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COLOUR APPEARANCES AND THE COLOUR SOLID

1. PREFACE

This paper has two distinct purposes. One of them is to make explicit
some of the themes that the other essays on colour in this book have in
common. And the other purpose is to make a contribution to one of
those themes. Very briefly and generally, these themes are the ways
colours look different to different people, and the ways in which
painting and other visual arts can exploit these differences. The papers
in this book by John Clark, Bernard Harrison, John Gage, Peter Lloyd-
Jones, and Michael Podro connect with each other in many ways, some
of which can be described in terms of questions about individual
variation in colour perception. These are the connections that I hope to
make explicit. In doing this I will have to straighten out some dif-
ferences between the ways these writers use their terms and some
apparent differences in their aims. The easiest way to do this is to
develop an idea of my own. That idea is, just as briefly, that some
differences between different people's perception of colour can be
represented by taking people to have differing perspectives on the
colour solid which is common to us all. And that one way in which
paintings and the like are expressive is by imposing on the viewer's
attitude to colour a different such perspective. (I described the colour
solid below, and explain these perspectives via a technical notion of a
colour transform.)

I write as a philosopher and not as an art theorist or art historian.
What I say below about Titian, Poussin, and other painters is not meant
as a contribution to the understanding of their work but as an example
of what someone might say about a painting. I have no doubt that
someone would have to be fairly ignorant to say some of what I say, but
that does not matter for my purposes.

2. DIFFERENT PEOPLE, DIFFERENT COLOURS?

Clearly there is an enormous, probably unlimited, variety of ways in

which people can use and react to colours. And very likely this enormous variety is based on some ways in which colour reactions are not varied, ways in which people's perception of colour is normally the same. Two ways in which colour perception can vary from one person to another should be mentioned right away, just to dismiss them. First there are actual differences of perceptual acuity: some people have defective colour vision, for example the varieties of red-green 'colour blindness' or for that matter the capacity a few people have to see further into the infra-red than is normal. And then there are simple differences of taste: different people like and loathe different colours and different combinations of colours. I am not concerned with either of these. What I am concerned with is something very ordinary which lacks an ordinary name, which I shall refer to as differences of colour appearance. I give a number of examples in Section 3 below, but I should be able to get the idea across with one example here.

I find the colour of the sky in Titian's *Bacchus and Ariadne* [PL. 5] garish and at variance with the mood of the rest of the painting. (I prefer Auerbach's commentary-painting on the Titian to the original, for this reason.) Michael Podro evidently does not agree with me. So far this is just a difference of taste. But suppose that Podro and I begin to discuss our disagreement. I will describe the sky in the Titian as having a purple tint that sets up unresolved dissonances with the colours in the rest of a painting whose general range of colour harmonies is much more sedate. Podro will explain to me why this is a naive way to see the picture, no doubt explaining both that the combination of the sky colour with the lower colours is not as tense as I see it and that the picture is meant to have more tension in it than I anticipate, anyway. And I will reply to this, and eventually we will uncover not only some irreducible differences of taste and perhaps some differences of perceptual acuity, but also the fact that some colours and combinations of colours do not *look* the same to the two of us. Perhaps blues look very different from bluish purples to me and less different to Podro. Perhaps the combination of green and even a very blue blue-purple is a striking disharmony to me and is just a run of the mill resolvable dissonance to Podro. (But perhaps not: this conversation is imaginary.) Differences of this sort would be differences in the ways colours look to the two of us, or as I shall say, differences in colour appearance.

Colours can look very different to different people. If there were no differences of colour appearance, determined in part by differences in

people's cultural and personal histories, painting — and also the colouring of houses and clothes — would be a less interesting business. In fact it is pretty clear that one of the ways in which paintings express some of the things that they do is by showing ways in which colours can appear. Is this not often what happens when a particular painting or a style of painting changes ones perception of landscapes and interiors? It can be a revelation: suddenly familiar coloured scenes look new. And one reason that they look new is that colours and combinations of colours do not look the same. They combine and stand out in different ways. And it is just as clear that painting would not be possible if there were not also definite limits to the variability of colour appearances. If colours and combinations of colours did not look roughly the same to all people, then no painter could have any idea what his efforts would look like to others.

