R E P O R T   R E S U M E S

ED 019 655 AL 001 003

UNIVERSALITY AND EVOLUTION OF BASIC COLOR TERMS. WORKING PAPER NUMBER 1.

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EDRS PRICE MF-$0.50 HC-$3.24 79P.

DESCRIPTORS- *LANGUAGE UNIVERSALS, *VISUAL DISCRIMINATION, *CULTURAL FACTORS, *COMMUNICATION (THOUGHT TRANSFER), *LANGUAGE RESEARCH, COGNITIVE MEASUREMENT, COGNITIVE TESTS, HYPOTHESIS TESTING, CODIFICATION, ANTHROPOLOGY, LINGUISTIC THEORY, BASIC COLOR TERMS,

THE RESEARCH REPORTED IN THIS WORKING PAPER "STRONGLY INDICATES" THAT SEMANTIC UNIVERSALS HAVE BEEN DISCOVERED IN THE DOMAIN OF COLOR VOCABULARY. MOREOVER, THESE UNIVERSALS APPEAR TO BE RELATED TO THE HISTORICAL DEVELOPMENT OF ALL LANGUAGES IN A WAY THAT CAN PROPERLY BE TERMED EVOLUTIONARY. THE RESEARCH WAS CONDUCTED IN A GRADUATE SEMINAR GIVEN IN THE DEPARTMENT OF ANTHROPOLOGY, UNIVERSITY OF CALIFORNIA, BERKELEY. STUDENTS AND THE AUTHORS SYSTEMATICALLY COLLECTED DATA FROM SEVERAL INFORMANTS IN EACH OF SEVENTEEN LANGUAGES FROM A NUMBER OF UNRELATED LANGUAGE FAMILIES. AN ADDITIONAL THREE LANGUAGES WERE INVESTIGATED IN DETAIL AFTER THE ORIGINAL RESEARCH SEMINAR WAS COMPLETED. THESE MATERIALS FROM TWENTY LANGUAGES WERE SUPPLEMENTED BY COMPARATIVE DATA FROM THE LITERATURE, BRINGING THE SAMPLE OF LANGUAGES TO 80 REPRESENTING A WIDE VARIETY OF MAJOR LINGUISTIC STOCKS. THE SEMINAR WAS DESIGNED AS AN EXPERIMENTAL TEST OF THE FOLLOWING, LOOSELY STATED HYPOTHESIS--THE PREVAILING DOCTRINE OF AMERICAN LINGUISTS AND ANTHROPOLOGISTS HAS, IN THIS CENTURY, BEEN THAT OF EXTREME LINGUISTIC RELATIVITY. PROPONENTS OF THIS VIEW FREQUENTLY OFFER AS A PARADIGM EXAMPLE THE ALLEGED TOTAL SEMANTIC ARBITRARINESS OF THE LEXICAL CODING OF COLOR. THE AUTHORS FEEL THAT THIS ALLEGATION OF "TOTAL ARBITRARINESS" IN THE WAY LANGUAGES SEGMENT THE COLOR SPACE IS A "GROSS OVERSTATEMENT." THEIR HYPOTHESIS WAS BASED ON INTUITIVE EXPERIENCE IN SEVERAL LANGUAGES OF THREE UNRELATED MAJOR STOCKS. THEIR FEELING WAS THAT COLOR WORDS TRANSLATED RATHER TOO EASILY AMONG VARIOUS PAIRS OF UNRELATED LANGUAGES FOR THE EXTREME LINGUISTIC RELATIVITY THESIS TO BE VALID. THEIR RESULTS SUPPORT THE ABOVE HYPOTHESIS AND CAST DOUBT ON THE COMMONLY HELD BELIEF THAT EACH LANGUAGE SEGMENTS THE THREE DIMENSIONAL COLOR CONTINUUM ARBITRARILY AND INDEPENDENTLY. THEY SUGGEST THAT ALTHOUGH DIFFERENT LANGUAGES ENCODE IN THEIR LEXICONS DIFFERENT NUMBERS OF BASIC COLOR CATEGORIES, THERE EXISTS UNIVERSALLY A TOTAL INVENTORY OF 11 BASIC COLOR CATEGORIES FROM WHICH THE 11 OR FEWER BASIC COLOR TERMS OF ANY GIVEN LANGUAGE ARE ALWAYS DRAWN--THESE CATEGORIES BEING WHITE, BLACK, RED, GREEN, YELLOW, BLUE, BROWN, PINK, ORANGE, AND GREY. (AMM)

Universality and Evolution

of Basic Color Terms

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Working Paper Number 1,
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Contents

0. Introduction

Ethnoscience studies, and studies of color vocabulary in particular, have firmly established the point that to understand the full range of meanings of a word in any language, each new language must be approached in its own terms, without a priori theories of semantic universals. H.C. Conklin (1955) has shown, for example, that Hanunóo "color" words in fact encode a great deal of non-colorimetric information. The essentially methodological point made in such studies has been frequently misinterpreted by anthropologists and linguists as an argument against the existence of semantic universals. The research reported here strongly indicates that semantic universals have been discovered in the domain of color vocabulary. Moreover, these universals appear to be related to the historical development of all languages in a way that can properly be termed evolutionary.

1. The hypothesis and general findings

Research was conducted in a graduate seminar given in the Department of Anthropology, University of California, Berkeley. Students and the authors systematically collected data from several informants in each of seventeen languages from a number of unrelated language families. An additional three languages were investigated in detail after the original research seminar was completed.[1] These materials from twenty languages were supplemented by comparative data from the literature bringing our present sample of languages to 80 representing a wide variety of major linguistic stocks.

The seminar was designed as an experimental test of the following, loosely stated hypothesis: The prevailing doctrine of American linguists and anthropologists has, in this century, been that of extreme linguistic relativity. Proponents of this view frequently offer as a paradigm example the alleged total semantic arbitrariness of the lexical coding of color.[2] We suspect that this allegation of "total arbitrariness" in the way languages segment the color space is a gross overstatement.

The hypothesis was based on the intuitive experience of the authors in several languages of three unrelated major stocks. Our feeling was that color words translated rather too easily among various pairs of unrelated languages for the extreme linguistic relativity thesis to be valid. Our results support the above hypothesis and cast doubt on the commonly held belief that each language segments the three dimensional color continuum arbitrarily and independently of each other language.[3] It appears now that, although different languages encode in their lexicons different numbers of basic color categories, there exists universally a total inventory of eleven basic color categories from which the eleven or fewer basic color terms of any given language are always drawn. The eleven basic color categories are white, black, red, green, yellow, blue, brown, pink, orange, and grey.

A second and totally unexpected finding is the following: if a language encodes some number $n < 11$ basic color categories, then there are strict limitations on which n categories it may encode. The list of 11 basic categories is partially ordered, producing seven equivalence classes[4]:

1. white, black < 2. red < 3. green < 4. yellow < 5. blue < 6. brown < 7. purple, pink, orange, grey   1

If a language codes a category from the mth equivalence class, $(m = 1, 2, \ldots, 7)$, then it encodes all categories in each equivalence class $r < m$. Thus, excluding the empirically unlikely possibility of a one-term color vocabulary, there are just twenty-one possible basic color lexicons.[5] (See Table 1; we are not of course referring to the phonological or syntactic features of the color lexemes). Moreover, if a color lexicon encodes six or fewer categories, we can predict exactly which ones they will be. This fact has clear implications for the evolution of color vocabulary in all languages. (In fact, the above ordering gives considerably over-simplified picture of the detailed evolutionary sequence, which is presented below).

