How significant is Berlin and Kay's work on linguistic relativity and colour determinism?

Abstract

The question of how significant Berlin and Kay's work is on linguistic relativity and colour determinism has never truly been posed before. The purpose of this essay is to attempt to answer this question. Research suggests that the order of the discrimination of universal foci found by Berlin and Kay applies to modern, medieval, basic and dead languages. With the exception of a few dialects and anomalies, all languages studied have adhered to the constraints of the revised order of 2009 [1]. Many theories have been posed as counterarguments to Berlin and Kay's original weak theories in 1969, but none have surfaced as undeniable. The variety of explanations for the order is what results in the most anthropological discussion and publications and can all be collated into four general vantages: geographical, developmental, biological and cultural. However, it would be anticipated that Berlin and Kay's explanations and theories will be questioned further as the ability to study language, the eye and the brain improves. Nevertheless, it is the work, not these explanations, that is proved to be truly significant by its ability to be applied to languages from all eras of documentation, and the likelihood that, at a time when their work and publications have been forgotten, the order will be discovered again. The conclusions that I have drawn are open to be questioned in the future as more evidence is found supporting a contrasting vantage or point of view.

Essay

Introduction

In modern times, it is a widely accepted idea amongst those who study the linguistic anthropology of colour that colour exists on a 2D spectrum or a 3D solid (Figure 3); and that there is a fluidity between the groups a language has deemed appropriate to fix. This idea is not ground-breaking, nor a modern revelation, but the individual boundaries set by a specific language have become a recent debate in cultural and linguistic anthropology. It was only within the past one hundred and fifty years or so that it became apparent that not only did languages have varying names for different colour groups (or categories), but they also had drawn different boundaries for these groups. An individual's preference for setting these boundaries is dependent on their language and the environment which surrounds it. However, this didn't explain why English has eleven basic colour terms, compared to, equally developed, Russian's twelve, and (Cote d'Ivoire) Wobé's three. As colour is a spectrum, languages, theoretically, should create categories surrounding their most populous and common colours, and therefore the plethora of varying colour categories are logical. Nevertheless, linguistic anthropologists continued to question these categories until, in 1969, Brent Berlin and Paul Kay published a book titled 'Basic Colour Terms: Their Universality and Evolution' [2], which outlined the fundamental research done on linguistic relativity on the subject of colour determinism. Their book went onto become the most significant publication on the subject and still is. Its true significance, however, will be determined by the ability of its results and conclusions to be replicated and generalised, not only *en masse* in today's modern world, but also its validity in the distant past and future. Berlin and Kay are recognised as the instigators of the colour-naming debate, as they inspired a plethora of publications, from countless encomiums to counterarguments and complete criticisms of their conclusions.

Significance, in this essay, is judged on a multitude of factors that range from factors that apply to anything to factors which apply to only scientific publications. The common conception of significance, as defined by the Oxford English Dictionary, 'is the quality of being worthy of attention; importance'. However, the significance of an anthropological study or publication is better judged by the validity and generalisability of the examples and findings (and explanations given for these) in the given publication and any other publication on the topic. The more referenced or cited the publication is, the more significant it is, regardless of whether the review of commentary is in agreement with or a criticism of the original work. Moreover, the significance of Berlin and Kay's work will also be judged on its ability to apply to dead languages (such as Greek, or Latin [3]), languages used in the distant past, and in the distant future. The true test of significance will lie on the ability for the same findings excavated in their work to be found in a not dissimilar society from our own where the conclusions had not already been drawn. The significance this publication shows suggests that, due to multiple factors (that will be identified), in a possible future, where our biological ability to perceive colour has changed, Berlin and Kay's conclusions on linguistic relativity should still be drawn.

Linguistic relativity, the subject of Berlin's and Kay's work, is the inability to perceive something because of linguistic restriction. This is the entire basis of colour and coding in which we determine a colour's group in a language, as is the reason why colour groupings vary between languages and cultures, despite perhaps having a shared history. A commonality between language colour systems is what drove Berlin and Kay towards conducting a study of 98 languages and the number and foci of colour groups. Their hypothesis claimed that the doctrine of extreme linguistic relativity, believed by Edward Sapir and Benjamin Lee Whorf [4] was a gross overstatement of the true state of colour determinism. This doctrine outlined that each language codes an experience, whether visual, auditory or kinaesthetic into sound uniquely and in differing manners. Berlin and Kay felt that the basic colour terms (abbreviated to BCTs) translate too easily between languages that have no true relation or commonality for the Sapir-Whorf hypothesis, and ergo the extreme linguistic relativity thesis to apply and be valid. Furthermore, according to Berlin and Kay, colour categories are referring to the foci of the colour 'groups' or categories, rather than to the area in which the foci is surrounded by. An individual's brain's primary storage procedure is concerned with points, or foci, of the Munsell Colour Space; not the extended volumes or parameter of the colour group designated by the speaker's native language.

Berlin and Kay's Major Works

Basic Colour Terms: Their Universality and Evolution

The primary data of the study included languages from nations at different points of development and exposure to Western society: some speakers contributed Arabic, Bulgarian, Catalan, Cantonese, English, Hebrew, Hungarian, Ibibio (Nigeria), Indonesian, Japanese, Korean, Pomo (California), Mandarin, Mexican Spanish, Swahili, Taglog (Philippines), Thai, Tzeltal (Southern Mexico), Urdu (India) and Vietnamese. The method that Berlin and Kay used to obtain the following results is not mentioned in the book, however, it is assumed that the procedure is then reflected in the following studies done by either Berlin or Kay; that the participants were asked to refer to each of the three hundred and thirty Munsell Colour Chips by name individually in a random order. This methodology produced hints, which soon became the foundation of colour determinism, of an order in which languages designate foci a colour group. Figure 1. depicts Berlin and Kay's colour order as of 1969. The pattern described through research was found to be: a language of two terms (of which there are very few) has BCTs for light and dark (or bright and shade, white and black, etc.); a language of three has BCTs for light, dark and red (stage II); a language of four had light, dark, red and yellow (stage III); then green (stage IV); blue (V); brown (VI); and eventually a combination (or most likely all four) of pink, purple, orange and grey (VII) (see Figure 15). A language with a specific number of terms was deemed to be at a stage, and a stage was only possible if all the previous colour categories had an evident BCT in the language. For example, a language could not have BCTs for black, white and blue without terms for red, green and yellow. Any given language can only be assigned to one stage and consequently, must have historically passed through all the prior stages in the specified order. Languages which reach Stage VII are found to possess a strong tendency to be Type twenty-two as if the language has a BCT for either orange, pink, purple or grey, it is most likely to have all four (forty-five percent of the twenty Stage VII languages).

