Between Glare and Abysmal Dark: Toward a Conversation on Colour Appearance

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Summary

As a geographer, urban designer and a town planner my concern is with our increasingly placeless townscapes. I am particularly concerned by the use of inappropriate colour, including some 'heritage' colours, made worse as the forces of globalisation standardise and erode the sense of locale and local community. Communicating colour appearance as opposed to paint colour is difficult, particularly as people see what they know, know what they see, not what appears. By working towards a way of communicating colour appearance as 'events' in all their richness, I hope to make it possible for people to have a constructive conversation based on shared concepts. When people understand what others are talking about, the possibilities of identifying and addressing the shortcomings of our townscapes becomes real. I have attempted to go back to basics and look at my environment with an 'honest eye'. I try to communicate my experiences of colour appearance (the events in time and place) as they are and to identify parameters of colour appearance that exist. Likewise, with two exceptions, my photographs are direct digital simple mode 'snaps' for this paper, unedited. This paper establishes a set of parameters from my personal observations which need testing in a sympathetic forum. I need feedback to find out the extent to which my conclusions resonate with other people before I can move on to developing a diagrammatic means of communicating colour appearance.

Introduction

This paper represents a provisional foundation for my search for basic parameters of a formalised means of communicating colour appearance (and, in future, a diagrammatic means). Communicating colour appearance as opposed to paint colour is difficult, particularly as people see what they know, know what they see, not what appears [1]. By working towards a way of communicating colour appearance as 'events' in all their richness, I hope to make it possible for people to have a constructive conversation based on shared concepts. Personal observations and conclusions are outlined following an intensive study of environments, colour and light in Western Australia. I believe that with some adjustment to detail, they will hold true for other geographical places and I seek feedback on these. I have addressed what I see around me not established theory or concepts, thus the cited references are deliberately minimal.

The light in Western Australian is renowned for its clarity and strength and this must

always be borne in mind when communicating an experience to people in other locations. By considering the three dimensional aspect of colour appearance, i.e. the whole event, we can communicate more holistically and effectively than by using colour models derived from painterly or scientific approaches.

Some readers might recognise that little is new in what is outlined within this paper. Stage managers in theatres, photographers and artists have understood and worked with these ideas for a long time, for example Monet's series of haystacks near Giverny painted in different light. However, in the search to communicate colours much of the event and experience of colour has been lost. The significance of local light and colours, the values of colour material and traditional colours within specific cultures, the psychology and – dare I say – even the spiritual elements of colour have been diminished and reduced to standardised colour chips.

The study of colour has been largely informed by painters seeking pigments and scientists examining how we see. This, combined with the modern tendency towards deconstructive thinking, has reduced three dimensional events to one dimension. Colour is an experience in time and place; it affects our senses and our emotions. We see and sense and respond to illumination, transparency, opacity, reflectivity and texture of colour. Are there general parameters by which we can communicate colour appearance more sensitively, respectfully and holistically?

For some years, I have concluded that we rarely truly see our environments. We live by assumptions and it is my belief that with the alarming tendency towards mass standardisation in modern life, for ease of administration or marketing, we are losing vast areas of rich and complex experiences. Subtle events, experiences and differences are particularly vulnerable to the commercialisation of culture. Could there be better ways than those used now of communicating colour appearance?

Sumner says, 'Colour is such an integral part of our visual experience that most people assume perceived colour comes directly from the physical properties of objects themselves – my shirt looks yellow because it is yellow. That this assumption is not continually proved wrong by everyday experience is a testament to the cleverness of our visual system. But the assumption is wrong because colour is invented within the brain, and the colours we perceive are determined by many factors that differ between species, between people, between different parts of the retina, between each environment an object may be seen in, and also between moments in time. Therefore, there is no consistent one-to-one mapping of the light entering my eye into the colour I perceive' [1]. And in relation to our physical vision, 'Our colour system continuously attempts to make colour represent the physical properties of an object itself, rather than the spectrum of light that happens to be reaching us from the object in any given circumstance. Thus, what we see is actually our brain's interpretation of objects, rather than any simple representation of the light entering our eyes. It is this automatic interpretation that makes colour vision so useful for detecting and recognising objects despite changes in their environment' [1].