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	+	+	+	+	+	+	+	+	+	+	+

In sum, our two major findings are (i) the referents for the basic color terms of all languages appear to be drawn from a set of 11 universal perceptual categories, (ii) these categories become encoded in the history of a given language in a (partially) fixed order. There does not appear to be any evidence that differences in complexity of basic color lexicon between languages reflect perceptual differences between the speakers of those languages.[6]

1.1. Procedure.

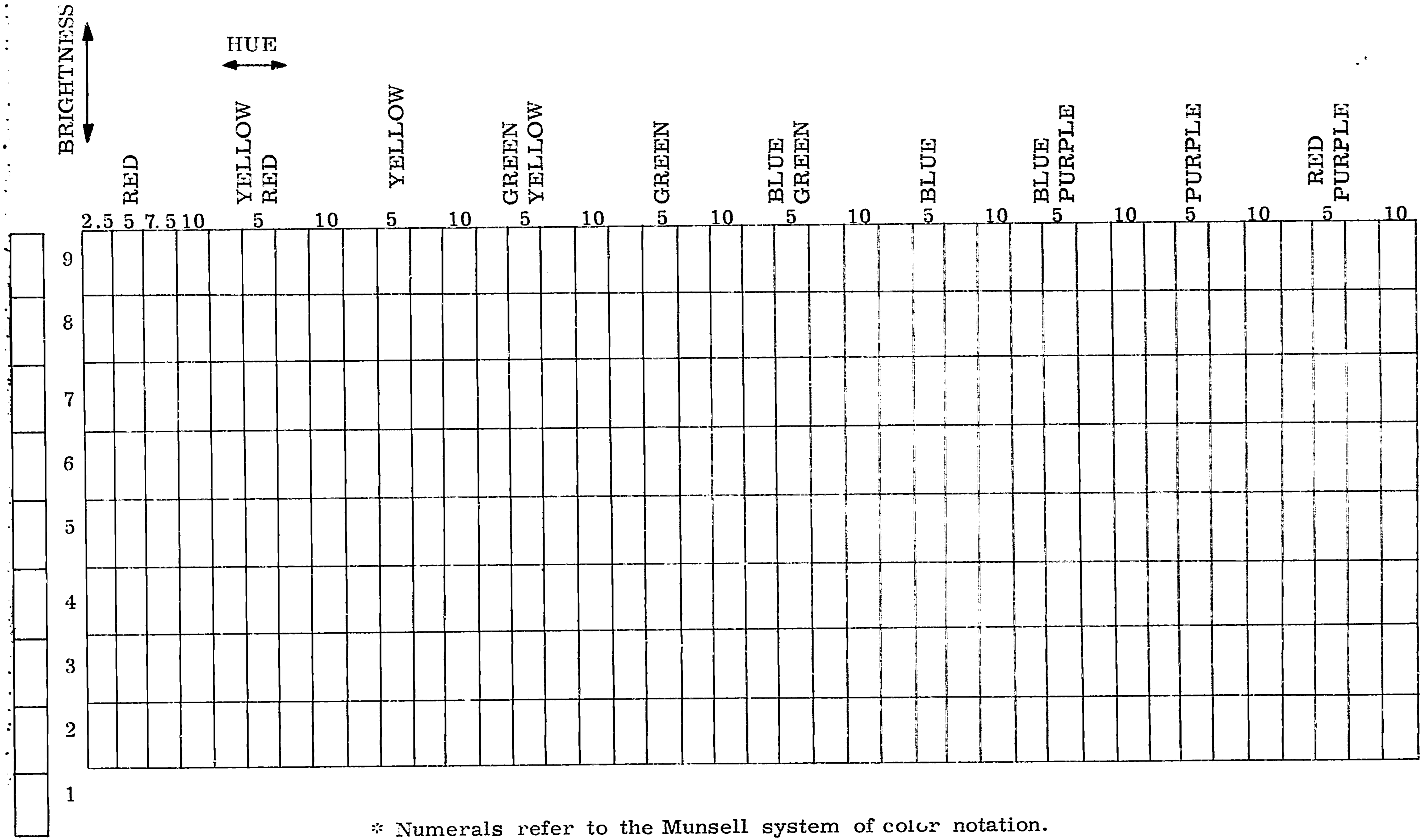
Standarized color stimuli were used in conducting the research. These consisted of a set of 329 color chips provided by the Munsell Color Company.[7] The set is comprised of (i) 320 color chips of 40 equally spaced hues and eight degrees of brightness, all at maximum saturation, and (ii) nine chips of neutral hue (white, black and greys). The full array of chips was mounted on stiff cardboard and covered with acetate to form the array shown in Fig. 1. With the exception of our addition of the neutral hue series, these materials are the same as those used by Lenneberg and Roberts (1953) in their classic cross-cultural study of English-Zuni color terminology. Our method of obtaining the individual mappings differs, however, from theirs, as may be seen by comparing the following discussion with their work.

Data were gathered in two stages. First the basic color words of the language in question were elicited according to ethnoscience techniques[8] using as little as possible of any language other than the one under study during the interview. Secondly, each subject was instructed to map both the focal point and the outer boundary of each of his basic color terms on the array of standard color stimuli described above.

1.2. Defining basic color terms.

There is in every language an indefinitely large number of expressions that can denote color. Note, for example, the following English expressions:

Figure 1
The Stimulus Materials Used
for Obtaining Mappings of
Basic Color Terms*



* Numerals refer to the Munsell system of color notation.

(a) crimson, (b) scarlet, (c) blond, (d) blue-green, (e) bluish, (f) lemon-colored, (g) salmon-colored, (h) the color of the rust on my aunt's old Chevrolet. On the other hand, psychologists, linguists, and anthropologists have long operated with a concept "basic color term" or "basic color word", which excludes forms such as (a)-(h) and includes forms like black, white, red, green, and so on. "Basic color term" does not have a unique, accepted operational definition. Our operational procedure for the determination of basic color terms is as follows. Ideally, each basic color term should exhibit the following four characteristics:

(i) It is mono-lexemic, i.e., its meaning is not predictable from the meaning of its parts.[9] This criterion eliminates examples (e)-(h) and perhaps also (d).

(ii) Its signification is not included in that of any other color term. This criterion eliminates examples (a) and (b) which are both kinds of red for speakers of English.

(iii) Its applicability must not be restricted to a narrow class of objects. This criterion eliminates example (c) which may be predicated only of hair, furniture and perhaps a few other things.

(iv) It must be salient for informants, tending to occur at the beginning of elicited lists of color terms, stable in its reference, occurring in the ideolects of all informants, etc. This criterion eliminates all the examples (a)-(h), most particularly (h).

Criteria (i)-(iv) suffice in the vast majority of cases to determine the basic color terms in any language. The few doubtful cases that arise are handled by the following subsidiary criteria:

(vi) The doubtful form should have the same distributional potential as the previously established basic terms. For example, in English, allowing the suffix -ish, e.g., redish, whitish, greenish, etc., but not *scarletish, *blue-greenish, etc.

(vii) Names of objects characteristically having the color in question are suspect, e.g., gold, silver, ash. This subsidiary criterion would exclude orange, in English, if it were a doubtful case on the basic criteria (i)-(iv).

(viii) Recent foreign loan words are suspect, other things being equal.

(ix) In cases where lexemic status is difficult to assess, morphological complexity is given some weight as a secondary criterion. The Engoish term blue-green might be eliminated by this criterion.

1.3. Mapping basic color terms.

No mapping of color terms was attempted until each investigator had elicited verbally the basic color terms in each language. Mapping was accomplished by use of acetate strips cut to the size of the stimulus board. Each informant was given a black grease pencil (china marker) and asked, for each basic color term, x:

(i) Please indicate all those chips which you would under any conditions call x.

(ii) Please indicate the best, most typical examples of x.

Our querries were designed to get at the total area of a basic category and to determine, as well, its focus or most typical member(s). The mapping procedure was carried out at least three times, at one week intervals, for each informant. Often, we had access to only one informant per language. However, in the case of Tzeltal (Mayan), it was possible to consult 40 informants.

The languages we selected were relatively diverse genetically. The choice of each, however, was limited by informant availability. All informants were native speakers of their respective languages and, with the exception of the Tzeltal individuals, resident in the San Francisco Bay Area. Our primary data include basic color categories for the following languages:

1. (Lebanese) Arabic
2. Bulgarian

3. Catalan
4. Cantonese (Chinese)
5. Mandarin (Chinese)
6. English
7. Hebrew
8. Hungarian
9. Ibibio
10. Indonesian
11. Japanese
12. Korean
13. Pomo
14. (Mexican) Spanish
15. Swahili
16. Tagalog
17. Thai
18. Tzeltal
19. Urdu
20. Vietnamese

1.4. Universality of basic color terms.

After each language was mapped, we made a composite for all languages of the foci of all basic color terms. The composite is given in Fig. 2, where letters indicate the twenty languages for which we have systematically collected data. When several neighboring chips are marked by the same letter, it indicates that several chips were judged to be equally good representatives of the focus of a category. Fig. 2, although a brute summary of the data and consequently rather hard to read, nevertheless shows the considerable extent to which the foci of color categories are similar among totally unrelated languages. Both (i) the large blank areas (over 70% of the surface of the chart) and (ii) the close

Notes to Figure 2

a) Dotted-lines on chip YELLOW RED 10, brightness 7, indicate overlap of the categories orange and yellow. It is affiliated with yellow for Tzeltal and Cantonese, with orange for Swahili.

