

Colour Zones – Explanatory diagrams, colour names, and modifying adjectives

Paul Green-Armytage, School of Design, Curtin University of Technology, Western Australia

ABSTRACT

This paper presents a flexible system for describing colours which links everyday language to colour order systems. The structure, based on that of the *Natural Colour System* (NCS)¹, has reference points which are defined and named. The structure is illustrated and an account is given of the processes used to establish the system of colour names and modifying adjectives which identify the reference points.

Keywords: Colour order systems, colour names, basic colour terms

1. INTRODUCTION - COLOUR ZONES

Colour Zones are subdivisions of the 3-D colour solid. Each zone contains a range of similar colours with a focal colour as a reference point at the centre of the zone. All the colours in a given zone have the same identification.

1.1 Three levels of precision.

The smaller the zones, the narrower the range of different colours in each zone, the larger the number of zones needed to fill the colour solid, and the greater the precision. A primary source of inspiration, which gave impetus to this project, was the *Universal Color Language* (UCL)² with its six levels of precision. A simpler alternative to the first three levels of the UCL was one of the objectives of the Colour Zones project. At level one there are six zones, the focal colours of the zones being the six Elementary Colours as defined by Ewald Hering³ which form the basis of the NCS: White, Black, Yellow, Red, Blue, and Green. Further subdivisions provide 27 zones at level two and 165 zones at level three.

1.2 Merits of imprecision – the *Post-it* advantage

Challenging assumptions is one of the strategies recommended by Edward de Bono⁴ for generating new ideas. If we assume that the value of a glue is to be measured by how firmly it sticks we might not recognise the advantage of having a glue that does not stick very well. In their humble way, *Post-it* notes have changed the world. A common assumption about colour order systems is that they should be as precise as possible, but I believe that a system which is imprecise and flexible can offer what I call the *Post-it* advantage. If the hit-and-miss of everyday language can be so imprecise as to be the equivalent of no glue at all, and a colour order system is the equivalent of *Supa-Glue*, it can be useful to have something in between – the equivalent of *Post-it* – a fuzzy system with a somewhat elastic structure.

2. STRUCTURE

The colour solid of the NCS provides the structural skeleton for the Colour Zones. It can be presented in two projections – a plan view (a colour circle which shows the sequence of hues) and part cross section (a colour triangle which shows the set of nuances). Hering's Elementary Colours are the focal points of the six zones at level one. Anders Hård⁵ has drawn attention to the distinctive character of colours with equal resemblance to Elementary Colours such as a grey that is equally whitish and blackish. These equal resemblance colours together with the Elementary Colours provide focal points for the 27 zones at level two. Further subdivision, with intermediate colours as additional focal points, results in the 165 zones at level three.

3. IDENTIFYING THE ZONES

Colour names are used to identify colours in the zones at levels one and two. Colour names, used singly or in pairs, and with modifying adjectives, are used for the more precise descriptions required for the smaller zones at level three. Research was undertaken to find a set of colour names and modifying adjectives which reflect current usage and can be used to describe colours in this way. A definitive study, with a large number of participants randomly selected from different populations within the English speaking world, was beyond my resources. So I can claim no more than provisional status for my findings. My objective was a set of words that people would accept and that I could defend.

4. COLOUR NAMES

Colour is a sophisticated concept which requires the ability to make connections between things that are otherwise quite different from one another. Most, if not all words that are used as colour names in English were first used for something else, 'orange' being a clear example. In some cases the original meaning has got lost in history. Philologist Anna Partington⁶ has traced the word 'red' through its migrations from one language to another to an ancient word for 'blood'. This seems a likely scenario: Someone notices a similarity in appearance between blood and a particular flower and describes the flower as 'blood-like'. With increasing use of the expression it becomes possible to describe the flower simply as 'blood' – a colour name has been born.

4.1 Basic Colour Terms – past, present, and future

Research, which began with the study by Brent Berlin and Paul Kay⁷, has provided convincing arguments for a set pattern of language evolution; there are strict limitations to the order in which languages acquire 'basic colour terms'. Basic colour terms are best defined as 'the smallest subset of color terms such that any color can be named by one of them'⁸. In today's English these are white, black, red, green, yellow, blue, brown, grey, purple, orange, and pink. But today's smallest subset was once smaller. In 1721 Nathaniel Bailey's dictionary⁹ did not recognise orange or pink as colour names with today's meanings; what is 'pink' today would then have been just another kind of red. If the smallest subset was once smaller, presumably it may also get bigger. The Colour Zones project is an attempt to establish a kind of ideal subset for the future. The level two subdivision offers a manageable range of 27 colour zones in a coherent structure with well defined focal points. The idea is to boost the number of basic terms from eleven to 27. Today's eleven terms are spread unevenly over those 27 zones, with eight zones that would be 'green' and only one 'pink'. If these terms are now restricted to the zones which suit them best, new names can be provided for the remaining 16 zones. The most suitable names will be those which come most readily to people's minds and which are commonly applied to the colours in question. Several studies were conducted.