The variety of ways colours can appear, against the background of the limits to that variety, is the basis for the expressive power of colour. A colour style in painting, clothing, interior decoration or whatever — which I shall take to consist of a palette or range of basic colours plus a set of preferences among colour harmonies and patterns of distribution of colours in space — allows some of this expressive power to be realised. One might therefore dream of a universal colour style, one whose vocabulary was so rich that using it one could express everything of aesthetic importance that can be expressed by colours. John Gage, in his article in this book, makes very clear how this dream is at work in the writings and intentions of Kandinsky, Malevich, and other early abstractionists. Beneath Kandinsky's mystical descriptions of the meanings of particular colours there is the ambition of finding a technique of using colour in painting, and probably elsewhere in life, given Kandinsky's occasional allusions to clothing in *On the Spiritual in Art*, which evokes universal spiritual meanings. Universal spiritual meanings may not be things that bear much close analysis, but the general idea has to be that beneath our differing individual reactions to colours there is a level at which we all take colours in the same way, that this level is of artistic importance, and that a style of painting or more generally a way of using colours, could bring this level of perception nearer to the surface. Moreover, as Gage emphasises, the theorists who influenced Kandinsky were not so much assigning individual meanings to individual colours as defining colour systems, descriptions of the structural relations which govern our perception of colour as a whole.

Parts of Peter Lloyd-Jones' paper in this book can be read as continuing this tradition, in attempting to understand the expressive power of a particular family of colour harmonies.

Kandinsky's dream contrasts with John Clark's fear. Clark's paper in this book expresses a fear of rich colour vocabularies, such as those made possible by film and video technology. He doubts that television colour, rich as it is, could reproduce the specific qualities of early abstraction, or for that matter of many historical colour styles or folk traditions. And so he fears that its ubiquity — the fact that people see a lot of colour on television, that in television people often have their only experience of an organised system of colours, and that this single colour system is becoming central in the lives of an increasing proportion of the world's population — may make it increasingly hard to see pictures, films, or the world itself except through this one colour vocabulary. The most imprisoning vocabularies are those that are just expressive enough to say *almost* what you need to say.

How alarmed should we be by what Clark says? How much faith can we still have in Kandinsky's dream? There are difficult questions of fact here, about the range of forms human colour perception can take and its susceptibility to cultural and technological influences. But there are questions of definition and meaning too. Let me make a start on both with some very simple cases.

3. EXAMPLES

Here are some ways in which colours can seem different to different people.

(a) Sunglasses: Sunglasses rarely just make the scene darker. Usually when you look through sunglasses the colours of things change. Sometimes the effect is simple; everything is more blue or more yellow. But often it is harder to describe, and the eeriness of the world as seen through the glasses is partly due to the difficulty of saying to oneself what it is that the difference consists in. Reflective and polarized glases can be like this. But, in either case, it is undeniable that colours look different to the person wearing them and the person without them. There seem to be three components to the effect. First there is the transformation of hue, the superimposition of a tint of blue, brown, or

yellow. Second there is the change of brightness, which can make colours look different, transforming oranges to brown for example. And third there are special effects, not really a single phenomenon at all, consisting of peculiar glints and metallic tinges and indescribable alterations in the feel of parts of the scene. I expect that part of this third component is very much like the second one, coming down to the effects of a complicated reduction in illumination. If the brightness is reduced in a very irregular way — irregular both in reducing different levels of illumination by different and unexpected proportions and by reducing light of different colours by different degrees — then much of what the observer expects about the effects of shadows and reflections and sources of illumination will be subverted. So inevitably things all look strange and different.

Sunglasses make the appearances of colours to a person at one time different from the appearances of colours to that same person at another time. They thus give a simple example of how colour appearances can vary.

(b) Emphases: You and I are walking through a grassy field. It is an English sort of a landscape, endless and subtle varieties of green. I remark on this to you. And you say "but look at the little flowers, the celandine and the speedwell, there's yellow and blue all about". Then suddenly for me the field is bright and variegated, *bunte*, less moving and more cheerful.

