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Colour Categorization in the Real World (POSTER)

The (relatively recent) history of "colour categorization", as a tool to describe colour identification, is well codified. The official starting point is usually given as Berlin and Kay (1969) and, since that time, research has been carried out:

a) "in the field", within the anthropological framework

b) in the visual laboratories, by working on the (uniform) samples of the Munsell *Atlas*, of the OSA, UCS, *etc.*, an important contribution being made by Boynton and co-workers.

At the end of the second millennium, an unsolved problem was still debated: the possibility that a twelfth basic category would be needed, to be sought for, possibly, among the non-basic colours, the list of related non-basic colours having been produced by Boynton and Purl (1989). It covers a broad range of colour space. Their colour naming, based on the frequence of occurrence of the psychological primaries, implies mainly combinations of green and blue (G and B), as well as of green and yellow (G and Y) names.

Ronchi (2000) noted that the suggested missing twelfth category covers just the colour met with in the real world, from pastoral scenes to building materials, to the human skin (including racial differences), and so on. The possibility of a transfer of colour categorization to the real world seemed auspicious, in order to enlarge the practical use of colour categorization. In this experiment, samples from four different atlases were employed.

At the start of the third millennium, the research appeared to be split into a number of channels, *e.g.*:

- revision of the concept of "basic name" as related to a wide variety of languages (Roberson, Davidoff & Davies 2002),
- an operational decision, *ad usum*, of lighting engineering (Ishida 2002), where non-monolexemic names (green-blue and green-yellow) were added to the agreed eleven by leaving open the application of the term *basic* for every language (although supported by enquiries across the countries of the Far East),
- implications of the transition from the uniform samples used in the laboratories to the surfaces of real objects (non-lambertian, textured, rough, wavy, complex *etc.*) (Koenderink & van Doorn 1998),
- interactions between colour naming (even through categorization) and perceptual constancy as well as the cognitive factors (Ronchi, Villani & Abbozzo 2003).

An experiment is here described dealing, in particular, with the recently introduced green-blue category, which is nowadays accepted as a current communication tool, probably because of the widespread commercial availability of green-blue paint, dyes, textiles, coloured plastics, *etc*., contrary to what was the case decades ago.

We use the blue-green name to describe the appearance of both the samples of the NCS *Atlas* and of vegetation, trees, *etc*., bearing in mind (Ronchi, Villani & Abbozzo 2003) that the percentage occurrence of the blue component in the colour naming, *e.g.* of evergreens, gradually increases during the course of a long-lasting training. A number of practical considerations follow: should the "quality" of a colour reproduction be assessed by reference to trained or to untrained observers? By considering the variability of daylight (from "warm", under direct solar illumination, to "cold", under prevailing diffuse natural

illumination), what should the colour temperature of the source be when artificial illumination is designed?

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Meanings of Colour in the Mexican University Population

Colour has effects on a psychological level, evoking emotions, sensations and other semantic aspects. However, these psychological aspects of colour are not universal nor applicable to the entire population, since they are constructed with individual as well as collective participation and there are, therefore, some transcultural variations (Jacobs *et al.* 1991). Although no-one doubts that the effects exist, in Mexico there do not seem to have been studies to support or demonstrate the effects which colours have upon the people, so that the data might be taken into consideration for designs appropriate to our population.

This work's focus was to recognize the meaning given to colours among undergraduate students at the University of Guadalajara, via a pencil-and-paper test given to a sample of 1,262 students of both sexes, with an average age of 20 years old. We provided the students with the following materials:

a) an answer sheet which consisted of two parts: 1) general data for those surveyed, in which questions were asked regarding age, sex, place of residence, whether the students themselves paid for the costs of their studies, parents' occupations, income, and academic

levels completed; 2) sixteen windows with three lines alongside each for noting down a maximum of three meanings.

b) A rectangular letter-size sheet was employed with sixteen 2 x 4 cm (approx. ¾ x 1½ inch) rectangles in the following colours: grey, red, blue, pink, purple, green, yellow, black, white, lilac, brown, cream, burgundy, orange, silver and gold.

c) A page listing 66 meanings, in three versions, each of which varied the order in which meanings were presented, was also employed. This list was obtained by starting with concepts resulting from the application of a pilot test.

399 meanings were found, which, when grouped according to their semantic similarity, gave an end result of 54 conceptual categories. In the present work only those receiving a percentage above 4.5 were considered.

All associations between colour and meaning were statistically significant ($p=0.000001$) by means of the X^2 test. The colours that showed well-determined meanings with more than 20% of the associations with a single meaning were: red-sexuality, gold-wealth, black-death, white-innocence, green-nature, brown-dirtiness. Less determinate meanings with percentages of 10-20 were assigned to the colours: grey-sadness, pink-femininity, cream-passivity, yellow-brightness, burgundy-sexuality, blue-passivity, orange-activity. The colours receiving meanings between 5 and 10% were: silver-brightness, lilac-sexuality and purple-activity.

One interesting finding was that there were statistically significant differences observed between men and women in applying the X^2 test ($p<0.05$). For example, of the total of pink-femininity meanings, 55.2% corresponded to men and only 34% to women. In contrast, of the total of blue-masculinity meanings, 22.8% corresponded to women and 17% to men. Similarly, of the meaning of sexuality associated with pink, 23.4% were by men and only 6.3% by women, contrasting with the meaning of innocence which corresponded by 44.2% to women and 20% to men. Although the meanings attributed to lilac are not very determinant, it may be observed that in those referring to sexuality, 21.1% correspond to men and only 9.6% to women. So that, for Mexican male students, the colours red, pink and lilac are more strongly associated with a meaning of sexuality, while for women only red has a strong association.

In comparing the study's results with research conducted outside Mexico, the colour with the strongest association was red, with a percentage of 28.7 for a meaning of sexuality, 14 for love, and 8.4 for heat, which coincides with Wexner (1954) and Jacobs *et al* (1991). Some transcultural differences were also observed in meanings associated with colours, as when meanings for grey were encountered which might be classified as negative, such as sadness, passivity, fear, cold and dirtiness; very different from Wagner (Laney 1991) having affirmed that grey is associated with the more positive images of strength, exclusivity and success. In a similar manner, orange was associated with positives like activity, energy, heat, and happiness, in contrast to Wexner's findings where it has negative meanings such as sorrow, shame or disturbance.

Regarding gender, from the results obtained in this study it is suggested that there are meanings associated with certain colours which differ according to sex. In the review of the literature, no supporting research was found for this last aspect. Ellis and Ficek (2001) refer to preferences for colours, and mention that men prefer blue, with women's preferences lying between blue and green. In our case, since it is not a study of colour preferences, we could only make some inexact comparison related to the number of meanings, with statistical difference assigned to men and women. In some instances, significant difference was shown, as in the colour green whose meaning of 'life' turned out to be significantly higher for women as compared with men.

In general, the results of this study seem to support the supposition upon which the work was based: that not all meanings for all colours are universal, and, therefore, designers must consider the specific users for whom the product is destined, avoiding the extrapolation of meanings from other populations.

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Social and Linguistic Trauma in the Colour Vocabulary of Early English

As far as can be ascertained, the acquisition and development of most of the early basic colour terms that were eventually to be used in English proceeded at a ponderous, but untroubled, pace. Thus Modern English *red* and, probably, *yellow* were inherited from Proto-Indo-European (Shields 1979), and took the forms *read* and *geolu* in Old English, the form of English which was spoken between the fifth and twelfth centuries. This stage of the language also inherited basic terms for GREEN and GREY from Northwest Germanic, and these took the Old English forms *grene* and *græg*. When the Anglo-Saxons migrated to Britain, principally in the fifth century, they almost certainly brought these three basic hue terms, and some basic achromatic terms.

By the time of surviving written records in Old English, commencing in the seventh century, it is evident that two further colour terms were developing towards basic status. They were *brun*, usually translated as 'brown' or 'dark', and *hæwen* which I define as meaning 'blue' and, sometimes, 'grey' (Biggam 1997: 115-270).

This paper centres on the fact that Middle English, the form of the language spoken between the twelfth and fifteenth centuries, inherited the ancient basic terms for RED, YELLOW, GREEN and GREY, now in the forms *red*, *yelwe, grene* and *grei*, and passed them, of course, to Modern English. Old English *brun* developed into the brown basic term of *broun* in Middle English, and *brown* in Modern English (Barnickel 1975; Burnley 1976). But that is where this scene of steady continuity ends. *Hæwen* almost disappears from view, retreating to the shelter of a single dialect, while leaving only the merest trace in the standard language. For a word that was, apparently, very close to full basic status, this fall from power is dramatic.

The paper investigates the loss of *hæwen*, and suggests that the reason can be found in the social and linguistic upheaval started by the Norman Conquest of England in 1066, when an invading force led by the Duke of Normandy defeated and killed the last Anglo-Saxon king of England, Harold Godwinson. Although the considerable influx of French vocabulary into English cannot be seen in the historical record until many years later, this event began the process, and it occurred just as the blue category in English was nearing equal prominence with existing basic categories. *Hæwen* was an Anglo-Saxon invention, with no colour relatives in other Germanic languages, or in French, so this word was completely foreign to French-speakers, unlike Old English *brun* which was in a similar stage of development. But this is not all. The blue category in Middle English has a different lexical character from any other colour category in the language (Biggam 1993: 42-4), and the paper will consider whether this dislocation in the hitherto steady development of the English basic colour terminology can be ascribed to the social and linguistic conditions of the period.

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Colour Categorisation in Preschoolers

Introduction: Human observers divide the physical continuum of wavelength into a set of so called 'basic' colour categories (Berlin & Kay 1969). However, the mechanism underpinning categorical colour perception is still unknown. Linguistic influences have been shown to operate on colour categorisation, thus supporting a Relativist viewpoint (*e.g*. Davidoff, Davies & Roberson 1999). In contrast, similarities in categorical colour perception across cultures (*e.g*. Rosch 1973) support a Universal basis (Berlin & Kay 1969).

We attempted to distinguish these two accounts of categorical colour perception by administering a colour categorisation task to a group of adults and two groups of preschool children with varying colour naming abilities. We predicted that, if language forms the basis of colour categorisation, children who are acquiring basic colour terms should show a different pattern of performance to that of children and adults with accurate colour naming.

Method: A group of fifty children (aged 2-4 years) and a group of fifteen adults, all of whom were screened for colour vision deficits, participated in the experiment. Categorical perception was assessed using a constrained colour-sorting task, in which participants were required to sort 100 Munsell chips into eight colour categories. The set of Munsell chips was systematically selected from the most saturated chip available at each of two hue values (5 and 10) for the 10 Munsell hues, at five lightness values (from 8 to 4). Categorisation of this set of chips has been reported previously for adults using a colour-naming task (Davidoff, Davies & Roberson 1999).

Children were sat facing a semi-circular arrangement of eight boxes, on the front of each of which was a teddy bear and a focal colour chip. The focal corresponded to the most representative sample of the 'red', 'green', 'yellow', 'blue', 'purple', 'orange', 'brown' and 'pink' categories. They were told that each teddy bear collected only his favourite colour (*i.e*.

the focal colour chip). The 100 chips were presented individually and the child placed the chip in the box belonging to the teddy bear that collected that particular colour.

To ensure that children understood the task, a pre-test (employing four basic shapes and colours) was given, and only children who were successful participated in the experiment. Upon completion of the colour-sorting task, children were asked to name each of the eight focal colour chips. This enabled two groups of children to be distinguished: 'colour namers' who flawlessly applied the 8 basic colour terms (N=22, mean age 3.8 years); and 'colour learners' who produced more than 25% of naming errors (N=11, mean age 2.8 years).

The adult version of the colour-sorting task was to sort the 100 colour chips into eight categories as identified by the focal colour chips.

Results: For each group of participants, similarity matrices were derived in which the cell entries corresponded to the number of participants who placed a given pair of chips together for each possible colour pairing ([100X99]/2). Prototypical colour mappings for each group were then obtained using a hierarchical cluster analysis for two to eight clusters.

Results showed an identical pattern across the three participant groups for the six first clusters generated, both in the colour categories that emerged (*i.e*. 'red', 'green', 'yellow', 'blue', 'purple' and 'orange') and the sequence in which they emerged. Additionally, the category boundaries were very similar across participant groups, with the exception of the 'yellow'/ 'orange' boundary for the colour learners.

In contrast, variation in the final two clusters was shown across participant groups. Whilst 'turquoise' then 'brown' emerged for the colour learners and the adults, the colour namers generated 'brown' which was followed by a separation within the red category suggestive of a 'pink' / 'red' delineation, and demarcation of the 'brown' category differed across groups.

Conclusions: Our data show boundary demarcation for the first six colour categories to emerge, in each of the three participant groups, that are in good agreement with the results obtained by adults performing a colour-naming task (Davidoff, Davies & Roberson 1999). This suggests that colour-sorting tasks and colour-naming tasks may tap the same underlying categorical representation of these six basic colours. Moreover, our data suggest that this categorical mapping occurs prior to the complete acquisition of basic colour names (Bornstein, Kessen & Weiskopf 1976; Catherwood, Crassini & Freiberg 1989), as the performance of the colour learners was similar to that of both children colour namers and adults. This suggests that categorisation of basic colours is initially perceptual in nature although linguistic factors may have a later influence on the sharpening of category boundaries.