Summarised Observations

As the author of this study, I am attempting to concentrate the truths of what I see into parameters for communicating colour appearance. The reader is therefore asked, to what extent can you agree with the principles that are outlined in this paper in the following sections? To provide the necessary feedback, a 'response sheet' can is available for completion (see the supporting information in Appendix S1) which outlines the scale ranges as: 1, disagree;

2, disagree slightly; 3, not sure; 4, agree slightly; and 5, agree. In addition, the reader may also find it useful to first refer to the Glossary at the end of the paper, which seeks to clarify some terms used in this study.

1. Fundamentals of colour appearance

1.1 Colour appearance is constrained by our culture, understanding and eyesight, but is defined by oppressive absolute lightness or 'glare' and intense absolute darkness or 'abysmal dark'.

1.2 Glare and abysmal dark are opaque, we cannot see beyond them (Figure 1) yet we can walk into them and generally they recede as we do so, becoming enveloping transparent lightness and darkness.

1.3 Colour appearance changes as light changes throughout day and night.

1.4 Colour appearance changes with distance and scale, and ranges from points of darkness or greyness prior to invisibility to highly visible chromatic aspects or subjects through various levels of greyness, fuzziness/increasing focus.

1.5 Colour appearance differs from place to place.

Note, for some people glare (from the sun) may have a sense of translucence of something beyond and abysmal dark a sense of absolute loss or nothing. Both of which may be terrifying.

2. Distinct/major daytime light phases in South Western Australian light

The light phases outlined in this section can be experienced daily as a general rule with slight seasonal variations.

2.1 Around dawn and dusk when the sun is just below the surface or less than approx. 15 degrees above the surface, light may be more coloured (yellows/reds) than at other times, there are far reaching shadows and tonal contrast is shallow, and there is a tendency to silhouettes (zone of silhouettes) and patches of translucent colour where elements such as leaves or grasses catch light and light is reflected as white mist and multiple colour in dew, rain drops and cobwebs; soft glare (whitish) may occur (Figure 2 and Figure 3).

Figure 1 Glare and abysmal dark (King George's Sound, Albany)

Figure 2 Dawn with silhouettes (Princess Royal Harbour, Albany)

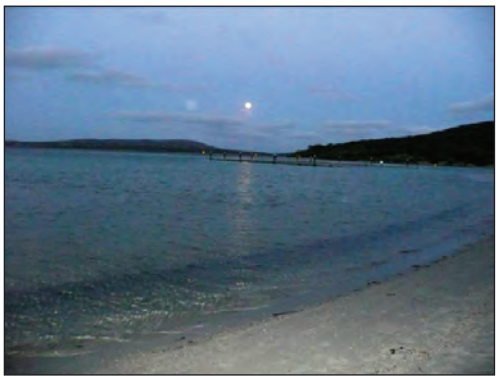

Figure 3 Dusk (Oyster Harbour, Albany)

Figure 4 Exquisite phase, prior to mid-morning; a couple of hours after sunrise (New Norcia)

Figure 5 Acute phase, after mid-afternoon; late autumn, afternoon shadow and light in balance, sunlight between 15 and 30 degrees (Manjimup)

2.2 The exquisite and acute phases occur when the sun is between approx. 15 and 30 degrees, respectively, to the landscape: prior to mid-morning is the exquisite phase (Figure 4) and after mid-afternoon is the acute phase (Figure 5).

Shadows are shortened from those at dawn/dusk yet the shadow is at least as great as the subject's height, i.e. between 1 and 2 times the height. There is an increased shadow depth of contrast with colour and increased colourfulness (highlights) which are balanced; form is at its most exact expression appearing sculptured, i.e. colour appears in three dimensions of shadowed colour, 'inherent' colour [2,3] and highlight colour. Colour appearance has greatest clarity, transparent and translucent colours are strong and silhouettes appear.

2.3 The midday phase when the sun is more or less overhead from approx. 45–135 degrees, reduced shadow footprint (less than the height of the subject), some increase in shadow density and increased tonal contrast and reduced colourfulness; and a greater likelihood of glare. An individual element's form may be harshly marked by deep shadow and whitish colour, but generally the landscape appears less interesting, flatter and a greyish tinge may occur on vegetation from much impacted or reflected glare on surfaces and especially on glossy leaves. Translucence and transparency can occur when the viewer, object and light are sympathetically orientated. Silhouettes are less common (Figure 6 and Figure 7).