Or the opposite could occur. You say to me "how dull, just those few little flowers". And I say "don't you see how all the greens are different, the poplars are two shades by themselves, and the limes are in between the two, and just a little mist is making the further grass quite different from the grass at our feet." And then you pick up, perhaps for the first time, the force of a landscape that varies immensely within a tiny range.

In either case someone comes to see a coloured scene differently, by paying attention to a particular aspect of it. One could pay attention to a particular colour or range of colours or a particular colour harmony. Or something more subtle, but still depending on the relations between the colours before one. And it doesn't seem to be in too remote a sense of 'look' that colours look different before and after the effect of this kind of attention. The effect can mark one person's typical perception off from another's: some people pay more attention than others, and different people attend to different things.

Each of these examples is suggestive. In (a) the important point is that it is clearly particular colours that look different. I look at a blue sky without the glases and it looks, well, sky-blue. Then I put them on and it is a glimmering peculiarity, but still skyish blue. In (b) the important point is that systematic features of one's reactions to colour-in-general are exploited: which colours and which harmonies one takes as salient. There are pretty clear connections here with the way in which paintings are expressive, which I shall take up later.

Colour perception can vary in much more subtle ways from one person to another, too. Here is an extreme example.

(c) Colour constancy: I volunteer for a psychological experiment. (The point of it might be to undercut slightly Land's theory of colour, but that need not matter now.) In the experiment I watch a videotape of a scene, in which a person in a striped jumper walks around inside an artificially illuminated room and then walks outside. The camera is not recalibrated as she walks outside, and so the apparent colours of her jumper and of familiar objects outside seem crudely wrong. Then I am taken on a walk through exactly the same scenes under exactly the same lighting. Things outside look very different to me than the way they did on the videotape, but I have a mysterious inkling that the tape is not completely unrelated to what I see. I then undergo further training, the point of which is to allow me to predict what colours will appear on a videotape taken under various lighting conditions. The training succeeds, and eventually I am able to turn at will a switch in my mind which makes me see the colours about me not in terms of their relations to the overall range of wavelengths in the scene but in a more nearly absolute way. Generally when I switch myself into this way of seeing things look ugly and confusing, but occasionally the effect is startling and interesting.

This is a fantasy example based on fact. Some actual psychological experiments follow very roughly these lines, and the skills videocamera technicians have to learn are related to those the person in my example acquires. Illumination does affect colour perception in very subtle ways so that it is only via an automatic mental adjustment that colour constancy, the fact that objects do not seem to change colour when the illumination changes, is maintained. And we can to some extent bring these adjustments under conscious control. The importance of the example is the way in which it undercuts some trivializing objections to

(a) and (b). For in (c) as in (a) the same range of colours *is* clearly visible as in 'normal' experience, but it is clear that this is quite consistent with the quality of the visual experience concerned being quite different: no one could be mistaken whether or not it was his 'normal' or his 'special' colour experience he was undergoing. And in (c) as in (b) the difference is the result of something voluntary, a kind of attention which is applied to a field which is common to both the normal and the special perception. But the common field is subtly different in (c). It is now something that is not normally perceptible at all, the influx of light of various wavelengths.

It is examples (b) and (c) that are most relevant to issues about the perception of colour in paintings. (c) is particularly interesting, for it is a very attractive guess that one way in which a coloured scene is represented by means of pigments which do not exactly match those in the scene, is by exploiting the capacity of human vision to interpret colours in terms of the overall balance and pattern of wavelengths present. That is one reason, presumably, why most pictures need a frame, and sometimes a fairly wide one, for the colours to look right: the eye needs to be given a definite limit within which it can evaluate each patch of colour in terms of the overall distributions of intensity and frequency. And presumably, too, one of the sources of the expressive power of colour in paintings — the way in which they can make things look different to one — derives from subtle differences they induce in the way in which one performs these evaluations. And even when nothing this involved is going on, the (b) effect will still apply: one will see the world in terms of the colours, harmonies, and contrasts which the picture makes salient. (I take this idea further in section [5] below.)

4. THE COLOUR SOLID

These examples are meant to show some ways in which colour appearances pretty clearly do vary from one person to another, even among people with normal colour vision. But they are also chosen so as not to undermine the idea that there are ways in which colour experience does *not* vary among people with normal colour vision. The most basic feature of this lack of variation is best expressed in terms of the standard colour solid.