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Materials, Exchange and Abstraction in the Colour Terminology of Early Antiquity

In this paper, we will address theoretical aspects of the evolution of colour terminology, and the importance of colour in the societies of the Ancient Near East, which is the earliest available source for the study of the development of the human expression of the perception of colour. The most important languages – Sumerian, Akkadian and Egyptian – not only preserve the earliest known colour terminology, but they also betray the evolution of the understanding of this terminology. The archaeological material provides a complementary source as the materials upon which the colour terms were based appear in the archaeological record. All of these sources confirm that colour was linked to valuable materials and the expression of ideological values. These values are also visible in commercial terms and thus allow access to the formation of the concepts of colour expression and the appreciation of values in terms of colour.

A great part of the theoretical debate about colour terminology and symbolism in the earliest societies has been based on philological sources which imply a limited colour vocabulary in ancient languages (some four or five colour words each in Akkadian and Egyptian). Such approaches have been rooted in theoretical interpretations, partially rooted in anthropology (*e.g*. Berlin & Kay 1969) and partially based upon direct philological evidence.

These language-based sources are, however, complemented by archaeological evidence (*e.g*. jewellery and painting) which testifies to the importance of colour in the expression of social values, reflecting ideology and hierarchy. The offerings in tombs reveal a graduated appreciation of gold, silver, lapis lazuli, turquoise, carnelian, amethyst, alabaster, *etc*., and these same terms (which in several cases designate both materials and colours) are associated with the divine and the royal in the texts.

The narrow philological approaches have admitted that the archaeological sources reveal a nuanced use of colour, but have avoided integrating the entire system in social terms. Both textually and archaeologically, "red" and "blue" assume a central role in the ideological systems, ranging from bright red carnelian through dark red granite to dark blue lapis lazuli and light blue turquoise and amethyst.

The texts not only link archaeological material including real colours and early terminology, but economic documents specify the prices (and, therefore, the relative values) of articles associated with colour in the archaeological material. In the hierarchy of prices, gold ("yellow") is followed by lapis lazuli ("dark blue"), the value of which was higher than silver ("money", "white"); carnelian, amethyst and rock crystal, *etc*. follow.

Lapis lazuli came from Afghanistan, gold and amethyst from Nubia, silver from Anatolia, turquoise from the Sinai, and Near Eastern carnelian was imported from India. Alabaster vessels were manufactured in Egypt, the Aegean, Iran and Central Asia, and exported into the Near East. Aside from granite, the Egyptian government organized missions to mine gold, turquoise, and amethyst, but silver and lapis lazuli were only available on the international market, with silver itself not only fuelling the exchange, but also playing a role. The trade in alabaster and carnelian was divided between markets and states as available in different regions. The materials and the colours they represent are thus not mere illustrations or symbols, but are themselves at the foundations of social power and intellectual expression. These basic principles are shared by nuances in regional usage, allowing a comparison of the usage in textual sources with the actual material of colour in each cultural region.

One of the fundamental approaches to the conceptual understanding of the expression of colour has been the issue of "abstraction", applied as a criterion for the identification of ancient "colour terminology". In fact the texts of the second millennium (Mycenaean,

Akkadian, Egyptian) include a wide range of colour terms, yet many of these are applied to particular concrete articles, and, therefore, do not appear to be abstract, although present. On the other hand, however, both the objects and the words travelled, and this process contributed to and facilitated the increasing abstraction of the expression of colour, visible in the languages of the Mediterranean. The commercial exchanges included not only the actual materials, but also colour-words related to materials, such as lapis lazuli ("dark blue [stone]" in Sumerian, Akkadian, Ugaritic becoming "dark blue" in Greek) or amethyst (a stone in Egyptian, but a colour-word, as a foreign loan word, in Akkadian). The word "red" appears to have a similar origin, deep in the processes of exchange. The process of assigning ideological and commercial value to highly-prized materials led to the crystallization of "abstract" colour terms, and the whole is visible in the Near East. Exchange and social values were central to the process.

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The Rivalry between Chromatic and Spatial Features in Infant Response to the Visual Field

Colour is clearly a dominant attribute in infant attention to and encoding of the visual environment and yet there may often be alternative features of visual stimuli that compete with colour for processing resources in the infant brain. Consideration of the resolution of any such rivalry between colour and other visual attributes may offer insights into basic patterns of response to the visual world. This issue is explored in regard to infant response to colour and spatial attributes. There may be a number of ways in which the infant brain handles competing demands to process colour and salient spatial features of the same stimulus. Both colour and the competing spatial features may be processed in parallel in an equitable way with a *territorial* separation of processing activity for either attribute. This could occur either through different processing "streams" or channels, or perhaps by hemispheric asymmetry in processing of the attributes. Alternatively, there may be a *temporal* separation of processing activity so that one attribute is processed then the other, either to completion or in an alternating fashion.

These possibilities are considered in respect to three experiments in which 5-month-old infants were presented with visual stimuli involving two dominant and potentially competitive attributes, namely *colour and facial pattern*. In one experiment, a backward visual masking procedure was employed to assess the relative rates of encoding for colour and the spatial location of colour within a facial pattern. The infants were able to encode both the colours and their correct spatial locations, but did not do so in the earliest intervals of processing. Colour *per se* was apparently encoded in the initial moments of response but this was not bound to spatial attributes. The second experiment employed a "pop-out" procedure in which infants were exposed to arrays of facial patterns with one of these being an odd or discrepant colour to the others. Again colour must have dominated the initial intervals of response since the odd-coloured face was better encoded than the others, suggesting that the discrepant colour had captured infant attention and processing resources. The final experiment examined the possibility that the response to colour and facial pattern may be shared across the hemispheres of the infant brain at least during primary encoding intervals. Infants were familiarised to triads of coloured facial patterns in either the left or right visual

field. The faces were all distinct in colour and facial features but one was in an upright orientation while the others were inverted. This arrangement potentially presented a rivalry between facial configuration and colour, with the issue of interest being whether the infants would selectively process the upright face (due to its spatial configuration) or, alternatively, would focus on the colour of the items with no special advantage for the upright face in this respect (since all items were equally colourful). The results were consistent with primacy for the facial configuration (with bias to the upright pattern) but, thereafter, a right hemisphere bias to the colour of the target and a left hemisphere bias to the spatial attributes of the distractor (inverted) patterns. The results of these three experiments will be individually and collectively considered in terms of the dynamic allocation of processing resources for colour and spatial attributes in the infant brain.

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Towards a General Description of the Semantic Field of 'Colour' in European Portuguese

This paper is a result of a larger investigation on property names in European Portuguese, presented as a PhD thesis to the University of Lisbon and directed by Danielle Corbin (University of Lille, France) (Correia 1999). The goal of that work was to understand how different properties are named in this language and what type of morphological, semantic, pragmatic and cognitive aspects are taken into account while selecting one of the different word-formation patterns available in this language to name a specific property. One of the basic assumptions of this work is that linguistic form and meaning are not dissociable in the naming of different categories, and, thus, that it is not possible to study them separately.

Although colours are generally admitted to be the most representative properties, it was verified that colour names in European Portuguese are not, in fact, property names, presenting particular morphological structures and specific semantic and syntactic behaviour. However, some colour names may function as bases for the formation of derived property names, serving to designate either the physical property of exhibiting a colour (*amarelo* [yellow] > *amarelidão* [yellowness]) or the psychological property of being / behaving in a way designated by a specific colour (*cinzento* [grey] > *cinzentismo* [greyness - the fact of behaving in a way that can be referred to as "grey"]). The choice of the suffix used in the formation of these property names depends on the morphological structure of the base, on the type of property to be named (physical or behavioural), and also on the way that property is seen (objectively *vs*. subjectively).

Even if colour names were not the focus of the work previously referred to, some interesting aspects of the way Portuguese name basic and derived colours, which deserve particular attention, were detected. Hence, the main goal of this paper is to present the main characteristics of the lexical field of colour in European Portuguese, by answering the following questions: How do Portuguese people name colours? What morphological structures do they use? How did this semantic field evolve? Is there variation in the field of colour names considering specialised language *vs*. current language?

Firstly, after explaining why colour names are not property names and, after presenting how this semantic field is organised, some attention will be paid to the evolution of basic colour naming, given the fact that some aspects of Portuguese language history lead to changes in this subfield. This is the case for the naming of the red colour: in Portuguese two

near-synonyms are available, *encarnado*, and *vermelho* (a derived word and a loan word), this being a distinctive feature of Portuguese when compared with other Romance languages. Morphological patterns available for naming derived colours and tonalities (suffixation, conversion, composition) will also be briefly presented.

Secondly, an analysis of colour terms within specialised discourse will be held, in order to verify if there is significant variation between current and specialised language. Data under analysis belong mostly to the *Reference Corpus of Contemporary Portuguese* (Linguistic Centre of the University of Lisbon) and they cover both current and specialised language discourse. This corpus includes data from fashion and decoration, two domains where colour performs a crucial role, collected in the frame of Carvalho's and Andrade's research. Data from movie and photography language will also be observed (Antunes, in preparation).

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Colour Category Acquisition in Himba and English Children – a Longitudinal Study

The research presented addresses the question of the extent to which colour categories are learned, and free to vary, rather than innate and tightly constrained by the properties of the visual system. Categorization is a fundamental property of human cognition and the domain of colour categorization has been put forward, both as an extreme case of linguistic influence on cognition (*e.g*. Ratner 1989) and the reverse – an instance of the complete independence of thought and language (*e.g*. Bornstein 1973). Recent studies have found evidence of cultural and linguistic relativity, both in other fields of categorization (*e.g*. shape, number, space) and for colour, in adult speakers of different languages (Roberson, Davies & Davidoff 2000). However, it remained possible that learned linguistic categories induce divergence from an originally innate universal set. To investigate this possibility, we observed the process of colour term acquisition in speakers of two languages with radically different sets of terms.

Previous investigations of the process of colour category acquisition in young children have focussed on a narrow time window and on the attainment of those categories deemed 'basic' in Western languages (black, white, red, blue, green, yellow, pink, purple, orange and brown). We present a study that examined the extended process of both lexical and non-lexical colour category acquisition in two very different populations, whose colour

terminology also differed. Starting at approximately 3 years of age, a large group of children from the semi-nomadic Himba tribe in Namibia, in south-west Africa (a language with only 5 basic colour terms) and a smaller group of English children, were tested at 6-month intervals over a three-year period. A range of tasks examined the extended process of both lexical and non-lexical colour category acquisition. Despite large differences in visual environment, language and education, there were notable similarities in the pattern of term acquisition. Children from both cultures appeared to acquire colour vocabulary slowly and with great individual variation. Even for the English sample, of the twelve children who knew five colour terms, only two knew the same five. Importantly, those who knew no colour terms made recognition errors based on perceptual distance, rather than on their culture's adult categories. In both groups, for those children who knew at least one term, memory performance was consistently better for known than for unknown terms. This result held across tests and regardless of the number of terms known, until ceiling performance was reached. The results suggest that an initial, perceptually driven colour continuum is progressively organized into category sets appropriate to each culture and language. Language also appears to promote perceptual learning. These results suggest that what is universal about the acquisition of colour vocabularies is a gradual progression from an uncategorized organization of colour based on perceptual similarity (where dimensions are viewed as continua) to a structured organization of categories that varies across languages and cultures. The increase in the influence of linguistic categorization on memory for colours is progressive and cumulative in both groups. Moreover, without intensive adult input, colour category acquisition is universally slow and effortful.

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Monkeys Categorise Colours Differently to Humans (POSTER)

The debate about Universal colour categories has been largely argued from cross-lingual data (Berlin & Kay 1969; Davidoff, Davies & Roberson 1999; Kay & Regier 2003). In support of Universal categories, there is also a small corpus of data from the preverbal child (Bornstein, Kessen & Weiskopf 1976) and, similarly, for non-human primates (Sandell, Gross & Bornstein 1979 for macaque; Matsuno, Kawai & Matsuzawa in press, for chimpanzee). Matsuno *et al*. argue that chimpanzees have the same colour classification experience as humans but the data points were obtained from only very few observations. The Sandell *et al*. study argued that macaques categorise the spectrum in a similar fashion to humans, but it was

flawed by its inappropriate assignment of stimuli to between- and within-category colour groups. The present study takes a new approach to the monkey/human comparison by using a matching to sample technique that can be administered in equivalent procedures to the two species.

In this study of baboons (*papio papio*) and humans, two sets of experiments were conducted that could enable monkeys and humans to perceive categorically a boundary between blue and green. A computerised display presented a continuum of stimuli each separated by 2.5 Munsell Hue with brightness and saturation kept constant. Participants were eight humans and eight baboons per experiment. They were firstly subjected to a training phase in which identity matching (2.5G [Green] or 10B [Blue]) was taught; a colour seen separately (probe) had to be matched to a subsequent two-alternative choice. Baboons were food reinforced and humans were given feedback. In the test-phase, similarity matching trials were included in addition to identity trials. For baboons, the similarity matching trials were not congruently reinforced, and humans were not given feedback. The probes for similarity matching varied from 5G to 7.5B with 40 trials for each probe. Accuracy and RT data analysis showed no overall performance differences between species but that there was a difference in the shape of the categorisation function between baboons and humans. Humans showed extended latencies and choice variability only around the category boundary at 5BG. Baboons showed flat RT functions and a linear accuracy function for probe matching from 5G to 7.5B.

