

INTRODUCTION

First I would like to thank Peter McGinley and his committee for inviting me to contribute to "Colour Renaissance", and I would like to congratulate them on what promises to be a really excellent programme for the Conference.

My topic is "Colour and Other Aspects of Appearance". These other aspects are texture and what might be included under a general heading of "surface quality": transparency, opacity, gloss, metallic lustre etc. I should say at the outset that the ideas I will be putting forward are not fully resolved. This topic was among those I offered in answer to Peter's invitation, not because I had anything ready, but because it was next on my agenda. Then I became anxious in case the committee asked me to speak on this topic because I knew how much work it would need. Not only did they choose the topic, they have made it the opening lecture for the conference! This is an extremely big topic and I have still a long way to go. What I will be presenting is not so much a theory that has arrived, as one that is on the way, which has a lot of loose ends and which may or may not turn out to be useful. So this will be more of a progress report.

I have found that there is nothing like this kind of pressure to stimulate the thinking process. One of our members from Western Australia, Gwenyth Ewens, passed on to me some words of wisdom from one of her own professors, three words which could amount to a complete course for designers: "Look and Think". In preparing for this lecture I have been doing a great deal of both. I have also picked up clues from conversations with several people and I hope that I will get more while I am here.

VISIT WITH HOWARD TAYLOR

The story begins in the Karri forest in the South Western corner of Western Australia where Howard Taylor lives and works. Howard Taylor is an artist whose work I admire, not only because I find it beautiful but because it fulfils so well the role assigned to painting by Patrick Heron (1) as that of "... man's laboratory for the disinterested explorations of visual appearance as such...". Howard Taylor works in two and three dimensions and a striking feature of his work is that there is no sharp dividing line between his painting and his sculpture.

I had heard about the time when Howard Taylor was teaching in Perth and was anxious to meet him. I was familiar with his earlier work, particularly his large sculptures commissioned by the AMP and the ANZ Bank for their office buildings in the centre of Perth, but what I saw in his studio when I visited him in May 1985 came as quite a shock. he was working on a series of small paintings. The format for many of them was simply a rectangle within a rectangular field or a rectangle within a larger rectangle within the field (Fig.1).

COLOUR AND OTHER ASPECTS OF APPEARANCE

Invited paper

for

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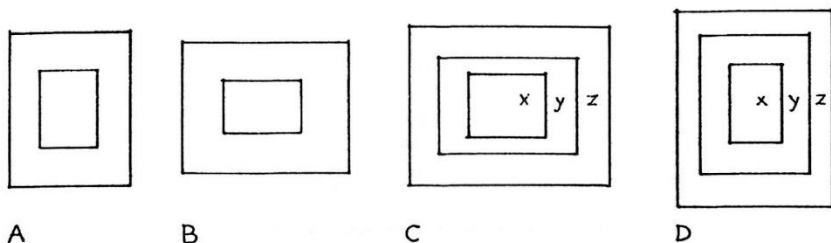


Fig. 1. Typical formats used by Howard Taylor for a series of paintings exhibited in 1988 at the Galerie Dusseldorf in Perth under the general title "Object - Space Figure-Ground."

The borders between rectangles and fields varied in how sharply they were defined. Sometimes there was a subtly graded change of colour just before the border and, especially striking, were the contrasts in surface quality. The paintings were reminiscent of the kind of exercises one might give to first year students. It seemed to me that Howard Taylor was going right back to the beginning to explore basic issues of perception and picture making.

The paintings were shown in July 1988 at the Galerie Dusseldorf in Perth, in an exhibition which had as a sub-title: "Object-Space. Figure-Ground". In his introductory essay in the exhibition catalogue Howard Riley (2) concludes: "Howard Taylor's painting ... is full of communicable discoveries about the ecological relationship between our perception processes and the natural environment which transcend more style and place him at the frontier of human visual discovery."