Very briefly, it works like this. There are a limited number of basic

ways in which colours can vary. The only ones I shall consider, though others would probably have to come into a comprehensive discussion, are the well known contrasts of hue, saturation, and lightness. As is explained in any standard work on colour, colours may be classified first as being of a certain colour character or hue, then as being more or less intensely of that colour, and finally as having a position on a scale of lightness between white and black. Thus any red and any green will contrast in hue, a red and a pink will contrast in saturation, and a bright red will contrast in lightness with a dark red. (See Clulow [1972]. The relevant chapter of Rock [1975] is very simple. See also Westphal [1984] and [1986]).

The difference between the contrasts of saturation and lightness is important, but takes some grasping. Many of the early colour theorists discussed in Gage's paper in this book (see also footnote 14 to Clark's paper) are in fact working their way towards a clear differentiation between the two. Once one has separated the three contrasts, one can represent colours as points on a three-dimensional diagram, by placing them at locations inside an asymmetrical lozenge shape with the features that (i) the vertical axis runs from pure white to pure black (ii) going around it horizontally colours vary in hue and (iii) going out from the central axis to the surface colours vary in saturation. (See the diagram.) The result is really rather marvellous: the colour solid gives a fairly simple and graspable structure which ties together both the perceived likenesses and differences of colours — and in fact it is the basis of the colour-systems used in paint manufacture, in art schools, and elsewhere — and a fair amount of what we know of the physiology of colour perception. (This is what Clark refers to as trivariance and the tristimulus analysis of colour: the fact that each colour can be obtained by mixing light of three suitably chosen wavelengths of red, blue, and green. Imagine a colour formed by projecting light of these three primaries onto a small area of a white screen. The intensity of the light from each of the three projectors can be varied. Then — ignoring some crucial facts, in particular the different sensitivity of the eye to light of different wavelengths — variations in hue are got by varying the ratios of the intensity of the three projectors while keeping the total intensity unchanged; variations in saturation are got by varying the intensity of the projector of least intensity while keeping both the ratio of the other two and the total intensity unchanged, thus in effect changing the proportion of white; and variations in lightness are got by varying the

intensity of all three projectors simultaneously while keeping their proportions unchanged.)

When someone has normal colour perception the contrasts between the colours that they see define a standard colour solid. Moreover the detailed structure of the colour solid ensures that when two people see the same colour it must look the same to them in certain respects. For example, it is not possible that what one person sees as green another might see as blue. This point is argued in detail by Bernard Harrison, both in his paper in this volume and in Harrison [1979]. As he says in that book

... the distribution of numbers of hues between the extensions of different colour names is not even. As a result, what one might call the linguistic topology of the quality space of colour is asymmetric. No transposition of the sort the sceptic [who suggests that one person sees red where another sees green] envisages could avoid producing the result that A would discriminate more hues within a given category than B, or that hues indiscriminable to A would be discriminable to B, or that A would detect different gradations of hue, or tonality from B in a given colour display. Another difficulty is that ... the number of named colours on the red-yellow side of the circle of hues is greater than the number on the blue-green side. A third difficulty is that any transposition of colours ... must maintain parity as regards complex predications of the 'x is blueish green', 'x is yellowish-orange' variety; which excludes, for one set of reasons, exchanges of primary of secondary colours, and for another set of reasons, 180° rotations of the circle of hues. (Harrison 1973, pp. 22—23)

I am convinced by this. Harrison is pointing out two asymmetries about colours. First there is a basic asymmetry in the colour solid: if you measure it in terms of just noticeable differences of colour then it is not a symmetrical double cone but bulges on one side, towards the yellows. (In fact it bulges upwards in the lightness direction as well as outwards in the saturation direction, creating a complex asymmetry.) In effect, we are better at seeing small differences of colour for some colours than others. And then superimposed on this there is a linguistic asymmetry: even given the bulginess of the colour solid the standard colour names in English and other languages do not pick out regions of the colour solid of the same shapes. As a result, the extensions of no two English colour words can be exchanged without violating some basic characteristic of one of them. So if you and I both perceive the whole range of hues, and find ourselves able to use the English colour vocabulary and the practices that go with it, then it cannot be that when you and I apply the same English colour word to an object, I am actually picking out one subset of the colour solid and you are picking

out another, which I would have taken as the extension of a quite different colour word.