Figure 6 Midday phase; light with reduced shadow length and stronger tonal contrast, colours whitish (Bremmer Bay)

Figure 7 Midday phase; increased shadow depth , reduced shadow extent, whitish colour (Pilbarra)

3. Light and dark

3.1 Lightness and darkness are transparent as we move within them.

3.2 Lightness and darkness change in location and intensity throughout day and night.

3.3 Lightness and darkness impact on or affect (the subject's) inherent colour and adjacent colours over which they move through increasing or decreasing the effects of contrast, camouflage, complementary blending and clashing, etc.

3.4 Light on only one side of form creates dark silhouettes and shadow, darkness on the other side.

3.5 Increasing early morning light pulls silhouette into form and three dimensional colour, the reverse happens at dusk; as light retreats silhouettes occur.

3.6 Lightness intrudes through and onto elements appearing as transparent and translucent colour (see Figure 4 for an example of exquisite phase with translucent leaves).

3.7 Lightness emanates from colour (appearing luminous) particularly within grey or dark environments, e.g. a golden karri tree trunk on a grey day in an autumn forest, or the autumn leaves of deciduous trees (Figure 8).

Figure 8 Luminous effect on autumn leaves (Manjimup)

Figure 9 Grey day translucent leaves with reduced shadow

3.8 Lightness may appear on opaque pastels, but pastels themselves, i.e. whiteness within colours which are light or pale, these are not lightness.

3.9 Normally opaque surfaces, such as leaves, may appear translucent with light behind or beside them (Figure 9), even on a grey day light through leaves creates translucence.

3.10 Light may increase the brightness of colour to a point beyond which light becomes too strong and reflected and or impacted whitishness replaces colour. At the same time, strong light may drive shadow darkness into apparent black or blackishness by contrast (refer back to Figure 1).

4. Light or whitishness on coloured surfaces

4.1 Whitishness appears when light at any angle on any surface is powerful enough to make the surface whitish. It may be a torch beam on a carpet (impacted whitishness, i.e. on a non reflective surface) (Figure 10) or the sun on water (reflected whitishness/glare) (see Figure 1).

4.2 At midday, overhead sun in low latitudes may be sufficiently strong to cause the sky to glare making the landscape whitish and flattened by reducing shadow footprints. Colour appears leached though tonal contrast of light and dark, whitishness and blackishness may be strong (see Figure 7).

4.3 One of the best example of lightness impacting a colour can be seen daily in Western Australia when shadows fall across bitumen on the road or in car parks, the contrast between shadowed (black) bitumen and the pale grey, whitish bitumen in full sun is particularly noticeable (Figure 11 impacted glare and shadow on road)

Figure 10 Impacted whitishness of torchlight on carpet; light enhances colour but when too strongly focused light overwhelms colour as whitish

Figure 11 Impacted glare and shadow on road

Note, the reputed 'dreariness' of West Australian Jarrah forest may be a 'greyness' caused by the whitish effect of glare on waxed and reflective eucalypt leaves viewed from a distance, while a walk through a Jarrah forest discloses the beauty of translucent greens as light is seen through leaves.

5. Darkness is shadow

5.1 All form projects shadow(s) and has shadows within the contours of the form – shadows are transparent, shadows move. Night is earth's shadow.

5.2 Transparent elements project shadows (Figure 12).

5.3 Shadows appear as an overlay of darkness on a subject. Shadow is a lack of light or diminished light, diminished chromaticity. Shades and shadows dissolve into darkness, which may be deep blue, brown, purple or green blacks (etc.). Shadow contrasted with glare may appear 'pure' black.

5.4 Clouds cause shadows and have opaque shadows on them, parts that catch the sun are whiter or coloured and translucent.

5.5 A grey day is cloud shadow, a shadowed day.

5.6 Shadows tend to be less dense or appear lighter, almost non-existent on a grey day. (Figure 13).

5.7 Grey day colour is highly chromatic with reduced depth of shadow but form may lack sculptured quality (Figure 14).

Figure 12 Old bottles and transparent prism illustrate shadows and reflections of transparent subjects

Figure 13 Old bottles and prism on a grey day; high chromaticity, shadows are almost non-existent, reflected whitish glare factor remains

Figure 14 Colour appears more chromatic on grey days with less shadow and flatter form

6. Night light events

These need a great deal of further investigation, but include the following.

6.1 Night is darkness, darkish shadow, blackish not blackness or rarely blackness and then perhaps only in contrast to light.

