, since it involves *designating some type of situation* to be the crucial situation” (Harvey: 2000: 142). The decision is based upon the various present colours that the object manifests as well as which perceptual circumstances the object most often found or in which that object serves its most important purpose. The official colour is a subclass of

present colours as it is merely one of the many present colours that have (non-arbitrarily) been decided upon, and therefore the present colours are epistemologically prior (theoretically more fundamental) to official colours. He adds that there is no such thing as an object's 'real' colour (or at least that this term is misleading), rather there are many present colours and one official colour that we often refer to the real colour of the object, though this is epistemologically on par with that object's other present colours.

With this distinction in place, Harvey goes about answering Hilbert's objection to the dispositionalist view. Harvey argues that at C_1 both objects have the same present colour, though at C_2 the objects have different present colours. It is then a matter of non-arbitrary convention under which of the two situations do we see the official colour of each object. In this situation as C_1 is a 'normal' viewing condition it would probably be the situation under which the present colour would be labelled the official colour (however this does depend on the function of the object viewed i.e., whether C_1 is a situation where the object is functionally important/used), therefore one would conclude that the objects both have the same official colour (the present colour in C_1), though they have different present colours in C_2 . He therefore argues that the anthropocentric dispositionalist is not committed to saying that we see a real physical difference by seeing a colour illusion, rather one can say that by seeing that the objects have different present colours in C_2 from their common official colour as seen in C_1 , one can conclude that there may be some physical difference between these two colours.

Section 2.3

The Cost of Anthropocentric Dispositionalism

This revision does allow the dispositionalist to meet the objection from metamers, though at a cost. Our commonsense intuition about externality does seem to entail that objects do have a 'real' colour, and not merely an agreed upon official colour that is but one of many epistemologically equal candidates. This, by itself, is not necessarily a strong objection as the anthropocentric dispositionalist is free to argue that what we mean by real colour is just the official colour of the object, the official colour being deeply entrenched in our concept of

colour and therefore seeming to have some epistemological priority. The serious problem comes in when one looks to the phenomenon of colour constancy.

Colour constancy is the common case in visual perception whereby colours continue to look the same despite changes (to a certain extent) in the circumstances. Even though there are changes in illumination, the object will continue to be perceived as having the same colour. This was shown experimentally by Land (1977) who set up two identical Colour Mondrians consisting of many different colours, a photometer, and three projectors that emitted short (S), medium (M) and long (L) wavelengths respectively. He then measured the S, M, and L wave flux (known as a triplet) from a certain coloured square found on the left Mondrian. Then, using the three projectors on the second Mondrian, altered the amount of light that was being reflected from a square of a different colour at the S, M, and L wavelengths, to match the triplet of the square of the first Mondrian. Therefore, even though the spectral power distribution of light being reflected from the first Mondrian was the same as that of the second Mondrian, these still appeared different in colour. Further if two squares of the same colour were chosen (on each Mondrian) and the amount of light reflected at each of the three wavelengths was altered so that the light from the two squares differed, these squares would still look the same colour. This shows that colours, to a large extent, are illumination independent. This phenomenon occurs as colour perception is both a perception of the percentage of incident light reflected (therefore the stimulation across each of the S, M, and L wave sensitive cones) as well as due to the fact that the light that stimulates the different kinds of cones is a comparison of light coming from the object with light coming from the entire visual field, therefore as the illumination changes the light from the object will change, but so too will the light from the entire visual field. It is then this colour constancy (both the scientific evidence for it as well as our experience of it in everyday life) that leads us to claim that there is an illumination-independent physical correlate of our illumination-independent perception of colour.

Now, what this means for the anthropocentric dispositionalist is that there is a strong intuition (as well as scientific evidence) that there are 'real' colours, or at least that the official colours are somewhat different from the present colours that are manifested in different circumstances. This difference being more than mere agreement amongst standard observers that such and such a present colour should be the official colour. There therefore does seem

to be reason to claim that there is some intrinsic connection between the official colours and the objects being viewed.

A problem with the way that Harvey re-describes the metamer case is that even though it seems a fine explanation of the problem posed, it is an explanation that gives colour perception and judgement a somewhat different status to that of the rest of perception. Here is a case of two objects that in such and such circumstance appear to have the same colour, however upon closer scrutiny, by changing the circumstances, we find that they are different. If one were to take two shapes, a triangle and a cone, and one were to look at these two shapes under certain circumstances C_3 where they both appear to look like triangle (i.e., from a certain distance, at a certain angle, and under such and such light), and then move to a different viewing condition C_4 whereby one would see that the one shape looked like a triangle while the other looked like a cone. Here one would not say that under C_3 both objects had the same present shape, while under C_4 they had different present shapes, and then claim that as C_4 was a more standard viewing condition, the present shapes of the objects in C_4 were also their official shapes. In this situation one would say that in C_3 one was mistaken as to the shape of the objects (or at least as to the shape of the cone) while in C_4 , when conditions were better to be able to discern between the two shapes, one could see that the two were actually different. Now, why does our perception of colour have some other (special) status? Surely, as in the perception of shape, one should say that in C_1 , one was mistaken as to the colour of the objects (or at least to the colour of one of the objects, as in the case of metamers often one of the perceived colours remains unchanged, while the other changes) while in C_2 , where conditions were better to be able to discern between the two colours, one could see that the two actually were different.

Another problem for Harvey's anthropocentric dispositionalism is that it has the consequence of forcing a change in our concept of illusion. A central aspect of his dispositionalism is that of standard-state (human) perceivers/viewers. Harvey argues that the standardization of these perceivers is based upon having a standard human visual apparatus that manifests such and such experiences, and therefore the "role of relevantly similar sensory apparatus in producing the rough uniformity of perceived colours is what the anthropocentricism of colours is about in a sound version of dispositionalism" (Harvey: 2000: 147). This results in the claim that one could only have a colour illusion if one has either a visual system that somehow deviates enough (as there will be slight differences between each perceiver's visual system) from the

standard, or if there is some form of extrinsic influence (Harvey uses the example of a toxin that affects the visual systems causing an apparent present colour) on one's visual system. Harvey sees this as an advantage and uses it to reply to Averill's (1982; 1985) counter-example to dispositionalism. Averill puts forward the example of a disk that is half red and half green, and appears such when spinning slowly, though, when spinning quickly this disk appears yellow. Averill argues that the disk does not become yellow when spun quickly, but that "its apparent yellowness is an illusion" (Averill: 1985: 304). Harvey replies that the "present colour of the *spinning* disk is yellow, and if a viewer claims it is purple we will speak of colour illusion and suspect some abnormality in the person's visual system" (Harvey: 2000: 144). However, this is just *not* what we would say. I agree in the latter case one would say that the person who saw purple is having an illusion and as their experience differs from ours it must be caused by some difference in their visual system, though, in the former case one would say that the experience of yellow is also an illusion. This is an illusion caused by the inadequacy of our visual systems, in that our visual systems are not fast enough to track the spinning red and green, therefore conflate these into a single yellow. Most illusions that are had are illusions of this sort, illusions caused by some or other limitation of our visual system. This reveals yet another counter-intuitive consequence of this dispositionalism.

Section 2.4

Anthropocentric Chauvinism

I now turn to what I will argue should be seen as an unfounded bias, which motivates the desire for a dispositionalist account. I call this 'anthropocentric chauvinism'. We need to start by reviewing (briefly and somewhat abstractly) how the visual system functions.

Light of various wavelengths is reflected from the surface of objects as well as their surrounds. This light enters the eye and stimulates the photoreceptors/cones (S, M, and L wave sensitive pigments (having 445nm, 535nm, and 570nm peak sensitivities respectively)). These pigments are however not individually responsible for our seeing spectral stimuli as blue, green, red, or yellow. Collectively these pigments respond throughout the spectrum, but the visual system responds only to the differences in their relative levels of activity

(Thompson: 1995: 53-54), whereby the pigments give off response-signals (S, M, and L receptor signals, known as triplets) that are compared (roughly through addition and subtraction) to determine their relative strength, and then recoded in the three post-receptoral channels: An achromatic channel (L+M; as there is no difference measured, it is not spectrally opponent, therefore does not signal difference in wavelength), which determines the luminance of the colour perceived, and two spectrally opponent chromatic channels, a red-green channel (L-M), and a yellow-blue channel (S- (L+M)).

Each channel can be seen as a relative visual response curve. The achromatic response curve determines the whiteness (also known as lightness or brightness⁸) component, in that it specifies the amount of energy necessary at each wavelength for a given observer to first detect the stimulus (Thompson: 1995: 62), this being to the exclusion of chromatic responses. The two chromatic response curves then represent the four basic hues (red, green, blue, yellow), with red and green as opposites on one curve, and blue and yellow as opposites on the other curve, each curve passing through neutral balance points where the chromatic response of that curve is zero, and therefore that channel is nulled. Colour experiences are then determined by the interactions of these channels. If, at a wavelength (around 475nm), the red-green curve crosses its neutral balance point, then the red-green channel is nulled, and the colour experience is determined by the value of the corresponding blue-yellow channel. If the value of the blue-yellow channel is negative, the chromatic response will be blue (as the blue is below the null point while yellow is above the null point, this is however merely convention, and one could indicate the blue as positive and the yellow as negative, as long as one adjusted the red-green curve accordingly). As, in this case, the red-green curve is nulled, we have a unique blue, a blue that has neither red nor green. Further there are points on the curves where the two curves cross each other, either in the positive (whereby red and yellow cross) or in the negative whereby blue and green cross). In such cases one experiences a colour that contains equal quantities of the two hues, this is known as a balanced binary colour (i.e., red and yellow, will result in a balanced orange). Finally, the saturation of the colour experienced at a given spectral location corresponds to the ratio of the responses of both chromatic channels at that location to the sum of the chromatic and achromatic responses at that location (Thompson: 1995: 63).

⁸ Though, as Thompson (1992: 346n) points out, brightness refers to colour appearances (dim-to-dazzling) in the aperture mode, while lightness refers to colour appearance (grey scale of black to white) in the surface mode.

We can thus divide the visual system into three parts: the receptor colour space, determined by the various possible cone triplets; the post-receptor colour space, determined by the three visual response curves corresponding to the three channels; and a phenomenal colour space, determined by the phenomenal aspects of visual experience (i.e., the experience of colour as the combination of hue, saturation and brightness/lightness/whiteness)⁹. It is not altogether clear that one must divide the receptor from the post-receptor colour spaces as these two can quite easily be viewed as one single colour space, a process of ‘stimulation-response-opponent processing’. (Matthen argues: “Information about spectral distribution is extracted from the outputs of [the L, M, and S] cells by sampling the relative strength of a signal in selected wavebands. This process, called “opponent processing” (in effect) computes the following functions: (L+S)- M, (L+M)- S” (Matthen: 1999: 49)¹⁰. The first function gives us the red-green opponent pairs, while the second function gives us the blue-yellow opponent pairs). I have chosen to divide them merely for ease of explanation of the move from stimulation to phenomenology, though it is not important to this argument whether they are treated like this or not, as long as one takes note of some ‘stimulation-response-opponent processing’ process.