If this is right, how should we describe the examples of the last section? They seemed to show that two people's colour experiences could be very different, and now we seem to see that they must be the same. But of course that is not really what the argument shows. It only shows one way in which two people's experience could not differ, namely by variations on the 'when you see red I see green' pattern.

Consider the examples again with this in mind.

(a) (sunglasses) If I am wearing glasses which change colours in a very simple way, just by making everything a bit darker and a bit more blue, say, then I will generally apply the same colour words to things as you do, except perhaps for a few shades on the yellow/green/blue and red/purple boundaries. But then people do disagree about the names of many of these shades anyway, especially on the blue/green boundary, and so perhaps when I wear these glasses I do actually see colours as you do without them. But it does *not* follow from this that the extension of any colour word is exchanged with that of any other, or that the hues that I see are not the same as those that you see, and indeed organized in the same way. One might express this as: you and I see the same colours but see the same scenes as slightly differently coloured.

(b) (attention) The person paying attention to colours, or some feature of colours, does not see *different* colours to the person who is not. Reds and greens still have just the same contrasts of hues for the two people, just as reds and pinks have just the same contrasts of saturation and light and dark reds just the same contrasts of lightness. *Those* features of their colour perception are common to the two people. The features that do distinguish the colour perception of the two people have nothing to do with the location of colours on the colour solid. One might express this as: they see the same colours but see them differently.

(c) (colour constancy) Although in this example the colouration which the subject sees a scene as having is very different from that which an 'ordinary' person would take it to have, the colouration consists of colours all of which have definite locations on the colour solid and which bear to each other and to the colours and ordinary person would see the standard basic contrasts of hue, saturation, and lightness. One

might express this as: they see the same colours, but in different parts of the scene.

5. FALSE ENDING

This gives a nice comforting resolution of one form of our original worry. The colour perception of different people with normal colour vision is the same in that they see the same colours — meaning that they can apply the same contrasts of hue, saturation, and brightness — and can be different in that they can see these colours differently — meaning that given a scene different people can apply these same colours to it with different emphases and even somewhat different distributions. In this way the colours of the colour solid, identified simply by our ability to see similarities and differences between shades, are kept apart from colour appearances, the ways in which a coloured scene can look to someone. There seems to be room for everyone's conclusion in this framework: Harrison's refutation of colour-scepticism is upheld, since it rests on the link between colour words and the colours of the colour solid; the abstract possibility of a Kandinsky-style deep universal significance for colours remains, since it postulates a way of using the resources of the colour solid to represent will possible colour appearances; and different people can see colours differently, in a way that may be subject to cultural variation and inhibition as Clark suggests, since colour appearances are distinct from colours. So perhaps I should end here.

There is another reason why it might be wisest to stop now. What I have done so far in the way of clarifying the issues makes it clear that there are some quite definite theoretical and factual questions to be answered before we can know how much of Kandinsky's dream is realisable or how many of Clark's fears are real. And it is clear that they are very hard questions, too hard and too complicated for a short article. We need a full description of the range of possible colour appearances; we need to know what colour resources are needed to evoke each of them; and we need to know what the cultural conditions required for a particular colour stimulus to present a particular colour appearance are. I cannot satisfy any of these needs.

But it is not always wise to meet the big questions head on. Instead of a description of all the ways in which colours can appear to people we might try to get a grasp of some smaller class of colour appearances.

And in fact what I have said so far does give a way of describing one class of colour appearances, which are among those provided by representational painting. That is certainly relevant to the first of the large needs I cannot satisfy, that of giving a description of the full range of colour appearances, and some of the details are interesting, so I shall spend the rest of the paper explaining it.