Explanations for their findings is where the publication falls short. They claim that "there exists universally a total inventory of eleven basic colour categories from which the eleven or fewer basic colour terms encoded in any given language are always drawn… There is a fixed partial ordering of the basic colour category foci according to which they become lexically encoded in a given language over time. This ordering is black, white < red < green < yellow < blue < brown < purple, pink, orange, grey'… This sequence is an evolutionary one". Explaining the order was something that Berlin and Kay didn't effectively address. They suspected the completed answer lied in the area beyond human neurophysiology. Clearly, many of the assumptions made were based on a small sample and the hypotheses drawn were a result of a lack of counter evidence. This, therefore, led to a large uptake of criticism of the 1969 book. However, the criticism wasn't on the order or the findings, but instead the methodology, the sample and the conclusions drawn. Only twenty participants took part in the original publication of ninety-eight languages, and therefore, according to anthropologists, the results become incredibly hard to generalise, even with random sampling. But the sampling was not random; the participants were gathered by an opportunity sample based in San Francisco, California. With speakers of the 'under-developed' languages living in the US, it is incredibly unlikely that their individual perception of colour was completely reflective of the true native speakers, all of whom were also bilingual English speakers. This bilingualism has been shown to have an effect on colour determinism [5]. Not only were the participants not monolingual native speakers, but almost all the languages featured in the study were industrialized societies, not 'under-developed' as Berlin and Kay had claimed. Some critiques were due to the etic viewpoint of the data retrieved. These languages were studied from a foreign perspective and not one from inside the culture, where the true meanings of the dialect's BCTs can be studied, which increases the effect of an individual's perception of colour being unique and a result of their personal experiences, rather than the experiences of the combined speakers of the language [6]. Also, in regards to the languages sampled, their basic colour terms were seen as too specific as Yele (Papua New Guinea) was classified into a Stage II language despite having a broad vocabulary of everyday objects that are used as colour comparisons that cover almost all English colour words [7]. On the other hand, the order was supported by various ethnographic and experimental studies conducted soon after 1969 [8] [9] [10] [11] and largely accepted by psychologists and vision researchers.

The World Colour Survey

Then, in 1976, Berlin and Kay started the World Colour Survey as a response to the criticisms [1] (Appendix 2). The findings from 1969 were replicated in the 2009 publication. Nevertheless, the revised research of Berlin and Kay still attracted a proportion of criticism, but instead on the subject of the findings and the following conclusions drawn. The results straight after publication were generally accepted in the scientific community, but nevertheless there have always been dissenters from this consensus [8] [12], and various counterarguments have gained prominence in recent years [13] [14] [15] [16] [17] [18] [19]. In Lucy's 'The Scope of Linguistic Relativity' [20] he states 'when a category is identified… it is really the investigator who decides which 'colour' it will count as. What appears to be objective – in this case, a statement of statistical odds – is not.' Berlin and Kay's subjective methodology means that they can impose their own universalistic assumptions on the collected data. As a result, their universals are not in the languages of the world, but instead in the minds of the investigators. Ironically, Lucy [20], Davidoff [18] and Saunders [17] conducted research on the languages on Berinmo, Hanunó'o and Zuni, but nevertheless concluded that they fit the universal pattern found by Berlin and Kay in 1969. The weight of the evidence given in the WCS [1] and various independent statistical studies supported the conclusion that these universal statistical constraints exist. In the WCS, the centroids of the colour categories elicited by the speakers were found to cluster in the Munsell Colour Space more closely than if it were a result of chance; this finding was then reiterated in the study of the foci of the WCS colour terms, but the conclusion was replicated more tightly. Reiger et al. then suggested that there was an intimate relationship between universal tendencies in colour-naming and focal colours. In addition, a clustering and concordance study also found a hierarchical order in the lexical partitions, or boundaries, in the colour space which reflected the revised (2009) order of colour distinction. To test this revised order again, Loreto, Mukherjee and Tria [21] conducted a computer simulation on how language can evolve through conversations between people. The simulation presented artificial agents with multiple colours at a time, and through a series of simple negotiations, the agents developed shared terms for the different colours. The order in which the labels occurred mirrored that of the 2009 Berlin and Kay order (red < green/yellow < blue < orange). Griffiths and Kalish [22], in a similar way the Loreto et al., questioned whether the explanation of the colour-naming systems lied between individuals or within individuals (whether the systems could be explained by the communication between individuals or by their inherent neurological processes). They concluded that 'the environmental structure might be internalised in the mind over evolutionary time, and then externalised in the form of language through iterated social transmission, with the result that models capturing the structure either in the environment, or in the mind, can fit colour naming well'. This suggests that it is the colours themselves and the communication of these colours that determine the order, rather than development or economic growth of the culture which is home to the language. As a result, it was theorised that the colours that are more fundamentally distinct are associated with colour terms first. Simply, the multitude of publications that were done after the work of Berlin and Kay [2] [1] conveys the significance of the studies clearly, of which a great proportion were positive [23] [24].

Alternative Theories

Hardin's review [25] on the Berlin and Kay Theory posed alternative explanations for the order found in both 2007 and 1969. Webster [26] suggested that the elementary colours are perceptually salient for all speakers which in turn makes the foci more likely to be determined a name or group. Roberson and Davidoff [27] conducted a study comparing colour-term acquisition in English, Himba and Berinmo participants, and posed a few explanations to Berlin and Kay's order. The 2005 study found that the speakers of all three languages encode, remember and discriminate colour stimuli differently, even though the coding systems of the three languages are very similar. Himba participants only showed categorical perception for their own linguistic categories, and not for English or Berinmo categories, so as a result, not for universal categories (evidence to suggest that universal categories do not exist). These findings are likely due for a number of reasons. Firstly, it could be that case that all adults have a universal set of cognitive categories, which are initially innately determined and independent of the of the terms used to describe them. Secondly, speakers may recruit a culture-specific naming system, so that two stimuli may be judged more similar if given the same name than those with different names, biasing our perception [28]. Conversely, this explanation has been nullified by various studies. There has been no correspondence between BCTs and any biological or visual process yet found that could support a universal categorisation system [29, 30, 31]. Additionally, recent cross-cultural studies have found no increased salience for Berlin and Kay's 'proposed universal focal colours' [18] around which such universal categories develop [32, 33]. Thirdly, humans may be born with an innate set of internalised universal cognitive categories, which is later moulded and distorted by the education of the appropriate set of categories for their language [34, 35]. However, it could be that there is no single set of universal categories that are independent of language and culture, so that all divisions of the perceived spectrum (or continuum) of colour have to be learned wither through education or social transmission via communication. If colour categories are formed initially based on the relative similarity between stimuli, then both the salience of stimuli in the natural environment and the variability in the need to define and communicate about those stimuli will affect the set a language creates [36, 19].