6.2 Strong focused lights (including moonlight) have a similar effect as in daylight of diminishing colour and creating impacted or reflected whitishness.

7. Silhouettes

7.1 Silhouettes occur when a subject is between the observer and light, i.e. particularly at dawn and dusk which are 'zones of silhouettes'. A silhouette is the dark shape of a subject outlined against lightness and appears vertical and flat (see Figure 2 which shows chromatic form emerging from silhouettes and Figure 3 showing silhouettes taking over from chromatic form).

7.2 A silhouette the front of which, towards the observer are shadow(s), has a fine blackish edge, the back of the silhouette (the side that is lit) may be highly colourful or whitish, depending upon the strength of the light.

7.3 Silhouettes may also occur any time stronger light, than surrounds the observer, shines behind an object that sits between the light and the observer.

8. Reversed silhouette and glare

8.1 When the observer looks towards a strong light, the glare of the light and reflections from all elements can denude the scene of colourfulness. When this happens, objects may take on shades of white, grey or darkness within and around the glare. This may occur when strong light is in front of an object, between the object and the viewer, which then is reduced to a reverse silhouette by the glare, leaching colour and tonal contrasts from the object (see Figure 1; the mid-ground behind the light is grey to the foregrounds blackness – the light is between them).

8.2 A reverse silhouette is usually a lighter grey, less dark than a silhouette.

9. Whites and blacks

9.1 These are powerful colours, neither neutral in appearance nor neutral in their effect on other colours (Figure 15).

9.2 They appear suddenly or gradually in/on or adjacent to other colours. In nature, pure black or white tend to be relatively rare and apply to birds, flowers and insects, burnt landscapes and polar landscapes, etc. (Figure 16).

9.3 Blacks and blackness, as with blackish, can support even increase the colour intensity of adjoining colour (see Figure 16, new growth green within blackness), whereas whites, whiteness and whitishness tend to leach colour from surrounding colours and 'take over'. Whites stand out or advance towards the observer while blacks may retreat particularly when the surface is matt.

9.4 Solid mass and large scales of black or white can be both oppressive and intrusive.

9.5 Pure whites and blacks can be highly visible, particularly with surface texture contrasts to their context, with the exceptions of occurrences in landscapes where similar distributions of black and white (e.g. zebra or magpies) mimic background landscape of dark and light.

9.6 White is not light, white may be a 'light' colour in that it reflects light, as are pastels but they are opaque and solid (Figure 17). 'Dead white' is a term that illustrates the contrast of white with lightness (living light). If we try to walk into white, whiteness or black, blackness we may get hurt.

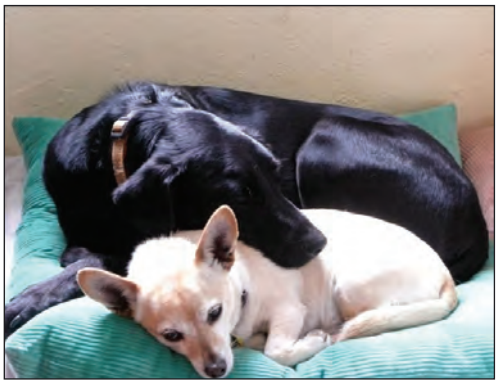

Figure 15 (left) Black and white are powerful colours and are not light and dark (lightness and darkness appear on black, white and all colours)

Figure 16 (below) Blackness enhances other colours

Figure 17 (left) Opaque whites with lightness and shadow (Santorini)

9.7 The defining edge of a three-dimensional form displays a fine, sometimes extremely fine, outline of blackish (shadow) between it and its surrounds when light is to the front or side.

9.8 A whitishness is readily discernable at the edge(s) of the light side of a subject when the light is focused from the side or back.

10. Colourfulness and lightness or darkness

10.1 Transition from colourfulness to lightness, as in whitish and glare, or darkness (blackish) may be sudden and absolute with no fading of colour or it may be gradual through tints, pastels, shades or tones (Figure 18).

10.2 Equally, the transition from either darkness or lightness to colourfulness may be sudden with no tones or shades or gradual through shades, tints, pastels, etc.

10.3 All colours' appearance may be related to all colours by tones, shades, tints or pastels as in camouflage or harmony and through contrast or clash by proximity and scale, light or shadow.