6. COLOUR TRANSFORMS

One could paint pictures showing some of the variation in the appearance of colours in the examples I have used. The very simplest sunglasses cases would simply require that a standard depiction be glazed over with a blue or green wash; more complicated sunglasses cases would require selective use of some metallic colours. (And ideally the picture should be enormous, and seen from close up, so that like most sunglasses it presented no visible edges.) The examples depending on selective attention would require a picture in which the relevant colours were emphasised in terms of increased saturation or lightness and the relevant contrasts were emphasised by exaggeration. And the colour appearances involved in the colour constancy examples could be represented with pictures whose lightness and saturation were systematically distorted from a 'natural' representation of the scene. (In this case the edges of the picture could profitably be left visible, so that a wide suitably coloured surround could lure the eye into making the right — that is to say, unnatural — adjustments of brightness. But although questions of brightness adjustments within a limited area are of central importance for understanding how pictures work, neither I nor anyone else knows enough about them to say anything very systematic yet.)

It might at first seem puzzling that colour appearances — which in the early sections of this paper I carefully distinguished from colours, that is, points or areas of the colour solid — can be described by presenting a picture, which is after all just another array of colours. The colours in the picture would themselves present different appearances to different people, and would this not undo the explanatory value of the picture? It need not. Consider a picture which represents in an exaggerated way the colour appearances of a selective attention case. The picture might represent the appearance of an English landscape to someone very aware of all those greens. In it all colours except greens would be desaturated and reduced in brightness relative to the greens,

and the further a colour is from the green area of the colour solid the more this would be done. And the greens would be exaggerated by increasing the range of brightness and saturation among them. The result would be a pretty ugly representation of the scene. But no one could look at it without having their attention drawn to all the greens and the differences and harmonies between them. And the reason for this is quite simple and general: there would be in the picture more perceivable differences among the greens than among other colours.

In this example the colours used in the picture were transformed systematically from the colours present in the scene. (More exactly, the colours of light which would be reflected from the picture under standard conditions of illumination differ systematically from the colours of the light entering the observer's eye when looking at the scene. I shall often conflate colours of things such as spots of pigment and colours of light.) Many colour appearances can be represented in this way, by transforming the full range of colours into another range, squeezing it in some regions and not in others. These transformations can be thought of quasi-mathematically as mappings of the colour solid into itself. I shall call them colour transforms.

Colour transforms are essential to painting. For the most basic fact about representative painting in colour is that the range of pigments available is always less varied than the range of colours in the scene represented. This is most evident with lightness contrasts: no range of pigments that has ever been available can reproduce literally the contrast between even a fairly dark sky and a tree or animal lit by that sky. The important point is not that the sky as painted when normally lit is not as bright as a real sky, but that the *range* of brightnesses, expressed as the ratio between the brightest colour and the least bright or even as the number of noticeable gradations of brightness, in the actual scene is never reproduced in a painting. The same happens throughout any painting: the pattern of colours used represents the pattern of colours in the scene, but not by reproducing them exactly. What is presented is the result of a colour transform. An interesting example both of how this works and of the problems it can lead to is provided by Poussin's *Worship of the Golden Calf* [PL. 12]. As Michael Podro points out, following Alberti, Poussin has represented the shining light golden colour of the calf with umbre and ochre. Gold leaf could not have been used, first because the glintiness of the gold would only be visible from some angles, but also because to have used anything like the literal

brightness of gold-in-sunlight would have undermined the transformations of lightness of the other colours in the painting. The colour Poussin has used is a compromise: he could not have made it any lighter without either using gold or some other reflective paint or making it implausibly unsaturated and he could not have made it darker without having to darken the rest of the surrounding figures, destroying the effect of bright sunlight. (The effect is not, to my untrained eye, completely satisfactory.)

Hue contrasts have always been easier to reproduce than lightness contrasts, and most of the advances in pigment technology have been directed at getting a richer variety of hues. And saturation contrasts can be captured to the extent that one's pigments can be mixed with a gradation of whites and greys. Largely because of these facts, most representational ·paintings transform the colours in the scene represented by systematically reducing the lightness of all colours, and to a lesser extent their saturations, thus projecting all the colours observed downwards in the colour solid. (See the diagram.) The projection is not uniform: lighter colours are reduced more than darker ones. And the range of colours that can be used to represent black is quite small; they are all pretty dark, though Chagall and others have got some strange effects by representing the black of night with glowing reds and blues. And in many pictures two different such projections are used simultaneously. (Just as many pictures represent space by using two or more related linear perspectives.) Representational painting thus uses a wide but not unlimited family of colour transforms, in all of which lightness is reduced considerably and non-linearly (that is, greater degrees of lightness are reduced disproportionately).