The case given above is what is often referred to as colour perception by a standard perceiver by dispositionalist accounts. If an object reflects light which stimulates the three cone-types, which in turn send a triplet response signal that is recoded in the three post-receptor channels that determine the hue, lightness, and saturation that is experienced by the perceiver, as long as the perceiver has these three colour spaces formulated (roughly) in this way, and the experience in the phenomenal colour space corresponds, more or less, to that of the experiences of other perceivers looking at that object, then that perceiver can be said to be seeing the colour of that object, as colour is the disposition of an object to manifest such and such an experience in a standard/trichromatic perceiver (one having three cone-types cross connected to three post-receptor channels) in standard conditions.

We can turn to the case of colour-blind individuals. These are individuals who due to a failure in the functioning of their photoreceptors (lack of function or non-existence of one of the L, M, or S pigments in their cone) are not able to have certain colour experiences. They

⁹ The visual system is of course far more complicated than what I have given above, and there are other visual spaces (such as cortical colour space), though what I have given is sufficient for the purpose of the following discussion.

¹⁰ Thompson speaks of ‘trivariance’ to refer to the “receptor-channel linkage” (Thompson: 1995: 66).

are known as dichromats, as they only have the function of two of their cone-types. Colour-blindness comes in two main forms: 1) individuals not able to distinguish colour along the red-green phenomenological axis, these are either protanopes who cannot see red due to lack of L pigment, or deuteranopes who cannot see green due to lack of M pigment; 2) individuals not able to distinguish colour along the blue-yellow phenomenological axis, these are tritanopes. These are therefore individuals who are classified as non-standard perceivers, as their visual systems are somewhat lacking and therefore they are not able to have the colour experiences that trichromats have when faced with a certain object. If a deuteranope looks at a green object, the dispositionalist would say that the deuteranope does not see the green as the perceiver is non-standard, therefore does not see the disposition to manifest such and such an experience in a standard perceiver. Though the dispositionalist will insist that though the deuteranope does not see the object as green, the object is nonetheless green, in that if the perceiver were standard then the object would be disposed to manifest a green experience in that perceiver.

This amounts to the claim that the trichromat, who has a better visual system (a visual system that has three functioning cone-types, and is therefore able to better discriminate between colours, offering a greater range of colours), is able to see colours that the dichromat is not able to see. But now let us imagine an individual who is an even better colour discriminator¹¹ than the trichromat, a tetrachromat (who has four visual pigments/cone-types). One could imagine that this individual had an extra visual pigment that was sensitive to wavelengths that fell in the ultraviolet end of the spectrum. This individual would therefore have UV, S, M, and L wave sensitive cones. This individual is sensitive to the wavelengths that the trichromat is sensitive to, and in addition, is sensitive to an extra wavelength, the UV wavelength, that through the limitations of the trichromat's visual system, the trichromat is not sensitive to. One can therefore conclude (from knowledge of how the visual system works as a 'stimulation-response-opponent processing' process) that the tetrachromat is able to see colours- UV colours¹²- that the trichromat is not able to see. Imagining such a situation does not require a great stretch of one's imagination, as when one looks to nature one discovers that many species are tetrachromats (e.g. pigeons¹³), and therefore as we have evidence of

¹¹ Averill has a similar idea, referring to "unusual human observers" (Averill: 1985: 290)

¹² As it is not exactly clear what these would be like phenomenologically, when I refer to them as UV colours all I mean is that they involve light from the near-UV (shorter-wavelength) end of the visual spectrum (wavelengths that do not feature causally in the human visual system).

¹³ See Thompson (1995: 148-152), and Matthen (1999: 51).

human beings that are dichromats, the possibility of human beings who are tetrachromats is not a great leap of faith¹⁴.

Now let us assess the situation at hand. We have a dichromat (the deuteranope) who cannot experience green due to a lack of M pigments. We have a trichromat that can experience green, as the trichromat has S, M, and L pigments, though s/he cannot experience UV colours as s/he lacks UV pigments. Finally, we have a tetrachromat who can experience both green and UV colours, as s/he has UV, S, M, and L pigments.

The problem for the dispositionalist should now be clear. The dispositionalist defines colour as a disposition of an object to manifest such and such an experience in a standard perceiver. Therefore the dispositionalist would have to say of the situation I have described, that the trichromat sees green where the dichromat fails to see green, while the tetrachromat sees green, but only has a UV illusion. It seems unclear why the UV colours should be labelled as illusions. After all, the reason that the tetrachromat can see UV colours is not because their visual system is malfunctioning, but rather because it is a better (of greater sensitivity) discriminatory device, in that it can cover a larger part of the visual spectrum than the visual system of the trichromat. This is the same reason why the trichromat's visual system is taken as better than the dichromat's visual system. Saying that the tetrachromat experiences a UV illusion is as odd as claiming that the trichromat experiences a green illusion. The dispositionalist is forced into holding some mysterious double standard. I am arguing that maintaining this double standard is motivated by what I am calling anthropocentric chauvinism. Once again it is the bias of seeing humanity (or the major part of humanity-as-it-is-now) as the centre of the universe.

The double standard becomes even more mysterious when one looks at colour language. The dichromat is not able to know what the experience of green is like, yet is still able to speak about green things, such as the 'go' (green) traffic light, and actually believes that that light is green, even though s/he cannot experience its green-ness. Why then is the trichromat not in the same position when speaking about UV colour? Surely commonsense dictates that as in the case of the deuteranope and green, the trichromat should say that certain things are UV, though not being able to have a UV colour-experience. Just as the deuteranope would have to

¹⁴ See Thompson (1995: 166-168) for a discussion on the real possibility of tetrachromacy in a portion of the human female population.

ask someone if a certain object was green, and then only after being told that the object is green (by someone with a better visual system, i.e., a trichromat or a tetrachromat) refer to that object as green, so too the trichromat would have to ask someone if a certain object is UV (someone with a better visual system, i.e., a tetrachromat) and only then refer to that object as UV. Through advances in science, one can no longer appeal to the argument that ‘where that dichromat can, through language, appeal to the trichromat’s experiences about the existence of extra colours, the trichromat has no one to appeal to’ as through an understanding of the workings of the visual system, one can conclude that tetrachromats do see other colours, even though we are not able to conclude what the colour experiences caused by these colours would ‘look like’. When conceptualising trichromats and tetrachromats, one would not have to conclude “that the best way to describe the two groups of viewers is to speak of their having two different colour-languages” (Harvey: 2000: 54), in fact one would be mistaken to do this. They *would* share a colour language, speaking about which objects are which colours (like the dichromat and the trichromat both speaking of the ‘go’ traffic light, as green), though they would not share certain colour experiences. This however is merely a difference in the phenomenological colour space, which is either more or less sensitive to colours depending on the receptor and post-receptor colour spaces of the particular organism.

If one looks at colour concepts in the real world (our tetrachromatic human being aside), then when told of how the visual system works, and then told that pigeons do have an extra UV-sensitive pigment, and therefore have an UV colour-experience¹⁵, one is *not* cast into some conceptual confusion. As Smart points out: “Since Wittgenstein we surely know better than to think of a word’s having meaning as consisting in its evoking a certain sort of mental image. Meanings are not mental images [rather] the meaning of a word consists in its *use*, not in its associated imagery” (Smart: 1961: 135). One is therefore able to accept that the pigeon does see an extra colour, even though we are not able to know what its colour experience is like. This merely places us in a position similar to that of the deuteranope who is faced with the ‘go’ traffic light, which is a perfectly acceptable position, a position that in no way conflicts with (but rather, is a part of) our commonsense view.

¹⁵ As the tetrachromat probably has three post-receptor chromatic channels, this could be a situation where both the red-green and the blue-yellow channels are nulled, while the UV channel has a response value.

Just as we once held that the sun revolves around the earth, now the dispositionalist wants us to hold that colours revolve around our (trichromatic) visual system. Both the former and the latter claims can be attributed to mere anthropocentric bias, an appeal to some kind of ‘human-special-ness’. The dispositionalist has no justification as to why we (trichromatic) human beings should have some special colour-incorrigibility. As we have seen from science, other species have visual systems that are more sensitive than our visual system. As we have seen from colour language, we *do* separate out colours from colour experience (as in the case of the dichromat). Therefore as we are able to speak of objects having colours other than those that we experience those object as having, and as we do speak of visual systems that are more sensitive as giving us a greater ability to discriminate between colours than those less sensitive, we have no reason (as the dispositionalist would have us say) to conclude that tetrachromats, when responding to UV light, are having a colour illusion. “A general conception of color and color experience should allow us to treat the human and the pigeon systems as instances of a general kind. Or else it should give us a principled reason for excluding the pigeon” (Matthen: 2000: 51). As no principled reason is given it seems that the dispositionalist is not justified in appealing strictly to standard human observers in arguing for an ontology of colour. The dispositionalist needs to acknowledge this and therefore, when doing metaphysics, cease being an anthropocentric chauvinist.

Section 3

Section 3.1

Causation

In section 1.4 I argued that through our prime intuition (consisting of Paradigms and Explanation) we hold that some things in the external world that we see as red are red, and that this perception of red can be explained as a red property of that thing causing the red perception. This is a view that both primary and secondary quality theories support as both want to uphold colours as external and real¹⁶, thereby both adhering to our commonsense intuitions.

As both primary and secondary views hold the position that colour-experience is typically a appropriate response (appropriate in the sense that it corresponds to the property in such a way to count as a representation/presentation of that property) to a colour property, they uphold that, at least, part of what makes the colour-experience a response is that it is caused by the colour-property. However, as “there are far too many normal causes of any given experience” (Jackson: 1998a: 90), causation, though not sufficient¹⁷ for an experience to count as representing a property, is at least necessary. To explain our prime intuition one must start by asking *what* is doing the causing. The difference therefore between the primary and secondary quality positions is whether *the red property of the object that causes the red perception* is: 1. a secondary quality (constituted) response-disposition; or 2. a primary quality disjunctive property (these disjuncts could be either singular or complexes of physical properties). The question thus, at its base, turns around which is the causal property.

When one turns to the dispositional account one is told that colours are dispositions (second-order properties, constituted by first-order intrinsic properties) of objects to cause the experience of colour. Dispositions can thus be determined by specifying “a pair of antecedent circumstance and a manifestation” (Prior, Pargetter, Jackson: 1982: 251), in this case

¹⁶ Though as shown in section dispositionalists who take Harvey’s approach would deny that there are such ‘real’ colours. However as I argued, this approach forces us to give up too many of our commonsense intuitions.