10.4 Horizontal scale blurs colour and creates 'average' colours or regional colours in the near and middle ground, blurring and darkening them, they become increasingly grey and lighter towards the horizon (Figure 19).

10.5 Too much glare and too little shadow flattens form into outline shapes, reverse silhouettes and too much shadow and too little light flattens form into outline shapes of silhouettes (see Figure 1).

Figure 18 Transition from colourfulness to lightness, with unexpected glare on the green leaves

Figure 19 Scale and distance blur colour; foreground and mid ground are highly chromatic, brighter and or darker than the back ground beginning to fade to greys (Pilbarra)

11. Colour responds to grey days (diffused light), shadow days and shadow

11.1 Grey days may have a glare factor if the cloud is thin (see Figure 13).

11.2 Foreground natural greens of vegetation in Western Australia are more colourful, less shadowed and less three dimensional on a grey day, with smaller tonal contrast than on a sunny day with greater tonal contrast. Where colours are highly yellow they appear particularly luminous on a grey day or in late afternoon light (see Figure 8). On grey days, green leaves can be seen in Figure 14, with translucent colour showing less shadow and less sculptured form in Figure 9.

11.3 Shadow makes colours appear more colourful, particularly yellow based colours. Too much shadow (large scale) removes colour, i.e. as in mid-ground landscape greens are darkened on a grey day.

11.4 Greys that are coloured may have very different effects on colours around or on them, e.g. dark blue grey horizon storm clouds set off harvest golds and yellow greens etc. making them appear luminous.

12. Minor light events (not exclusive) – light may be focused, broken or diffused

12.1 Cloud or trees cause spotlights or dappled effects.

12.2 Cloud, mist, fog and steam can create a pervasive context of greyness that can make some colour, particularly yellow based colour, brighter.

12.3 Equally, cloud, mist, fog and steam can intrude between the observer and the event and eventually obliterate it, creating an opaque greyness.

12.4 Pollution, especially smoke, causes a brown/red tinge to the landscape, similarly volcanic ash can redden sunsets/sunrises.

12.5 Precipitation blurs with the ultimate ‘white out’ of driving snow.

13. Transparency, translucency and opacity

13.1 Transparency (clear) is invisible or appears as reflections of other colours, glare and or shadow or through contamination with water and dust, etc. (Figure 20).

13.2 Coloured transparency appears only as contaminated colour, i.e. reflections, shadows and as a coloured overlay (shades or tones of colour), increased thickness of material, as in folds in fabric or bends in glass will give an effect of purer colour with less if any contamination (Figure 21).

13.3 Transparency and translucency increase when viewed against the general direction of the incoming light, opacity may also increase to the point of silhouette.

13.4 Transparency and translucency are prominent when viewed across the general direction of the incoming light while opacity may show greater chromaticity and some silhouetting;

13.5 Transparency and translucency decrease into opacity and whiteness (reflected or impacted) with a strengthening light focused directly upon them from the general direction of the observer (Figure 22).

Figure 20 Spiders web with dew; transparency made visible by contamination with moisture and reflections on the moisture

Figure 21 Transparency as contaminated by colour behind it; greater chromatic colour appears in bends and double layers

Figure 22 Bottles and glare; strong focused light creates an appearance of translucence/near opacity of surface by whitish (glare) reflections on transparent surfaces

13.6 Transparency and translucency decrease into invisibility or opacity with distance or on a grey day.

13.7 Transparent pure colour appears as shades, tones, tints and pastels. Contaminated by context colour, an object or element that is transparent may appear pure as translucent or opaque colour where viewed along edges, corners, curves or folds, i.e. looked at through a greater thickness of material. For instance, a coloured bottle (transparent) appears as contaminated colour on background colour(s)/shapes, the edges of the bottle viewed through thicker glass or layers of glass may show a strong translucent colour appearance (see Figures 21 and 22).

13.8 Coloured glass appears brightly coloured where light strikes and the resultant glare is reflected through the glass as brightened colour or onto the surface as whitish.

13.9 When light and viewer are the same side of a transparent surface it acts as a (semi) opaque surface and reflects or impacts lightness, i.e. the trellis effect (see Figure 22 and Figure 23). The same surface with light and viewer at different sides, is transparent (Figure 24).

13.10 Opacity increases when viewed along the direction of incoming light and away from the light (see Figure 18, Figure 22 and Figure 23).

13.11 With increased scale and distance opacity in turn gives way to translucence, misty mountains, etc. (see Figure 19).