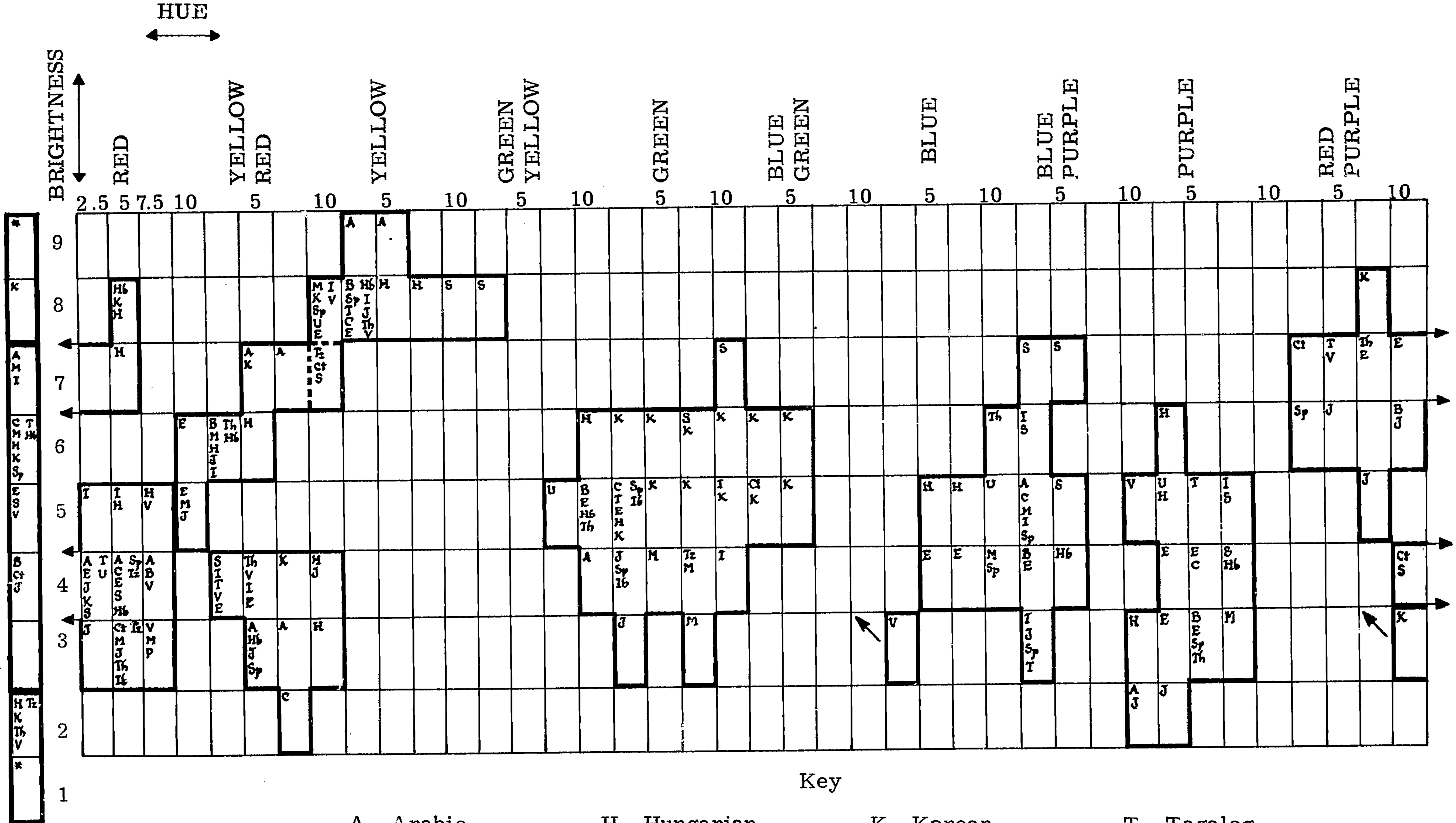
b) Arrow emanating from chip BLUE 2.5, brightness 3 indicates its affiliation with the category 'green' for Vietnamese. Likewise, chip RED PURPLE 10, brightnese 3 is affiliated with 'purple' for Korean.

c) * indicate chips chosen as category foci for each of the 20 languages.

d) Where a letter occurs more than once, several chips were judged to be equally good representatives of the focus of the category.

Figure 2

Composite of Foci of Basic Color Terms in 20 Languages



Key

A--Arabic
B--Bulgarian
C--Catalan
Ct--Cantonese
E--English
H--Hungarian
Hb-Hebrew
Ib--Ibibio
I--Indonesian
J--Japanes
K--Korean
M--Mandarin
P--Pomo
S--Swahili
Sp--Spanish
T--Tagalog
Th--Thai
Tz--Tzeltal
U--Urdu
V--Vietnamese

clustering into discrete, contiguous areas of the foci of the various languages, attest to the failure of the strict linguistic relativity hypothesis.

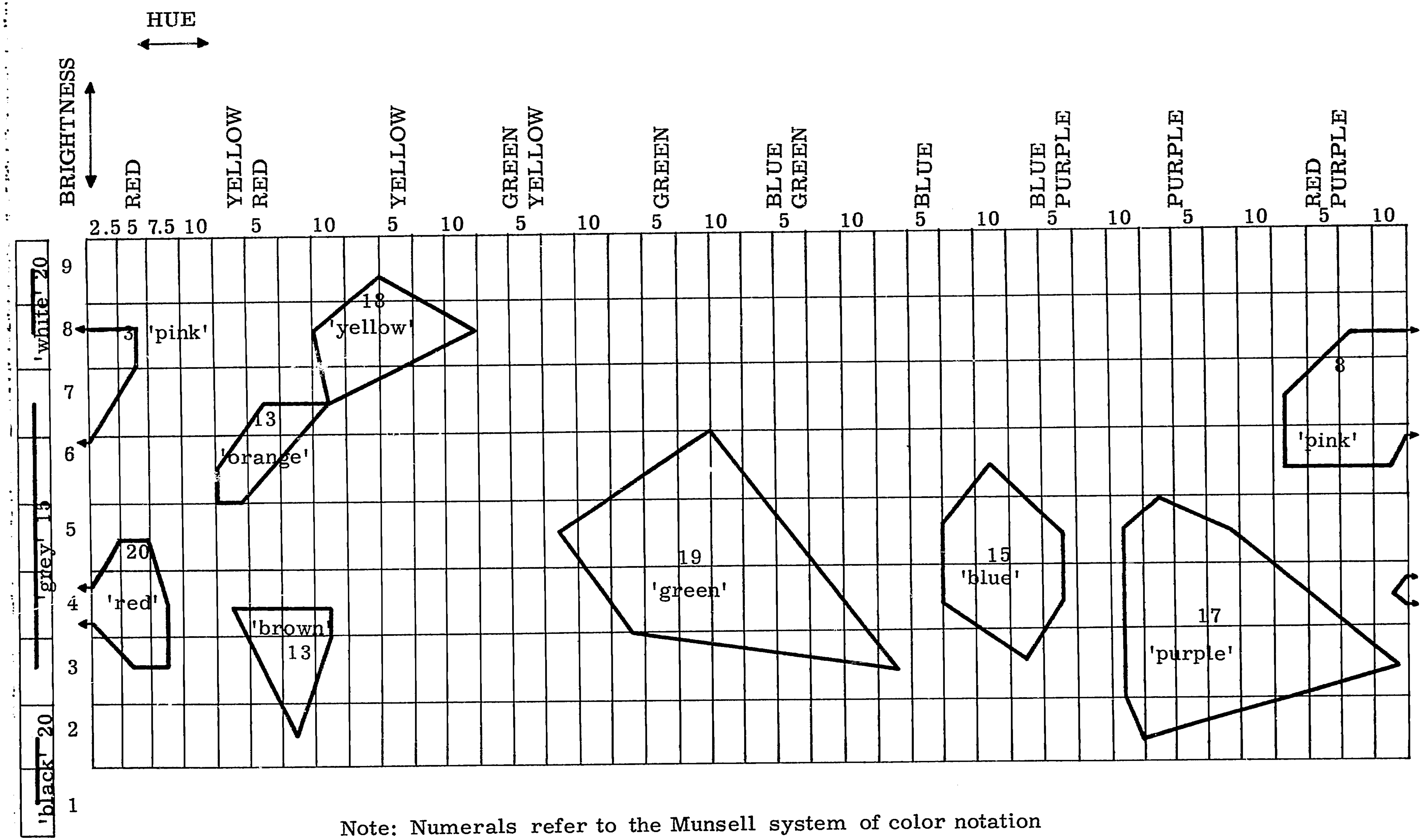
This effect can be seen more clearly in Fig. 3. As shown in Fig. 2, informants frequently designate more than one chip as the focus of a color term. Fig. 3 is based on a calculation for each language of the center of gravity of the focus area for each basic color term in each language; each of the eleven areas, with an associated gloss (e.g., 'white', 'red') includes foci for a number of languages equal to the corresponding numeral (e.g., the area 'red' includes the foci for all 20 languages, the area 'orange' includes foci for 11 languages, the remaining 9 languages in the sample lacking a term for this category, and so on). The results shown in Fig. 3 support quite strongly our initial hypothesis: color categorization is not random and the centers of basic color terms are very similar in all languages.