¹⁷ As pointed out by Grice: “For in any particular perceptual situation there will be objects other than that which would ordinarily be regarded as being perceived, of which some state or mode of functioning is causally relevant to the occurrence of a particular sense-impression: this might be true of such objects as the percipient’s eyes or the sun” (Grice: 1961: 142).

<observing, experiencing (coloured-ness)>. However, the problem from causation is that it is *not* the disposition that is doing the causing, as dispositions cannot (strictly) cause their manifestations, but rather it is the first-order properties that constitute that disposition that cause the experience. To illustrate this, one can turn to the dispositionalist's example of a glass that is fragile, specified by <striking, breaking>. This glass has the fragility-disposition if (oddities aside¹⁸) it breaks when it is struck- breaking as a result of being fragile and not as a result of some peculiarity in the way that the glass was struck (as non-fragile objects could break if struck in such and such ways (i.e., with a large hammer), though this does not necessarily make them fragile). The dispositionalist would say, as with colours, that the glass has a second-order dispositional property of fragility (that has a first-order constituting property) that is responsible for the breaking of the glass when struck. However, when one looks at what is actually going on one sees that the breaking is caused by a combination of the first-order property (i.e., the bonding of the glass molecules) of the object and the striking, there is no causal work done by the disposition at all. Jackson puts the problem neatly: "To admit the fragility also as a cause of the breaking would be to admit a curious ontologically extravagant kind of overdetermination" (Jackson: 1998a: 92). Even though there is an interaction of the property and the antecedent circumstances, as seen above, breaking when struck in such and such a way (i.e., struck with a large hammer) would not necessarily make the object fragile, rather it would only be fragile if the object had the appropriate first-order property. The first-order property is then the causal basis, which "is a sufficient causal explanation of the breaking *as far as the properties of the object are concerned*" (Prior, Pargetter, Jackson: 1982: 255).

There is a second reason why dispositions such as fragility should not be taken as causes. In a paper addressing the problems of mental causation Jackson (1995) points out that if one were to allow the fragility-disposition to be a cause one would be violating Hume's thesis about the contingency of causal connections, which states "that what a state causes, or would cause were such to happen, is not an essential property of that state. For any state it is true that that very state might not have caused what it did in fact cause" (Jackson: 1995: 257). The fragility-disposition itself, as opposed to its constituting basis, however, has breaking (when

¹⁸ Lewis (1997) argues for a way to reform the conditional analysis of how things are disposed to respond to stimuli, in light of oddities/finkish dispositions (a disposition that when put to the test would vanish as the stimulus for its manifestation may cause the disposition to go away and therefore prevent its manifestation). His proposal is that: "Something *x* is disposed at time *t* to give response *r* to stimulus *s* iff, for some intrinsic property *B* that *x* has at *t*, for some time *t'*, *s* and *x*'s having of *B* would jointly be an *x*-complete cause of *x*'s giving response *r*" (Lewis: 1997: 157).

struck) non-contingently. Thereby allowing it to be a cause would be to allow that certain properties have causal powers essentially. Jackson argues that even if one were to allow the possibility that certain properties may have causal powers essentially (he notes the possibility of 'strong' vectors which point in a certain direction by their very nature), one should still "look on Hume's thesis as a *default* position: whenever there is a choice, assign causal powers to properties that possess them accidentally" (Jackson: 1995: 258). In the case of fragile objects breaking when struck (unlike in the case of 'strong' vectors), we do have such a choice. The choice is between second-order properties that have breaking non-contingently, and the (first-order) causal bases that have breaking contingently. As the bases offer sufficient causal explanation as to why certain objects break when struck, we should (by the default version of Hume's thesis) choose the causal bases over the dispositional property, thereby assigning the bases all the causal work, while leaving the disposition causally inefficacious.

There is however a slight difference between fragility-dispositions, and colour-dispositions. The former are dispositions whereby when the object is placed in the antecedent circumstances the manifestation will occur within that object. The latter however are dispositions whereby when the object is placed in the antecedent conditions, the manifestation will occur within another object (i.e., the observer). It is therefore useful to turn to an example of the latter disposition, to see if the same holds. One could look to the example of the heat-disposition, thereby <touching, experiencing (hot-ness)>. An object is disposed to feel hot when touched if (odds aside) the object causes the experience of hot-ness when touched. Here it is once again not the disposition that is doing the causing of the manifestation, but rather it is the underlying causal basis. The causal basis is (roughly speaking) the molecular kinetic energy, and this (much like the molecular bonding in the fragility case) is a sufficient causal explanation of the hot-ness experience as far as the properties of the object are concerned. As heat is taken to be the property of an object that causes our experience of heat, one does not thereby identify heat with a disposition, but rather identifies heat with the causal basis that cause the heat manifestation contingently. This shows that both fragility-dispositions as well as heat-dispositions do not cause their manifestations, but rather it is their causal bases that do the causal work. It is completely unclear then why the same should not hold for colour-dispositions. It seems reasonable on these grounds to conclude that as colours are (from our prime intuition) properties of objects that cause colour experience/perception, colours are not dispositions, as dispositions cannot

cause their manifestations (the experiences/perceptions), and therefore hold instead that colours are the causal bases of these experiences- that is, the first order properties of the coloured objects.

This does not however mean that we can no longer refer to higher-order properties, such as dispositions, as being causally relevant, as even though dispositions are not causally *efficacious* (as shown above) they can however be causally *relevant*. Jackson and Pettit (1990: 108) identify three principles governing causal efficacy:

1. A causal explanation of an effect must direct us to a causally relevant property as opposed to causally irrelevant property of the factor it describes as explanatory.
2. One of the ways that properties are causally relevant is by being causally efficacious with regard to an effect, in that their instantiation, at least in part, produces that effect.
3. A property F is not causally efficacious in the production of an effect *e* if all three of the following sub-conditions are fulfilled:
 - (i) there is a family of distinct properties G_1, \dots, G_n such that F is efficacious in the production of *e* only if some G_i ($1 \leq i \leq n$) is efficacious in its production¹⁹.
 - (ii) the F-instance does not help to produce the G-instance in the way that the causally efficacious G-instance helps to produce *e*, therefore they are not sequential causal factors.
 - (iii) the F-instance and the G-instance do not combine, directly or through further effects, to help in the same sense to produce *e*, therefore they are not causal coordinate factors.

They then argue that properties, such as dispositions, are not causally efficacious as they fulfil assumption 3 (i)-(iii): in that a disposition (such as fragility) has an causally efficacious causal basis (i.e., molecular bonding) that produces the manifestation (i.e., breaking) when placed in the antecedent circumstances (i.e., being struck), therefore 3(i); the disposition does not help to produce the causal basis in the way the causal basis helped to produce the manifestation, therefore 3(ii); and as one could predict the manifestation if one had full

¹⁹ This is an alteration by McFarland and Miller (1998: 78) of Jackson and Pettit's original sub-condition.

information about the causal basis, the antecedent circumstances, and the relevant laws, one would not need to take the disposition into account as a coordinate factor, therefore 3(iii). However, they maintain that such a property, although not causally efficacious, *is* causally relevant, in that “its realization programs for the realization of a lower-order efficacious property” (Jackson & Pettit: 1990: 115). This works, in that by this higher-order property being realized it ensures that there is some lower-order causally efficacious property that is doing the work. One can view the higher-order property as a role-property, while the lower-order property is the causal property that is playing that role. This can be made clearer with a further example from Jackson (2000), that of a car’s petrol gauge and the amount of petrol in the car’s tank. The reading on the petrol gauge represents how much petrol is in the car’s tank. The amount of petrol therefore causes the appropriate reading on the gauge: the more petrol the higher the reading, the less petrol the lower the reading. The petrol in the petrol tank is disposed to affect the reading on the petrol gauge, though the reading itself does not represent this disposition, as when the representation changes (the gauge reads closer to full or closer to empty) the disposition (to affect the reading) remains the same. The representation changes as the amount of petrol in the tank changes, as the representation represents the amount of petrol by being caused by the amount of petrol left in the petrol tank. The disposition is therefore causally relevant in that it “explains why the reading counts as representing the amount of petrol remaining” (Jackson: 2000: 155), though as the disposition itself is not what is represented (does not cause the representation) it is not causally efficacious. The analogy can then be drawn with colour, whereby microphysical (colour) properties (much like the petrol) are represented in colour-experience (much like the petrol gauge reading), and therefore are disposed to affect colour-experience. This disposition is however not what is represented, but rather it merely explains why colour-experience counts as representing microphysical (colour) properties. This allows us to retain talk of the higher order properties as causally relevant, thereby one can maintain that a crystal glass’s fragile-disposition is causally relevant to the glass breaking when struck as this means that the crystal glass has the relevant molecular structure for causing the manifestation when placed in the antecedent circumstances, though strictly speaking, the lower-order property is what caused the breaking. As our prime intuition (from our core belief of Explanation) holds that colours *do* cause our colour-experience, it seems that the causally efficacious primary qualities emerge as the better fit to our intuitions about colour than do their causally inefficacious dispositional rivals.

Section 3.2

Colours

The process I propose in identifying colour, is that one separate out colour from colour-experience, with the former identified with microphysical causal properties (primary qualities), and the latter identified with representations²⁰ in phenomenological space (having hue, saturation and brightness/lightness). This move may at first seem slightly counterintuitive, though I believe that even though colour and colour-experience are often conflated by us into a single concept, this is a mistake on our part made largely by the fact that these two concepts do not often have occasion in our day to day life to come apart. I shall however argue that when we analyse our concepts of colour we find that these two concepts do come apart, and evidence for this is given through language use, in that they often are taken apart in language when need arises in certain circumstances. It is in circumstances such as ‘Metamerization’ (in section 2.1) and those of ‘Extra Colours’ (in section 2.4) that we can see our concepts coming apart, in that here we address colour as separate from colour-experience. It is this separation of our concepts that made these circumstances problematic for secondary quality theories.

From our prime intuition we hold that colours are properties of objects. This is reflected in our language when speaking of colours and objects, in that we speak of coca-cola cans as (mostly) red. Further we believe that we see the can as red because of a property that is possessed by the can, and not because of the event of looking at the can. Pre-theoretically we do not believe that the can ceases to be red when we are not looking at it. The sentence ‘the can is red even though I am not looking at it’ is perfectly intelligible, while the sentence ‘the can is no longer red as I am no longer looking at it’ does require a conceptual switch (giving up our prime intuition) in order for us to maintain it as true. It is for this reason that I rejected the subjectivist stance in section 1.4. We were however left with two candidates: primary or secondary qualities.