To seek the explanation of whether colour acquisition is determined by language in children, Roberson et al. [37] tested groups of English and Himba children with normal colour vision before pre-school and through three years, at six month intervals, of 'formal education' (although a minute number of Himba children received any 'formal education'). After three years, twenty-eight of the English three-year olds and sixty-three-year olds had completed all six (not including the introductory test) tests. Using the 'Colour Aid Matte Stimuli' the children completed four tasks: colour term listing ('tell me all the colours that you know'); colour naming ('what colour is this?'); colour term comprehension ('can you find the red one?'); and a recognition memory task in each of the six tests. Some un-hypothesised similarities were found. The results showed no evidence of the universalist theory (in which primary colours are learned before non-primary terms), and neither group of children acquired colour terms in a predictable order (similar results found in [38, 39, 40, 41]). However, the acquisition of colour terms of a language and its eleven-colour organisation yields the optimal combination of discriminability and 'cognitive economy' for the representation and by proxy, recognition of large numbers of stimuli and their colour categories. Consequently, dialects with fewer terms acquire new terms by introducing/borrowing terms from other languages, but only when there is a greater need to communicate more precisely about colour and certain stimuli through technological advances and increased contact with these cultures. On the other hand, there has been evidence that suggests that the categorical divisions between red, green, yellow and blue are, in fact, innate and perceived categorically by both humans and other primates [34, 42], although this colour categorisation is qualitatively different [43]. Nevertheless, (according to Roberson) the results suggest that infants gradually acquire an order or organisation of colour categories that varies across languages and cultures and is initially based on perceptual similarity. Moreover, without formal education or intensive adult input, the acquisition of colour category is universally a slow and effortful process, but still occurs. Therefore, Robertson et al. confirms Berlin and Kay's theories that the acquisition of colour terms is innate and the order found in colour determinism is not only applicable to language, but also to human beings, like the artificial agents [21]. This further solidifies the significance of Berlin and Kay's work as due to its influence on Roberson's studies, by proxy, it had influence on the studies that were done as a result of Roberson's work.

Another theory posed that counters the Whorfian stance Berlin and Kay take on linguistic relativity is the Vantage theory [44] (Appendix 3). Adam Glaz [45, 46] conducted a review of the cognition based model of colour categorisation that was proposed by MacLaury (a student of Berlin and Kay). Truly, although mapping of colour categories is largely related to the language of the speaker, the Vantage Theory suggests that because the colour boundaries are set in relation to similarity and difference between stimuli, which are inherently mobile and vary between individuals, a speaker's preferred colour terms can have a large proportion of individual variation in colour categorisation.

Explanations for the Order of Colour Determination

Biological

These studies would highlight the biological explanation for the order, where the number and boundaries of the colour categories is dependent on biological/individual factors which is inherently dependent on the mind's process of categorisation. This is possible evidence that humans are born with an innate set of colour categories that are then moulded in later life and perhaps, this innate set is differentiated between groups of individuals. It could be that our biological differences between our social divisions cause alterations in our retina's ability to perceive colour, that is then manifested into the norm through procreating in that group. Evolution of an initial mutation could lead to the number of colour-perceiving cones in the eyes increasing, or the brain's ability to perceive colour changing, which would, over time, create the need for more colour groups as new hues are being identified.

Geographical

A further explanation for the order is due to the geographical differences between the homes of the languages. Marc H. Bornstein [47] conducted an analysis that revealed a pronounced latitude effect that highlighted the tendency of languages spoken natively near the equator to include a 'grue' colour group (the merge of the terms green and blue), in comparison to 'blue' languages that tended to be spoken at temperature latitudes. His attributions combine both the geographical and biological explanation for the colour naming system as he attributed the results to the geographical variation in the 'intra-ocular pigmentation', including the tint of the ocular media (where the speaker's vision is tinted very slightly yellow) and the amount of melanin in the eye (as a result of increased UVB-ray exposure [48]). However, the number of colour categories a language has can also be influenced by the salience of that colour in the nature environment and the geographical factors of the surroundings. A language of a tribe based in the Saharan desert is much more likely to differentiate yellow before green as a colour group than one surrounded by a lush green jungle [1]. It is not only BCTs that are influenced by geography, but clearly a common western example of the geographical influence of colour is in either the Inuit language and the vast plethora of terms for snow that are then used to refer to specific shades of achromatic stimuli (the hues between black and white), or the number of terms in Sona (Zimbabwe) there are for sand/mud which are used to reference the colours of yellow/orange/brown. However, like in Jalé [49], these colour terms do not affect the stage in the Colour Order the language is, as the groups are in reference to an object or a feeling, and therefore are not categorically BCTs.

Cultural

The cultural explanation is given by Allen and Magnus [50] when they sent questionnaires to Christian missionaries, explorers and diplomats (in other words, individuals who have experienced a plethora of cultures in their natural environment first-hand). Allen wrote, 'the colour sense is, as a whole, absolutely identical throughout all branches of the human rights' and Magnus agreed: 'some gave proof of the lack of ability in identifying colours of middle- or short-wavelengths, and this was noted particularly in reference to blue' (similar to Bornstein [47]). This mirrored the effect procreating and social transmission had on colour determinism within a culture. In 1878, Magnus concluded that 'one might be tempted to formulate a… natural law of awareness – be that linguistically engendered or physiologically – anatomically conditioned as part of the natural growth of man'. This was an incredibly close predication of what Berlin and Kay were going to uncover almost one hundred years later.

Developmental

Similarly to the cultural explanation, the developmental explanation of the Colour Order proposed by Berlin and Kay is one that most notably fits the early theories of the investigators back in 1969 [2]. This theory suggests that the number of BCTs that exists in a language is predominantly dependent on the technological and economic status of the speakers' environment. A language that has more native speakers that trade with another will encounter more stimuli and thus, more BCTs will be created if there is a lack, boosting the language's stage, according to the Colour Order. This reliance on trade salience is also evident in the lack of blue in languages used predominantly before the Industrial revolution, where trade and manufacturing of blue dyes found specifically in one culture pushed for the introduction of colour terms for the same stimuli in other languages. Grant Allen [50] also concluded a similar statement in the mid 1800s when he said 'the further differentiation of a colour vocabulary… is most developed among… dryers, milliners, and others who have to deal with coloured articles of clothing'. Individuals who are surrounded by artificial dyes and unnatural colours will have to designate terms for these stimuli, which through trade, will eventually correspond into BCTs for the language which is spoken. In addition, with the increasing presence of technology (in homes or transportation-centred) communication with other languages is increasing dramatically which call upon language which may never have experienced westernised culture and languages before to evolve their variety of BCTs.