The second experiment was carried out to determine the effect of shifting the range of stimuli (more green or more blue) in the identity training phase. The same paradigm and procedure was used as in the first experiment. The training stimuli were now 10GY (Green) and 5B (Blue) in one part of experiment 2, and 7.5G (Green) and 2.5PB (Blue) in the other, counterbalanced across participants. The probes ranged from 2.5G to 10B with eight data analysis points that each coincided with the first experiment. Humans were found to be clearly affected by Helson (1947) adaptation in positioning their category boundary. However, the shape of the accuracy and latency functions were not substantially affected.

Comparison of human and baboon performance indicated that the groups are doing something qualitatively different in colour categorisation. It is argued that human colour categories came about in relation to language (Davidoff, Davies & Roberson 1999; Ozgen & Davies 2002) rather than from our common visual apparatus that determines monkey categorisation. Thus, on-going studies will examine the effects of instruction in changing similarity matching. Previous research (Kay & Kempton 1984) gives reason to believe that humans can alternate between both similarity matching procedures.

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The Development of Perceptual Colour Categorisation

Categorical Perception of colour

Colour perception is categorical. Although the colour spectrum is continuous, it appears to be segmented into qualitatively different perceptual categories. Moreover, discrimination of pairs of colours from adjacent categories is easier than discrimination of equivalently spaced colours in the same category. This is the hallmark of "categorical perception" (Harnad 1987). Bornstein and Korda (1984), using a same-different judgements task on adults, showed that 'different' responses were faster for pairs of stimuli that straddled the blue-green category boundary than for equivalently spaced pairs of stimuli from the same category.

Perceptual colour categorisation in infancy

Categorical Perception of colour has also been demonstrated in pre-linguistic infants. For example, Bornstein, Kessen and Weiskopf (1976) showed that infants at four months respond categorically to colour. Using monochromatic lights, four-month old infants were habituated to stimuli of one wavelength, and dishabituation rates to the original stimulus and novel stimuli were compared. The novel stimuli were either from a different adult category to the original or from the same category, and the stimuli were equated in luminance. The blue-green, green-yellow and yellow-red boundaries were investigated. For each category boundary, the within and between pairs were separated by equal differences in wavelength. In general, looking times for new category stimuli were longer than for same category stimuli, and longer than for the original stimulus. Looking times for the habituated stimulus and the novel stimulus from the same category did not differ. Infants showed dishabituation when the novel stimulus was from a different category but not when the novel stimulus was from the same category. In other words, within-category stimuli were treated as equivalent, and between-category stimuli were treated as different. There were exceptions to this (one of the red-yellow sets), nevertheless, Bornstein *et al*. concluded that infants perceive the colour continuum categorically.

Limitations of Bornstein, Kessen and Weiskopf, 1976

Bornstein *et al*.'s results are frequently interpreted as evidence that infants perceive colour categorically. However, there are various technical problems with the control of stimuli that may provide alternative explanations for the pattern of results (Werner & Wooten 1985). For example: stimuli were radiant, not reflective; stimuli were saturated at artifically high levels; stimulus differences were equated in wavelength and, therefore, variations in discrimination thresholds were not taken into account. In addition to these limitations, there are various issues that warrant further investigation. For example, Bornstein *et al*. only tested for categorical effects across primary boundaries. Primary categories are those which correspond with Hering's (1964 [1878]) unique hues and to the principal directions in colour space (*e.g*. Krauskopf, Williams & Heeley 1982). Secondary categories appear to be a blend of these primary categories (Kay & McDaniel 1978). It is of interest to establish whether infants

perceive secondary categories categorically. For example, languages are more likely to encode primary categories than secondary (Berlin & Kay 1969). Bornstein *et al*. also only tested for categorical effects across hue boundaries. However, category boundaries are not only defined by differences in hue – for example, they can also be defined by differences in lightness and saturation. It is of interest to establish whether infants also perceive non hue boundaries categorically.

New evidence for perceptual colour categorisation in infancy

The current investigation (Franklin & Davies, forthcoming 2004), therefore, aimed to replicate and extend Bornstein *et al.*'s investigation. To overcome the limitations of Bornstein *et al*.'s investigation, reflective stimuli of lower saturation levels were used and stimulus separations were equated in the perceptually uniform Munsell metric. In addition, a wider range of category boundaries was tested. For example, categorical responding was tested across a primary hue boundary (blue-green), a secondary hue boundary (blue-purple), and a boundary defined by differences in lightness and saturation (pink-red). Four-month old infants were familiarised to stimuli of one colour and then tested for novelty preference with the original colour and a novel colour simultaneously. The original and novel colour were either from the same colour category (within-category) or from different colour categories (between-category). For all three boundaries (blue-green, blue-purple and pink-red), significant novelty preference was only found for between-category but not within-category stimulus pairs. The size of the category effect was the same for all three boundaries. It was concluded that four-month old infants show categorical responding, not only across primary hue boundaries, but across a range of boundaries. The implications for our understanding of the origin and development of perceptual colour categorisation will be discussed.

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Evolving Secondary Colours: Evidence from Sorbian

1. Introduction

The endangered languages of Lower and Upper Sorbian are part of the large, genetically close language family of Slavonic. They are unique amongst the Slavonic languages in that they form a genetic 'island' entirely surrounded by speakers of another language family, Germanic, making them a fascinating area for historical and typological studies. There are few speakers: Stone cites a 1987 survey which gave the number of Sorbian speakers as 67,000 (Stone 1993: 594-5). This situation means that there is an urgency attached to any informant-based study of the Sorbian language. We report on work we carried out amongst Sorbian speakers to elicit basic colour terms, following strictly established field methods outlined in Corbett and Davies (1997). Besides the inherent interest of endangered languages, the findings turn out to have considerable typological interest when we examine them in relation to Berlin and Kay's (1969) theory of basic colour terms.

2. Research question / Secondary colours and Berlin and Kay

The question we explore is whether secondary categories themselves play any role in determining the space of other colour categories. In the modified theory (Kay & McDaniel 1978), evolution of basic colour categories for a language progresses along the lines of decomposition of all composite categories (*e.g.* WHITE/RED/YELLOW) into the six elemental ones (*e.g.* WHITE and RED and YELLOW). The elemental colours are then combined to form secondary colours, *e.g.* RED and BLUE to form PURPLE, and WHITE and RED to form PINK. One consequence of this model is that the colour space occupied by a secondary colour term will be determined by its already established constituent elemental colours. In other words, elementals like RED limit the space of secondary colours like ORANGE.

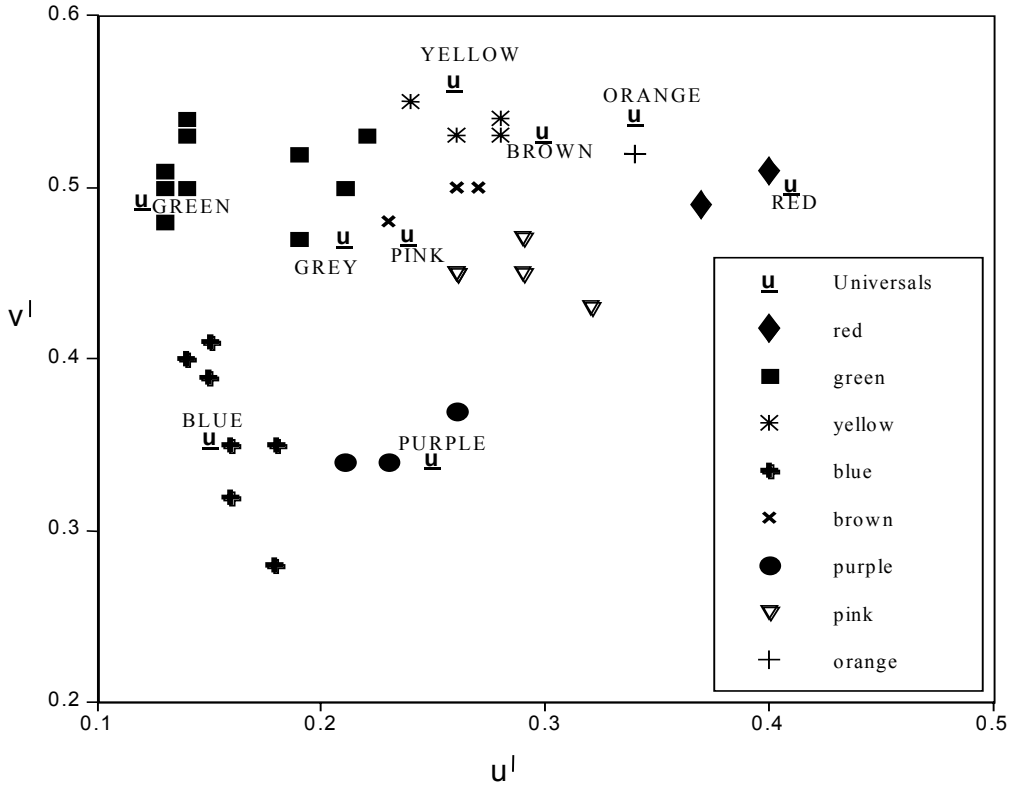
3. Method

The Berlin and Kay theory is a claim about the lexicalization of colour categories as basic colour terms, and criteria are provided for determining a language's core colour vocabulary, an inventory of basic terms. In determining whether or not a colour term is basic, it is assumed that there is a correlation between baseness and psychological salience. Tests for psychological salience include colour naming tasks, and colour eliciting tasks. The data we present is the result of three behavioural tests, the 'list task', the 'colour naming task' and the 'colour mapping task'.

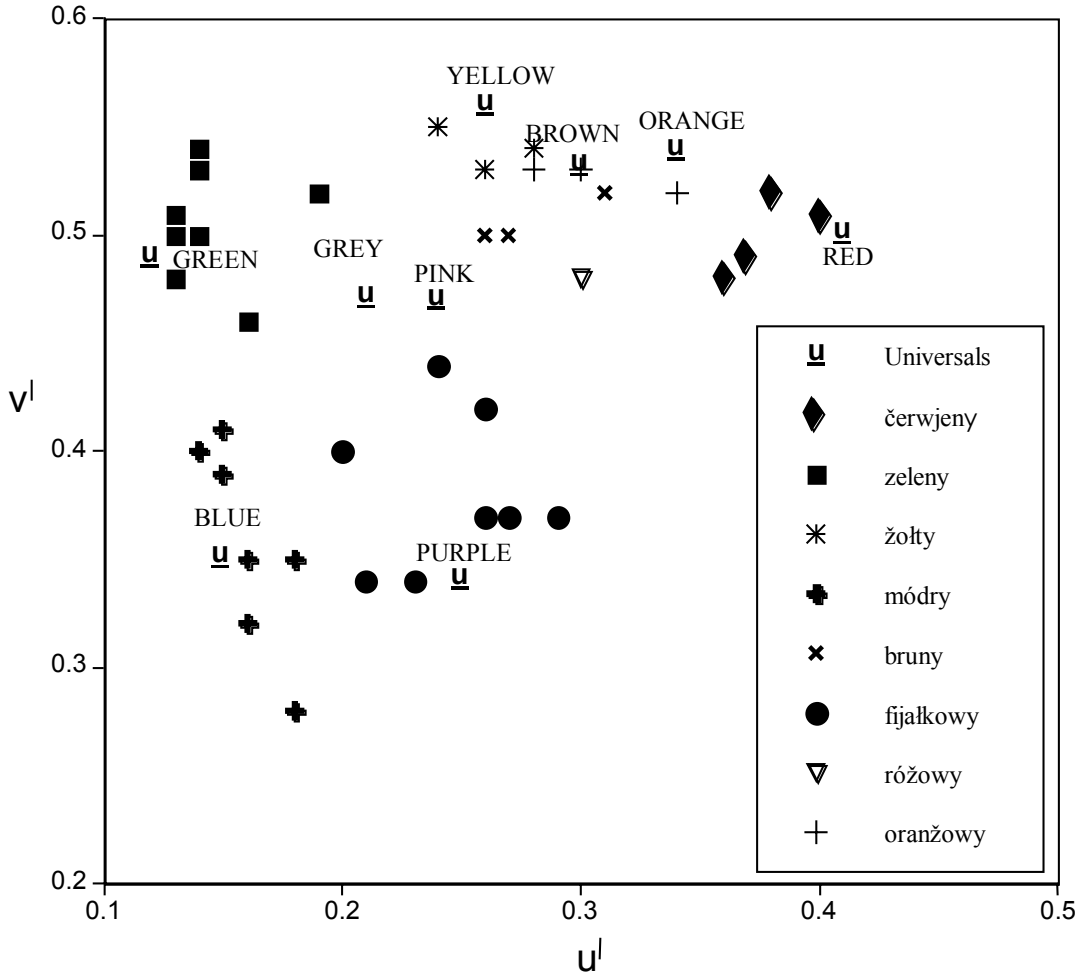
4. Findings

Rather surprisingly, our findings from Sorbian suggest that secondary categories themselves play a role in determining the space of other colour categories. We concentrate on the PURPLE and PINK regions in Lower and Upper Sorbian, where we have gathered strong evidence that they have evolved a PURPLE term, *fijałkowy* for Upper Sorbian and *lylowy* for Lower Sorbian, while at the same time lacking a PINK term. We investigate the possible consequences this situation holds for the PURPLE region. By comparing Lower and Upper Sorbian with English and Catalan, two other languages which have evolved both PINK and PURPLE, we were able to establish that the absence or presence of one secondary category PINK does indeed determine the colour space of another secondary category PURPLE.