We have seen that by equating colours with secondary qualities one is led, under certain circumstances, into certain counterintuitive positions. First, from Metamers, we have seen

²⁰ Though the question of what it means to have such representations, and exactly how the primary qualities are represented is another debate altogether, and would require a separate thesis to be adequately discussed.

that a dispositionalist who wants to maintain our prime intuition, is left holding the peculiar claim that when we are faced with two objects that are colour metamers and see these objects (under certain circumstances) as different in colour from each other, these are actually the same colour as under standard viewing conditions to a standard perceiver they would manifest the same colour experience. The dispositionalist is left claiming that we see real differences between these objects (that they have different spectral reflectance) only by seeing a colour illusion, a position that in no way fits our overall concept of perception. Second, from Extra Colours, we have seen that the dispositionalist is left holding a double standard, claiming that though we see (through visual experience) real colours that a dichromat does not see (as our visual system is more sensitive than that of the dichromat), a tetrachromat (whose visual system is more sensitive than ours) only sees a colour illusion when s/he has certain colour experiences that we do not. Finally (in section 3.1), we have seen that the dispositionalist who wishes to maintain the prime intuition is not able to do this, as secondary qualities, though causally relevant, are not causally efficacious. Secondary qualities are not able to cause our experience of colour, as dispositions cannot cause their manifestation, rather they are only causally relevant in that they inform us that there is a primary quality that is doing the causal work.

Objects are disposed to look coloured, this is clear in that some objects do look such and such a colour to such and such a perceiver under such and such circumstances. None of the arguments that I have presented have denied this claim. Dispositions are however relational and highly relative concepts. A colour-disposition is a relation between properties of an object and a certain kind of observer in certain circumstances. They are causally relevant in that an object's disposition to manifest a colour-experience in a certain kind of perceiver under certain circumstances informs that perceiver that the object has a (causally efficacious) colour property that is causing them to have such and such a colour-experience. Colour-dispositions are therefore useful in that they provide a group-specific account of the perceived colours of certain objects under certain circumstances. The problem is that the dispositionalist theory is too reliant upon these perceived colours, the particular group of perceivers and the circumstances in which they are perceived. The dispositionalist account is left trying to do too much in that it tries to incorporate our colour and colour-experience concepts under the single label colour from a single group perspective, and because of this it is not flexible enough to accommodate our extended (non-experiential) colour concepts adequately, instead it imposes certain counterintuitive positions upon us when circumstances

deviate from the norm. This is clearly seen in cases of Metamers and Extra Colours. It is thus best to conceptualise colour-dispositions as heuristics for identifying colour, as each colour-disposition of each object would provide a certain group of perceivers (these being united by similarity in their visual system) with information about which colour they are observing, this information is in most cases somewhat crude as it is limited according to limitations of that groups visual system. Dispositions thus are causally relevant in informing a group of the colours *for that group*, though this does not mean that that group has full information of the colours proper. This position places groups of colour perceivers on a continuum, with dichromats at the one end (as this is the minimum visual state to experience colour) and n -chromats at the other, with trichromats, tetrachromats, and so on, in between. The positing of n -chromats does not however mean that this continuum is endless, with each organism with ever increasing number of kinds of photoreceptive pigments (and corresponding post-receptoral and cortical visual systems) placed further and further along the continuum (ad infinitum), as after a certain n -chromatic system has been reached, an $n+1$ -chromatic system would no longer offer the organism any visual advantage over the n -chromatic system, as the difference in sensitivities of the visual systems would be finer than the difference in colours, therefore both visual systems would be equally efficient in discriminating between and representing all colours accurately into colour experience (where the continuum ends is however a question for science to solve). This is just part of our commonsense intuition, as shown in the case of Extra Colours, that the trichromat (standard human perceiver) discriminates more precisely and represents more accurately the colour properties of objects than the dichromat (a colour blind human perceiver), while a tetrachromat (i.e., a pigeon, or our imaginary tetrachromat human perceiver) would discriminate more precisely and represent more accurately the colour properties of objects than a trichromat.

One can therefore see the way that colour properties of objects and the colour-experiences come apart. Colours are primary qualities of objects that cause colour-experience. Johnston points out (section 1.4), through his example of Zinka the canary and a colour photograph of Zinka, that the primary quality account would have to maintain that as the physical property (P_1) which causes the canary yellow experience when looking at Zinka is very different from the physical property (P_2) which causes the canary yellow experience when looking at a photograph of Zinka, canary yellow must be a disjunctive property consisting of disjuncts P_1 , P_2 , as well as other disjuncts that cause canary yellow experiences. The problem for the primary quality view then, is that our belief of Explanation is that yellow is the property that

causes yellow-experience, however it is dubious to say that such a disjunctive property is the cause, as it seems to put forward to many different possible causal candidates. This is mostly, though not entirely, right. Jackson argues that disjunctive properties can be causes, citing the example of the depth of a wound that is responsible for the death of a victim, arguing that it is not the precise depth that is important, but rather that the depth fall in the range of depths that would count as deep enough to be fatal, claiming further that “it is arguable that most things we cite as causes are more or less disjunctive” (Jackson: 1998a: 106), though adding that such disjunctive properties are causes as long as they are not excessively disjunctive. When faced with disjuncts that are excessively disjunctive, one rather makes sense of these as separate causes, whereby the claim is about either one or the other disparate disjunct, where an excessively disjunctive claim such as ‘either a 10cm knife wound by Frank or a 15cm bullet wound by Mark caused the death of the victim’ should rather be understood as ‘either a 10cm knife wound by Frank caused the death of the victim or a 15cm bullet wound by Mark caused the death of the victim’.

Returning to Johnston’s example, the reason why I refrain from saying that his analysis of the primary view commitment is right, is that he cites the property P_1 as “very different” (Johnston: 1992: 235) from P_2 ²¹. If these properties were very different (though one need not say that they are), then one would have to conclude that the disjuncts are excessively disjunctive, and thereby have to rephrase the situation as done with the knife wound and the bullet wound above: either P_1 caused the canary yellow experience or P_2 caused the canary yellow experience. P_1 and P_2 should then be identified as two different colours as, through being excessively disjunctive, they are separate causes. However the two properties do cause a single colour-experience in human beings, which is identified by us, phenomenologically, as a single canary yellow-experience. We therefore need to accept that even though they do cause a single colour-experience (canary yellow-experience) in human beings, P_1 and P_2 should however remain separate colours (canary yellow₁ and canary yellow₂) as they have separate causal properties that cause the same effect in human beings *only because of the limitation of the human visual system*. These would however cause two different effects in beings that have visual systems that are finer discriminators (are more sensitive) of colour.

²¹ This would however be the view held by primary quality theorists such as Smart (1975), whereby Smart identifies colours as disjunctive physical properties underlying our (normal observer) colour experience under normal lighting conditions. Therefore Smart would have to accept that even if the microphysical properties causing Zinka’s canary yellowness and the microphysical properties causing the yellowness of the photograph of Zinka were found to be very different (excessively disjunctive), they would still be the same colour.

These beings would then have a separate colour-experience/representation of canary yellow₁ from the colour-experience/representation of canary yellow₂²² (thereby they would have the ability to separate out canary yellow₁ from canary yellow₂ through perceived/phenomenological differences between the representations caused by the two properties). We should therefore accept that two objects that we see as having the same single colour could actually differ in colours. Further if this difference were pointed out, it could then be that in some cases we should refer to them as separate colours (which however cause the same experience in us). One could imagine that the male canary (which we can imagine has the ability to discriminate between canary yellow₁ and canary yellow₂) is attracted to female canaries because of their canary yellow₁-ness, while is simply unmoved (or even repelled) by canaries that have been painted with a canary yellow₂ paint (because of a dislike of the canary yellow₂ colour, and not because of it being paint etc.). In such cases, when speaking about the mating activities of canaries, an ornithologist would say that the colour that canaries are attracted to is canary yellow₁, while they are repelled by canary yellow₂. An example (given by Jackson: 1998a: 112) that lends plausibility to this explanation (as a way that we do actually react to similar cases) is that of the ornamental stone jade, whereby when it was discovered that there were two different forms of jade- nephrite and jadeite- this did not lead people to denounce the existence of jade, rather one says that there are two kinds of jade. The lay person may refer to these as both being Jade, and in a way s/he would be right, though a mineralogist would then be able to correct them and exclaim that there are in fact two different kinds of jade where the lay person saw only one. So too then could an ornithologist correct a painter who by using canary yellow₂ paint believed s/he was painting a wall the same colour as that of a canary. This however, does not mean that the painter need say that the room is not canary yellow, s/he needs merely accept that technically it is a different canary yellow to that of a canary.

One does not then however have to extend this division to every disjunct of the disjunctive property. In that one would not be compelled to claim that each strawberry red disjunct is then a different colour, i.e., strawberry red₁, strawberry red₂, strawberry red_n. The primary quality theorist is *only* compelled to say that the excessively disjunctive properties are separate colours, as argued above, though disjuncts that are not excessively disjunctive would

²² By using 'represent' I do not here tie myself to the view that the representation is the object of perception (i.e., a sense datum view), but rather that the external object of perception is perceived by me by being represented in a certain way through the use of my visual system.

be labelled as a single colour. I have equated colours with microphysical causal properties, therefore those properties that are not excessively disjunctive are properties that are unified under their causal role (though as noted above, this causal role is not a role identified by the effects on a human being (trichromat), but rather on the effects of a n -chromat). What therefore prevents a colour from being an excessively disjunctive property is that it is highly implausible that excessively different disjuncts would be able to play the causal role required for a disjunctive property to count as a single colour. It is therefore the role that restricts which causally efficacious microphysical properties fall into which disjunctive colour property. A point that needs to be noted is that even though I speak of microphysical properties that cause experience in the n -chromat, this does not mean that there has to be such an n -chromat, or any perceiver at all for that matter. Colour properties can be causal even if they do not have the colour-experience effect (i.e., they cause light to be reflected in such and such a way; one could here possibly appeal to something like Hilbert's Surface Spectral Reflectance as the common cause that holds the disjuncts together). The use of the n -chromat is merely there to indicate that the physical colour properties are disjuncts that are grouped together by some commonality between them that surpass our experience of them and that can be adequately discriminated by a perceiver if such a perceiver has an appropriately sensitive visual system. Colour properties are however external real properties that are not relational (in the sense that they would exist in a world where there were no colour perceivers) even though they do (in a world where there are such and such colour-perceivers) play a relational role in causing colour-experience in perceivers.