Curtin University now owns three of these paintings. They exemplify Howard Taylor's preoccupation with contrasts and transitions. The central rectangle (area x) of "White Figure" (format C) is smooth and opaque; the texture of the canvas is completely covered. In the outer area (z) the canvas is clearly visible through a very thin film of paint. In between (area y) is a transitional surface. The central rectangle (x) of "Black Figure" (format C) is glossy and the outer area (z) is matte but in between (y) the surface has a buttery texture so that there is not only a contrast between glossy and matte but also between smooth-matte and textured-matte. Further contrasts are revealed when you look at "Black Figure" from different viewpoints. The matte surfaces remain quite constant but the central rectangle appears lighter or darker as the glossy surface reflects more or less light. The subject of "Veiled Figure" (format D) is transparency. The outer area (z) is red and the central rectangle (x) is pink, but instead of area y being seen as separating areas x and z and being on the same plane, it appears that a complete rectangle, larger than x but smaller than z and translucent, has been laid over the surface.

Before my visit I considered such phenomena as texture and transparency as significant and I would draw this to my

students' attention but I would go on to tell them that these phenomena were separate from colour and would not be part of the colour programme. Apart from any other considerations I was keen to emphasise that paint is not "colour"; it is merely a substance which gives rise to a sensation of colour. Now it became clear to me that, just as colour is not the same thing as paint, so a glossy appearance is not the same thing as specular reflection. Colour and surface quality can both be considered from a phenomenological point of view and a change in surface quality can have just as profound an effect on our responses to objects as a change in colour. So I came away from Howard Taylor's studio determined to give serious thought to issues of surface quality and to see if I could develop my teaching programmes to embrace these issues and establish links between surface quality and colour. In fact, a good example of their inseparability had been presented to me some time before my visit: a car that I had seen several times in my neighbourhood had been painted matte black. This conveyed an impression of evil in very sharp contrast to the respectable glossy black of the Governor's Rolls Royce.

#### STUDY LEAVE

Earlier this year I was on study leave in Europe and South America. Surface quality and texture were recurring themes. At Oxford Polytechnic, Byron Mikellides showed me a "texture scale" which he had made by painting sand paper of increasing coarseness with the same paint.

At a one day meeting in London where the topic was "Getting Colour Together - Who Leads, Who Follows" several speakers dealt with texture and surface quality in their "Colour Stories". They spoke of metallic sheen, soft downy appearances, wrinkled textures, the look of weathered metals, a frosted look, weathered and crushed surfaces, chalky and powdered surfaces. One of the sessions was chaired by Dale Russell who also organises the "Colour Directions" workshops for the Colour Group of the Chartered Society of Designers. I learnt from her that participants in the workshops are required to include examples of "special effects" with their colour proposals.

During a discussion of personal colour analysis Linda Rice suggested that systems like "Color Me Beautiful", while interesting, are missing a major dimension. Just as a person may look better wearing purple rather than orange that same person may also look better wearing tweed rather than silk.

All this confirmed my feelings about the importance of including surface quality and texture in any serious study of colour, and it prompted me to add an introductory note on appearance to the poster paper which I subsequently presented at "Color 89", the 6th Congress of the International Colour Association in Buenos Aires.

## CONVERSATIONS IN AUSTRALIA

Two observations by friends since my return to Australia provided further insights; In a conversation about the colour samples in the Natural Colour System (NCS) Juliet Albany said she did not like what she called the "whitish" or pastel colours. We went on to compare pinks produced from "red" paint by mixing in "white" paint when the medium was opaque gouache and by diluting the paint with water when the medium was transparent watercolour. Juliet Albany said she much preferred the latter.

In another conversation I was discussing the colour of bricks with Colin Latchem. He said he responded differently to painted and unpainted brickwork. Even if bricks were painted "brick colour" the colour would be perceived to be a skin on the surface whereas the unpainted brick would be perceived to be "coloured all through". I was reminded of a distinction Howard Taylor had made between colour that was on an object and colour that was in an object.

Another artist whose work now seemed to be significant in this enquiry is Peter Travis. He chose kites as a medium partly because he likes the fact that his fabrics are coloured all through - the colour shows when the kite is seen in the sky against the light as well as when it is seen on the ground. He has exploited this interplay between the transmission and reflection of colour in several large scale kite-inspired installations in public buildings such as the Merlin Hotel in Perth.

## THE LITERATURE

I have not yet conducted a detailed literature search on this topic for myself but in 1972 Jacob Beck (3) observed that "...The variations in surface texture and finish are many but a review of the literature ... indicates that they have been little studied."