Overall, through the multitude of studies conducted after Berlin and Kay's book [2] and WCS [1], is can be theorised that their explanations for the evidently valid universal Colour Order System were indeed proven correct to at least some degree of validity. However, it is most likely a contribution by all four theories (biological, geographical, cultural and developmental) that determines the order of the determination of BCTs and the stage of an individual language. As a result of the overall acceptance of the work of Berlin and Kay, it is proven that their work is hugely significant in the anthological field. The vast number of explanations posed by various large linguistic anthropologists also connotes the significance of the publications and the contributions of the pair.

Analysis and application of the theories

The inevitable question that appears next is what the significance of all the work is. As defined before, significance is also judged by the work's relevance across a large time frame, before the investigation of the order and in a time in the far future when the research has been forgotten.

The colour deficiency explanation outlined in Brown's 2015 Review [51] was based on the psychological analysis of extinct languages by scholars in the 19th Century and arose most likely due to the investigation into human evolution by Darwin at the time. This view was most famously taken by W.E. Gladstone [3] where his study on the paucity of BCTs (especially blue) in Homer's Greek Poems led him to conclude that the Greek were perhaps colour-blind *en masse*. Mark Bradley [52] claimed that the Greek viewed chroma (Latin for 'colour') as the visible outermost shell of an object. In other words, a table would be described as wood-coloured instead of brown, a window, glass-coloured instead of translucent, etc. Therefore, this could easily explain the lack of BCTs as colours were often related to objects and were external manifestations that often refer to ideas such as smell, liquidity, saturation, touch and texture. According to Berlin and Kay's approach, Homeric Greek was between stage III and IV out of VII, as their approach did not take into account different ways of understanding colour (for example, through synaesthesia). Homer's 'wine-dark sea' was interpreted by Gladstone as an example of colour blindness, but in more recent times there have been a few speculations: Bradley suggested that it was a metaphor for the blood shed at a shipwreck at the death of Odysseus's men; another interpretation is that the colour references the colour of the Black Sea at sunset which is said to be a 'fiery red'; and a final interpretation suggests it's an allusion to a now obsolete type of French wine called 'le petit blue'. Triulzi [53] refers to Homer's colour descriptive palette as being limited to metallic colours: black; white; yellow/green ('chloros'); purple/red ('rhodos'). Empedocles, around the same time as Homer, described colour as falling into four areas: light/white; black/dark; red and yellow and Xenophanes described the rainbow as having three bands of colour; blue/purple, green/yellow and red. All three examples of Ancient Greek works convey the colour order of Berlin and Kay with any major deviation, at a time when no such order was theorised. Further examples of ancient languages following the order are given by Geiger and his reviews of a selection of Ancient Texts [54] (Hindu Veda hymns of India, Zend-Avesta book of the Parsees, Old Testament of the Bible, various Greek and Roman transcripts). Geiger argued that 'of the words in any language that are used for blue, a smaller number signified green; the greatest number in the earliest time signified black. We must assume a gradually and regularly rising sensibility to colour'. This significantly follows the developmental explanation for the colour-naming system and the explanation that Berlin and Kay give in 1969, conveying the true significance and validity of their work.

Looking forward to the distant future, it is easily predicted that this order will stay valid, regardless of the technological advances and the further use of transportation. The only shift expected to see is the proportion of languages that will evolve to become stage VII significantly increasing. However, in the distant future, when the work of Berlin and Kay, it is important to hypothesise whether the findings can be investigated again without prompting. At a time where nothing may be known about colour determinism, it is suspected that the order will be found again. This is because the explanations are eternal, individuals will always have to reference colour, and will continue to have a plethora of languages which make communication harder, colour terms will be necessary to trade and for the economy to grow. Biologically, warm tones, in the foreseeable future, will continue to be easier to discriminate from black and white than cool tones, so the order should remain the same.

Therefore, Berlin and Kay's work should have an effect on all linked publications in the foreseeable future, which is true significance, regardless of whether the references act as criticisms or encomiums. It can be hypothesised that if Berlin and Kay had not found the order of colour category discrimination, another linguistic anthropologist would have. This could have been very soon after the actual publication of the 1969 book, or perhaps in the very distant future. This conclusion, and the evidence manifested by the countless other studies of languages that were done as a consequence of the book and the World Colour Survey emphasise the extent the linguistic anthropologists had on the topic.

Brent Berlin and Paul Kay's order and by proxy, their explanations, had a great influence on colour determinism. The various stages, that were later proved by countless behavioural scientists and anthropologists, manifested their claim that not only did colour exist on a spectrum but was malleable according to its environment and its speakers. Along with linguistic determinism, where a language influences the speakers thought processes, Berlin and Kay clearly proved languages influence the speakers as much as the speakers and their environment influence the language. It is this guaranteed identification that solidifies the significance of the work of Berlin and Kay on linguistic relativity and colour determinism.