Section 3.3

Causal Efficacy and Disjunction

An objection that is raised against the superiority (in that it offers the most basic cause) of the primary quality view is (as mentioned in section 1.4) that when one looks closely both the primary quality and the secondary quality views are on equal footing in that an "appeal to the disjunctive property is as much an explanation at one remove from P_1 , an explanation by courtesy, as the explanation that the canary yellow appearance of Zinka is due to the property, in Zinka's case P_1 , which oddities aside, causes the manifestation of the disposition to appear canary yellow" (Johnston: 1992: 235). We should here however (for the sake of this

criticism) treat the canary yellow disjuncts as not being excessively disjunctive, as this (as argued above) would amount to their being two different colours and thereby the claim that these two (separate) colours are on equal footing with the dispositional property would in no way be an objection to the primary quality account. We will therefore hold that canary yellow is not excessively disjunctive and therefore is characterized, by the primary quality account, as a disjunctive property with P_1 and P_2 (I will limit it to two disjuncts for simplicity's sake though of course there could well be more) as its disjuncts. The objection is given precision by McFarland and Miller (1998: 82-83; 2000: 210-212) where they argue that as both the disjunctive property and the dispositional property are once removed from P_1 , and as Jackson (1998a) has argued that dispositions cannot be causally efficacious in that it is their causal basis that is doing the causal work, so too "the disjunctive property which the primary quality account identifies as yellowness cannot be causally efficacious with respect to object's looking yellow" (McFarland & Miller: 1998: 82), in that the disjunctive property faces the same troubles as the dispositional property when faced with the third assumption (section 3.1) of causal efficacy:

3. A property F is not causally efficacious in the production of an effect e if all three of the following sub-conditions are fulfilled:
 - (i) there is a family of distinct properties G_1, \dots, G_n such that F is efficacious in the production of e only if some G_i ($1 \leq i \leq n$) is efficacious in its production.
 - (ii) the F -instance does not help to produce the G -instance in the way that the causally efficacious G -instance helps to produce e , therefore they are not sequential causal factors.
 - (iii) the F -instance and the G -instance do not combine, directly or through further effects, to help in the same sense to produce e , therefore they are not causal coordinate factors.

They argue that the primary quality theorist holds that canary yellow is a disjunction of properties P_1 and P_2 . Looking then at 3(i), they argue that as there is a family of distinct properties P_1 or P_2 (the disjuncts), such that the disjunctive property ($P_1 \vee P_2$) is efficacious in the production of e (colour experience) only if either P_1 or P_2 is efficacious in its production, 3(i) is satisfied. Looking at 3(ii), they argue that as the disjunctive property does not help to produce the instance P_1 or instance P_2 in the way that the causally efficacious

instance P_1 or instance P_2 helps produce e , 3(ii) is satisfied. Looking at 3(iii), they argue that as the disjunctive property and either P_1 or P_2 do not combine, directly or through further effect, to help in the same sense to produce e , 3(iii) is satisfied. As all three sub-conditions are fulfilled, (by Jackson's own account) the disjunctive property that the primary quality theorists (like Jackson) equates with canary yellow is not causally efficacious. And so, they argue, if canary yellow cannot be a dispositional property (as dispositions are not causally efficacious) then neither can it be a disjunctive property.

Jackson replies that being $P_1 \vee P_2$ and being P_1 "are not distinct in the operative sense; rather, they stand in some kind of inclusion relation. Distinct in these discussions does not simply mean non-identical" (Jackson: 1998b: 88). Even though I believe that this is right, McFarland and Miller argue that Jackson needs to tell us "what kind of inclusion relation [he] has in mind" (McFarland and Miller: 2000: 211). I believe that their worry stems from a misunderstanding of what being a disjunctive property ($P_1 \vee P_2$) is. By claiming that $P_1 \vee P_2$ caused the colour experience one does not mean P_1 caused the colour experience or P_2 caused the colour experience (as would be the case if the disjuncts were excessively disjunctive as discussed above). If this were so then we would have reason to claim that $P_1 \vee P_2$ is not causally efficacious. Rather what is meant is that instance P_1 and instance P_2 fall into a single disjunctive property because they fall within a certain range of similarity. $P_1 \vee P_2$ is a single causally efficacious property exactly because of the common causal role that P_1 and P_2 play, in that it would be no different (causally, as far as colour is concerned) if P_1 or if P_2 were instantiated (in that each would play the same causal role as the other from circumstance to circumstance). Therefore the disjunctive property $P_1 \vee P_2$ implies: instance P_1 or instance P_2 , both of which play the same causal role. As it is the causal role that defines their similarity, one is justified in claiming that $P_1 \vee P_2$ causes (in the sense of being causally efficacious) e - as it is $P_1 \vee P_2$ that plays a single causal role- just in the instantiation of P_1 or the instantiation of P_2 .

McFarland and Miller then go on to demand that the primary quality theorist give "some motivation for reading the causal constraint on the representational content of experience in terms of the conservative notion of causal efficacy rather than the more liberal notion of causal relevance" (McFarland & Miller: 2000: 209).

From a methodological standpoint, causal efficacy is more basic than causal relevance -in that it is causal efficacy that is doing all the work- therefore if one has a choice between a causally efficacious property and a causally relevant property one should choose the causally efficacious property, unless causal efficacy leaves out something crucial to the concept that causal relevance would better explain. I think this claim is uncontroversial. Now, our prime intuition is that colour is a property of an object that causes colour-experience. As it is the disjunctive property that is doing all the causal work as far as the object is concerned, the disjunctive property therefore offers a sufficient causal explanation as far as the properties of objects are concerned. What the secondary quality theory introduces are factors that are extrinsic to the object (i.e., <Observing, Experiencing>). By not including these, the causally efficacious disjunctive property does not leave out anything crucial to the concept of colour properties of objects. Therefore, as far as colour is concerned, by equating colour with the causally efficacious disjunctive properties one identifies which properties of the objects are doing all the causal work without leaving anything crucial to the concept of colour out. One is thereby left with a simpler theory (more basic) that leaves nothing crucial out. What more motivation could one want? It is for this reason that I believe that one should reject Johnston's claim that the two theories are on equal footing, and thereby conclude that Jackson is right in claiming (in the quote in section 1.4) that we need not lower our standards and accept a dispositional account, as by putting forward the disjunctive property, we put forward a better candidate.

Section 3.4

Colour and Colour-Experience

“It is important to keep issues about how we know what colour an object is conceptually separate from issues about the nature of color. The ontology and epistemology of colour are related but distinct topics” (Hilbert: 1987: 53)

From the arguments above one can now see what it is that a primary quality view (as I present it) consists of. One must divide colour from colour-experience. Colours are microphysical causally efficacious properties that surpass our colour-experience. These

microphysical properties are taken to fall into disjunctive colour properties because of their common causal roles. These disjunctive properties are therefore labelled as colours as they directly imply (without reference to extrinsic properties) the instantiation of their disjuncts (microphysical properties). It is then these disjunctive (though not excessively so) properties that are causally efficacious in producing colour-experience. It is therefore the disjunctive properties that are doing all the causal work and are therefore the most basic (though sufficient) explanations of the colour of objects.

Colour-experiences represent these colours by being caused by the instantiation of the microphysical properties. Colour-experiences are however limited representations due to limits in our visual systems. Therefore in certain cases two different colours may cause the same single colour-experience in (trichromatic) human perceivers. However, a visual-system that is more sensitive than that of the trichromatic visual system would then have greater efficiency at discriminating between these colours, as it would represent the colours as two different (but possibly similar, i.e., canary yellow₁-experience and canary yellow₂-experience (if taken to be excessively disjunctive) would probably (though not necessarily) be phenomenologically quite similar) colour experiences.

Now, even though colours and colour-experience are separate, there is an obvious link between the two. It is through colour-experience that we identify colour. Colours cause our colour-experience, and it is through this colour-experience that we identify which objects have which colour properties. This identification though, is (much like the rest of perception) corrigible as we are using a limited visual system to gain information about external properties. We therefore are not able to adequately perceive all the colours that there are in the world, as, in some cases, our visual system will represent (or misrepresent) two separate colours as a single colour-experience.

Section 4

Section 4.1

Dispositionalism, Unity, and Availability

I now turn to a criticism, made by Gold (1999), which questions the validity of the dispositionalist's claim to Unity and Availability, especially in light of our overarching schema of perception in general in regards to external properties.

In section 1.7 I set out how Johnston argues that, on the basis of our core beliefs of Unity and Availability, the secondary quality view should be preferred to the primary quality view as it, unlike the primary quality view, is able to meet the demands of these two beliefs. He argues that, according to the secondary quality view, as colours are dispositions of objects to manifest such and such experiences, one is entitled to infer from various unity/difference relations found in the manifestations that the dispositions (the colours) themselves bear these relations. One therefore has, through perceptual experience, sufficient justification to make judgements about colour relations. One is thereby justified to claim from perception alone (from the manifestations) that canary yellow (the canary yellow-disposition) is not a shade of blue (one of the blue dispositions). He then argues that the primary quality theorist is not justified through perceptual experience alone, as s/he needs to look to science to discover whether any such relations hold amongst the microphysical properties. Johnston thereby situates Availability and Unity in inferences from the relations between dispositions and their manifestations.

Gold (1999: 31-40) raises a question as to whether one is really entitled to make such an inference, and points out that this relation between the disposition and the manifestation can either be weak or it can be strong.

On the weak relation view, one maintains that the manifestations provide *prima facie* evidence that the dispositions, like their manifestations, share such relations. This however takes away the advantage that Johnston has given the secondary quality view over the primary quality view. As, if the relation is weak it is defeasible, and therefore "we don't have a *guarantee* that what is true of the color manifestations is true of the color dispositions

though the manifestations may be justified grounds for beliefs about the dispositions” (Gold: 1999: 35). As the weak relation cannot guarantee that one is entitled to infer that the relations that hold amongst the manifestations hold amongst the colour-dispositions, the secondary quality view, just like the primary quality view, needs to defer to science to discover whether canary yellow is really (or cannot be) a shade of blue.

It follows that for the secondary quality theorist to argue that Unity and Availability give us reason to choose the secondary quality view over the primary quality view, s/he must hold a strong relation view. A strong relation would be one whereby “whatever is true of the color appearances *must* be true of the colors” (Gold: 1999: 36), and thereby such and such relations amongst colour-experiences would guarantee corresponding relations amongst colour-dispositions (this is an appeal to some form of Partial Revelation). However, by offering us this guarantee, the strong view thereby bestows our colour experience with incorrigibility, and therefore privileges our experiences over science, insulating colour experience from revision. This leaves colour perception with a privilege that we do not bestow upon the rest of perception, and limits *a priori* any scientific discoveries within this field. Scientific evidence that may lead one to have misgivings about this situation is that found in psychophysical experiments run by Crane and Piantanida (1983) where visual stimuli presented to observers led the observers to report having a yellow-blue colour-experience. Such a yellow-blue experience has both yellow and blue phenomenological components, therefore could be categorised as either a shade of yellow or as a shade of blue. If one categorises it as a shade of blue, then one accepts that a ‘yellow’ (as yellow-blue is also a yellow, even if one does not officially categorise it as such) could be a shade of blue, despite an earlier view held -from visual perception- that yellow cannot be a shade of blue. This shows that even though our visual perception initially informed us of certain unity/difference relations (that the yellows and the blues are separate), this information is fallible, or at least (as seen from the psychophysical experiments) we do have reason to doubt it.