One of the few to have done so was Richard Hunter (4). In his book "The Measurement of Appearance" he dealt with various kinds of gloss as well as colour. He pointed out that "When we 'see' things we are actually evaluating light" and "In assessing color the eye looks at a uniform area of the object; to evaluate gloss and texture it looks for non-uniformity across the whole surface of the object, as indicated by variation in the intensity of light reflected from the object."

An earlier pioneer was David Katz (5) who first systematised the concept of modes of appearance. David Katz was clearly concerned with surface quality, as well as colour, since his modes include lustre, sparkle, glitter and transparent surface colour.

In their book "The Science of Color" (6) the committee on Colorimetry of the Optical Society of America suggested that some of the modes proposed by David Katz, and others after him, were "more like attributes or dimensions of modes than like

modes proper." They proposed a simpler classification which has gained wide acceptance:

- OBJECT MODES :
1. Surface (e.g. the skin of a lemon)
  2. Volume (e.g. wine in a glass)
  3. Illuminant (e.g. a signal lamp)
- NON OBJECT MODES :
4. Illumination (of empty space. E.g. the colour of the illumination at sunset is different from that at midday.)
  5. Film (where colour is perceived neither as self luminous nor as illuminated object. E.g. the sky).

These modes are set out on a table with a list of 14 attributes which can be applied variously to some modes and not to others. In this table "texture", "gloss" and "transparency" are listed as possible attributes of surface and volume colour while transparency is also essential to the perception of illumination colour. ("Hue" and "Saturation" are listed as attributes of colour appearance in all five modes, while "brightness" is restricted to illuminant, illumination and film and "lightness" to surface and volume.)

It is possible to experience a change in mode which can lead to a change in perceived colour. An example is given in "The Science of Color" :

An officer directing traffic at a busy intersection was observed to be wearing a pair of light blue pants but then, almost immediately, they changed to dark blue. The explanation was that a pale blue wisp of exhaust fumes hung in the air between the observer and the officer about 50 yards away, and at first the light blue was associated with, or perceived as belonging to, the pants: but almost immediately the observer realised that it was an exhaust cloud which was light blue, whereupon the officer's pants were perceived to match the dark blue of his coat. This was a shift from film, or possibly volume, to surface mode. As soon as the perceived color of the fumes had been dissociated from the surface, the color of the surface was perceived through the cloud. This is one of many cases of overlapping object-color perceptions in which different colors are seen in the same direction without change in stimulation.

Richard Hunter draws a distinction between colour attributes and geometric attributes. The colour attributes - hue, saturation, lightness etc., can be organised as the dimensions in a colour-order system but "... the geometric attributes such as gloss, haze and translucency are more difficult to organise. These attributes, which are associated with the spatial distribution of light by the object, cannot be uniquely defined in any organised coordinate arrangement as can the colour attributes."

After this extensive scene setting I come to the point: I believe it is possible to establish organised coordinate arrangements for the geometric attributes. What follows are my first ideas on the forms that such organised coordinate arrangements might take.

#### SCALES OF TRANSPARENCY

The breakthrough came when I was considering the cases of black and white. They are two colours that can never really be transparent. It can be possible to see objects clearly through a sheet of glass and that glass might be perceived to be yellow, red, blue, green or even grey, but it can never be possible to see through a sheet of glass that one would describe as black or white. There are different reasons why black and white cannot be transparent. The light is absorbed in the black glass and scattered by the white glass. Scales for what I have been calling "black transparency" and "white transparency" are shown in fig.2.

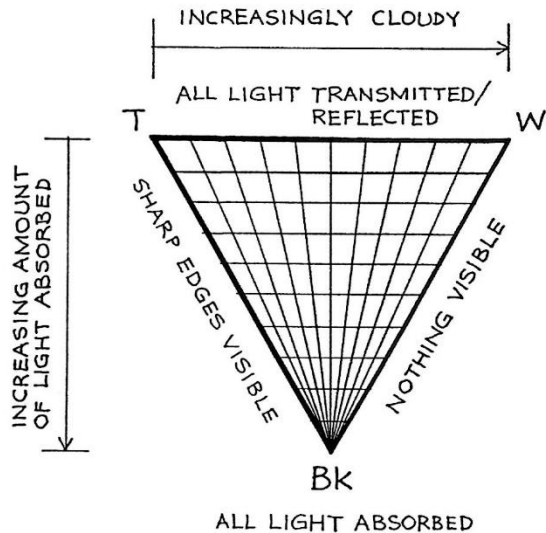


Fig. 2.