In the Figure we give a graphic representation of the colour space occupied by English.



We see that *pink* occupies a space between universals RED and WHITE (GREY denotes the achromatic focus) with a slight leaning towards WHITE, and *purple* between RED and BLUE, but further towards the BLUE edge of this space. This is as expected, since they are blends of elemental categories RED and WHITE, and RED and BLUE respectively. We compare this to how Upper Sorbian carves out the colour space:



The term *różowy* 'pink' is the weakest, according to our tests, and we clearly see how the basic term *fijałkowy* 'purple' has spread into the region that would be occupied if there was a basic PINK. For completeness we will outline the situation in Tsakhur, a Nakh-Daghestanian language spoken in Daghestan and Azerbajdjan, where it is the PINK that is the stronger of the two categories (Davies, Sosenskaja & Corbett 1999).

5. Conclusions

The results suggest that the colour spaces for secondary colours (pinks, oranges, and purples) are determined by the evolutionary status of other colour terms, specifically, secondary terms. Interestingly, the evidence has come from two endangered Slavonic languages whose basic colour term it was important to record for separate reasons. As it turns out, Upper and Lower Sorbian appear to be in transition from a 10 term language to an 11 term language, providing good sources to investigate an important theoretical question.

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Is There More Than One Explanation for the Universality of Colour Names?

What relationships obtain between the methods, presuppositions, and results of the different disciplines implicated in colour naming research? One answer to this question is that a unified explanatory model is required. I argue, alternatively, that there are distinct methodological advantages to viewing multi-disciplinary research programmes, such as colour naming research, as disunified. What is required, however, is not a disunity based on a modular autonomy among traditional disciplines, but an understanding of explanation types as they pertain to colour naming research. What is it that explanations do? Is there one thing or many things that they accomplish? Using an analogy with biological explanation, where scientists must distinguish between properties of populations and properties of individuals and other sub-population-level groups, I develop a fruitful way to think about and to relate the disparate models and data involved in colour naming research.

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Colouring our Emotions: the Measurement and Application of our Responses to Colour

It has long been recognised that the colour appearance of objects and of the visual environment affects the mood, sentiment and feeling of wellbeing of an observer. It follows that, through appropriate colour selection, a designer can enhance the aesthetic appeal and reinforce the emotional response to manufactured products and to the built environment.

Human emotions induced by colours are commonly expressed through words such as *warm, exciting, clean* and not by fundamental psychophysical percepts of colour such as lightness (L*), chroma (C*) and hue (h°) (CIE 1986). An objective of research is the determination of relationships between emotional associations and instrumental measures of colour. The semantic difference method of self-reporting has often been used to obtain sensory data describing the emotional response of subjects to coloured surfaces. During an experiment, an observer looks at a coloured panel under controlled conditions and selects the words from a list (*warm-cool, exciting-calming, healthy-unhealthy* etc.) that best describe their impressions of the appearance of the panel. By the use of logistic analysis and

maximum likelihood methods, the relationships between scales of emotional response and instrumental measures of colour have been developed (Nobbs *et al.* 1997).

The possible influences of culture on the emotion scales are being investigated, notably by an association of research groups committed to the free exchange of colour-emotion data sets and the development of rigorous methods of analysis. For example, visual assessment tests of colour emotion, as expressed by twelve kinds of word pairs, were carried out in the UK, Japan, Thailand and Hong Kong (Sato 2002). Reasonable agreement occurred between the Thai, Hong Kong and Japanese emotion scales, however there were significant differences between some of these scales and the corresponding UK scales. For example, certain blue shade reds were judged cool by 85% of Japanese but warm by 70% of UK observers (Nobbs *et al.* 1997).

Techniques for studying the additional influences of the shape of a coloured area, such as circle, square and triangle, and the relative areas of a two-colour design are being developed (Nobbs 2002). The aim of this type of study is to be able to suggest the likely "emotional" impact of coloured environments that have been created, or are being proposed, by architects or interior designers.

Several healthcare studies have shown that the visual environment has a substantial affect on the anxiety of patients and on the therapeutic benefit of treatments. Of importance is the research conducted at the Chelsea and Westminster Hospital in London. The study included recording physiological and biological responses in the presence or absence of works of art (Staricoff *et al.* 2001). One project concerned the use of murals to decorate a hydrotherapy room. Using the method of relating the colorimetric description of the colours to emotional scales, the Chelsea study (Duncan, Staricoff & Nobbs 2001; Duncan 2003) produced quantitative evidence of benefit in an area of design that is traditionally described only in qualitative terms.

The aim of a second project was to determine if the appropriate use of art could reduce the stress and fear that inhibit labour during childbirth. Patients were treated in an area where a screen designed by one of the authors (Duncan), showing abstract forms in calming, earthy colours, was used to hide equipment that would be required in a medical emergency. It was found that the duration of labour was reduced, by up to two hours, compared with a control group and requests for anaesthetic epidurals were also reduced.

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Recent Progress in Greek and Latin Colour Terms

The paper examines the changing understanding of selected colour terms in Latin and Ancient Greek in the period from 1974 to the present. Contributions to be surveyed include those by H. Duerbeck, E. Irwin, P. G. Maxwell-Stuart, and R. Edgeworth.

Two opposed trends are discerned, one operative mostly in Greek terms, the other in Latin terms. The former involves the abandonment of attempts to fit fractious terms onto the Procrustean bed of spectral hues, *e.g. khloros* as 'moist' or 'fresh' (not always 'green'), and *kyaneos* as 'dark' (not always 'blue'). The latter involves the abandonment of attempts to construe fractious terms as non-chromatic, *e.g. purpureus* as 'red' (not 'bright'), *ferrugineus* as 'dark red' (not generally 'dark').

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Age-Related Differences in the Basic Colour Vocabulary of French with Particular Reference to *brun* and *marron*..

French has a fully developed basic colour vocabulary in that it has eleven basic categories encoded using basic colour terms. However, all my studies up until now show that French appears to have twelve basic colour terms but only eleven basic categories. There is only one basic category, BROWN, named using two basic terms *brun* and *marron*. This is not evolution in the Berlin and Kay sense since we do not have the addition of a category. Rather we have the co-existence of two basic terms to encode one category. Quantitative studies based on the replication in 1995 of an investigation done in 1975 did, however, strengthen my feeling that *brun* was gradually giving way to *marron* and that it is possible that French will revert to having eleven basic terms, *brun* being pushed to the periphery. However, at the present time, mapping exercises show that the two terms are in coextension in the MacLaury sense of the term (MacLaury 2000), both terms being used throughout the BROWN area of the colour space.

There is undoubtedly change and variation in the basic colour vocabulary of French and, as Kay (1975) points out, "in a community undergoing change in the basic color lexicon, stage of speaker will correlate with various social factors… but there should be a pervasive correlation with age". I have reported elsewhere some of the social factors connected with variation and change in the basic colour vocabulary (Forbes 1986). This paper focuses on age-related differences and mainly on the acquisition and use of *brun* and *marron* because that is where there is most evidence of change.

Children acquire colour terms, and the ability to use them appropriately, remarkably late. I started by testing children from nursery schools in the Paris outer suburb of Saint-Michel-sur-Orge and it was found that, in this age group, no children used *brun* in tests where they were asked to complete sentences containing a colour term. At this stage, the basic colour vocabulary is not complete and, where children used a colour term to describe brown objects, it was usually *marron*. Children from primary schools in the same district, aged between six and eleven, were tested in the same way. Although, by this age, the basic colour vocabulary is complete, and non-basic terms have entered the vocabulary, it was again found that *brun* was not used for brown objects, the usual term being *marron*. In tests carried out with older informants between the ages of twelve and sixty it was noted that *brun* was used less by the lower age groups than by the higher and that, the younger the informants were, the less they used it. A quantitative analysis shows a very clear pattern with very little use of *brun* in the twelve to seventeen group, an increase in the eighteen to thirty group and, in the middle group, aged thirty-one to forty-five, an almost equal distribution of the two terms. In the highest age group, aged forty-six to sixty, the position is reversed from that in the two lower age groups, *brun* being used more often than *marron*.

The data from the early 1975 study, the revisiting study of 1995, and the study where the focus is on age differences reveal the slowly but surely changing pattern of the basic colour vocabulary of French. Only time will tell if French reverts to being a language with eleven basic colour categories encoded in eleven basic colour terms with *brun* joining other important and salient colour terms such as *turquoise* and *bordeaux* which do not, however, fulfil the criteria for basicness.

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Beyond Colour: Modelling Language Data in Colour-like Ways

As indicated in the title, the study does not focus on colour or colour terms as such, but the way(s) in which modelling of colour categories can contribute to the understanding of (and modelling of) issues of language and categorization. Specifically, an attempt is made to adapt and apply Robert E. MacLaury's Vantage Theory (VT; *cf*. especially MacLaury 1995, 1997, 2000, 2002) to language data.

Adaptation of the theory is necessary because VT is a model of colour categorization rather than a theory of language. Yet, its cognitive grounding, pertinent observations on the nature of category construction, approach to the question of relativity (*cf*. MacLaury 2000) and a metalanguage appealing to the taste of cognitive linguists, allow one to view such attempts as worth undertaking. (One tentative proposal is to elevate the notions of *contracted* or *expanded cognitive distance*, which VT views as derivative of *similarity* and *difference*, into the status of fully-fledged coordinates. Another is to extend and elaborate on the notion of *viewpoint*.)

Second, should such a modified version of VT offer insight into the nature of language, two things would be confirmed: the explanatory value of the VT framework and, more importantly, the cognitive grounding of language use. If colour perception (measurable with reasonably objective techniques) and cognitive processing of colour categories give rise to valid accounts of language data, cognitive linguistics would gain a powerful ally.

Especially valuable in this respect is the VT's notion of *viewpoint*, correlated with the conceptualizer's *cognitive engagement in* / *detachment from* the object of conceptualization. The latter is described in terms of the so-called *spotlight effect*, a function of the aforementioned contraction and expansion of *cognitive distance* between the conceptualized entities.

Two types of English data are analyzed: the use of articles and the use of aspect. In the former case, the concept EARTH can be expressed (in written texts) as *earth*, *the earth*, *Earth* or *the Earth*, where the conceptualizer's engagement/detachment is manifested through the use of the definite or zero article and the capitals or small letters. Further, articles can manifest the conceptualizer's viewpoint, which alternates between the more detached and engaged positions, in a narrative text. As far as aspect is concerned, the more engaged viewpoint is correlated with the progressive aspect, whereas the more detached one – with the simple aspect. The analyses of the data offered here, although couched in their own terms, are compatible with accounts attainable within the framework of Ronald Langacker's (*e.g.* 1991, 1999) Cognitive Grammar (CG). Parallelisms between VT and CG, such as the active role of the conceptualizer in the conceptualizing process, are not only welcome but, in fact, deliberately sought (*cf.* the Appendix to Głaz 2002b for the treatment of articles, and Głaz 2002a for the treatment of aspect).

An important observation arising from these analyses is that a fuller account of language data must also involve further aspects of viewpoint, other than the degree of the conceptualizer's engagement in / detachment from the scene being conceptualized. One such aspect is the *orientation* of the conceptualizer relative to the scene. Indirectly, VT provides, in the form of spatio-temporal coordinates, a fertile breeding ground for an elaboration of this notion. They must be, however, translated into the types of coordinates applicable to language data, just as the *hue*, *brightness*, *saturation* and *similarity-difference* tug-of-war provide, according to VT, adequate coordinates for explaining the construction of colour categories.

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Colours of the Landscape

The majority of English place-names, and many of those in the border counties of what is now southern Scotland, were coined during the Anglo-Saxon period (*c*.450–1100 AD) and derive from Old English or – in areas of Scandinavian settlement – Old Norse. All contain what is known as a generic or defining element: a term identifying the type of habitation or setting originally designated by the name. Examples include Combe (OE *cumb* `valley'), Ford (OE *ford* `ford'), Leigh (OE *leah* `clearing') and Wick (OE *wic* `specialized farm'). Most place-names, however, are compound, combining the generic with an additional term known as the specific or qualifying element. This gives more information about the particular habitation or setting, such as who owned it (Barnsley `Beorn's clearing'), the purpose for which it was used (Cheswick `cheese farm'), its size or shape (Langley `long clearing'), indigenous flora or fauna (Nettlecombe `nettle valley'), and so on. Whereas generics generally comprise a word for a habitation or landscape feature, specifics cover a much wider range of vocabulary, including personal names, plant and animal names, agricultural and industrial terms, religious, social and cultural references, and descriptive adjectives. Colour terms comprise a small but important group, forming place-names such as Blackley `dark clearing', Radford `red ford' and Whitcombe `white valley'.

Although many of the colour terms represented in place-names are also attested in literary sources, others are not, and some are used with a different range of meaning in the toponymic corpus. The place-name evidence therefore makes a substantial contribution to our knowledge of the Old English colour lexicon. Toponymic uses of individual colour terms have formed the focus of a number of recent studies, but they have not previously been discussed as a group. The purpose of this paper is to establish a provisional corpus of Old English colour terms in place-names, based primarily on the findings of the English Place-Name Survey, supplemented by other sources for southern Scotland. Attention will be drawn to some of the major differences between this corpus and the corresponding corpus of colour terms in Old English literature, and possible reasons will be discussed.