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Appendix

1. Probably the most famous stage I (Figure 7) language is the language spoken on the Torres Straights of Papua New Guinea. [55] This dialect, spoken on the islands of Badu, Moa and Saibai in 1901, had six notable 'names in general use' but only two (black and white) true BCTs. Rivers noted that four of the six colour groups contained the suffix '-dgamunlga', which roughly translates into English as 'it looks like'. These four names were Kadgamulnga (referring to red or purple) which derived from 'kulka', the name for blood; Murdgamulnga (yellow and orange) from 'mur' meaning yellow ochre; Ildgamulnga (green>blue) from 'il', meaning gall bladder bile; and Maludgamulnga (blue>green) derived from 'malu' meaning sea. As these expressions are formed by the name of an object plus this suffix, they are not true basic colour terms, and therefore don't contribute to the stage of the language. Contrastingly, the terms for what English natives describe as black or white are amiable to analysis; Miakalunga (or merkalunga) refers to a 'spirit' ('merkai?') as is used in conjunction with bright and light descriptions, and Kubikubinga is a true term for black as it is used to describe things such as 'charcoal, night and darkness' (from the stem 'kubi'). These incipient colour categories are, according to Rivers, a result of a 'coexistence of a large number of special names with a few which have become definitely abstract for terms for colour'. It is assumed that all colours were born from names given to objects that were then slowly associated with hue and saturation until they became BCTs. Therefore, as it is often found than the colour term for red usually derived from 'blood' [56] [57], the colours associated with an object (with the suffix -dgamunlga in Mabuiag) will become BCTs at some point in the future. Another Stage I language was a dialect of Tamil (a clear stage V language), called Paliyan Tamil, where cognates of five Plains Tamil BCTs had radically altered meanings, so much that they were no longer associated with a colour, but with a dimension of brightness [58]. 'Karuppu' referred to the darkest of BCTs in both dialects of Tamil, but 'vellai', meaning white in Plains Tamil, was converted to 'velle', meaning illuminated or bright in Paliyan. The other words used to describe yellow, blue, green and red (in order of brightness-related appearance) in Plains were used to describe bright, of medium brightness, and dark in Paliyan. This Paliyan Tamil is unlike any other Stage I language explored in [2] the study as not only has it rejected the BCTs of its dialect, but it also the only language with terms associated with brightness that is not a Stage VII language. Its highly idiosyncratic taxonomy shows a 'de-emphasis on both verbal communication and formality of expression' regarding the basic aspects of Paliyan sustenance related classifications, or in other words, their BCTs. A final example of a unique Stage I language is Koch's research on the New Guinea Highland Group's language, Jalé [49]. Jalé is known for its complete lack of colour terms as it only has words for black ('sin') and white (hóló), and has no suffix (like Mabuiag) to suggest a colour category or any other distinction of brightness (like Paliyan Tamil). Jalé, of course, has terms for other specific hues, but often only refer to the colour one object is and is not referred to at any other point; 'mut' for red soil, 'pianó' for 'the colour of leaves used to dye yarn a green colour'. In conclusion, Stage I languages are usually due to simple technological and cultural development, with very few, if any meetings with the western world, as this communication would push for the distinction of more BCTs.
   In summary of the rest of the book, it gives examples of each stage presented in the original sample of 98 languages. For Stage II, (Figure 8) the introduction of red provides a different category for warm hues, in which lies the foci 'red'. Many of the less developed African languages fall into this stage, like Tiv [59]. Tiv has three BCTs:

‘ii’ covers all of English green, some blues and some greys, in other words, it’s their distinction for black; ‘pupu’ (white) covers very light blue and some light greys; and ‘nyian’ which covers most warm hues, like brown, red and yellow. Stage II, although for most languages, symbolises this distinction of red from white and black, is truly the categorisation of the warm hues that are most distinctive to the eye after distinctions of brightness. Stage III (Figure 9) includes a language that has garnered a lot of celebrity due to its unique method of colour categorisation. Hanunó’o, spoken in the Philippines, categorise their four colour categories by light (malagti) v. dark (mabi:ru), and fresh (malatuy) v. dry (marara) (Figure 2) [13]. These comparisons then correlate into strength v. weakness, or saturation, which correlates with Conklin’s conclusion that groups were determined by a multitude of factors, but most namely hue, saturation and brightness, with an element of succulence v. desiccation (it can also be, but rarely, surface texture, shape and consistency). ‘Malatuy’ as a BCT covers the English equivalents of green, yellow and dark brown, whereas ‘marara’ includes maroon, red, orange and warm yellow. This is where cool hues, instead of being distinguished by brightness, is now given its own group, mirroring red in the previous stage. Ascending a stage, Stage IV is shown to be increasingly common in the sample. This is when yellow and green are separated. Examples include Ibo, a Nigerian language, and all the Mexican and Guatemalan Mayan dialects studied. Tzeltal is then the bridge between stage VI and V as ‘yaš’, its BCT for green, has a maximum extension of green, blue-green, blue and some blue-purples [60]. Whereas, in a normal Stage IV (Figure 11) language, most blues, with the exception of very light blues, and blue-purples, would categorise under the BCT for black or dark. Furthermore, In MacLaury’s study, thirty-one informants indicated that ‘yaš’’s foci fell precisely on the foci of English green, but nine informants referred to English blue as the Spanish BCT ‘asul’, so it is hypothesised by Berlin and Kay [2] that furthered economic development and education will lead to Tzeltal becoming a Stage V language. Stage V (Figure 12) languages, in the 1969 sample, are found only in Africa and Southern India, but only in tribal dialects, such as the Nupe and Maasai. Similarly, Stage VI (Figure 13) contains the BCT for brown, but is also found in African and Southern Indian dialects, with a few Native American dialects additionally. Finally, Stage VII (Figure 14) is the utmost stage which has multiple variants. Any language that has BCTs that cover all other stages and any of orange, pink, purple and grey, count as Stage VII, and consequently, this Stage includes languages that have all four final BCTs, just one, or any combination of the four. Twenty of the eighty languages in the Berlin and Kay study make up this Stage, which include: Urdu (has a BCT for purple); Cantonese (BCT for pink); Taglog (lacks BCT for orange); and Catalan (BCTs for pink and orange). Most western languages, like Spanish, English, French, etc. have eleven BCTs, including all four that were introduced in stage VII. Conversely, there a few exceptions to Stage VII as some of the most developed (and influenced by colonialism) countries are home to languages which further this stage. Russian, for example, has twelve BCTs, with one for dark blue (синий ‘siniy’) and one for light blue (голубой ‘goluboy’) [61]. In addition, Hungarian also has twelve BCTs, with two for red (‘piros’ and ‘vörös’) [62]. As of 1969, Berlin and Kay described the existence of a further stage to be ‘unknown’.

2. The new sample was updated to include over two thousand six hundred native speakers of one hundred and ten unwritten languages. The participants were asked to name each off the three hundred and thirty-three (originally three hundred and twenty-nine but the whitest possible to manufacture was added to complete the palette) Munsell colour chips (Figure 3) in random order and were then asked to choose the foci of the major

colour terms (‘the smallest set of simple words with which the speaker can name any colour’) elicited in the naming task.

3. The theory’s ‘major tenet’, is that humans ‘construct colour categories as one, two or occasionally three vantages, and a category is an assembly of those vantages. MacLaury interviewed approximately nine hundred speakers of one hundred and sixteen Mesoamerican languages. Through three tests of naming, focus selection and mapping (collating all the stimuli into groups of colour using the Munsell Colour Chips), MacLaury found that a person will anchor their cognition on a specific dimension of colour (hue, saturation or brightness) and will relate the colour stimuli to that fixed coordinate/spatial landmark/foci through similarity or disparity. Speakers will shift their focus by moving between the extremes of the dimensions. From the mapping activity of the study, MacLaury found that each of two terms that are elicited is always in reference to a different elemental hue (as there are no categories which contain the same foci in a single language). There is also a common substantial overlap of the two terms during mapping, commonly with English turquoise or very dark hues of any colour.