The claim of incorrigibility is problematic for the secondary quality view when one considers that the dispositionalist wants to maintain externality, arguing that colours are properties of objects, thereby upholding the core beliefs of Paradigms and Explanation. If colours are real external properties then they must face the problems of perceptual epistemology- those of corrigibility. This is made evident by the fact (as argued in section 2.4) that our visual system is limited. The dispositionalist may dig in their heels and claim that despite all this, colour-

perception just does have this privilege. However, as this would require a revision of our beliefs of perception in general, undermining our beliefs in science, the dispositionalist can no longer claim that s/he is backed by commonsense. It does therefore seem to be, given the commonsense methodology that is being followed by dispositionalists such as Johnston, undesirable. Gold therefore seems right in claiming that if the strong view is upheld then “the dispositional account wins the battle at the cost of losing the war” (Gold: 1999: 22).

Section 4.2

Dispositionalism and Revelation

As explained in section 1.5, Johnston argues that Revelation is too great a demand upon colour, in that if one accepts it (in the strong sense) one is forced to give up the externality of colour. This would however be too high a price to pay, as it would amount to giving up our prime belief about colour. He argues that we should be content with colour satisfying a weaker form of Revelation, whereby we are acquainted with the dispositions through their manifestations, even though they are not represented as dispositions.

Levin (section 1.6) argues however that we need not weaken revelation²³ as dispositionalism is able to stand up to the demands made by it. She denies that dispositions are merely inferred properties (and thereby denies that they fail to meet Revelation) by arguing, through use of the example of the fragility-disposition of a crystal goblet, that a subject’s mental state when seeing the goblet has an equally good causal/informational relation to the object’s fragility as to its shape and size. She thereby argues that this shows that one does see the fragility-disposition, and from this concludes that so too does one see a colour-disposition, in that having the appropriate colour-experience *is* what it is too perceive the colour-disposition directly.

Her argument, however, fails to be convincing. When one looks at the intact crystal goblet (from her example) one does not see the object’s disposition to break directly in the sense that is required by strong Revelation. Here, one sees the goblet, its physical properties, and then

²³ Johnston later believed that one *cannot* weaken Revelation, see footnote 4.

infers that it may be disposed to break. This however is not full Revelation. One does still believe that the situation depends upon whether the goblet has the appropriate causal basis, which is necessary (as argued in section 3.1) to cause the breaking. One could have heard of a new kind of crystal that is virtually indestructible (as it has a stronger microphysical bonding) and therefore upon seeing the crystal goblet one could wonder whether the goblet is made of crystal as we know it, or the new super crystal. Further, if the crystal is just normal crystal (thereby fragile), then even though one is presented with a disposition to break, one would not know this. The example therefore may support a weak Revelation (much like Johnston's) but not Revelation in the strong sense.

But Levin is appealing to Revelation and colour-dispositions, which are, as she notes, response-dispositions (dispositions to produce experience in perceivers). These would (as argued in section 3.1) be more like heat-dispositions: colour is the disposition to manifest colour-experience when speaking about objects looking coloured, while heat is the disposition to manifest heat-experience when speaking about objects feeling hot. With this in place one can look to a thought experiment²⁴ that shows that response-dispositions cannot meet the demands of strong Revelation. One can imagine a torture chamber where people were tortured through branding. This torture chamber is surrounded by great furnaces that have flames bellowing from them. A person is then strapped down, with their face strapped away from the torturer, facing one of these furnaces. The torturer then approaches the person from behind, telling the person that he is now going to brand them with a piece of hot metal. However, unbeknown to the person to be tortured, the torturer takes a block of ice and places this on the back of the person. The person believing that he has been branded by a piece of hot metal, and feeling the ice though experiencing it as heat, screams out in pain, just as if he had been branded by a hot piece of metal. The block of ice is however not hot, it is cold (in that it lacks the appropriate causal basis). One thus has a heat-experience, yet the intrinsic nature of that experience is not fully revealed. This illustrates the epistemological corrigibility of experience. The analogy gives us reason to believe that colour-experience (as it too is a response-disposition) is also corrigible. Levin would admit this and therefore argues that one perceives these properties directly by "having the very experiences that one is supposed to have when one looks at something colored" (Levin: 2000: 154-155). Though this

²⁴ This is a thought experiment from philosophy of the mind. It is used there to question the thesis that we are infallibly correct about our sensations. The thought experiment in that setting is used to question whether we could be wrong about sensation of pain. See Smith & Jones (1986: 215).

leads us to have to accept that in some cases when we have colour-experience we have the intrinsic nature of colour-dispositions revealed to us, while other times when we have colour-experience we do not have the intrinsic nature of colour-dispositions revealed to us, and that from the experience itself we would not know whether we are in the former or the latter situation. The claim is therefore that even though the intrinsic nature is fully revealed we have no real epistemic access to it. This hardly sounds like the strong Revelation that proponents of revelation are asking for. In this case it does seem that McGinn is right in claiming that dispositional properties are properties that are inferred from our colour-experiences, and not, in themselves, actually visible.

Levin goes on to deny that “color properties do not look much like dispositions to produce color experiences” (McGinn: 1996: 537), by arguing that even though normal colour perception is phenomenologically similar to perception of shape, this parity can be shown to be fragile through the setting up a similar fragile parity between shape and other response-dispositions (i.e., sexiness) and through the use of thought experiments that show colour to be a response-disposition. I believe her argument does little to appease those who argue from Revelation. The apparent parity of shape and sexiness is weak to say the least. When one attributes the property of being sexy to another person one does not believe that this is some real property that the person has, but rather one is making a judgement about a sum of that person’s properties, and thereby concluding that they hold that that person is sexy based upon their various background beliefs. One does not actually see a sexy property, but instead makes a judgement about the properties that one does see, thereby inferring that the person is sexy (has the sexy response-disposition). Sexiness is experienced as a response-disposition, a judgement call, and it is for this reason that people find it hard to define what sexiness is. Therefore indirect perceptual evidence does not seem to reveal (as Levin would have us believe) sexiness, as it does shape, as monadic. The same does not however hold for colour. The parity between shape and colour seems, phenomenologically, less fragile. Levin’s appeal to thought experiments does little to help the situation. The use of thought experiments is an appeal to concepts and extended concepts and not to perceptual experience. Revelation is however a demand about the latter, irrespective of the former. Revelation demands that colours be revealed as dispositions through perceptual experience, and that it is this perceptual experience alone that reveals them as such. Appeals to possible worlds are just as much outside of the demands of Revelation as appeals to science (made by primary quality theorists).

Finally, the appeals to unsteady colours made by some secondary quality theorists who argue that “at least some colours *do* look like dispositions” (McFarland & Miller: 1996: 83)²⁵ has little force, as this relational aspect of the unsteady colours is exactly what leads us to deny that these are real colours. Gold gives the example of The Herman grid illusion, consisting of sixteen small squares that are evenly spaced from each other in a 4x4 formation (making up four columns and four rows). When one stares at this grid, “[i]llusory colored circles appear at the intersections of the grid except for the intersection one is looking at... For this reason, as the eyes move to a new location on the grid the colored circle in the intersection at which one was previously looking does seem to “come on” in a way that makes the colors appear as a result of a relation between the grid and the position of the eyes” (Gold: 1999: 41n). One does not however want to claim that these unsteady coloured circles are real colours, rather one refers to these as illusions *because they are relational*. It seems an odd and undesirable claim for the secondary quality view that if colours are dispositions, then by appearing more like dispositions they appear less like colours and more like illusions.

The point here is not that dispositionalism is shown to be false, but rather that the dispositionalist is unable to meet the demands of Revelation. The arguments from Revelation merely show that dispositionalists must as Ross says “distinguish between the appearance of colour in ordinary visual experience and its constituting nature. A defensible dipositionalism must reject Revelation” (Ross: 2000: 238). Therefore the dispositionalist does not have the conceptual advantage here over the primary quality theorist.

²⁵ See also Johnston: 1992: 227.

Section 4.3

Why accept Revelation?

“ The question is: why accept Revelation?” (Ross: 2000: 241)

Revelation (much like the strong relation between disposition and manifestation in the question of Unity and Availability discussed in section 4.1, which was essentially an appeal to Partial Revelation) is an appeal to a privileged position for our colour perception. This, despite not fitting with our concept of perception in general (in that perception of other external properties does not reveal their intrinsic nature) is a claim made by those who appeal to Revelation, who assert that colour perception just is special in this way. They are entitled to make such a claim, but since this does not fit with our commonsense view of perception in general it does mean that the onus is strongly on the proponents of Revelation to motivate this assertion. So far no such motivation (other than bare assertion) has been given.

Reasons why we should give up Revelation (especially in the strong sense) on the other hand are plentiful and compelling. Along the lines of the arguments from perception in general (above) Hilbert speaks of the fallacy of total information, arguing: “Vision provides partial information about objects, not only in the sense that there are properties that are not visually accessible, but also in the sense that even properties that are visually accessible may not be completely determined by any given visual perception” (Hilbert: 1987: 37). The fallacy then is that our visual-experience gives us total information (a full picture) of the objects being perceived. It seems that by demanding Revelation one is committing this fallacy.

Jackson (1998a) argues that we have good reason to deny that Revelation really is part of our folk theory of colour, that is, to deny that it is one of our core beliefs. He puts forward three arguments: (1) When one looks at the experience of heat, one may have held -before there was knowledge of what heat really is- that the experience of heat reveals the intrinsic properties of heat, the ‘feeling hot’. However, he argues that “our very preparedness to identify heat with molecular kinetic energy when the empirical evidence came in shows that this opinion was merely opinion” (Jackson: 1998a: 103). As it is plausible to hold that experience of heat is similar to experience of colour, it is plausible to hold that just as we

were prepared to accept that heat-experience does not reveal the intrinsic nature of heat (molecular kinetic energy) so too are we prepared to accept that colour-experience does not reveal the intrinsic nature of colour (the microphysical properties). (2) As we are willing to accept that some colour-experiences are illusions, we are able to conceptually separate out colours as they are from colour appearance, thereby colours having a nature that outruns our experience. (3) As our prime intuition is of colours as causal properties that cause colour-experience, and as our folk theory is of cause and effect being distinct, it seems odd to claim that our experience of colour, which is distinct from what it is an experience of, would reveal the nature of colour transparently.

However, Revelation did seem to have some initial conceptual appeal. And it would be useful to explain where this appeal stems from. There does seem to be some intuitive plausibility to the claim that by experiencing red I know what redness is, in that through the experience I have full access to redness. Does this mean that we should not deny that Revelation is part of our pre-theoretical conceptual scheme? I believe that, to an extent, we should not. This can be made clear by separating colour from colour-experience.