4.2 Salience test

Responses from 247 people to the request that they write down as many colour names as they could think of in five minutes produced 216 names that were listed by more than one person. Of these, 183 are recognised as colour names in more than one of the six current dictionaries consulted. A rank order of salience for the names was established by the number of people who listed each one.

4.3 Preference test

The 27 focal colours were shown to a group of eleven people who were asked to propose names for the colours. This exercise confirmed earlier ideas about which colours should become the limited domains of the existing eleven basic terms. From the names proposed for the other 16 colours, 32 names were chosen as potentially most suitable. Colours and candidate names were then shown to several groups. Responses from 148 people established orders of preference where there was more than one candidate name for a given colour zone.

4.4 Correspondence test

An indication of the range of colours to which each name might be applied was established by asking people to choose the best example for each candidate name from all the colours in the NCS atlas. Responses from 54 people established the extent to which each name was on target, the ideal situation being that all colours chosen would fall within the zone to be named.

4.5 Conversation test

To test the credibility of the names as colour names, people were asked to imagine this fragment of overheard conversation: "We saw it on television, it was" Responses from 35 people established the extent to which candidate names might be used to complete that sentence and be recognised as names for colours as opposed to names for other things.

4.6 Decisions – strong claims, conflicting claims, and problem colours

Decisions were made. The key consideration was the correspondence test. A name could only be accepted if the majority of colours chosen for it were within the zone to be named. For some colours the choice was easy: lemon, khaki, lime, olive, aqua, turquoise and navy were generally well supported by the data and scored better than any rival names in the tests. For other colours there were two names with competing claims. In such cases the first appeal was to the correspondence test. So apricot was chosen ahead of peach, and teal ahead of jade. But there was nothing in that test to separate maroon from burgundy, mauve from lilac, or azure from sky. Although burgundy and lilac were preferred by more people, maroon and mauve were more salient and scored better in the conversation test. Although less appealing on aesthetic grounds, maroon

and mauve are clearly better established as colour names and so were chosen. Azure was chosen ahead of sky because it is a complete colour name. Unlike navy, sky cannot yet stand alone, it still has to be sky blue. Four problem colours remained. Mint and forest came out of nowhere as names for light and deep green. They are barely established as colour names, but were clear winners in the preference and correspondence tests. Chartreuse, though unfamiliar to many, is an established colour name and the best option for light yellow-green. For deep purple the best option seemed to be grape, but with green grapes and purple grapes there was ambiguity which was born out by two clusters in the correspondence test. At the last minute I came across aubergine and chose it although it has not been subjected to all the tests.

5. MODIFYING ADJECTIVES

For the greater precision at level three the 27 zones of level two contract around their focal points and new zones are formed in the gaps. It might be possible to find or invent 165 colour names but their use would be neither practical nor in line with normal use of language. We combine names, e.g. yellow-orange, to add precision in terms of hue. And we introduce modifying adjectives like pale and deep to add precision in terms of nuance. Further studies were conducted to find a useable set of modifying adjectives to identify differences in nuance.

5.1 Salience test for adjectives

As with colour names, people were asked to list as many modifying adjectives as they could think of in five minutes. In responses from 106 people, 161 words were listed by more than one person and a rank order of salience for these words was established. Of these words, the 32 most salient and most potentially useful were selected for further testing.

5.2 Correspondence test for adjectives

An indication of how modifying adjectives might be used to describe colours according to their variations in nuance was established by asking people to use a seven point scale to rank the appropriateness of each adjective as a description for each of a given set of colours. Ten colours of similar hue were presented together. Four sets were used, one for each of the elementary hues. Responses from 30 people made it possible to derive patterns which can be used to justify the choice of specific adjectives for specific nuances.

5.3 Preference test. Adjectives for describing colours in general and colours that are also named

The four sets of ten colours were arranged in random order in a square grid of 40 colours. From the list of candidate adjectives people were asked to select the most appropriate as a description for each colour. While a preference order could then be established, responses from 41 people made it clear that the choice of adjective could depend on whether or not the colour was also named – in a comparative situation a ‘light blue’ might or might not also be a ‘light colour’. It is possible to refer to a group of unnamed colours as, e.g. ‘pale colours’ or ‘deep colours’, but when a specific colour is also named, the role of modifying adjectives is somewhat different. An adjective indicates relative appearance. E.g. focal pink belongs in the ‘light’ zone. In relation to focal pink a given pink might be judged to be pale, dull, deep or strong.

5.4 ‘Road test’. Adjectives and names combined

To test whether a finite set of names and adjectives could be used by different people to describe colours consistently and with some degree of precision in normal conversation, the grid of 40 colours was presented to another group. This time the choice of names and adjectives was limited to lists which were now all but finalised. Responses from 32 people using this system for the first time (some under protest!) did result in some degree of consensus.