Scales of "Black transparency", T-Bk and "White transparency" T-W. (See text)

The scale for black transparency starts from the perfectly transparent-point T. As more and more light is absorbed the glass appears a darker and darker grey until so much light is absorbed that it is no longer possible to see through the glass and it appears black.(Bk). Different steps along this scale can be seen in different grades of sunglasses. A continuous sequence can be seen when one sheet of polarising material is rotated in front of another.

The scale for white transparency is marked along the top of the triangle from perfectly transparent (T) at one end to perfectly opaque white(W) at the other. This scale can be seen in the bathroom mirror while someone is having a hot shower. At first you can see your face clearly. As the condensation builds up on the mirror your face gets less and less distinct until you can only see white fog on the mirror. None of the light is absorbed; it is scattered more and more until the surface is opaque. The same effect would be seen if there were a clear glass window in the bathroom through which one could normally see the outside world quite clearly.

The scale on the diagram which connects white (W) and black (Bk) is the scale of opaque greys - the grey scale familiar as the central axis of most colour order systems.

Chromatic colours can be represented on a square diagram (fig.3). The T to W scale runs along the top. All colours down the left hand side are perfectly transparent in that it is possible to see clearly through them. All colours down the right hand side are perfectly opaque.

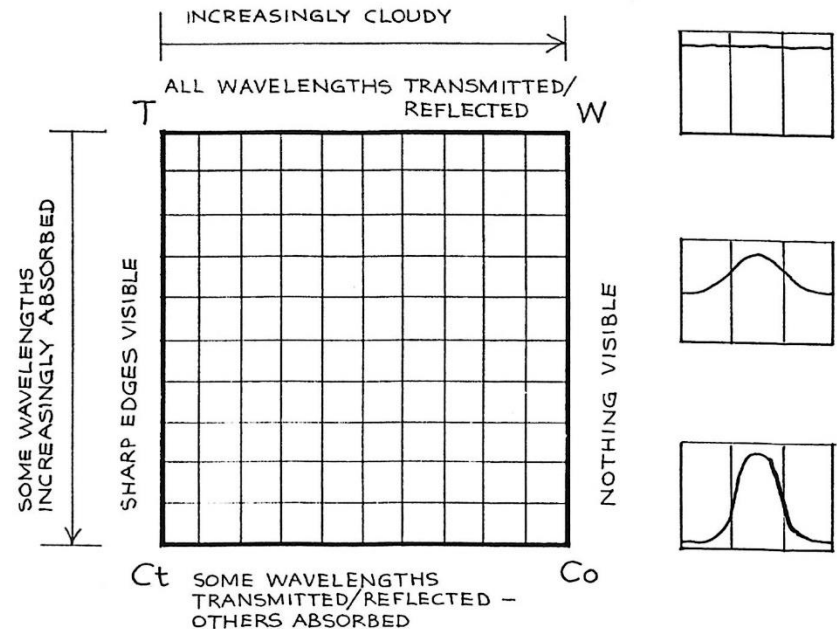


Fig. 3. Scales of increasing saturation (or chromaticness), T -Ct and W -Co, and increasing opacity - T-W and Ct - Co, (See text).

Along the top there is no chromatic colour, only clear transparency and increasing degrees of opacity ending in completely opaque white. All wavelengths are transmitted or scattered equally. Moving down the diagram there is an increasing amount of selective absorption so that chromatic colour appears. If the wavelengths in question were from the middle of the spectrum there would be a scale of highly chromatic greens along the bottom of the diagram, transparent on the left (Ct) and opaque on the right (Co).

This square diagram (fig. 3) can now be connected to the triangular diagram (fig. 2) and an upside down pyramid would be formed (fig.4). This would be an extension into three dimensions of a constant hue plane from a colour order system. If the system in question were the Natural Colour System (NCS) the constant hue plane would be the triangular plane W - Bk - Co.