When one has a red colour-experience, the intrinsic nature of that experience is, in a way, fully revealed. This is Revelation within our Phenomenological colour space (see section 2.4), a three-dimensional colour space consisting of a hue-dimension, saturation-dimension and a lightness/brightness-dimension. It is then these dimensional phenomenological aspects of colour-experience that are revealed. The hue-dimension offers us the degree of red-ness, or green-ness, or yellow-ness, or blue-ness of a given colour. Black, white and grey are colours with a hue of zero, thereby known as achromatic colours. All colours therefore that have a nonzero hue are chromatic colours, “[i]t is these which we demand to see when we pay for a color television set” (Hardin: 1988: 26). The saturation-dimension is then the proportion of hue in a given chromatic colour in relation to neutral grey (achromatic) point. This determines the strength of the hue (i.e., the closer the hue is to the achromatic point the weaker the hue). As for the lightness/brightness-dimension, in the surface mode it is the achromatic or black-white dimension along which colour-experiences are scaled, while in the aperture mode the colour-experiences are scaled over a range from those that are experienced as dim to those that are experienced as bright/dazzling. It is because these phenomenological aspects are revealed to us in colour-experience that we are able to partake in psychophysical tests where we are able to report our colour experiences, reporting whether the experience is

chromatic, under which hue category it falls, whether it is saturated or unsaturated and whether it is experienced as light, dark, dim, or dazzling. As there is a close relation between colour and colour-experience (colour causing colour-experience), one does not have to deny Revelation a place in our overall conceptual schema, though it is a limited Revelation, one that does not reveal the intrinsic nature of the colours that cause the colour-experiences (or for that matter the receptor, post-receptor, or cortical colour spaces are also not revealed). This is a result of what Jackson calls “the opacity of our experience of color” (Jackson: 2000: 157), in the sense that a physical colour property (or a complex thereof) “is presented to us under a guise that leaves it opaque which physical (as it happens) property it is” (Jackson: 200: 158). Once again parallels can be drawn with heat, whereby the heat-experience does not reveal molecular kinetic energy, even though heat just is molecular kinetic energy, thereby in that sense the experience of heat can be said to be opaque.

It is therefore only by conflating colour and colour-experience that one feels the pull of strong Revelation. By sorting out our overall conceptual schema and distinguishing the concepts colour and colour-experience, one is able to save our concept of Revelation, without being forced to deny the externality of colour.

Section 4.4

Unity, Availability and Primary Qualities

We can now look to whether Johnston is justified in claiming that the primary quality account forces us to give up our core beliefs of Unity and Availability. He argues that by accepting primary quality theory we are left in a position whereby we must always defer to science in order to be justified in our ascription of colour-names to objects, thereby giving up Availability. He does admit that the primary quality theorist is able to block this objection by arguing that Availability does not require that one have access to the physical properties through visual experience, as would be required by Revelation, but he argues that this then still leaves open the possibility that we could be mistaken about the various similarity and difference relations that make up our core belief of Unity. According to Unity, each colour/colour-shade “has its own unique place in a network of similarity, difference and exclusion relations exhibited by the whole family of shades” (Johnston: 1992: 222) in the

colour solid (phenomenological colour space). As the primary quality theory thereby allows the possibility that science may reveal that these relations not to hold between the physical properties, it leaves open the possibility that canary yellow could be a shade of blue.

Johnston's argument from Availability by appeal Unity is therefore a claim that the similarity and difference relations in visual experience specify colour space essences. But the primary quality theorist "*allows* that the qualitative relations represented in the color space *don't* specify essences, for it allows the physical properties that are the colors *aren't intrinsically* related in ways that correspond with these qualitative relations" (Ross: 2000: 232). An appeal to colour space essences is an appeal to Revelation, in that it assumes that colour-experience reveals intrinsic properties, and therefore relations between these properties. But as argued above, we have good reason to reject this kind of Revelation.

The primary quality view, by separating out colour from colour-experience, allows that one is justified in attributing colour-names to objects on the basis of our colour-experience as colour-experience is caused by physical colour properties. Colour-experiences (as was argued in section 3) represent the colours by being caused by the instantiation of the microphysical properties. We therefore identify colours through our colour-experience and our background beliefs, and are justified in doing so *because* these experiences represent the colour-properties and *because* we know that we are in circumstance in which we are able to represent these colours as accurately as possible (i.e., not wearing funny coloured glasses). As was argued, our colour-experiences are limited representations, due to limitations in our visual system, though limited does not mean useless. We do not have to accept an all-or-nothing approach. By accepting a primary quality view we *do* have Availability, though this Availability, like the Availability in the rest of perception, is corrigible (as seen from the heat thought experiment in section 4.2). And this, as argued in 4.1, fits better with commonsense than the dispositionalist's appeal to an incorrigible Availability.

What then does the primary quality theorist say about Unity? How does the primary quality theorist meet the conceptual demand for certain similarity, difference and exclusion relations between colours? Hardin (1987: 113-134) argues²⁶ that this resemblance ordering of colours in our colour-experience has no counterpart in the physical world independent of colour

²⁶ See Maund (1995: 157) for recent formulations of this argument

perceivers (as such relations are a result of the way the visual system works, i.e., the trichromat has three photoreceptors that give off response signals which are then compared and recoded in the post-receptoral channel and so on, resulting in these phenomenological relations through opponent-processing; see section 2.4). For a colour to count as red it must be located a certain position in the resemblance ordering of colours and thereby bear such and such similarity and difference relations to other colours (e.g., be an opponent to green; be more similar to orange than to blue). He argues that the physical properties that the primary quality theorist identifies as colours do not have these various similarity and difference relations amongst themselves. Thompson (1995: 123) builds on this and sets up what he calls ‘the argument from external irreducibility’:

1. For something to be a (chromatic) colour it must be a hue.
2. A colour must be either unique or binary.
3. Therefore, if hues are to be reductively identified with perceiver-independent, physical properties, these properties have such and such corresponding unique and binary divisions.
4. External, perceiver-independent physical properties do not have such divisions.
5. Therefore, colour cannot be reductively identified with such perceiver-independent physical properties.

This however is not a real problem for the primary quality view. The primary quality view separates out colour from colour-experience, and the similarity and difference relations are part of colour-experience. Thompson’s argument begs the question against the primary quality view from the start, in that it is not necessarily true that for something to be a (chromatic) colour it must be a hue (this is exactly what the primary quality view is denying). The primary quality theorist can however agree that what is necessarily true is that for something to be a chromatic *colour-experience* it must be a hue, but then the argument fails to raise a problem for the primary quality view. We are not trying to reduce colour-experience to physical colour properties. Our visual systems pick out colour properties via colour-experience, as the colour-experiences are caused by the colour properties. “Why can one not hold that *experience of red* and *experience of green* track properties that exist independently of us, but that the experienced opposition between them has no real

counterpart?” (Matthen: 2000: 68). The similarities and differences in our experience are about the various representations and comparative judgements between these representations. It is possible that these judgements are fallible (as was suggested in section 4.1 whereby opponent yellow and blue colours are experienced as a single yellow-blue colour), though even if they are not we have no reason to assume that these similarity and difference relations have to have corresponding similarity and difference relations between (physical) colour properties. To place this demand upon colours would once again be demanding Revelation.

Section 4.5

Saving All Our Beliefs

Dispositionalism’s appeal to Unity and Availability as offering us a reason to prefer a secondary quality account over a primary quality account fails. If the dispositionalist holds a weak relation between manifestation and disposition, then s/he allows that judgements based on experience are fallible, and thereby places the secondary quality theory on par with the primary quality theory (as far as Availability is concerned), as the primary quality theory holds that colour-experience represents (though this representation is fallible) colours by being caused by these colours. This allows the primary quality theorist to be justified in attributing colour names to objects based simply upon experience, though, much like the secondary quality theorist, s/he must accept that sometimes these experiences are fallible.

If, on the other hand, the dispositionalist holds a strong relation, then s/he is claiming that colour perception is, unlike the rest of perception, incorrigible, and thereby is left holding a position that has little backing from commonsense. Yet it was an appeal to commonsense that first brought about the belief in Availability. The primary quality theorist therefore has every right to demand that the dispositionalist explain why they bestow colour perception with such incorrigibility while denying the rest of perception this privileged position. A satisfying explanation has however not yet been given.

As I have argued, strong Revelation is a demand that neither the secondary quality view nor the primary quality view can meet. They however need not meet this demand as when one looks to how extreme a claim this really is one can simply deny that it really is one of our

core beliefs. When one examines the belief of Revelation one sees that this belief pertains only to our colour-experience, and not to colours themselves. Therefore by separating out colour from colour-experience we are able to explain that the belief in Revelation stems merely from the revelation of the hue, saturation, and brightness/lightness dimensions of our phenomenological colour space, and thereby deny that Revelation poses a threat for a primary quality ontology of colour.

Finally, the similarity and difference relations that make up our core belief of Unity are also merely part of our phenomenological colour space, and not of colours themselves. Arguments that appeal to these relations as showing that the primary quality view is false, are arguments that are appealing to Revelation as they hold that the relations in colour-experience reveal relations between colours themselves. As we have good reason to doubt Revelation (in the strong sense required for such an argument to go through), this argument has little force against the primary quality theorist.

The primary quality view by separating colour from colour-experience is therefore able to incorporate all our core beliefs into our overarching (colour) conceptual schema. What becomes evident is that a little conceptual housekeeping is required, sorting out our concepts, ordering them, and placing them in the appropriate positions in our overarching schema.

Section 5

Section 5.1

Problems from Commonsense

A complaint from commonsense (one that stems from Johnston's worry about disjunctive properties) laid against the primary quality theory is that when we speak of canary yellow we speak of a single property, the property of canary yellow (P_{cy}) and not of a disjunction of properties ($P_1 \vee P_2 \vee P_n$). We say that that the canary is P_{cy} and not that it is either P_1 or P_2 or... or P_n . Therefore if canary yellowness "is a single property of objects, as our ordinary understanding of colour suggests, *which* single, causally respectable, non-dispositional property of the world is it (Tolliver, 1994)?" (Akins & Hahn: 2000: 220).

I don't believe that this really is a problem for the primary quality view. This can be explained by what we have identified above. The disjuncts are grouped together because they play a common causal role with respect to light (those objects that effect light in the same way in all possible circumstances would be classified as playing the same causal role), which can then best be discerned by the n -chromat. It is because of this that an instantiation of P_1 would cause the same representation as an instantiation of P_2 . There is phenomenologically nothing different between the two representations, even though physically there is (though not excessively so). These two representations would count as the same representation, as both represent the property that is defined (when speaking of colour, as this property may play other roles as well) by the appropriate causal role that it plays. This property is however disjunctive, in that each of these disjuncts is doing the causal work at the time when that disjunct is instantiated.