1.5 Inter-language vs inter-informant variability

Further evidence for the cross-language universality of color foci is the fact that variability in the location of color foci appears to be greater among the speakers of a given language than between languages. Whether or not the observed result - that inter-informant variability in a given language exceeds inter-language variability - would attain statistical significance under various sampling assumptions, from the fact that intra-language variability absolutely exceeds inter-language variability, we can confidently reject the hypothesis of greater intra-language variability in favor of the null hypothesis of no difference.

The question of inter- vs intra-language variability was assessed as follows. The only language on which we have reliable data for a substantial number of informants is Tzeltal. Data were collected for forty Tzeltal informants. Of these, thirty-one located the center of *yaš* in the green area and nine in the blue area, a fact discussed in detail below (section 2.4.3.). Tzeltal has five basic color terms: 'white', 'black', 'red', 'green' (i.e., *yaš*), and 'yellow'.

Figure 3
Normalized Foci of Basic Color
Terms in 20 Languages



Note: Numerals refer to the Munsell system of color notation

From the thirty-one yaš-normal informants a random sample of ten was selected. The restriction to yaš-normal informants biases the Tzeltal sample toward homogeneity and thus in the direction opposite from the point being made here.

There are no other languages in the basic sample of twenty containing just five terms. However, three languages Japanese, Korean, and Cantonese can be reconstructed to five-term systems on the basis of internal evidence (see section 2.4 for detailed discussion of internal reconstruction). The foci for white, black, red, green, and yellow in these three languages and in Tzeltal were used for the inter-language comparisons. The bias, if any, introduced by using languages with varying numbers of color terms should be toward greater between-language variation, again in the direction opposite from the observed result. The foci for Cantonese, Korean, and Japanese were each obtained from a single informant.

In order to introduce a finer co-ordinate system for computing inter-focus distances each unit of hue and brightness was sub-divided into four units, yielding 160 units of hue and 36 of brightness. That is, each box in Figure 1 is considered a square of 4-unit side rather than 1-unit side.

For each of the forty-five pairs of Tzeltal informants, the Euclidean distance between their foci for each of the five color categories was calculated, resulting in 225 distances (45 informant-pairs x 5 color categories). The overall mean of these 225 inter-informant (intra-language) differences is 4.47 units on the fine scale, or roughly one and one half chip widths.

The distances between foci were calculated for each of the five categories, for each pair of languages. Two slightly different sets of foci were used for Tzeltal in these comparison: (1) the five foci of a single informant selected at random from the sample of ten, and (2) the five mean foci for the ten informants - that is, the points given by the arithmetic means of the hue and brightness co-ordinates of the ten informants for each category. The different ways of treating Tzeltal did not materially affect the result. The inter-language distances for each of the five foci were then averaged for each pair of languages to give a single mean distance measure for every language pair. The results of these computations are summarized in Table II, which shows that every inter-language distance exceeds the mean inter-informant distance for the sample of Tzeltal informants.

The above results, we think, are interesting given the traditional anthropological attitude concerning the nature of human color categorization. While it can be argued that bilingualism in English affects the results to some extent (cf. Ervin, 1961), we find it hard to conceive that English could influence the placement of the foci of categories in these diverse languages in such a total fashion. Moreover, the work completed with forty Tzeltal informants varying from pure Tzeltal monolinguals to perfect Tzeltal-Spanish bilinguals indicates that our results are not skewed due to bilingualism. Finally, the fact that inter-individual differences in a given language appear to be as great or greater than inter-language differences weakens considerably the possible objection on the basis of bilingualism of the informants consulted.

1.6. Category foci vs category boundaries

An immediate result of the mapping procedure was that judgements of category foci were highly reliable on repeated trials with the same informant and also across informants. It was very rare that a category focus was displaced by more than two adjacent chips on repeated trials. On the other hand category boundaries were not reliable, even for repeated trials with the same informant. This phenomenon was also reflected in the relative ease with which informants accomplished the focus-designating task in contrast with the boundary-mapping task. Many subjects engaged in long hesitations with regard to the latter, demanded clarification of the instructions, etc. In fact, in marked contrast to the foci, category boundaries proved to be so unreliable, even for a given informant, that they have been accorded a very secondary place in the analysis. Consequently, whenever we speak of color categories, either above or below, *we refer to the foci of categories, rather than to their boundaries or total area* (volume), except when specifically stating otherwise.

Two alternative interpretations of this result suggest themselves. First, it may well be that the primary storage procedure in the brain for the physical reference of color categories (i.e., their meaning) is concerned with points (or very small volumes) of the color solid rather than extended volumes. Some sort of secondary processes, of considerably lower salience and intersubjective homogeneity, would then have to account for the extensions of reference to points in the color solid not equivalent to (or included in) foci. Current formal theories of lexical definition do not appear able to deal with such phenomena naturally. If empirical results of this kind accumulate, simple Boolean function theories of lexical definition may have to be revised in favor of more powerful formalisms.[10] We do not have space here to pursue the matter further, especially since there appears some reason to suspect that color (and perhaps a few other semantic domains such as smell and noise) may have unusual lexical properties.

The alternative explanation for the superior reliability of category foci to category boundaries is that this is an artifact of our experimental procedure. In retrospect, we find nothing in our procedure which might plausibly be argued to produce such a bias, although others perhaps can. Moreover, the fact that the evolutionary scheme, including the data from the 60 additional languages ordered by it, works so well in terms of foci seems to argue against interpreting the apparent reality of foci as an artifact.

2. Evolution of basic color terms

Our second major result is that there appears to be a fixed sequence of evolutionary stages through which a language must pass as its basic color vocabulary becomes enriched over time.

This conclusion is based in part on the findings of universality for the eleven basic category foci, in part on the non-randomness of their distribution across contemporary languages (and certain logical consequences of the

Table II

Comparison of Mean distances in the Location of Five Color Foci Among Four Languages and Among Ten Speakers of One Language

I Mean inter-focus difference for ten Tzeltal (<u>yaš</u>-normal) informants	4.47
II Mean inter-focus difference for all pairs of four Languages	
1. Japanese - Cantonese	4.43
2. Japanese - Korean	4.30
3. Cantonese - Korean	4.18
4. Japanese - Tzeltal	
(i) one Tzeltal informant	3.84
[(ii) mean focus for ten Tzeltal informants	3.00]
5. Cantonese - Tzeltal	
(i) one Tzeltal informant	2.74
[(ii) mean focus for ten Tzeltal informants	3.72]
6. Korean - Tzeltal	
(i) one Tzeltal informant	2.30
[(ii) mean focus for ten Tzeltal informants	3.18]

particular distribution found), and in part on additional data and arguments to be introduced below.

An important methodological consequence of the universality finding is that it has allowed us to expand our data base from the twenty languages treated experimentally to a larger number, reported with varying degrees of precision, in the general literature. Cnce the basic universal category foci are established, meaningful comparison can often be made of literary accounts of various color nomenclatures.[11] It may well be that some of the motivation for the traditional relativistic position has derived from a confusion of noncomparability of descriptions of systems with random variation of structure among systems.