The paper will also address difficulties in distinguishing colour terms in place-names from other areas of language. This is in part because many colour terms have transferred uses, for instance, as personal names. Since the oblique inflection of an adjective in Old English may be formally identical to the genitive singular inflection of a personal name, even the survival of early spellings is not always conclusive for an interpretation of a place-name such as Whitwick (*Witewic* 1086) as either `white farm' or `Hwita's farm'. Other colour terms have transferred uses as animal names, some of which are only attested in place-names, as with OE **brun* `(brown) pig' (Brownwich `pig farm'), OE **græg* `(grey) wolf' (Greywell `wolf stream'), and, possibly, OE **fealu* `(fallow) deer' (Fawley `deer clearing'). Here, although contextual evidence or grammatical constructions sometimes point to one interpretation rather than another, there remain many instances of genuine ambiguity. Alternative interpretations have also been suggested in recent years for several colour terms previously taken to be straightforwardly descriptive. The colours blue and black, for instance, are now thought to have an association with woad growing and the textile industry, while the colour white may sometimes refer to dairy farming. The place-name corpus thus extends our knowledge of local history and farming practices as well as of the colour lexicon.

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Modeling Colour Categorization across Cultures: Alternative Cognitive Universals Linked to Relational Properties of Colour Sensation Space

Research in colour naming and categorization is largely represented by two opposing views: (1) Cultural Relativism, suggesting colour perception is largely determined by culturally-specific language associations and perceptual learning; and (2) Universalism, emphasizing pan-human physiological opponent-colour processing as the basis for colour naming coherence within and across cultures. Here a third view is described in which colour naming and categorization are shaped by both pan-human cognitive universals and socio-cultural evolutionary processes. This third view is supported by evidence showing that colour processing mechanisms differ both intra-culturally and cross-culturally. This divergent colour processing weakens the physiologically-based explanation proposed by Universalists for within-culture colour-naming coherence, and raises new questions about the sources of observed cultural coherence and cross-cultural universality. The new perspective proposes that universalities in colour naming and categorization arise because, across cultures, colour language and colour categories primarily reflect the culturally modal mapping of linguistic items and categories shaped by universal cognitive constructs and culturally salient colour appearances. Thus, within a culture, common representations of colour that are based on widely shared cognitive dimensions are proposed as a more plausible universal basis for colour naming and colour categorization. Across cultures such representations may be universally shared and result from convergent responses to similar pragmatic communication features.

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Colouring in the Past: Archaeological Approaches to Colour Studies

This paper considers the various and changing roles of colour in archaeological study. Colour has traditionally played a key role in archaeology and it can be argued that an archaeological concern with colour originated from, at least, the Renaissance with the collection of 'brilliant' objects. Ultimately, with the emergence of archaeology as a discipline, and the recognition that the context of discovery of these objects was as informative as the objects themselves, the colour of context was studied. Consequently, the study of colour has become entwined with the methodologies of archaeological practice.

In recent years archaeologists have, however, begun to study the significance of colour to past societies. Such studies recognise that colour potentially represented one component of systems of signification that were expressed through material culture and architecture in the past. Thus, it is possible, that colour systems have very ancient origins and may have played a role in the emergence of cognition, language and religion. The paper will consider examples from the prehistoric period in Europe (Palaeolithic to Bronze Ages), where colour has been actively deployed in material culture or monuments.

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Synaesthesia: a View from Within

"Far from being a mere curiosity, synaesthesia may provide a window into perception, thought and language." (Ramachandran & Hubbard 2001)

1. Introduction: The Affected (Kay).
Synaesthesia is a condition whereby perceptions of one sense are spontaneously, involuntarily and consistently associated with another sense, or with another modality within the same sense. One such association is between colours and things such as letters and names. Thus, for me, 'Wednesday' and '5' are, and always will be, green, while 'A' is scarlet and 'Katie' is dark red. These associations have been with me since childhood, and, like many other synaesthetes, I was for many years unaware that there was anything unusual about them. This paper will examine some recent psychological views on the subject and discuss their possible relevance to linguistic studies.

2. The Psychologist (Mulvenna).
As knowledge of the human sensory systems has developed and empirical techniques become more sophisticated, theories of the cause of synaesthesia have changed greatly. There have been many reasons why synaesthesia has not been studied in greater depth, or consistently

treated as a subject for serious enquiry. For example, synaesthetic experiences have been previously dismissed as a consequence of psychoactive drug use, learned associations between modalities, or an extension of metaphorical associations. However, as neurological investigations now support an argument for synaesthesia being an actual perceptual experience, research interest into what it can tell us about the human brain and behaviour has grown. Ramachandran and Hubbard (2001) propose 'hyper-connectivity' in at least the sensory areas of the brain, resulting in consistent, automatic associations in the synaesthete. It is also claimed that synaesthesia may be a result of the sensory areas not modularising correctly in the first few months of life. Since the first early report of synaesthesia by Galton in 1883, numerous consistent behavioural characteristics in synaesthetes have been proposed. These include above average intelligence, low spatial awareness, non right-handedness, poor mental arithmetic, the inability to distinguish left from right, and exceptionally high levels of creativity. Much of this is anecdotal and remains to be investigated empirically. In a study conducted by the speaker, the creativity levels of four synaesthetes and matched controls were measured using the Torrance Test of Creative Thinking. The synaesthetes scored significantly higher than non-synaesthetes, supporting previous claims of a creativity distinction, and providing encouragement for other suggested traits to be examined. In screening the population for synaesthesia, an additional observation we made was that there was a prevalence of almost 1 in 100. The issue of the rate of occurrence of synaesthesia has been controversial, with reported estimations fluctuating from 1 in 20 (Galton 1883), to 1 in 20,000 (Cytowic 1989), to 1 in 2,000 (Baron-Cohen *et al.* 1996) and 1 in 200 (Ramachandran & Hubbard, 2001). Such inconsistencies reflect the need for further widespread investigations.

3. The Linguist (Kay).

The ability to make unusual mental connexions lies at the heart of metaphor, which itself lies close to the roots of language and has been one of the most intensively studied psycholinguistic topics of recent years (for the beginnings, see Lakoff & Johnson 1980). A similar ability may help to explain other, neglected, linguistic phenomena. One such is folk etymology, where common sense connexions override those of serious philology. Another is phonaesthesia, where meaning is associated with sound, most notably in semantic groups such as slip, slither, slimy, sly (Reay 1994). Although he does not use the term, Luria (1968 [1987]) describes a multiply synaesthetic subject who was affected by the appropriateness or otherwise of words for their meanings. *Svinya*, for example, the Russian for 'pig', was regarded as too elegant to denote such a creature. As we learn more about the structure and functions of the brain, we may also learn more about such linguistic 'curiosities'.

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Basicness and Relative Basicness of Colour Terms: Contrastive Studies

Basicness is one of the main ideas introduced by Berlin and Kay (1969), but it seems that its full potential and meaning has not been realised. The mere existence of this more or less proven universal (Kay & Regier 2003) provokes the following logical questions: Is basicness only a state a colour term category may ultimately acquire or does it reflect something larger that regulates the whole colour naming system, affecting it in various ways? And, if the latter, is similar neurophysiological conditioning to be found in terminologies for other sensations? Hypothesising that basicness is an integrated part of the entire colour term system, I ran cross-linguistic studies on colour terms. To include all terms within the concept *basicness*, I coined a new concept *relative basicness*, which signifies the extent to which terms are established, in relation to each other. This paper discusses how relative basicness is realised in the colour terminologies of three languages, English, Finnish, and Swedish.

The three studies were run on database material, using a 100-million word English corpus consisting of both fiction and non-fiction, a 10-million word Swedish corpus of newspaper articles, and a 10-million word Finnish corpus of newspaper articles. Thousands of occurrences for each language were extracted and categorised, with those denoting other than actual colour senses (*e.g*. metaphors) excluded. The remaining occurrences were analysed using four criteria supported by existing colour term research (primacy, frequency, application, and derivation) and the results were transformed into values.

The values reveal notable similarities in the colour terminologies. The basic colour terms suggested by Berlin and Kay surface with clearly higher values in all studies. Results from English, which has the largest colour terminology and the maximum of suggested basic colour terms, show that additional basic colour term categories such as crimson may be emerging. It is noteworthy that the potential new categories are largely related to red and that terms for warm colours in general are created more easily than terms for cool colours.

As for the basic terms, their values have similar rank orders in the three languages. One of the most striking findings is that the terms for white receive the highest values in all languages. Since these terms represent the oldest colour terms and are etymologically related to brightness and lightness in both Germanic and Finno-Ugrian languages, their primary positions raise a question on the initial role of brightness/lightness in colour naming.

In both English and Finnish, red comes second and black third. However, in Swedish black has the second highest value. It is likely that the difference between Germanic English and Swedish results is caused by the change of the English basic term for black, when Old English basic *sweart* was later surpassed by English *black*. Such a change did not occur in Swedish, which still has *svart* as the basic term for black. This development suggests that basic terms are not as stable as the basic categories they represent, although etymology shows that these two tend to stick together. The orders of other basic terms are similar and correspond to the order in which recent colour theories expect them to emerge in languages. Terms for green, blue, and yellow follow with equally high values in all languages. Grey and brown are fairly established, but more so in English. Terms for orange, purple, and pink, which are all basic in English, have notably lower values, both in Finnish and Swedish. Newest non-basic colour terms in both Swedish and Finnish score low values, while English has a large number of well-established non-basic terms. The number of non-basic terms seems to increase when basic categories are established. The English results imply that this process has no limits.

The three studies confirm that basicness is integrated in the whole colour naming process and that measuring relative basicness can both provide a general view of colour terms

and show where individual terms stand. The results also give evidence of other patterns than that of basic colour terms and support the hypothesis that similar neurophysiological regulation is to be found in terminologies for other sensations.

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Peculiarities of the Colour Naming Sequence and Visual Searching in the Georgian-Speaking Population

Our earlier experiments (Khomeriki *et al*. 2001) have shown that, among the colours named verbally, the basic colours are given priority. In the Georgian language, such colours are considered to be red, yellow, green, blue, black, and white (Soselia 2000) (brown as a basic colour, proposed by linguists, has been disproved in our investigations). These colours are named first, and most frequently. In our studies, the attitudes of people of various ages, and age-dependent alterations towards different colours were investigated and recorded. It was interesting to assess whether the sequence of named colours perceived from the colour palette, and their order of priority, coincided with the results from the above experiments, and whether the presence of a sample in the visual field influenced the above events.

The experiments were performed with two groups of subjects. Group 1 consisted of forty children aged four; these children had no reading skills as yet. Group 2 consisted of forty subjects of school- and older age. In our earlier list-experiments, we studied children aged three, four and five, also schoolchildren of each respective age, and adult subjects. It was found that children aged three knew fewer colours than the four- and five-year olds. However, the five-year olds, unlike the four-year olds, were already familiar with rudimentary literacy. Our investigations have shown that, among a multitude of colours, during perception of a specific colour, importance is attributed to the location of these colours in the visual field. A priority is given to the colours distributed in the upper left part of a scene, or, generally, to the colours existing in the upper part of a scene. It is also obvious that a certain part is played by the particular colour as well. The latter feature is most characteristic in children because they, both by heart and visually, note predominantly those colours which are most familiar to them. Most frequently, these are the basic colours (red, yellow, green, blue, black, and white). The red colour should be especially emphasized. The results of the above studies and of the list-experiments, carried out before the studies with children, significantly overlap. Children, when recognizing colours, unequivocally give priority to red. Such an attitude towards red changes with age. During verbal questioning, red gives way to yellow, black, and green and, together with white, drops to the fourth or fifth position. However, according to the order of naming, red has a significant priority. During visual observation, the priority of a colour

depends on its location within the scene. The grown-ups, although first naming the basic colours in the list-experiment, gave priority to the non-basic colours – orange, light blue, grey – in the present experiments.

Consideration of the experimental results obtained meant the following conclusions could be reached:

In the visual perception of humans, colour has an advantageous importance over shape. Similar results were also shown in our previous work (Kezeli, Lomashvili & Khomeriki 1984).

Four-year old children, when perceiving a colour, first of all refer to the basic colours (mostly to red), but then their attention shifts to the non-basic colours located in the upper part of a scene. When the basic colours are presented, attention goes to the colours in the upper left corner or to the red. When naming the colours distributed in different places, no specific strategy was found: naming them occurs arbitrarily.

School-children and adults, during visual perception of colours, pay attention mostly to the location of a colour (on the upper left, or, generally, at the top) and, when naming colours, the sequence usually coincides with the eye movements characteristic of reading. In such a case no particular colour has any priority.

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The Development of Human Spectral Coding Mechanisms

The study of colour vision requires a rigid distinction between coding and perception. Coding refers to the manner in which information in the retinal image is sampled, integrated and transmitted in the visual system. In contrast, the term *colour perception* ought to be reserved for what we actually experience: the hue, saturation and brightness of colour. In this context, detection and discrimination experiments typically concern the number and characteristics of the mechanisms underlying the coding of spectra by the visual system. The trichromacy of normal human colour vision has been taken to imply the presence of three independent channels coding the spectral characteristics of light. Physiological studies of primates confirm that light spectra are encoded in the activity of three classes of cone photoreceptors (L, M and S, sensitive to long-, middle- and short-wavelengths, respectively) whose signals are then recombined in three independent sub-cortical channels (corresponding to L-M, S-(L+M) and L+M). While a prerequisite to colour vision, spectral coding, nevertheless, does not necessarily inform us about the organization of colour perception.