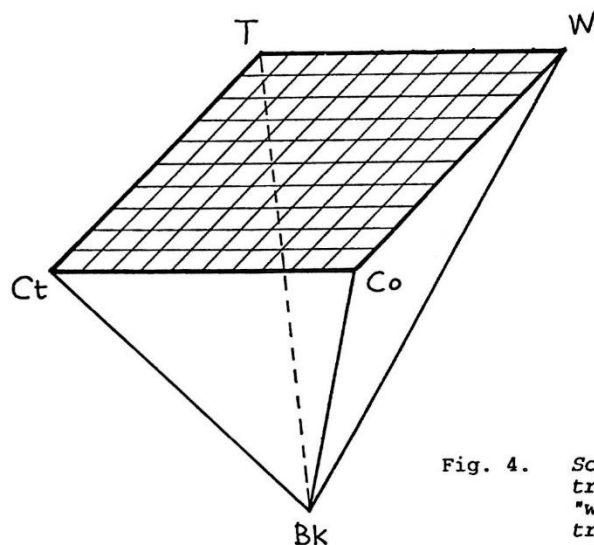


Fig. 4. Scales of "Black transparency", "white transparency" and increasing saturation (or chromaticness) combined in an upside down pyramid structure (See text.)

The colour samples in the NCS atlas are all opaque but one could imagine a parallel system where all colours (except black) were completely transparent, where there would be no white, and where the constant hue plane would be the triangular plane T - Bk - Ct.

A further diagram (fig.5) can show how the opaque world of the NCS atlas could be related to a transparent colour world. (In this diagram I have suggested that "saturation" might be the term appropriate to describe the appearance resulting from increasing selective absorption in a transparent colour world, while I have indicated the scale of chromaticness as used in the NCS in the opaque colour world. It might be that these different scales are appropriate respectively to the different colour worlds, but it might also be desirable to accommodate both scales in each world especially since the model implies the existence of intermediate colour worlds that are semi-transparent.)

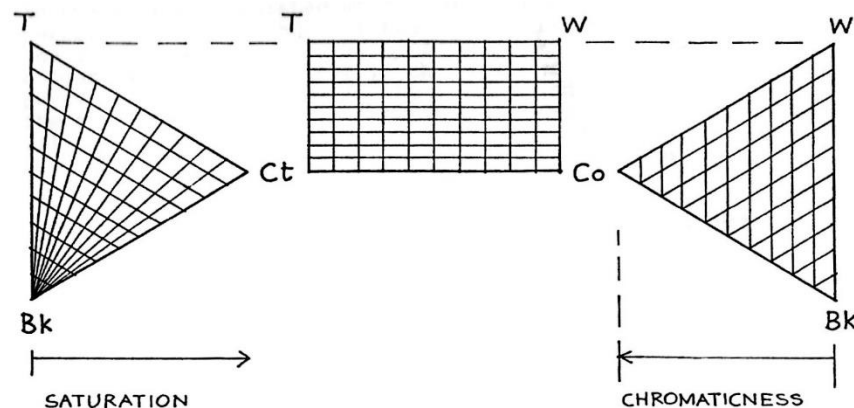


Fig. 5. Link between transparent and opaque colour worlds (See text.)

In his book "Blue and Yellow don't make Green" Michael Wilcox (7) illustrates how paints made with different pigments are more or less transparent.

When patches are painted over a black line the degree of transparency is revealed by the extent to which the black line remains visible. Alizarin Crimson is transparent; the black line remains sharply defined. Cadmium Red is opaque and covers the black line completely. Cadmium Yellow is partially opaque; the black line is visible, but indistinct as though seen through a yellow fog.

It could be argued that the distinctions between transparent and opaque colours are only to be made in terms of physics. If one could assume that the hue, lightness and saturation (or chromaticness) were the same, it would not be possible to tell the difference between a thin film of Alizarin Crimson painted so that the white ground showed through and a film of Cadmium Red mixed with Flake White. In each case the result would be described as pink and could occupy the same position in a colour order system. This brings us back to Juliet Albany's objections to "whitish" colours. I believe the difference can be seen and that it could be possible to assign positions to opaque, semi-opaque and transparent pinks on the scale connecting the opaque and transparent colour worlds.

Michael Wilcox emphasises the different qualities of opaque and transparent paints and the contributions each can make to a successful painting:

Transparent paints and inks allow underlying colours to influence the final result and in particular make it possible to create tints through their application over a white ground.