Different styles of painting use different colour transforms. Very often the transform is characterised as much by its effects on hue as on lightness and saturation. Thus a Rembrandt-like effect is got by not only using a characteristic transformation of brightness and saturation — reducing the lightness in the middle-to-low range considerably while reducing the lightness of some middle-to-high range rather less than is normal — but also at the same time emphasising browns and yellows in much the way that greens were emphasised in the landscape I described above. (One effect of using these transforms is that very bright or reflective objects can be represented well, since even a moderately bright colour will shine out aginst its sombre background.) Many painters with a distinctive colour style cannot be so easily characterized. Cézanne, for

example, has an easily recognizable use of colour for which even a crude first approximation such as I gave for Rembrandt is hard to give in terms of colour transforms of the sort I am using. But that may just mean that the transform is complex. I would suggest that in Cézanne there are often two regions of the colour solid that are emphasised. Which regions varies from painting to painting, but they are nearly always such that they can be connected by lines of his favourite blues, even when these are not very prominent in the painting. In some well-known paintings (for example the landscapes with Venturi numbers 396, 762, 775) the two regions consists of one stretching from a fairly dark saturated green to a light and less saturated blue and the other containing a limited range of yellows and oranges. A Cézanne-like effect can thus be got first by projecting colours onto slightly less saturated colours and reducing a middle range of the lightness scale by much less than the upper range is reduced and then by emphasising colours in these two regions.

The tendency for colour transforms in painting to affect hue as well as saturation and lightness is not really surprising. For if a picture is to present an interesting colour appearance as well as representing a scene then it must redirect the viewer's attention to contrasts, harmonies, and particular colours which would not otherwise be salient. And the natural way to do this is to employ a range of colours which cannot be made sense of except in terms of these colours and colour combinations.

A painting makes use of a colour transform. And in using it the painting presents it, makes the transform available to the viewer. The transform then presents the viewer with a colour appearance. And this is at the root of the well known phenomenon I referred to at the beginning of this paper, that for as along as one is in the grip of a particular painting or style of painting colours look different to one. The simple reason for this is that the painting has directed ones attention to colours and harmonies in ways that I have been describing. There are other ways in which it can work, too. For there are many ways in which once one has grasped a colour transform one can apply it to ones own experience, to produce variations and alternatives.

However it is done, the viewer who has understood the colour transform underlying a painting is able to understand one way in which colours can appear. The colour appearances thus made public certainly do not exhaust the range of ways colours can look, that Kandinsky

called the "sounds" of colours. But they are an especially important family of colour appearances, for two reasons.

First, they can be communicated by pictures. The colour transformation can usually be read quite easily from the picture by someone with normal colour vision and normal visual imagination. For given a representational picture one can imagine, given the depiction of the lighting conditions, the time of day, and so on, what the actual colours would have been. The comparison between this imaginary literal representation and the picture itself then partially defines the transform. (Some more pictures in the same style would pin it down more exactly, if need be.) An appearance given by a pair of pictures — the way an actual or imagined scene is actually seen or imagined and the result of applying the transform to it — has a particularly stable and intelligible form. For it captures both the fact that the resemblances and differences that can be discerned in the actual scene *can* be discerned and the fact that some of them, those which are discernible in the transformed scene, are particularly important for the appearance in question. These appearances, then, are neither unintelligible sub-perceptual qualia nor fully conceptualised thoughts. And that is what appearances ought to be.

The second reason, related to the first, can be extracted from something Michael Podro says in his paper in this book. Podro writes

The content of our perception of, say, a tree, involves not only a view of projection of it from a given position, it includes in its character for us . . . a sense of the other views it would yield from other position. It also includes a sense of other possible aspects we could fixate, other features we could make focal. These are parts of what Husserl termed a horizon of possibilities which an object of experience could yield. . . . Now, by contrast, let us turn to the perception of the drawing or painting of an object. What we perceive . . . *in* the drawing is a characterization or look of the object drawn and the "horizon" of that includes the belief or awareness that it could be used to show other objects, or other views of the same object or other features of the same view as salient. . . . In this way the perception of the drawing has a horizon of possibility that the object itself cannot have, and the contrary is also true.