As shown in 1, the basic color categories are partially ordered, in seven equivalence classes, such that if a language encodes a category from a given class m, it must encode categories from each prior class r ($r < m$). This empirical generalization holds, not only for the original twenty languages investigated, but for all 80 languages in our sample (with the minor exceptions discussed in section 2.5.). There seems no good reason to suppose that this generalization, which applies so clearly in the present, should not apply also in the past. At least we know of no result from historical linguistics--or any other discipline--which would impel such an otherwise unmotivated complication of assumptions. Accepting then, that 1 holds equally for existing languages at prior times in their individual histories, it follows that for a language to gain or lose color terms it must do so in just the order specified by 1. Although it is logically as possible for languages to lose basic color terms as to gain them over time, this appears never, or at most very rarely, to happen empirically. In our consideration of 80 languages with a fair amount of assesment of comparative and internal historical evidence, we have so far found no indication of loss of a basic color term.[12] Hence, the seven equivalence classes of 1 may be interpreted as <u>seven evolutionary stages of complexity of basic color lexicon</u> which have the properties (i) that a given language L, at a given point of time, can be assigned to one and only one stage and (ii) that if L is, at a given moment, in stage m ($m \leq 11$), then L must have previously passed through stages 1, 2, ..., m - 1 in that order.[13]

2.1 Basic color lexicon and technological/cultural complexity

In addition to the fact that the stages of complexity of color vocabulary have a temporal ordering, there appears to be a positive correlation between general cultural complexity (and/or level of technological development) and complexity of color vocabulary. All the languages of highly industrialized European and Asian peoples are Stage VII, while all representatives of early Stages (I, II, and III) are spoken by peoples of small population units and limited technology, located in isolated areas. However, this kind of correlation cannot be established with any great precision until concepts such as "level of technological development" and "degree of cultural complexity" are better understood theoretically and more precisely measured than they are at present. Such information as we have on this score, vague as it may be, suggests that the sequence of elaboration of color lexicon is an evolutionary one accompanying, and perhaps a reflex of, increasing technological and cultural advancement.

The total vocabularies of languages spoken by peoples possessing relatively simple technologies tend to be smaller than those of highly complex civilizations. Moreover, it seems likely that the earliest language(s) spoken by man had extremely small vocabularies, perhaps not many times greater than the repertories of discreet verbal symbols available to living apes and monkeys.[14] Increase in the number of basic color terms may thus be seen as part of a general increase in vocabulary, a response to an informationally richer cultural environment about which speakers must communicate effectively.

The above argument is not offered as conclusive but as a plausible speculation regarding the cultural evolutionary mechanisms accounting for the growth in size of basic color lexicon. In any case, the argument is addressed only to the problem of increase in size of color vocabulary and makes no attempt to explain the particular order in which color foci universally become lexically encoded. We return very briefly to the latter topic after presenting the seven stages in the evolution of basic color vocabulary.

2.2. The seven stages in the evolution of basic color terms

Stage I in the evolution of lexical color categories is represented by just two terms, (i) black plus most dark hues and (ii) white plus most light hues. For convenience we will call these categories BLACK and WHITE. Stage I is represented in Fig. 4.[15]

At Stage II, a third category emerges which we call RED. RED includes all reds, oranges, most yellows, browns, pinks and purples (including violet). WHITE and BLACK continue to segment the middle-range hues. Stage II is represented in Fig. 5.

At Stage III, the reduction in area of WHITE and BLACK continues. A new category, GREEN, becomes encoded at this time which includes roughly English green-yellows, greens, blue-greens, blues and purple-blues. WHITE and BLACK become more restricted at this stage to hues of high and low brightness, i.e., toward the top and bottom of the color chart.

There appears to be some variability at Stage III between languages in which the boundary of the category GREEN includes blues to the exclusion of yellows, as represented in Fig. 6a, and languages in which GREEN includes most yellows, leaving most blues and blue-purples included in BLACK. The minor variant is represented in Fig. 6b. Note that the variation at Stage III concerns only the boundaries of categories. The order of emergence of foci is not affected.

Stage IV sees the emergence of YELLOW, which includes roughly English yellows and oranges. Normally the YELLOW focus occurs in the formerly RED area (Stage III, major variant) but occasionally in the 'GREEN' area