6. CONCLUSION

The three levels of Colour Zones, with the reference points identified by names and adjectives, are shown in figures 1 – 3. While the underlying structure of Colour Zones is quite regular, it clearly needs to be able to bend and stretch if it is to accommodate everyday language. And it has to admit alternate descriptions for the same colour. The colour names themselves are not all entirely satisfactory and there are complications in the way people use modifying adjectives which threaten to undermine the simplicity of Colour Zones as a system. However, the degree of consensus shown in the way people used names and adjectives when their choice was restricted suggests that the system could serve its intended purpose. It could be like *Post-it*, a glue that does stick although it does not stick very well. I hope it may also ease the transition from use of unstructured language to use of a colour order system and make it easier for people to describe colours in a way that can be related to the NCS without needing to master that system’s letter/number notation code.

Fig 1 Colour Zones - Level 1

Colour circle and colour triangle showing the elementary colours as reference points

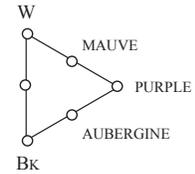
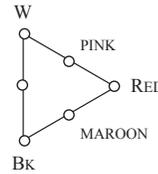
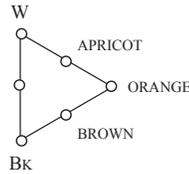
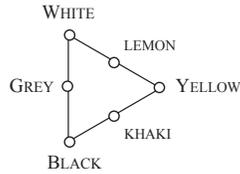
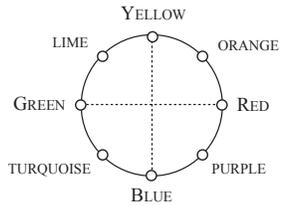
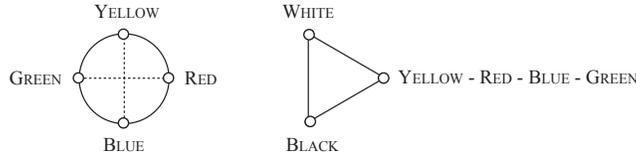


Fig 2 Colour Zones - Level 2

Colour circle and eight colour triangles showing the elementary colours and equal resemblance colours as reference points

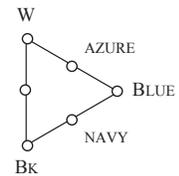
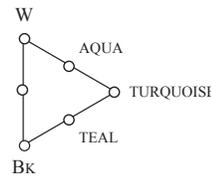
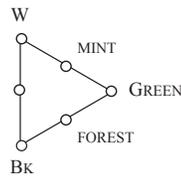
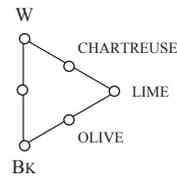
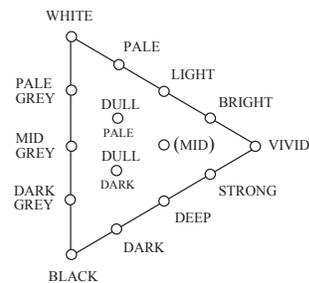
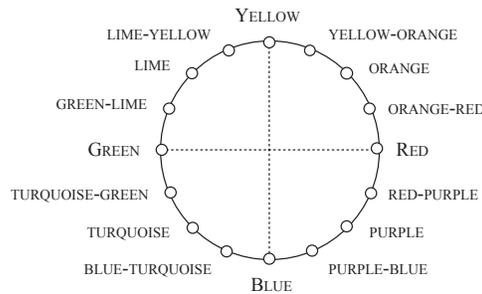


Fig 3 Colour Zones - Level 3

Colour circle with intermediate colours added as reference points between elementary and equal resemblance colours. Reference points in the colour triangle are identified by modifying adjectives



REFERENCES

1. Hård, Anders and Sivik, Lars, 'NCS - Natural Colour System: A Swedish Standard for Colour Notation', *Color Research and Application*. **6** (3), pp. 129 - 138. 1981.
2. Kelly, Kenneth, 'The Universal Color Language', in Kelly, Kenneth and Judd, Deane, *Color - Universal Language and Dictionary of Names*, U.S. Department of Commerce, Washington, 1976.
3. Hering, E. *Outlines of a Theory of the Light Sense*. Harvard University Press, Cambridge, Massachusetts, 1964.
4. de Bono, Edward, *The Use of Lateral Thinking*, Penguin Books, Harmondsworth, Middlesex, 1971.
5. Hård, Anders, Sivik, Lars and Tonnquist, Gunnar, 'NCS, Natural Color System – from Concept to Research and Applications', *Color Research and Application*. **21** (3), pp. 180 – 205, 1996.
6. Partington, Anna, *Red and Blue: Some Philological Comments*, Unpublished notes, 1998.
7. Berlin, Brent, and Kay, Paul, *Basic Colour Terms*, University of California Press, Berkeley and Los Angeles, 1969.
8. Definition proposed by Kay, Berlin, and Merrifield, quoted in Hardin, C.L. and Maffi, Luisa, eds, *Color Categories in Thought and Language*. Cambridge University Press, Cambridge, 1997.
9. Bailey, Nathaniel, *An Universal Etymological English Dictionary*, 1721.