Podro's point applies to the representation of colours as well as to the representation of objects in space. A coloured scene can be seen in many ways, with attention to many different aspects of the colours it presents. And there are correspondingly many colour appearances to be had from it. A painting representing the scene, on the other hand, has a different horizon of colour possibilities, a different range of ways

in which the colours can be seen. This range must be in some respects smaller than that of the scene itself: the painting must make it easier to grasp some colour appearances than others. If it does not it is not serving as a painting, but as an inferior substitute for the scene itself.

Colour appearances which can be represented by colour transforms of actual or possible coloured scenes are particularly important, then, since they are essentially related to one of the basic purposes of painting. That purpose is to represent by means of a picture a way in which the world can be experienced. That expressive purpose is, paradoxically, forced upon painting by the limitations of pigment. Another medium, video for example, may not be subject to such limitations. And then, as John Clark points out, its resources may threaten us with a loss.
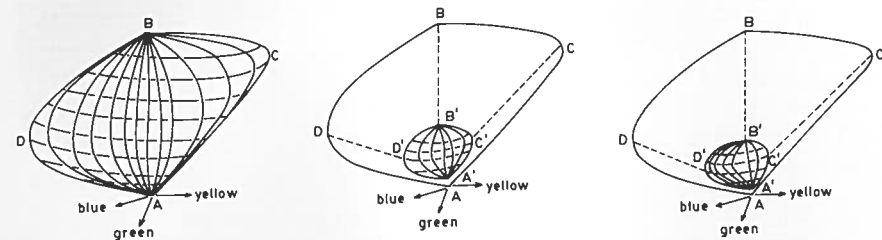
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Fig. 1. Three colour solids

On the left is the standard colour solid. Note that the directions corresponding to the primaries yellow and green are marked in but that the direction corresponding to the primary red points into the page. Lightness, sometimes called brightness, increases along the vertical axis. Points on the interior of the solid represent less saturated colours, becoming more saturated as one moves away from the vertical axis. The point A represents a black, B a bright white, C a bright saturated yellow, and D a bright saturated blue. Note the asymmetry of the solid, and the resulting difference between the heights of C and D.

The middle diagram represents a colour transform which might be found in an accurate but inexpressive style of painting or system of colour reproduction. A, B, C, D are transformed to A', B', C' and D'.

The diagram on the right represents a colour transform which might be used in a style of painting which emphasised blues. Note that the transform changes the shape of the colour solid drastically. (In the text the corresponding example is of a style that emphasises greens. Blue makes the diagram clearer.)

The scale in the middle and right diagram is not meant to be exact.

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COLOUR APPEARANCES AND THE COLOUR SOLID

1. PREFACE

This paper has two distinct purposes. One of them is to make explicit some of the themes that the other essays on colour in this book have in common. And the other purpose is to make a contribution to one of those themes. Very briefly and generally, these themes are the ways colours look different to different people, and the ways in which painting and other visual arts can exploit these differences. The papers in this book by John Clark, Bernard Harrison, John Gage, Peter Lloyd-Jones, and Michael Podro connect with each other in many ways, some of which can be described in terms of questions about individual variation in colour perception. These are the connections that I hope to make explicit. In doing this I will have to straighten out some differences between the ways these writers use their terms and some apparent differences in their aims. The easiest way to do this is to develop an idea of my own. That idea is, just as briefly, that some differences between different people's perception of colour can be represented by taking people to have differing perspectives on the colour solid which is common to us all. And that one way in which paintings and the like are expressive is by imposing on the viewer's attitude to colour a different such perspective. (I described the colour solid below, and explain these perspectives via a technical notion of a colour transform.)

I write as a philosopher and not as an art theorist or art historian. What I say below about Titian, Poussin, and other painters is not meant as a contribution to the understanding of their work but as an example of what someone might say about a painting. I have no doubt that someone would have to be fairly ignorant to say some of what I say, but that does not matter for my purposes.

2. DIFFERENT PEOPLE, DIFFERENT COLOURS?

Clearly there is an enormous, probably unlimited, variety of ways in