The immaturity of the human retina and visual pathways at birth raises the question of whether adult spectral encoding mechanisms are in place at birth and, if not, at what age they develop. Psychophysical studies suggest that receptoral mechanisms are present as early as one month and post-receptoral mechanisms by at least three months. Some evoked

potential studies suggest an earlier date for the post-receptoral mechanisms. Assessing the presence and number of mechanisms in infants is complicated by the difficulty of controlling infant behaviour but also by the presence of scotopic (rod) as well as photopic (cone) mechanisms. The close overlap of rod, M and L cone spectral sensitivities renders it difficult to demonstrate clearly the presence of M cones.

In order to separate out the responses generated in evoked potentials by each of these photoreceptor classes, we used the technique of silent substitution. This involves the alternation of pairs of lights whose wavelengths and intensities are chosen so that the response modulation of at least one photoreceptor class is nulled. In our case, we alternated a mixture of two monochromatic lights against a third monochromatic light. In this way, we were able to arrange a silent substitution for two mechanisms simultaneously, allowing us to measure a response from a third mechanism. The lights chosen are from the Rayleigh region of the spectrum, thus the S cones do not make a significant contribution. Using this technique, we measured evoked potentials for M cone, L cone and rod isolating stimuli in infants at 4 weeks and 8 weeks. The 4 week responses are much weaker but resemble those at 8 weeks after normalization to the luminance response. Action spectra measured for the receptor isolating stimuli confirm that M and L cone signals can be measured in the infant cortex by 4 weeks of age.

In a second set of experiments, the two-alternative forced-choice preferential looking technique was used to evaluate the chromatic sensitivities of infants and adults. Two random luminance noise fields were presented on the left and right sides of a CRT display. On one side, an equiluminant set of bars alternated between vertical and horizontal positions. In infants, the experimenter judged which side the stimulus was on by the child's looking behaviour. The minimum chromatic contrast at which the experimenter could deduce the location of the test stimulus was taken as the threshold. Older observers performed the task verbally. The tritan and the projection of protan and deutan axes in the equiluminant plane were tested.

Chromatic thresholds could be measured as early as three months with this technique. The log threshold declined linearly with log age until adolescence, after which it increased linearly with log age. While thresholds differed for different colour axes, the rate of change throughout the life span followed a similar course along each axis. The data suggest that the relation between spectral coding mechanisms is tightly constrained throughout life.

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Colour Terms in Nova Scotia

Just over two centuries ago, speakers of Scots Gaelic began emigrating to Cape Breton in the Canadian province of Nova Scotia. Many of their descendants continue to speak the language, either as native speakers or as learners.

Fieldwork among bilingual speakers of Cape Breton Scots Gaelic (CBScG) and Cape Breton English (CBE), monolingual speakers of CBE, and, if possible, monolingual speakers of CBScG will be used to determine the basic colour terms presently used in each language, and secondary colour terms in CBScG. This fieldwork will be done by questionnaire and will include both learners and native speakers of CBScG. If possible, detailed personal interviews will be conducted with a subsample of the speakers.

The scope covered by basic colour terms, and by the CBScG secondary colour terms used by Cape Breton speakers will be studied. Cross-language comparisons will be drawn, as

will comparisons with historical and present usage of Goidelic basic and secondary colour terms.

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Effects of Chinese Character Complexity on Stroop Test Performance

In an effort to promote mass literacy, the People's Republic of China has implemented a programme of character simplification, believing that reducing the number of components in a given character facilitates its acquisition and retention. However, empirical evidence to support this claim is lacking because no controlled experiments directly comparing reading in traditional and simplified Chinese have been undertaken. This study attempts to quantify performance differences between these two levels of character complexity by measuring Stroop Test lexical interference on colour perception, and discusses the possible constituent role of colour in the perceptual mechanism for processing character script.

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A Network Analysis of the Emergence of a New Colour Term

Social network analysis is used by epidemiologists to understand the transmission of diseases, such as SARS, through a network of connected persons. In an attempt to expand such epidemiological models to include knowledge, we used network analysis to study the diffusion of a new colour concept (measured by the Munsell System) and its lexical term (measured by socio-linguistic analysis) among a group of Mayan weavers who have recently adopted new colours of threads. In this study we reveal the dynamic of the emergence of a new colour concept and demonstrate a new methodology for studying the social influences upon colour terms and categories.

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The Status of Primary and Secondary Colours in Colour Term Acquisition

When learning to name the eleven basic colours, young children are predicted to map the terms that correspond to the six primary colours (black, white, red, green, yellow and blue) more readily than terms corresponding the five secondary colours (brown, pink, orange, purple and grey) (Berlin & Kay 1969). Some recent developmental studies lend support to this hypothesis by demonstrating an advantage for naming primary over secondary colours (*e.g*. Davies *et al*. 1994), however, others have failed to find that young children comprehend and name primary colours more accurately than secondary colours (*e.g*. Shatz *et al*. 1996). The discrepancy between studies could be due in part to methodological differences, or it could reflect the influence of different factors that may shape children's developing colour terminology, such as maternal input (Andrick & Tager-Flushberg 1986).

We were interested to investigate if young children exhibit a genuine advantage for learning primary colour terms over terms referring to the five secondary colours. In an extensive study, we gave each of 43 children, with language-ages ranging from 2-5 years, two measures of colour term knowledge. Colour comprehension was measured using a spoken-word-to-sample test that assessed children's receptive knowledge of the eleven basic colours. Colour naming was measured using an explicit naming task that assessed children's expressive knowledge of the eleven basic colours. We found little support for a consistent advantage for primary over secondary colours, across the different language-age groups, and across the two conceptual tasks. Although children with a language-age of 3-years named primary colours more accurately than secondary colours, the other age groups did not show this advantage, and none of the children showed this advantage on the colour comprehension task (Pitchford & Mullen 2002). Our results did, however, show a selective delay in the acquisition of two secondary colours, brown and grey, relative to the other nine basic colours. In general, our data suggest that brown and grey become reliable in children's colour vocabulary some six to nine months later than the other basic colour terms (Pitchford & Mullen 2002).

In a series of further studies we sought to investigate how robust the tardy acquisition of brown and grey is, relative to the other nine basic colour terms, by administering different conceptual tests to groups of preschool children (aged 2-5 years) living in different countries (either the UK or Canada). We then sought to investigate factors that may constrain the developmental acquisition of these two basic colour terms. We compared the performance of different groups of preschool children on five experimental tasks designed specifically to measure different aspects of conceptual and perceptual colour processing. Two conceptual tasks (colour comprehension and colour naming), two perceptual tasks (colour discrimination and colour saliency), and a colour preference task that assessed children's affective responses to the basic colours were given, and, in each task, primary and secondary colours were systematically compared. In addition, an objective measure of colour term frequency was determined by counting the number of times the eleven basic colours appeared in preschool texts.

We found no consistent advantage for primary colours relative to secondary colours by preschool children across any of our colour tasks, even though primary colours appear more frequently in preschool texts. Our data do, however, show a reliable delay in the conceptual acquisition of brown and grey, the two secondary colours we had previously found to have been acquired late, relative to the other nine basic colour terms. Thus, we suggest the developmental acquisition of basic colour terms is relatively unconstrained (Saunders & van Brakel 1997), except for the tardy acquisition of brown and grey. Furthermore, our

investigations have shown that this selective delay in the conceptualisation of brown and grey does not appear to be limited by perceptual factors, as our results show children can discriminate these two colours, and they will use these two colours to group together perceptually similar objects, even when they cannot comprehend and name them. Interestingly, brown and grey are colours that children least prefer, suggesting a possible developmental linkage between colour conceptualisation and colour preference in early childhood.

Andrick, G. R. & H. Tager-Flushberg. 1986. "The Acquisition of Colour Terms". *Journal of Child Language* 13.119-34.

Berlin, B. & P. Kay. 1969. *Basic Color Terms: their Universality and Evolution*. Berkeley & Los Angeles: University of California Press.

Davies, I., G. Corbett, H. McGurk & D. Jarrett. 1994. "A Developmental Study of the Acquisition of Colour Terms in Setswana". *Journal of Child Language* 21.693-712.

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Colour Categories and the Translation of Colour Terms from Irish to English

As an Irish speaker who learned Irish as a second language, I am constantly reminded of the heritage, variety and richness of colour terminology in Irish and the possibilities offered by this richness to the translator who is chiefly concerned with translation from English into Irish and Irish into English.

Having taught the Irish language at post-primary level for a number of years, I am aware of the difficulties and confusion of young learners with regard to some colour terms e.g. *glas* and *uaine*, both of which translate as 'green', *dearg* and *rua*, both of which translate as 'red', and the phrase *an cine gorm* which is translated into English as 'black people', even though *gorm* translates as 'blue', and *an cine geal*, which is translated as 'white people', even though young people are taught that *bán* is the Irish equivalent of the English colour term *white*.

Adult learners of Irish who are revising Irish learned at school face similar problems, as terms which they have acquired as children are no longer used or have become redundant. It is interesting to note that, in one particular text aimed at people who "... are learning Irish at school, visiting Ireland, or just brushing up rusty Irish ..." (Davies 1954: 92), the colour terms have been reduced to an over-simplified table of equivalences where three items are especially worthy of note. The term *glas* 'green' has been omitted altogether, to be replaced by *uaine*, and the terms *éadrom* 'light' (as in weight) and *dorcha* 'dark' (of night) have been introduced as colour terms in their own right. This oversimplification does not allow for the capacity of the Irish language to describe the myriad of hues, or the variety of unsaturated and saturated colours, and such an exercise also ignores the semantic complexities of certain colour terms. Suffice it to say at this point that it is not appropriate that the translator should use such an oversimplified table of equivalences in the translation of colour terms.

Colour is one of several cultural issues that is of concern to people working in the software localisation industry. When it comes to deciding on a background colour for a screen or software product, there are cultures in which the use of particular colours is precluded, *e.g*. yellow in China or blue in Egypt. Blue is the colour of commoners in Muslim communities *e.g*. in Iran.

The fact that colour terms in many languages are not equivalent to colour terms in other languages must be taken into account in machine translation. Terms may have different semantic extensions in the target language or a translational problem arises, for example, when a single SL word such as *red* in English can potentially be translated by *rua* or *dearg* or *flann* in the TL, Irish.

Finally, I was interested in the fact that the colour theme or, more accurately, the grouping of colours, has, in fact, been the testing ground for linguists in their search for a theory of categorisation.

I will refer briefly to a text by the author and translator Maolmhaodhóg Ó Ruairc which explores the richness of colour terminology in the Irish language in a chapter titled *An Mheiturlabhra*, 'Discourse' (Ó Ruairc 1996: 179-92). This chapter inspired me to investigate further the link between language and culture. Ó Ruairc echoes the view of the Relativists that no language can exist unless steeped in the context of culture, or that no culture can exist which does not have at its centre the structure of natural language: "… tá dlúthcheangal idir an saol máguaird agus an fhoirm urlabhrúil a thugtar dár smaointe …", *there is a close connection between the world around us and the way in which our speech expresses our thought processes* (Ó Ruairc 1996: 179).

It follows that the task for any translator is to be aware of, and take account of these cultural differences. The problem for the translator of English into Irish, as Ó Ruairc sees it, is that the influence of the English language on Irish has been so effective that the translator for whom Irish is now, more often than not, his/her second language, is no longer capable of communicating the rich cultural heritage of the language in translation, *e.g*. in colour terminology. Ó Ruairc also contends that cultural differences between languages which have different conceptualizing systems, as he claims have Irish and English, may, in fact, be almost impossible to translate: "Ciallaíonn sé sin gur deacra ar fad teanga a aistriú go teanga eile má tá na difríochtaí meiturlabhra an-leathan", *that means that it is much more difficult to translate from one language into another if there are marked differences in discourse/speech* (Ó Ruairc 1996: 181).

Davies, Helen. 1954. *Beginners' Irish Dictionary*. Dublin: Gill & McMillan.
Ó Ruairc, Maolmhaodhóg. 1996. *Dúchas na Gaeilge*. Baile Átha Cliath [Dublin]: Cois Life Teoranta.

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Learning in Context: the Effects of Linguistic Contrast and Functional Salience on Children's Acquisition of Novel Colour Terms (POSTER)

It is well documented that, despite the perceptual salience of colour, young children fail both conceptual and linguistic tasks involving colour. Two- to four-year-olds fail simple colour matching tasks (*e.g*. Rice 1980; Backsheider & Shatz 1993), and correct use of colour terms emerges late during development compared to that of other abstract object properties (Au & Markman 1987). Furthermore, in the process of learning, children make considerable overextension errors, suggesting that even when colour terms enter a child's vocabulary, their

meaning is not fully understood. Nonetheless, young children appear to understand that colour terms form an independent semantic category. When asked, "What colour is this?" a child might respond with an inappropriate colour word, but is unlikely to respond *big* or *cup* (Backsheider & Shatz 1993).