Glossary

In recent years – in anthropological terms, 'recent years' refers to the past 100 years.

Foci – the best example of a colour term, deemed the point at which there is no discrepancy between native speakers of the same language at to what colour group is falls under.

Sapir-Whorf Hypothesis – the structure of a language determines a native speaker's perception and categorisation of an experience.

Linguistic Relativity – an inability to perceive something because of linguistic restriction.

Munsell colour space – and order system which is applicable to all colours. Neutral colours are placed along a vertical line with black at the bottom, and white at the top. The different hues are displayed at various angles around the neutral axis.

Munsell Solid – the specific regions of the Munsell Colour Space where all colours lie.

Munsell Colour Chips – 330 individual chips in glass 35 mm slides which cover 40 different hues and eight levels of lightness. These chips cover all colours in the known visible colour spectrum.

Colour Determinism – the differentiation of colours by colour grouping.

Basic Colour Term (BCT) – a term for a colour group that has no affiliation with an object, texture, scent or pattern and is not borrowed from another language.

Categorical Perception (CP) – faster or more accurate discrimination of stimuli that straddle a category boundary, compared to stimuli of the same colour category.

Vantage – point of view.

Etic v. Emic – from outside the social group v. from within.

Pseudo-random – satisfying one or more statistical test for randomness but produced by a definite mathematical procedure,

Hering Colours – developed by Ewald Hering (1920-64), the opponent-process theory states that the cone photoreceptors are linked together to form three opposing colour pairs: blue/yellow, red/green and black/white.

Ethnographic – relating to the scientific description of peoples and cultures with their customs, habits and mutual differences.

Dogma – a principle (or set of principles) laid down by an authority as incontrovertibly true.

Grue Categories – those that cover both green and blue.

Corpus – a data set of naturally occurring language that can be used to generate or test linguistic hypotheses.

Motif – colour naming system.

Synaesthesia – the holistic approach held by many anthropologists that a colour term is the coding of an experience that is an expression of a combination of many senses.

References

Table I: The Twenty-one Possible Basic Color Lexicons

Perceptual categories encoded in the basic color terms:

Type	No. of basic color terms	white	black	red	green	yellow	blue	brown	pink	purple	orange	grey
1	2	+	+	–	–	–	–	–	–	–	–	–
2	3	+	+	+	–	–	–	–	–	–	–	–
3	4	+	+	+	+	–	–	–	–	–	–	–
4	5	+	+	+	+	+	–	–	–	–	–	–
5	6	+	+	+	+	+	+	–	–	–	–	–
6	7	+	+	+	+	+	+	+	–	–	–	–
7	8	+	+	+	+	+	+	+	+	–	–	–
8	8	+	+	+	+	+	+	+	–	+	–	–
9	8	+	+	+	+	+	+	+	–	–	+	–
10	8	+	+	+	+	+	+	+	–	–	–	+
11	9	+	+	+	+	+	+	+	+	+	–	–
12	9	+	+	+	+	+	+	+	+	–	+	–
13	9	+	+	+	+	+	+	+	+	–	–	+
14	9	+	+	+	+	+	+	+	–	+	+	–
15	9	+	+	+	+	+	+	+	–	+	–	+
16	9	+	+	+	+	+	+	+	–	–	+	+
17	10	+	+	+	+	+	+	+	+	+	+	–
18	10	+	+	+	+	+	+	+	+	+	–	+
19	10	+	+	+	+	+	+	+	+	–	+	+
20	10	+	+	+	+	+	+	+	–	+	+	+
21	11	+	+	+	+	+	+	+	+	+	+	+

Figure 1.

From B. Berlin and P. Kay, Basic Colour Terms: Their Universality and Evolution, Los Angeles: University of California Press, 1969. [2]

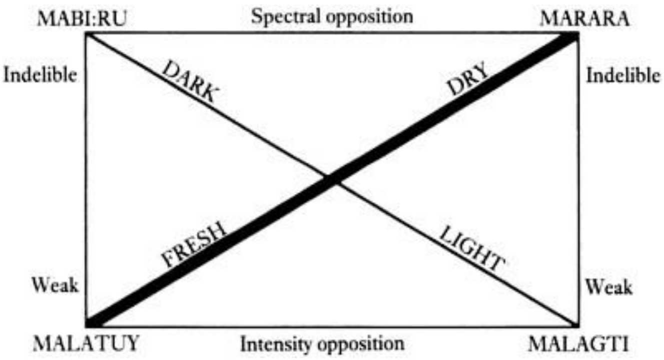

Figure 2.

From J. A. Lucy, "15 The linguistics of 'color'," *Color categories in thought and language,* p. 320, 1997. [13]

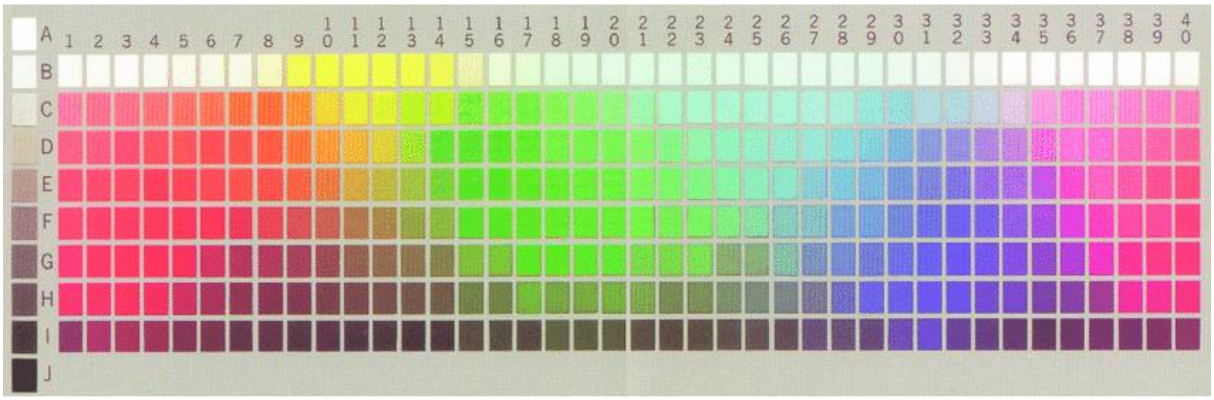

Figure 3. The Chart of Munsell Colour Chips used in P. Kay, B. Berlin, L. Maffi, W. R. Merrifield and R. Cook, The world color survey, San Francisco: CSLI Publications Stanford, CA, 2009. [1]