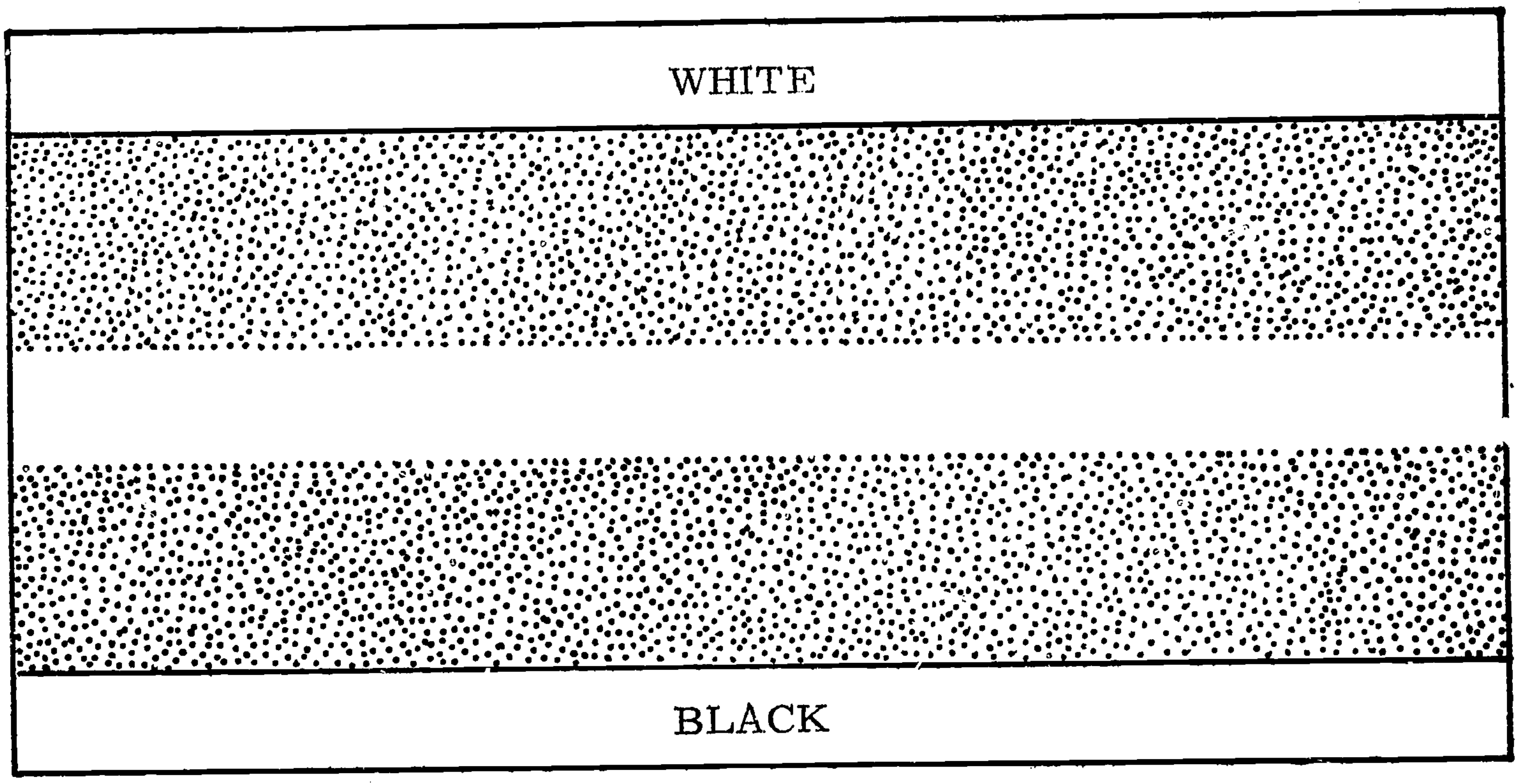


Figure 4

Typical Stage I Basic Color Lexicon

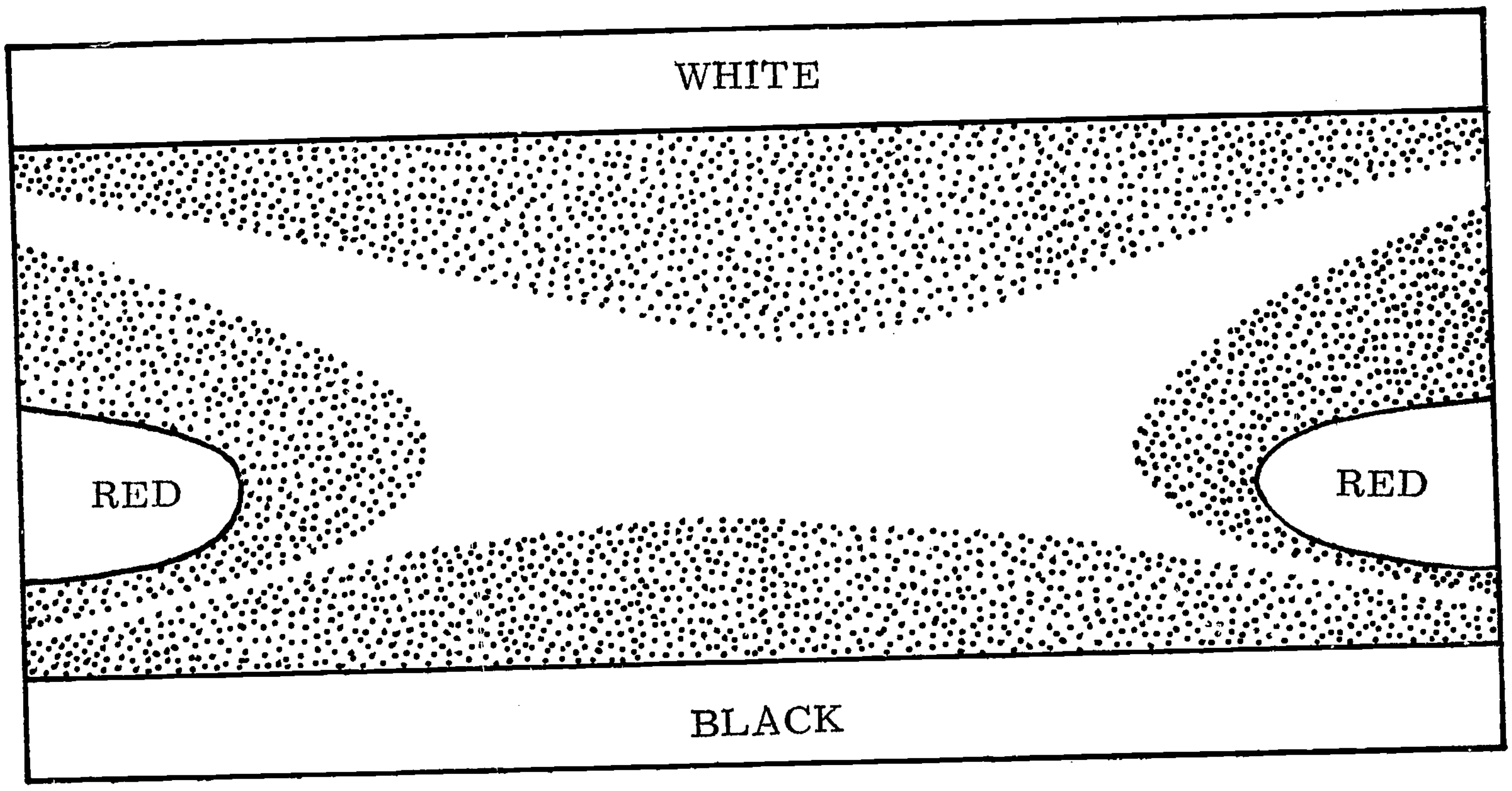


Figure 5

Typical Stage II Basic Color Lexicon

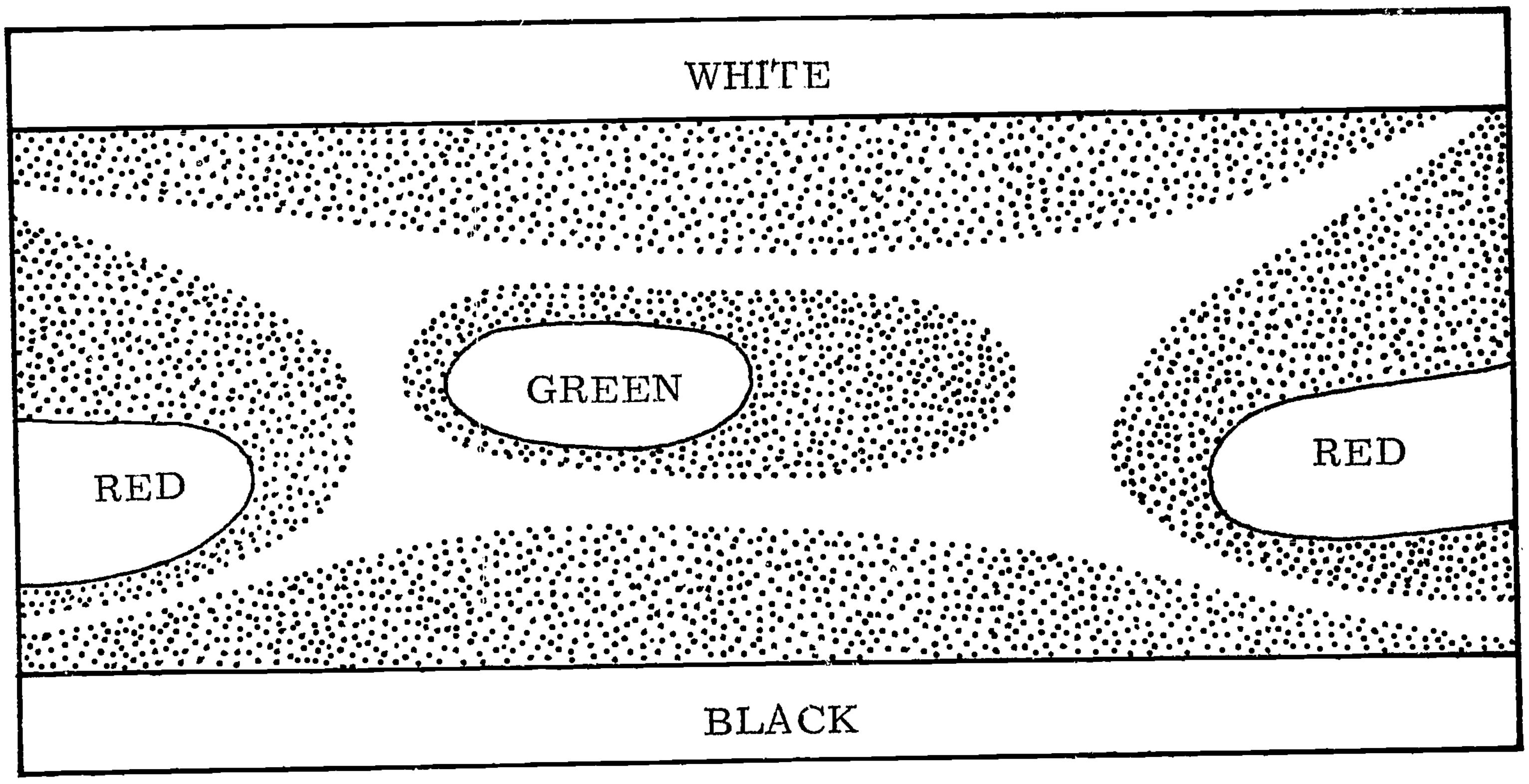


Figure 6a

Typical Stage III Basic Color Lexicon,

Major Variant

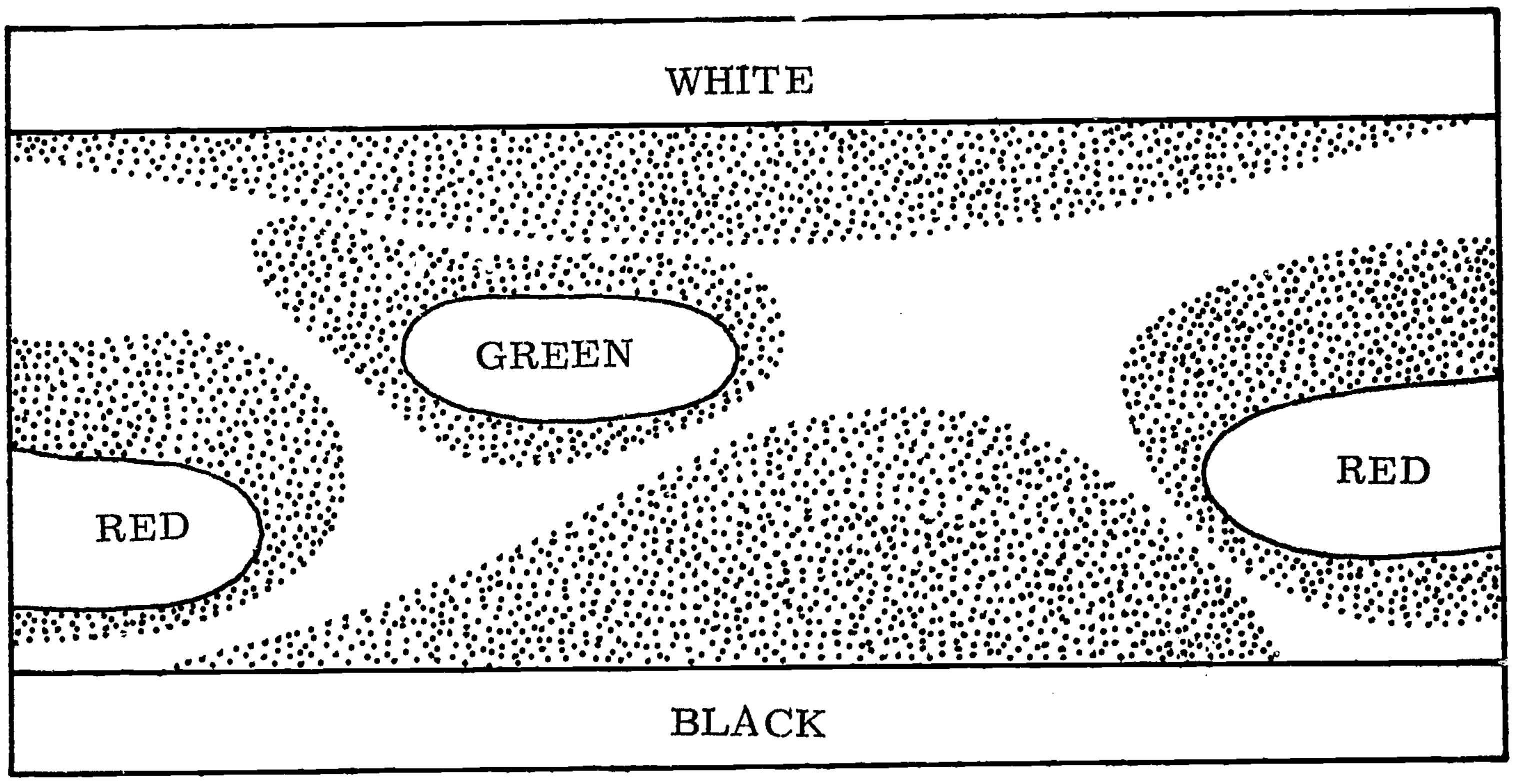


Figure 6b

Typical Stage III Basic Color Lexicon

Minor Variant

(minor variant). RED continues to encompass the areas of English red, some yellow reds, purple and purple reds. Presumably, BLACK and WHITE continue to be deprived of hue reference at this time, becoming more and more restricted to the neutral values. Stage IV is seen in Fig. 7.

At Stage V the focus of blue emerges, normally from the GREEN area but perhaps occasionally also from BLACK. In either case, GREEN now becomes green. At this stage, BLACK and WHITE are fully reduced to black and white; i.e., to neutral values. The RED area is probably also reduced with respect to purples and violets. Stage V is depicted in Fig. 8.

Stage VI is the last at which a single focus appears, brown. At Stage VI both RED and YELLOW become even more restricted in area although it is not until Stage VII that they become red and yellow. Stage VI is seen in Fig. 9.

When the color lexicon expands beyond seven terms, i.e., beyond Stage VI, there is apparently a rapid expansion in filling out the full roster of eleven basic color categories. This conclusion is suggested by the fact that, for the 80 languages investigated, only 4 color lexicons belong to types other than 1, 2, 3, 4, 5, 6 and 21. (See Tables III and IV). Apparently, at Stage VII, the remaining basic categories pink, orange, grey and purple are added to the lexicon very rapidly and, as far as we have been able to ascertain at the moment, in no particular order. Our data now suggest that purple and pink probably arise from RED while orange becomes isolated from YELLOW. There is, however, some evidence to indicate that orange may have, in some cases, arisen from RED. Grey represents simply the encoding of mid-brightness neutral hues between black and white.

Stage VII systems include all eight-, nine-, ten-, and eleven-term systems and thus include types 7-21. As shown in Table III, of the 20 Stage VII systems so far encountered, 13 are of type 21, i.e., contain all eleven basic categories while 11 of the fifteen possible types of Stage VII are not represented. (cf. note 5, also section 2.3.). An eleven term Stage VII system is seen in Fig. 10.