Learning the meaning of a new word involves semantic classification. Giving some type of Linguistic Contrast facilitates this process, as novel words are contrasted with familiar words from the same semantic domain. Au and Laframboise (1990) found that introducing a novel colour word in a contrastive manner (Corrective Linguistic Contrast), when the child had labelled a purple object *blue*, the feedback "This is not *blue*, it is *purple*", significantly speeded the process of acquiring the new word *purple.* They also used Semantic Linguistic Contrast, where a novel colour word was contrasted to two other random familiar colour words. Children in the latter group did not, however, show a significant degree of learning. Carey and Bartlett (1978) taught children a new colour word, *chromium*, by means of Referential Linguistic Contrast; introducing a new term in a naturalistic setting where the colours associated with the label are displayed at the time the critical word is introduced – "Pass me the *chromium* tray, not the *red* one". The methodologies used in these studies varied in terms of the type of Linguistic Contrast used, the time that elapsed between the linguistic input and the assessment of learning, and the type and number of objects present at the time the linguistic input was given.

The present study contrasted three kinds of Linguistic Contrast (Corrective, Semantic and Referential) within the same paradigm to compare the degree to which they facilitate children's learning of colour words. Using computer-generated stimuli, children played 'games' with a cartoon character who introduced novel colour words in a controlled learning context. Training took place over five to six weeks, and learning was assessed after each exposure by Naming and Comprehension tasks. Results showed a net superiority effect of Corrective Linguistic Contrast over both the Semantic and Referential Linguistic Contrast Groups. Findings are discussed in the light of both the common finding that children tend to overextend the first few colour words they learn to describe all perceivable colours in their environment (*e.g.* Au & Markman 1987), and the principle of mutual exclusivity (Markman & Wachtel 1988).

A further study investigated whether boosting the perceptual salience of colour in the learning context might facilitate children's acquisition of colour words. The methodology implemented was essentially the same as that used in the first study, but the new words were introduced in a functional context – *e.g.* "Which telephone should I use to phone my friend *Beige* Tippy?" Preliminary results suggest that giving colour functional salience within the word-learning context speeds the process of learning a novel colour word to a similar extent as Corrective Linguistic Contrast. This suggests that a child's ability to abstract colour as a dimension need not necessarily be preceded by the acquisition of the associated linguistic terms, as suggested by Sandhofer and Smith (1999).

Au, T. K. & D. E. Laframboise. 1990. "Acquiring Colour Names via Linguistic Contrast: the Influence of Contrasting Terms". *Child Development* 61.1808-23.

— & E. M. Markman. 1987. "Acquiring Word Meanings Via Linguistic Contrast". *Cognitive Development* 58.1021-34.

Backsheider, A. G. & M. Shatz. 1993. "Children's Acquisition of the Lexical Domain of Colour". Paper presented at the 29th annual proceedings of the Chicago Linguistic Society, Chicago.

Carey, S. & E. J. Bartlett. 1978. "Acquiring a Single New Word". *Papers and Reports on Child Language Development* (Dept of Linguistics, Stanford University) 15.17-29.

Markman, E. M. & G. F. Wachtel. 1988. "Children's Use of Mutual Exclusivity to Constrain the Meanings of Words". *Cognitive Psychology* 20.121-57.

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Sandhofer, C. M. & L. B. Smith. 1999. "Learning Colour Words Involves Learning a System of Mappings". *Developmental Psychology* 35(3).668-79.

Shatz, M., D. Behrend, S. A. Gelman & K. S. Ebeling. 1996. "Colour Term Knowledge in Two-year-olds: Evidence for Early Competence". *Journal of Child Language* 23.177-99.

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The Quantitative Structure of the Lexical Field of Colours

The goal of our study is a comprehensive quantitative analysis of the lexical field of colours in text corpora. Frequencies of basic colour terms are analysed in a multilingual corpus, representing ten Indo-European languages (Czech, English, French, Italian, Polish, Russian, Rumanian, Slovak, Spanish and Ukrainian). Several hypotheses related to the questions put forward by linguistic anthropology and the semantics of colours are tested. In particular, we explore the following areas:

A. The statistical independence of the frequency distributions of colour terms in different corpora.
This question, which is apparently a technical one, becomes quite important if one admits that the frequency distributions of colour terms in text corpora of various languages correlate with the semantic conceptualisation of the colour spectrum in these languages. Similar distributions would indirectly strengthen the hypothesis of universality which claims that conceptualisation of colours is independent of language, and thus may be thought to be identical in different languages. On the other hand, the discovery of significant differences in the frequency distributions of the lexical field of colours would provide a good argument for the relativistic hypothesis which claims that the conceptualisations of the spectrum of colours are different in different languages.

Neither of these extreme positions was found to be correct with regard to the empirical data. In particular, the results obtained allow us to discard the hypothesis advocating extreme universality in the coding of the colour spectrum and, *a fortiori*, any other kind of lexical field (the result of the *chi*-square test). They also contradict the extreme relativistic position. The conclusions, based on a comparison of genetically and culturally related languages, allow us to accept as highly probable the hypothesis which advocates moderate universality in the coding of colours. This is demonstrated by the result of the Spearman's rank correlation test.

It should also be added that the methodological error, which we strove to avoid in interpreting these results, was the psychologically motivated expectation of a clear, unambiguous decision between relativism and universality. The settlement of such a question does not exist – not only with regard to comparisons of lexical fields which are potential material for testing – but, most of all, because the transition from universality to relativism is not abrupt, but fluid. The aforementioned research justifies the introduction of the concept of moderate universalism, verified by the rank correlation test, which is less selective than the *chi*-square test.

B. The correlation between the frequencies of colour terms and the order of their appearance in the phylogenesis of a language.
Since the oldest and the most primitive notions tend to be the most frequent ones in any language, this correlation seems very likely. Two diagrams are compared: the evolutionary diagram by Berlin and Kay (1969) and the one based on the frequencies of colour terms. As expected, colour terms ordered according to their average frequency in text corpora appear in a

similar order (positive result of Spearman's rank correlation test). This result is an empirical corroboration of Berlin and Kay's conclusions, based on a different methodology.

C. The model of knowledge representation for the lexical field of colours in particular and for lexical fields in general.
Colour frequencies ordered decreasingly can be easily modelled with an exponential function. This model probably reflects an inherent neurolinguistic mechanism of optimal lexeme coding derived from the general principle of language economy. It can also be explained by means of M. Minsky's notion of the cognitive frame.

D. The coverage of colour vocabulary in texts by particular lexemes.
This point may be quite interesting not only for linguists, but also for ordinary language users. We learn from the analysis of language corpora that, out of the 150-200 colour terms or colour designations probably existing in any language, seven constitute 90% of all use of colour vocabulary and only two (black and white) constitute as much as 50%.

Berlin, Brent & Paul Kay. 1969. *Basic Color Terms: their Universality and Evolution*. Berkeley & Los Angeles: University of California Press.

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The Measurement of Appearance

The visual appearance can be one of the most critical parameters affecting customer choice and, therefore, needs to be quantifiable to ensure uniformity and reproducibility. A starting point in assessing the appearance of a consumer product might be the measurement of its colour. The description of its total appearance, however, cannot be achieved by the definition of colour alone; other attributes of the material from which it is fabricated contribute to the overall appearance. The gloss of a surface, for example, will cause changes in colour depending on the lighting direction; the freshness of food is judged by its overall appearance, but in a way that is much more subtle than by just its colour and gloss; and novel effects such as pearlescence are added to products to enhance their attractiveness. For some products, such as cosmetics, it is not only their own appearance characteristics that are important, but also the visual effect after they have been applied to the skin, nails, hair, *etc*. It is clear, therefore, that the interest of industry in the measurement of appearance goes beyond simply surface colour and gloss. This presentation will discuss a framework for appearance measurement and describe some work being carried at the National Physical Laboratory.

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and
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The Normativity of Colour

The familiar empiricist story of colour runs something like this. For animal behaviourists, colour vision is regarded as part of the phenotypic expression of an underlying genotype, which changes as the genotype changes. Anthropologists, in contrast, have treated colour as an aspect of a cultural system that has a dynamic of its own. It undergoes progressive development without entailing any further change in the basic biology of the species. It is as if colour in humans is totally decoupled from the process of evolution (see Ingold 1996).

In contrast to this dual-aspect account, Berlin and Kay (B&K) argue that the case of colour is exceptional: evolution under natural selection and the development of the cultural system are one and the same thing. Thus the sociobiologists Lumsen and Wilson describe B&K's theory of Basic Color Terms as a 'primary epigenetic rule', and B&K themselves assert that they have gone:

> … a substantial way in predicting the composite color categories of the world's languages from properties of color vision that are independent of culture and of language, biological properties which are in fact independent of human experience per se, being widespread in genera other than *Homo* (Kay, Berlin & Merrifield 1991: 18).

In other words, where colour is concerned, anatomy and culture are one and the same. In addition, as the telos of change is an ever closer approximation to the scientific image, so colour develops in culture to accord with the laws of science. The more 'a culture' is in tune with the science of colour, the more advanced it is. Advanced and complex societies – modern societies – belong to a scientific habitus with regard to their colour nomenclature and practices. In contrast, simple societies embody simple practices and nomenclature.

With regard to colour, the dual aspect theory produces what is known as 'relativism', whereas the Berlin and Kay theory produces 'universalism' – where relativism and universalism are exhaustive epistemological categories.

In contrast, I propose an approach which suggests that thematising 'colour' requires that one study both the total system of relations constituted by the organism-person-community in a richly structured environment (situating the practitioner in the context of an active engagement and involvement with real life settings), as well as science itself as a situated practice, entailing specific conditions of development. Following Ingold (1996), I suggest that the study of colour should be the study of the process through which humans and other animals, through their own actions, have established the contexts of development for their successors, as involved activity in the world. To elaborate this approach I shall draw on suggestions by Peirce, Sellars and Brandom, amongst others.

Peirce, for example, does not regard colour as an epistemological simple, as in the empiricist tradition, but rather, uses ideas of it to illustrate his maturest understanding of the pragmatist method. For example, he claims that the object of vision of someone who sees 'red' may or may not be real. Nonetheless, the relation between the general (the Red as seen) and the seer, is a real relation. The object may not exist, but the relation between what is seen to be red and the viewer, is a real fact. It is a representative of a real relation between observer and observed, such that it is *in* the relationship that the colour as colour is created. It is a consequence of the interpretive, factive relationship, which is historical and normative. Colour for Peirce is quality – a proto-idea – not a general prioristic idea as a Given. The process that makes the interpretation of colour possible is a process of semiosis, of sign-representation, or sign relations. Quality, or proto-idea is never an object of observation but

the product of logical reflection. When considering quality we do not always concentrate on the same thing. Sometimes we concentrate on 'value', sometimes on the pigmentation, or chemical properties, and sometimes on colour-as-metaphor related to transforming ideas. However, crucially colour is only concerned with 'intellectual concepts', on which arguments concerning objective fact may hinge. Colour as qualitative immediacy is not a quality *per se*, but a quality as classified and interpreted such as we know it. In Peircean terminology it is Icon, Index and Symbol – a multifunctional sign. As a representation it evolves; it is a dynamical complex sign system, and as ideational type, colour is a general area of thought. That which is predicated of this topic, colour, are tokens of the type. These have cross-referential function but may also become types in their own right (Kevelson 1996). I shall develop these insights further.

Ingold, T. 1996. "Situating Action V: the History and Evolution of Bodily Skills". *Ecological Psychology* 8(2).171-82.
Kay, P., B. Berlin & W. R. Merrifield. 1991. "Biocultural Implications of Color Naming". *Linguistic Anthropology* 1.12-25.
Kevelson, R. 1996. *Peirce, Science, and Signs*. New York & Berne: Peter Lang. [esp. Chapter 9: "Some Connections between Color and Idea", pp. 111-27].

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Colour Categories with Two Possible Basic Terms in the Romance Languages

The paper deals with colour categories which are represented by two terms, instead of one, that can be considered as basic. Well known examples are Italian *azzurro* / *blu* for BLUE, French *brun* and *marron* for BROWN, and *violet* and *mauve* for PURPLE. Less attention has been paid to couples like *vermelho* / *encarnado* for RED, and *preto* / *negro* for BLACK in Portuguese or *rojo* / *encarnado* for RED in some varieties of Spanish.

I will first discuss the status of these terms, applying the usual criteria for basic colour terms, and then try to determine the reasons for these double denominations, considering possible semantic, stylistic, contextual, connotative and regional differences as well as taking into account historical developments.

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Classifying Use as an Indication of Basicness

In their classic study of Basic Colour Terms (BCTs), Berlin and Kay (1969: 6) identified four basic criteria of a BCT:

i) it is monomorphemic
ii) its signification is not included in that of any other colour term
iii) its application must not be restricted to a narrow class of objects
iv) it must be psychologically salient to informants.

Four subsidiary criteria were also suggested in those cases where the first four produced non-conclusive results. Although frequently debated at first, and slightly modified by Crawford (1982), it seems that the basic criteria have stood the test of time and are still considered helpful in the identification of BCTs.