The more opaque colours are ideal for covering previous work, showing detail and adding 'body' to a piece of work...

A carefully planned combination of opaque, semi-transparent and transparent colours in a painting creates an emphasis between the heavier opaque colours and the vibrant transparent passages.

An entirely opaque painting often looks dull and heavy while a completely transparent piece can appear 'washed out'.

If you are tuned in to a problem and are constantly looking and thinking you can be rewarded with a perfect example which can make things clear. I had such a revelation while I was filling my thermos with coffee. I realised that when we make a cup of coffee or tea we determine whether or not it will taste the way we like it by making judgements along the black and white transparency scales.

We start with clear transparent water. In the case of tea, this is modified down the black scale by adding more and more tea leaves. The water remains transparent in that you can still see the bottom of the cup quite clearly but more and more light is absorbed as more and more tea leaves are put in. Clear water can be modified along the white scale by mixing in increasing amounts of milk. The right taste requires the right amount of tea leaves and the right amount of milk. We judge both visually which suggests that the perfect cup of tea could be plotted, without the aid of measuring instruments, on the triangle in fig. 3. (No doubt a tea connoisseur might also be able to extend judgements onto the other diagrams by assessing the hue,

chromaticness or saturation which might be expected from the teas produced in the different regions of India and Ceylon. I believe similar judgements also play a part in wine; gold medals are not won for taste alone.)

#### SPECULATION

From this point things get more speculative. It seems to me that it might be possible to establish a link between the transparency scales and gloss. In some cases a glossy surface can be perceived to have depth like very thin volume colour. (Just as white needs to be included among opaque colours, "clear" would have to be included among transparent colours).

In the case of varnished wood, the depth of the varnish can certainly be perceived. If the varnish is not perfectly clear one might see a slightly milky layer of semi-transparent volume colour over the rich brown of the wood and one might be able to perceive both the colour of the varnish and that of the wood in the same way that the observer in the story quoted earlier was able to see the light blue exhaust fumes and dark blue trousers from the same stimulus. (This was the kind of semi-transparency that Howard Taylor created in "Veiled Figure.")

The examples of the exhaust fumes, the glass of wine and the brick that is perceived to be coloured all through suggest that the concept of volume colour could be applied to each of the three states of matter - gas, liquid and solid. Solid volume colour suggests a possible link with texture.

There seems to be a connection between the value we place on materials and whether we perceive their colours to be surface or volume. When Colin Latchem raised the question of bricks and mentioned that he would respond differently to brickwork if it was painted, he also implied that he would value unpainted brickwork more. I believe we also value patterned textiles more if fibres of different colours have been woven together to create the pattern instead of the pattern being simply printed onto the surface of the fabric.

When fibres are dyed or wood is stained the colour seems to permeate the materials; they appear to be coloured all through. Transparent paint can achieve the same effect. A film of water colour can make the paper itself appear to be coloured. Fritz Fuchs (8) has produced beautiful effects with transparent paint on rough concrete walls.

There is another perceptual phenomenon which seems to increase the value of materials and which might also be plotted on the diagrams like the perfect cup of tea. It seems to be possible to see further into some materials than others. Alabaster might be described as more visually penetrable than limestone. Pearls and semi precious stones like jade and turquoise are also visually penetrable without being transparent. When materials are transparent, like emeralds, rubies and other gemstones they are more valuable still. A feature of materials that are visually penetrable is that they exhibit greater contrasts of light and dark - the more transparent the greater the contrasts.

Perhaps it is these contrasts, combined with the unity inherent in the stones themselves, which contribute so much to the excitement and satisfaction we get from them.

Illusions can be created by clever painting of materials which are not visually penetrable. Jocasta Innes (9) describes many techniques in her book "Paint Magic" including the technique of marbling. Veins are painted on the surface. Some are smudged and others left sharp. The impression is that the smudged veins are below the surface but still visible although blurred from being seen through the semi-transparent "marble". According to Mary Quant (10) the same trick was used in the time of Queen Elizabeth I when women painted "veins" on their faces in the hope that this would make them appear to have translucent skin.

Whether or not all these observations can be tied together into one neat theory remains to be seen. I am looking forward to all aspects of this conference, but especially the informal conversations. I hope I will be able to return to Perth with more clues and a clearer picture. Thank you.

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