Figure 4-14 are from: B. Berlin and P. Kay, Basic Colour Terms: Their Universality and Evolution, Los Angeles: University of California Press, 1969. [2]

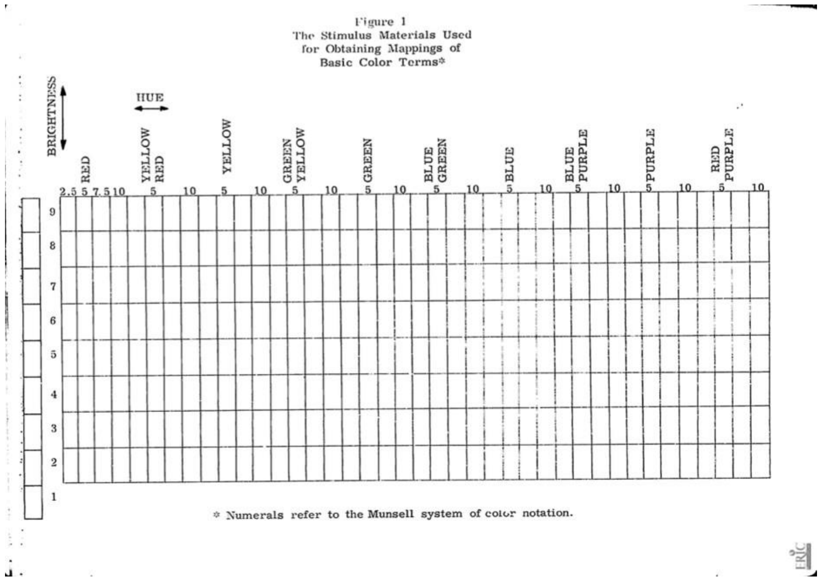

Figure 4

A blank colour spectrum used to label foci [2].

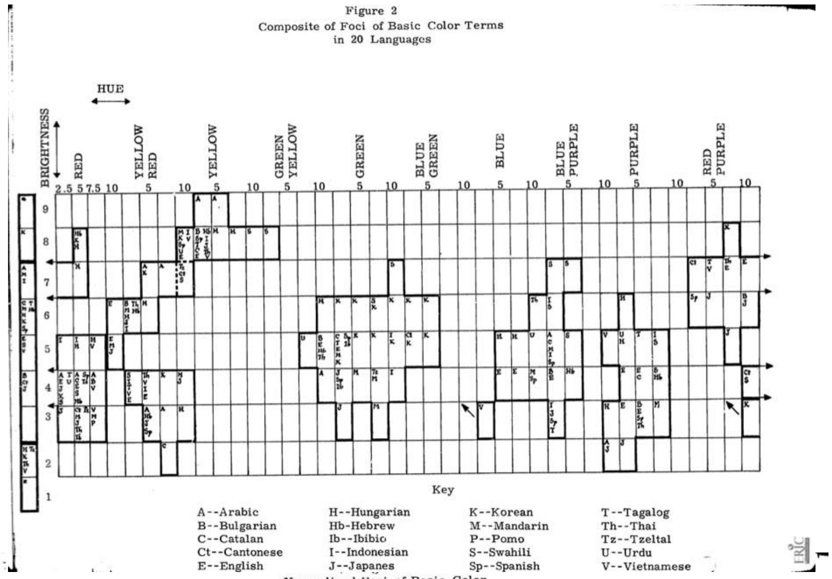

Figure 5.

The labelled foci of 20 languages used in the 1969 study [2].

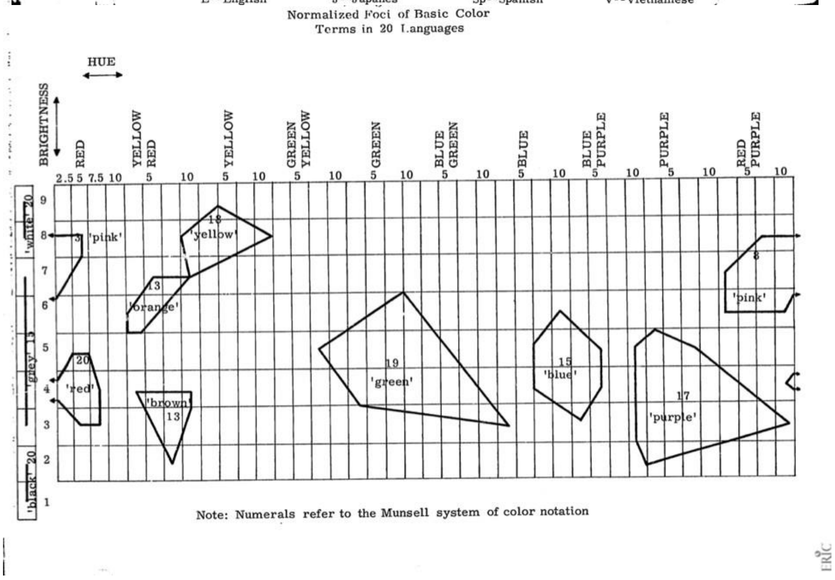

Figure 6.

The international layout of colour term foci found.

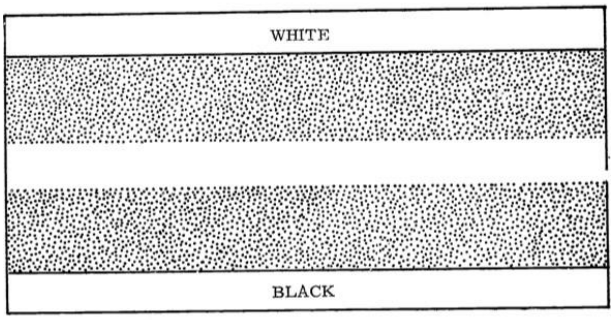

Figure 7.