13.12 Normally regarded opaque elements between strong light and the observer may appear translucent, e.g. leaves (see Figure 4 and Figure 9).

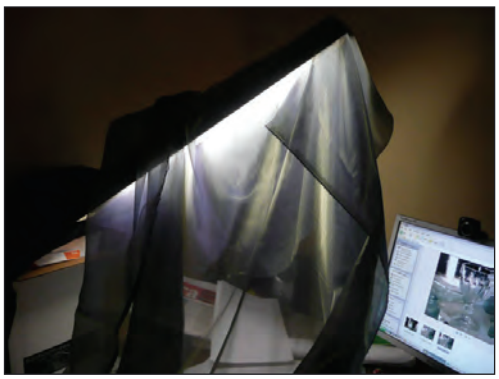

Figure 23 Transparent metallic cloth draped over a light becomes translucent/opaque where light shines sideways onto the face of it but remains transparent with the light behind it

Figure 24 Transparent metallic cloth with a light shining directly onto it from the same angle it is viewed from is now reflective (metallic) and opaque

Conclusion

I have attempted to outline some of the parameters of colour appearance, the event of colour and form. Colour appearance of a subject is at its clearest expression when light and dark, i.e. lightness and shadow, are balanced with colour to provide the clearest, most colourful three dimensional or sculptured effect possible – when light is angled between approx. 15 and 30 degrees.

There appears to be two periods during the day, the exquisite phase of early morning and the acute phase of late afternoon when colour appearance has its greatest clarity chromatically and sculpturally. Knowing this and knowing the effect of strong sunshine on colours over the midday period and the effect of grey days on chromaticity should guide designers into providing locally applicable colour in buildings and the landscape. In Western Australia, strongly chromatic colours are made whitish by glare, while transparency and translucency are high. These events are best experienced by walking, as viewed from a car there is a loss of transparency, translucency and chromatic impact with increased distance from the subjects.

Colour is constrained by glare and darkness at the extreme but is also blurred to darkness (shades and tones) in mid-ground and eventual horizon greyness by distance. Three-dimensional form is also constrained by darkness to silhouettes at the extreme but may blur to flatness, outline shape and whitish/greyish, even reverse silhouette under glare. Form becomes blurred with distance from solidity and opacity to translucent shapes that may be cloud or mountains.

Opacity may appear translucence, transparency may appear translucent even opaque, while translucence may appear opaque under different light conditions. Grey days, shadowy days favour less shadow, less defined form but strong chromaticity. Transparency may display strong shadows but only appears when contaminated with reflected light, colour, moisture or a foreign element.

Finally, a question is posed – should we refer to ‘blue’, ‘red’, ‘green’, etc. or, more accurately, should we be talking about blues, reds and greens, i.e. colour as a plural. Expanses of mono colour are rare in nature other than skies or landscapes viewed at distance. All form displays colour appearance variations, i.e. the three-dimensional colour of colour shadowed, colour highlighted and inherent colour because that is the nature of form. Therefore, when we colour large buildings or pave vast highways in towns this naturally pluralistic nature of colour should arguably be duplicated or at least decisions on colour made on a locally informed basis. The

sculptural qualities of some modern mono coloured buildings can appear exquisite on a small scale, i.e. the model produced for local government may have this quality, but the reality and scale of the built form is usually quite the reverse.

With feedback from other people, I hope to refine these observations as the basis for a means of communicating colour appearance as the event and experience it is. My hope is that the diagram(s) will make communication easier and more holistic while respecting local differences. Successful communication is the first step towards constructive dialogue about the environment which could ultimately lead to developments which truly represent the local.

Acknowledgment

I particularly acknowledge the support and kindness that I have received from Paul Green-Armytage.

Glossary

Terms to assist with clarity in this paper:

- White: is white as in paint or a white flower
- Whitish: is white on a subject caused by light as in impacted (non reflective surfaces) and reflected light and is interchangeable with lightness and light
- Whiteness: is white within colour, i.e. pastels
- Black: is black as in a black dog or a black tree stump
- Blackish: is black on a subject caused by shadow and reflections and is interchangeable with darkness and shadow
- Blackness: is black within a colour as in shades of colour.

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Supporting Information

Additional supporting information may be found in the following document:

- **Appendex S1** Response sheet, which readers are invited to complete and return to the author by email