The purpose of this paper is to describe a possible connection between basicness and the function of a colour term modifying a noun. Following Warren (1984) and several others, three functions of adjectives in attributive position in English can be distinguished: characterising, identifying and classifying. *Identification* and *characterisation* involve modification of an instance of a noun, thus indicating the colour of the object in the case of colour terms. In contrast with the other two, *classification* is more abstract as it involves modification of *type*, rather than instance. Its abstract quality allows colour terms to be used in extended senses (*i.e*. outside their normal area of designation). Examples of classifying use are phrases such as *red onion* and *blue oak*, where the colour terms do not refer to the colour of an individual onion or oak, but modify *onion* and *oak* as types, creating subtypes accordingly. Significantly, the colour of the leaves of a blue oak would not be called *blue* when judged in a colour array – *i.e*. out of context.

This type of extension can be accounted for if type modification is analysed as a kind of reference-point phenomenon (Langacker 1999), where it is the combined salience of the colour term and the colour category that is significant. In the process of extension, a salient reference point is used to access another less salient entity. Since the purpose of classifying use is to create a subtype, the emphasis is on distinction, and contrast with the most common instances of the general type (in our examples, onion and oak). In the case of *blue oak*, the weak bluish tinge of the leaves marks the distinction and motivates the name despite the green element being stronger. Thus, in naming the subtypes, a salient colour term (= Basic Colour Term) is preferred, even if the nuance could be considered a very poor example of the colour term.

This paper presents details of a study of English colour terms (Steinvall 2002), based on the *Bank of English* text corpus and the *Oxford English Dictionary*. Examples and figures are used to substantiate the theoretical models. The results show a correlation between the frequency of classifying use and the Berlin and Kay hierarchy, and it is, therefore, suggested that classifying use may serve as a further criterion for basicness.

Finally, the wider implications of the findings will be discussed, and the results from previous studies, such as Conklin's (1964) observations of Hanunóo colour categories, and Forbes' of the use of *brun* and *marron* in French, will be reviewed and reanalysed from the perspective of classifying use. In addition, a connection between classifying and figurative use will be briefly explored.

Berlin, B. & P. Kay. 1969. *Basic Color Terms: their Universality and Evolution*. Berkeley & Los Angeles: University of California Press.

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The Lens-brunescence Hypothesis: an Explanation for the Colour Categorization in Melanesian Languages? (POSTER)

According to Berlin and Kay (1969), different classes of basic colour terms define distinct stages of evolutionary development. For example, if there exists a word for blue in a language then there are terms for green and yellow in this language too, but no terms for brown, purple or grey. Many languages make no distinction between green and blue, in contrast to most Indo-European languages such as German, English or French. They only have one term for these colours, generally called 'grue'. Usually they integrate short-wavelength stimuli into the green category.

Lindsey and Brown (2002) suggested that the grue category is caused by altered perception through lens brunescence. Chronic exposure to a high amount of UV-B radiation, as in the sunlight of the tropics, causes increased ageing of the human eye, which means a yellowing of the lens. As a result of this yellowing, the bluish colours should appear greenish, and purple should appear greyish.

Roberson, Davies and Davidoff (2000) described the Melanesian language Berinmo, which is compatible with these predictions. I investigated the colour categorization in another South Pacific language and compared these two Melanesian languages to German colour categories with and without simulation of aged lenses.

Melanesian native speakers of the Lenakel language (west Tanna, an island in the south of Vanuatu) were asked to categorize an array of Munsell colour chips with their basic colour terms. They possess basic colour terms for black, white, red, yellow, grue, and one term that includes purple, brown and grey. The distribution of colour categories in Lenakel is similar to the colour categorization in Berinmo. The Berinmo use five basic colour terms: white, reddish, yellowish, and grue, and one common term for purplish, brownish, dark-green and -blue colours (Roberson *et al*. did not test unsaturated colours).

For German subjects, when looking through filters simulating the lens of an approximately 25 to 40-year-old Melanesian and categorizing the same Munsell chips, the green category expanded into the blue category. Previously purple colours were categorized as grey, brown or red, and dark green colours were replaced by blue.

The colour categories found in Lenakel contradict the rules of Berlin and Kay who claim that the grue languages should not possess colour terms for brown, purple or grey. The experiment with simulated aged lenses shows that the different colour categories in German and the two Melanesian languages could be explained by different colour perception caused by lens brunescence.

Berlin, B. & P. Kay. 1969. *Basic Color Terms: their Universality and Evolution*. Berkeley & Los Angeles: University of California Press.

Lindsey, D. T. & A. M. Brown. 2002. "Color Naming and the Phototoxic Effects of Sunlight on the Eye". *Psychological Science* 13(6).506-12.

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About Blue-stockings and Blue Books: Linguistic Considerations as to the Origin of Phraseological Units with the Colour Blue

Among the phraseological units containing a colour adjective, the units containing an adjective referring to the colour blue in the German, English, French and Dutch languages are by far the most numerous. This is due to the fact that the colour blue had, from the 13th century, an outstanding position in cultural life (especially when indigo prevailed against woad in the dyer's trade), and in Christian colour symbolism. The cultural-historical importance of the colour blue finally led to the great variety of meanings of the adjective *blue*.

The idiomatization of the phraseological units referring to colours can be done in three ways:

1. only the noun is idiomatized (e. g. *blue jeans*)
2. only the adjective is idiomatized (e. g. *blue Monday* 'Monday before Lent')
3. both the noun and the adjective are idiomatized (e. g. *blue blood* 'nobility').

As to the etymologization of phraseological units referring to colours, the following questions are of vital interest: how does a colour adjective acquire its different meanings? How do the meanings come into being, or, in other words, what are the characteristics of the motivation for naming? In order to be able to give satisfactory answers to these questions, it is important to reveal the history of the word. To this effect, it has to be investigated and proven when and in which source the colour collocation appeared for the first time, and to be checked to what extent it has the current meaning in related languages.

In a case where the reasoning behind a colour collocation is no longer identifiable, the likely motivation at the time of the formation has to be determined. In this context, one has to consider that, normally, the most unusual feature or the one that is deemed to be the most characteristic is decisive for the naming. As to the derivation of certain motives for naming, it may be necessary to establish a connection between two or even three lines of argumentation. With regard to the semantic meaning of colour adjectives in phraseological units, different types of explanation have developed. Type 1 contains expressions, the colour adjectives of which are motivated by a characteristic of the form of the reference noun (e. g. *blue book* 'explanation of foreign policy'). As to type 2, the meaning derives from a characteristic of the form of the reference noun in the larger context (e. g. *blue Monday*). Phraseological units of this kind of formation, referring to a colour, are able to express complex circumstances. By means of a colour adjective, the circumstances to be expressed are represented in a reduced way. Type 3 comprises colour collocations, the adjective of which joins the reference noun in a lexicalized meaning (e. g. *blue-stocking* 'intellectual woman'). Neither does the reference noun carry the colour sense, nor can the colour adjective be explained in the larger context of the reference noun. The colour of the carrier has often been chosen secondarily only in order to visualize externally the meaning attributed to a colour.

As to the clarification of the etymology in complex expressions such as *blue-stocking* or *blue blood,* the context referring to the history of the facts is decisive. Only subsequently, in a second step, can the motivation for naming be made transparent from linguistic criteria (*e. g*. by comparing it to corresponding expressions in foreign languages).

Generally, it has to be summed up that the spreading and new formation of phraseological units with the colour blue increased dramatically in the 16th century, in the context of the Reformation. The adjective *blue*, in the lexicalized meaning 'untrue', entered numerous units with nouns, such as, *e. g*. Ger. *blaue Entschuldigung*, Du. *blauwe excusacie* 'hypocritical excuse', and Ger. *blaue Lügen*, Du. *blauwe lueghene* 'silly gossip'. Apart from their use in conflict situations, idiomatic expressions involving colour adjectives were, in past centuries, very popular for the naming of religious holidays (e. g. *blue Monday*, Ger. *blauer Dienstag* 'Thursday of holy week', Ger. *blauer Osterstag* 'Palm Sunday'). In the modern use of language, colour collocations are principally used in precise situations. As a consequence,

the expressions *blue paper* 'urgent document of the UN Security Council', and the pseudo-borrowed expression, *blue card* 'special work permit for foreign computer specialists in Bavaria', can be understood only in their respective contexts.

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The Semantics of Colour: a New Paradigm

To be able to establish the true universals of visual semantics we must first of all reject the false universals. Above all, we must reject the widespread view that there are some 'colour universals', whether absolute or implicational. There can be no 'colour universals' because 'colour' itself is not a universal concept. The empirical work undertaken within the 'NSM' theory of language and thought (*cf.* Wierzbicka 1996; Goddard 1998; Goddard & Wierzbicka 2002) has shown that, while many languages do not have a word for 'colour', all languages have a word for 'seeing'. Accordingly, it is the concept of SEEing, not the concept of 'colour', which must be the starting-point, and the cornerstone, of our investigations.

So what, if anything, is common to the visual vocabulary – the vocabulary of seeing – that we find in different languages of the world?

The main answer emerging from cross-linguistic research triggered by Berlin and Kay's (B&K) immensely stimulating but ultimately misguided theory of 'colour universals' is that the main semantic mechanism for describing what one sees is, roughly speaking, the 'X looks like Y' one. This mechanism underlies visual descriptors like *gold* and *silver* in English, *yukuri-yukuri* 'grass-grass' in Martu Wangka (Australia), or *latuy* 'looking like lush vegetation' in Hanunóo (Conklin 1964). Ironically, most visual descriptors based on the 'X looks like Y'-mechanism were specifically excluded from the search for human universals undertaken within the B&K research programme. They were excluded because the descriptors in question did not meet the set of criteria chosen by B&K for the category of 'basic colour terms'. Shweder and Bourne (1984) note that by choosing, arbitrarily, that particular set of criteria, B&K excluded from their field of vision ninety-five percent of the relevant data. In my view, this excellent observation applies, above all, to descriptors based on the 'X looks like Y'-mechanism.

Most visual descriptors in the world's languages are not 'abstract colour terms' but terms which compare what one sees with some exemplar taken as a whole – an exemplar whose chromatic properties are not isolated (abstracted) from various other ones. To recall Conklin's classic example again, the Hanunóo word *latuy* does not mean that the *colour* of things so described looks like the *colour* of vegetation, but rather, that the *things* so described look like lush vegetation. In the Hanunóo concept 'colour' is not separated from 'juiciness', but rather, the exemplar is referred to globally, as an unanalysed whole. Similarly, in English, *gold* as a visual descriptor does not mean that the *colour* of the thing so described looks like the *colour* of gold, but rather, that the *thing* so described looks like gold; and in Martu Wangka, *yukuri-yukuri* 'grass-grass' does not refer to the *colour* of grass as such, but rather, to its over-all appearance (in places near water or at times after rain).

In addition to the 'X looks like Y'-mechanism, all languages appear to pay some attention to the difference between 'high visibility' and 'low visibility', or between 'daytime vision' and 'night-time vision'. In some languages, this is constructed, like in English, as a distinction between 'light' and 'dark' appearance. In others, like Martu Wangka and Burarra (Australia), 'low visibility' is associated, more explicitly, with the absence of sun and fire, and 'high visibility', with their presence. Crucially, the distinctions between 'dark' and 'light'

are not distinctions in colour but in visibility: colour is not of universal concern, but visibility is.

Furthermore, it appears that in all languages there are visual descriptors referring to some features of the natural environment. The sun and fire play an important role in the meaning of words referred to in the literature as 'macro-white' and 'macro-red'; and they also play a role in the meaning of words like *red* and *yellow*. While not universal, the sky, vegetation, and the earth are also widespread points of reference; and, in many areas of the world, so is snow. Apart from such universal or very widespread environmental features, all languages appear to have visual descriptors referring to some features of the local environment, in particular, to visually salient local minerals and other pigments, especially those which can be used for painting, decoration, or dyeing.

In addition to such commonalities in the visual descriptors, there is also a wide range of more restricted and even idiosyncratic types. 'Abstract colour terms' like *red* and *blue*, characteristic of present-day English, are one such relatively restricted – though spreading – type. 'Mixed' colour categories like *pink* and *purple* are another. Compounds like *sky-blue* or *snow-white* are another. Subcategories like *scarlet,* another. As van Brakel (1993) has written: "it should not come as a surprise that a cursory study of the languages of the world presents us, not only with alternative sets of BCCs or no BCCs at all, but also with a whole gamut of words, bearing vague and varying similarities to colour words".

Van Brakel is right, of course. But it is not enough to show that B&K's theory of 'basic colour concepts' and 'colour universals', attractive and influential as it was, must be finally farewelled and buried. As I have argued for many years (see *e.g*. Wierzbicka 1990; 1996; 1999), to understand the human conceptualization of the visual world in both its diversity and its commonalities, we need to base our analysis on the bedrock of universal human concepts; and it is only on this basis that we can hope to arrive at a tenable and enduring synthesis.

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The Changing Referents of *maroon*

As a historian of the English language I am interested in English colour terms which have changed their referent over time. *Maroon* signified 'chestnut brown' in English until the late 1850s, but changed in (?all) British Englishes to signify a kind of burgundy red after that date. However, in some registers of some extraterritorial Englishes, *maroon* continues to be used as a referent for the dark brown eye-colour of South Asian and Black peoples — notably, in the officialese of police and customs officials.

In this paper, I will hypothesize that the change in the referent of *maroon* in British English may be a result of the invention of aniline dye by Sir William Perkin in 1856; in particular, the by-product of the manufacture of the newly-named ‘magenta’. Further data will be adduced from the naming-practices of the writer Charles Dickens (1812-1870).

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