We can return the example (raised in section 3.1) of the car's petrol gauge and the petrol in the car's petrol tank, whereby the gauge tells one the amount of petrol in the tank. This is how we have defined what we are speaking about when speaking of petrol gauges representing amount of petrol. Now, the petrol gauge would be said to be representing the amount of petrol in the petrol tank if that petrol was unleaded petrol (P_s) from a Shell petrol station, and it would also be said to be representing the amount of petrol in the petrol tank if the petrol was unleaded petrol (P_b) from a BP petrol station. You would therefore in both

cases be justified in saying, upon looking at the gauge and seeing that it was at full, as well as having the appropriate background beliefs (i.e., that your car uses unleaded petrol), that you have a full tank of unleaded petrol, even though the two unleaded petrols are physically somewhat (though not excessively) different. This seems evident in that most people don't care (I know I don't) whether they fill up at Shell, BP or any other petrol station (especially in South Africa where the price of petrol is the same at all petrol stations within the same province). In such a case, however, when referring to unleaded petrol you are referring to a disjunctive property $P_s \vee P_b$, whereby an instantiation of P_s would be the property of unleaded petrol, and so to would the instantiation of P_b .

Once again it seems that what is driving us to mistakenly deny that colours could be disjunctive properties is some appeal to Revelation, whereby as phenomenologically there is no difference revealed between two different objects that have the same colour, one wants to deny that there could be some underlying physical difference. However as we have seen above, we have good reason to reject such appeals to Revelation, rejecting that our colour-experience does reveal the intrinsic properties of colour. Therefore we can conclude that the property P_{cy} *just is* the property $P_1 \vee P_2 \vee P_n$, in that when we speak of P_{cy} we actually *mean* $P_1 \vee P_2 \vee P_n$ (i.e., canary yellow is the canary yellow in the photo, is the canary yellow of the canary, is the canary yellow of that unfortunately-painted car, and so on).

Section 5.2

Problems from Possible Worlds

A second complaint against the primary quality theorist is that the primary quality view faces problems when looking to colour concepts across possible worlds. This is brought out through the use of a thought experiment (as well as many variations upon this thought experiment).

One is asked to imagine that in our world (the actual world) it is the physical property P that causes lemons to look yellow (cause yellow colour-experiences). Therefore P is the colour yellow. One is then asked to imagine that there is a possible world where our brains have a different receptor, post-receptor and neural structure, and therefore property P (of lemons)

in this world would look blue (we would have blue colour-experiences). (An alteration on this thought experiment is that we have, unbeknown to us, our brain structure reconfigured and are then taken across to this possible world, whereupon we see lemons and exclaim 'lemons here are blue'). One is then asked whether the lemons in this possible world are yellow (though appear blue) or whether they are blue.

The opponents of the primary quality view would then insist that in the possible world where lemons look blue, we would refer to them as blue, and they would (as our intuitions show) be blue, even though they have the same physical property P (which the primary quality theorist identifies as colour) as the lemons in the actual world. They would therefore argue that there is something counterintuitive about the primary quality view.

I however doubt that the criticism is as clear-cut as the opponents would have us believe. When faced with this thought experiment I doubt that we have the immediate (and confident) response that lemons *are* blue in this possible world. Rather it is more plausible to claim that some would say 'yes', the lemons are blue, others would say 'no', the lemons are not blue but only appear to be so, while others still (and this is probably the position of the folk, who are not trying to defend a particular philosophical theory) would claim that they are not sure, offering the old philosophical 'yes and no'. And in this case I think it would be wise to go with the folk, as it seems that this is a case "where what might have been thought to be a question in metaphysics turns out to be a question in the philosophy of language" (Jackson: 2000: 160). The reason for my response is clear when one separates out colour from colour-experience.

Strictly speaking (under the primary quality view that I propose²⁷), lemons would be yellow in the possible world where they look blue, as they would have the physical property that plays the yellow causal role (as was noted this causal role is independent of there being perceivers as it is a property that causes changes in light, i.e., if two objects are the same colour then each object will always effect light in the same way as the other object when both are found in the same (and across all) circumstances), and as in the possible world it is only we that are different (as opposed to a possible world that is far removed from the actual world, where there are differences in the causal roles that physical properties play, however it

²⁷ Though not necessarily so under the view that Jackson puts forward.

is unclear how you would imagine this world or what you would say in response to such a case) the lemons are still yellow as they have such and such a property. However, it is we, human trichromatic colour perceivers, who have given colours their colour-names. Further, we have given them these names through the colour-experiences that these colours cause in us, we identified colours by the way they look to us, then named the colours that looked different as different colours. Therefore, when we looked at lemons in the actual world these lemons caused yellow colour-experiences in us. We therefore gave lemons the colour-name 'yellow'. As colours were picked out by colour-experience, and then named accordingly, our use of 'yellow' in many ways stands for a conflation of colour and colour-experience. It is this conflation that then brings about our anthropocentric chauvinism, identifying colour with the property that causes the colour experience that we typically have. This conflation however has pragmatic value as it enables us to speak amongst each other about objects and their colours, and through our anthropocentrism (the similarities in our visual systems) we are able to speak about colour preference, and other emotional responses to the presentation of different colours. Therefore in the possible world where lemons look blue, one may have an intuition that these lemons would be blue, this however is an intuition tainted by anthropocentric chauvinism (in that the causal properties remain the same, and if in the possible world other animals did not have this perceptual restructuring, then they would still experience lemons as yellow), it is an intuition based upon our colour-experience, that gains intuitive appeal through the fact that we gave colours colour-names through our colour experience. Though as we gave colours colour-names through colour-experience, it is possible that we are then allowed (for pragmatic reasons) to change these names when (drastic and pervasive) changes in colour experience occur, though this is change in language, not metaphysic. What is metaphysically important is that the (disjunctive) colour properties remain distinct from each other, in that in the possible world lemons (and all other things that play the same causal role with light) may look blue, but (as our visual system is restructured) blueberries (and all other things that play the same causal role with light) will look yellow. These are therefore two distinct colour properties, though how we then name them depends on how anthropocentrically chauvinistic we are.

I therefore argue (as concluded in section 2.4) that when doing metaphysics we should cease being anthropocentric chauvinists, though I concede that in our day-to-day life anthropocentrism may, for pragmatic reasons, be inescapable.

Conclusion

The Primary Quality View Defended

“Perception of difference points strongly to the real existence of such differences, failure to perceive differences points much less strongly to the absence of differences”
(Armstrong: 1968: 286)

The primary quality view succeeds where all other contenders fail. From our prime intuition of colour we hold that colours are real properties of the world that then typically cause colour-experiences in perceivers. As the subjectivist position is incompatible with our prime intuition I argued that accepting subjectivism and thereby rejecting our prime intuition (and the way we use colour terms) is too high a price to pay, and therefore on these grounds I rejected subjectivism as a contender for the ontological status of colour. This left a choice between either the primary quality view and the secondary quality view. The secondary quality view, despite initially seeming intuitively impressive, however failed to meet its own commonsense demands. Though it captured an aspect of objectivity from our core belief of Paradigms, it however failed to meet the causal efficacy required to satisfy Explanation (which makes up the second part of our prime intuition). Further, the dispositionalist account was unable to gain the support it claimed from Unity, Perceptual Availability, and Revelation without appealing to some form of mysterious special status for colour perception that is removed from perception in general. Finally, the dispositionalist account, by appealing to standard observers and standard circumstances, failed to satisfy our extended colour concepts when faced with deviant cases such as metamers, and extra colours.

The primary quality view, by separating colour from colour-experience, is able to satisfy our colour conceptual schema. Colours are disjunctive microphysical properties (and complexes thereof) that play such and such causal roles. These colours, through typically causing colour-experience, are represented in colour-experience. The primary quality view is therefore able to meet our prime intuition of Paradigms and Explanation as it allows: that some things that we take to be paradigms of certain colours are that colour, therefore as rubies have the microphysical colour-property that plays the same causal role as other micro-physical

properties of things that are red, rubies are red; and as these microphysical properties typically cause (they are causally efficacious with respect to) colour-experience, something that is a certain colour does sometimes explain our visual experience of that thing being that colour.

By maintaining that colour-experience, though separate from colour, falls under our overarching conceptual colour schema, the primary quality view is able to satisfy our demands from Unity, Perceptual Availability, and Revelation. As colour-experience is typically caused by colour properties, a perceiver is justified upon having such and such a colour-experience, as well as certain background beliefs about causation and perception in general, in believing that s/he sees such and such a colour, though as with the rest of perception, allow that there is some room for error that may come about as a result of limitations in that persons perceptual system (having only a trichromatic system, or only a dichromatic system, or even only a tetrachromatic system). Unity and Revelation are beliefs from our phenomenological colour space in colour-experience. As we give colours colour-names through colour-experience it is through the experienced similarity and difference relations that we group colour shades under certain colour names and not under others. These relations are, however, anthropocentric as they are based in the colour-experiences that we as trichromats have, and are therefore corrigible, and not necessarily a part of colour proper. Revelation, we have good reason to believe, is the weakest of our five core beliefs, though it is the belief that seems to cause the most confusion as it often mistakenly leaks through to our other core beliefs. As has been argued we have no reason to accept Revelation in the strong sense (as revealing through visual perception alone all the intrinsic feature of colour), and many reasons to reject it. Revelation can however be maintained as part of our overarching conceptual schema as long as it is restricted to colour-experience where what is revealed through colour-experience is just the phenomenological hue, saturation and lightness/brightness dimensions. This doesn't give Revelation any great part in colour, though as I have argued we have no reason to expect it to play any greater a part than this.

The primary quality theorists, when faced with a ruby, are then able to say *on the basis of their colour-experience and background beliefs* that that ruby *is* red as it has a microphysical property that is *causing* their red colour-experience. Further, they can say that the red of the ruby *looks* similar to the red of a strawberry, while it *looks* different to the green of an emerald, and that these similarity and difference relations in colour-experience are revealed

by each colour-experience's position in phenomenological colour space (defined by the hue, saturation and lightness/brightness dimensions). Through limitations in the human visual system, the primary quality theorist must accept that their perception is corrigible. This however, when viewed in the context of perception in general, lends commonsense support to the primary quality view. The primary quality theorist must accept that when in day-to-day activities s/he uses colour terms these are (for pragmatic reasons) based in an anthropocentric chauvinism, as colour terms were made by human beings and used to identify colours through anthropocentric colour experiences. However as our colour concepts outrun our colour-experience, the primary quality theorist is able to maintain that, metaphysically, colours surpass our experience of them, and that if we were finer discriminators of colour we would then be able to identify a greater array of colours in the world.

As the primary quality view succeeds -where both subjectivism and dispositionalism have failed- in satisfying our core beliefs about colour, as well as accommodating them within our overarching (perceptual) conceptual schema, it is clear that the primary qualities should be awarded the ontological status of 'colour'.

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