Typical Stage I Basic Color Lexicon

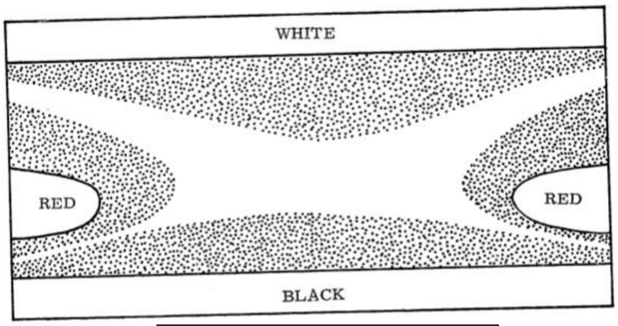

Figure 8.

Typical Stage II Basic Color Lexicon

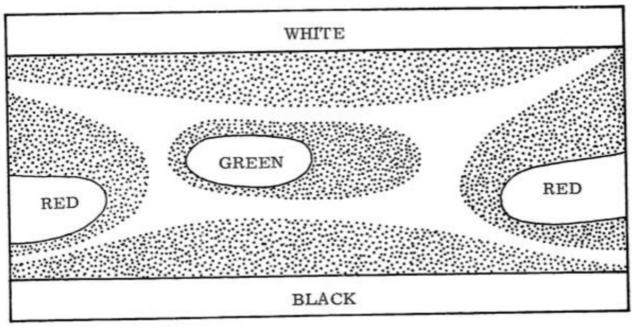

Figure 9.

Typical Stage III Basic Color Lexicon, Major Variant

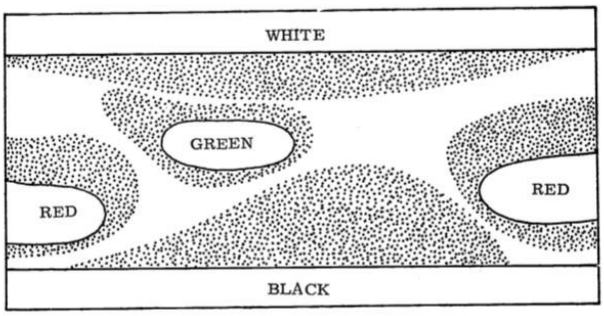

Figure 10.

Typical Stage III Basic Color Lexicon Minor Variant

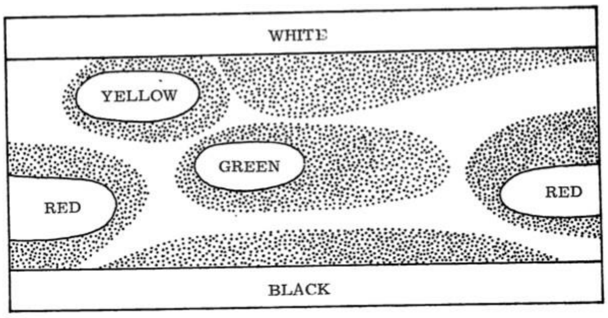

Figure 11.

Typical Stage IV Basic Color Lexicon

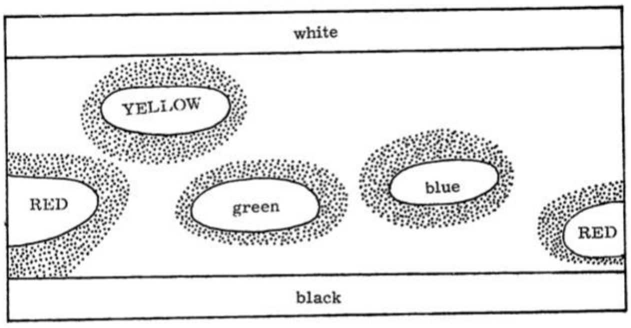

Figure 12.

Typical Stage V Basic Color Lexicon

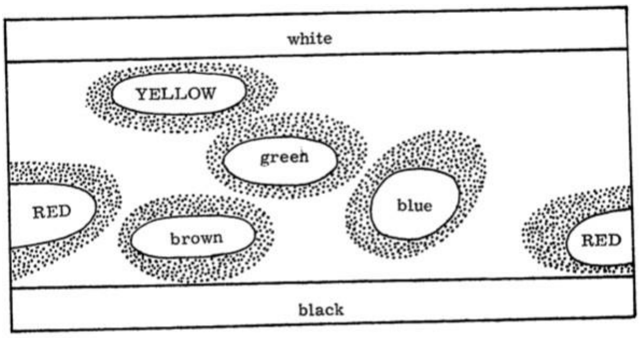

Figure 13.

Typical Stage VI Basic Color Lexicon

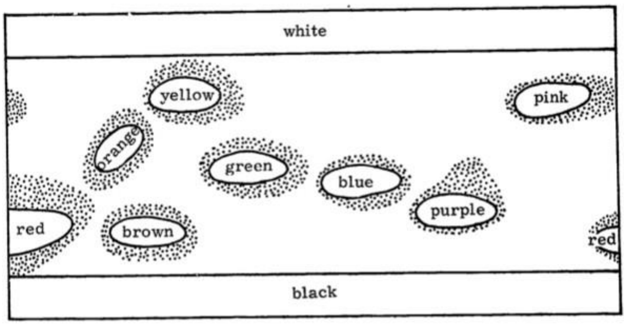

Figure 14.

Typical Stage VII Basic Color Lexicon, Eleven Term System*

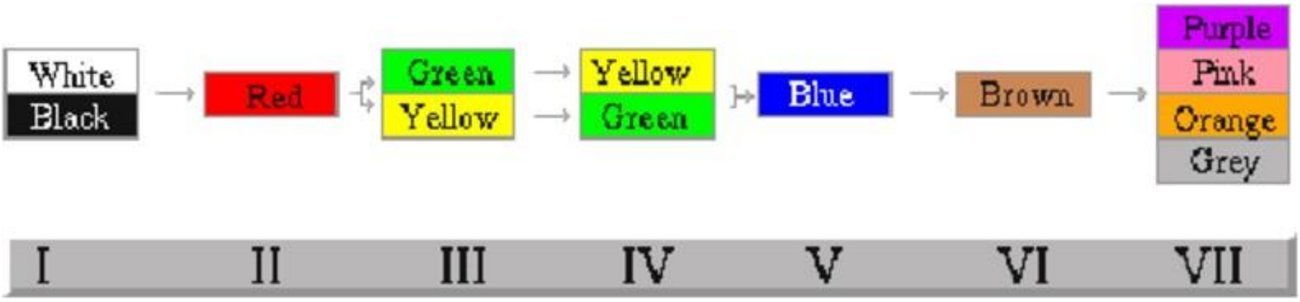

Figure 15. The order of colour group determination in V. Sarapik, "The Colour and the Word," *Folklore (Tartu),* vol. 3, no. 04, 1997. [63]