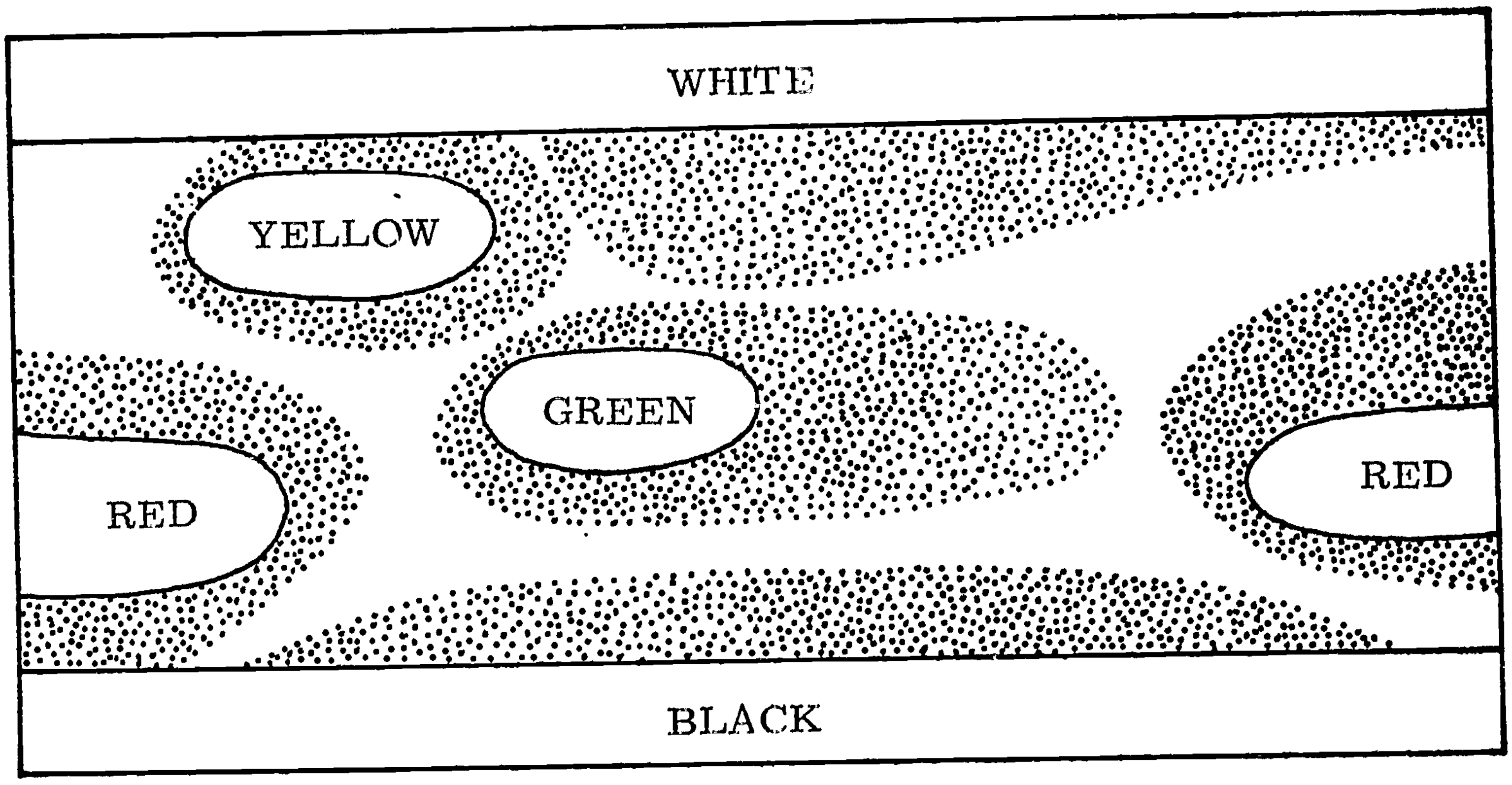


Figure 7

Typical Stage IV Basic Color Lexicon

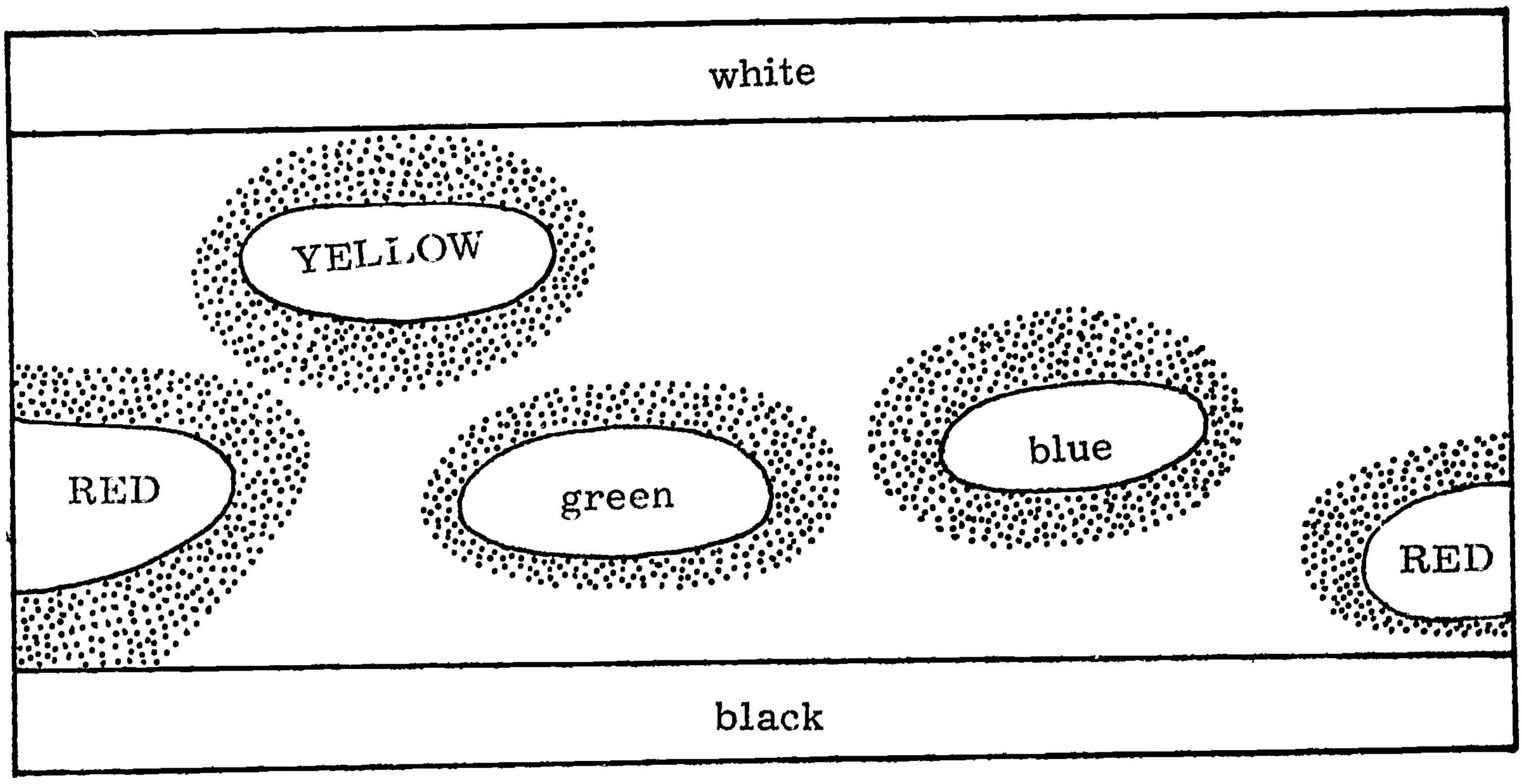


Figure 8

Typical Stage V Basic Color Lexicon

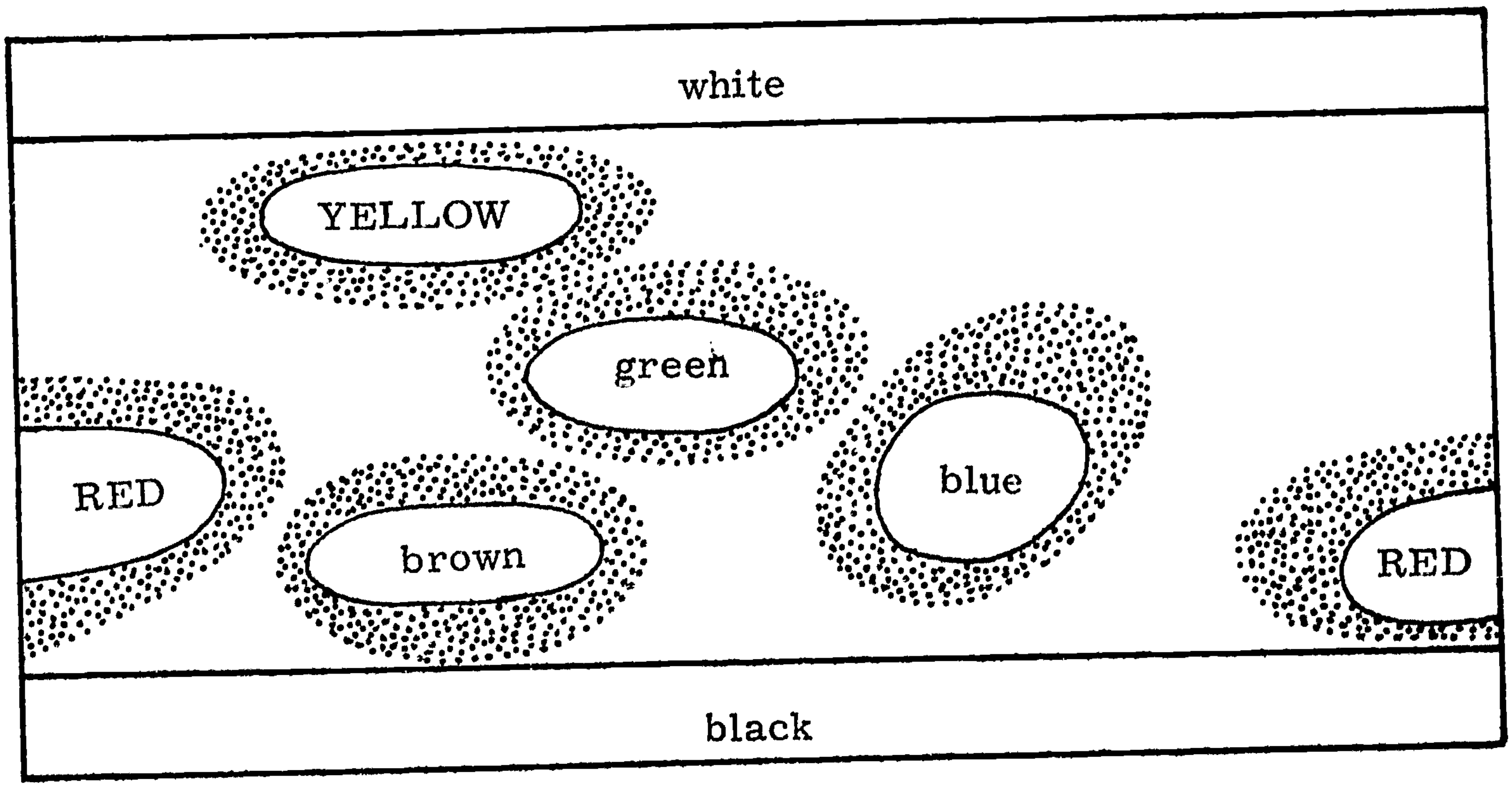


Figure 9

Typical Stage VI Basic Color Lexicon

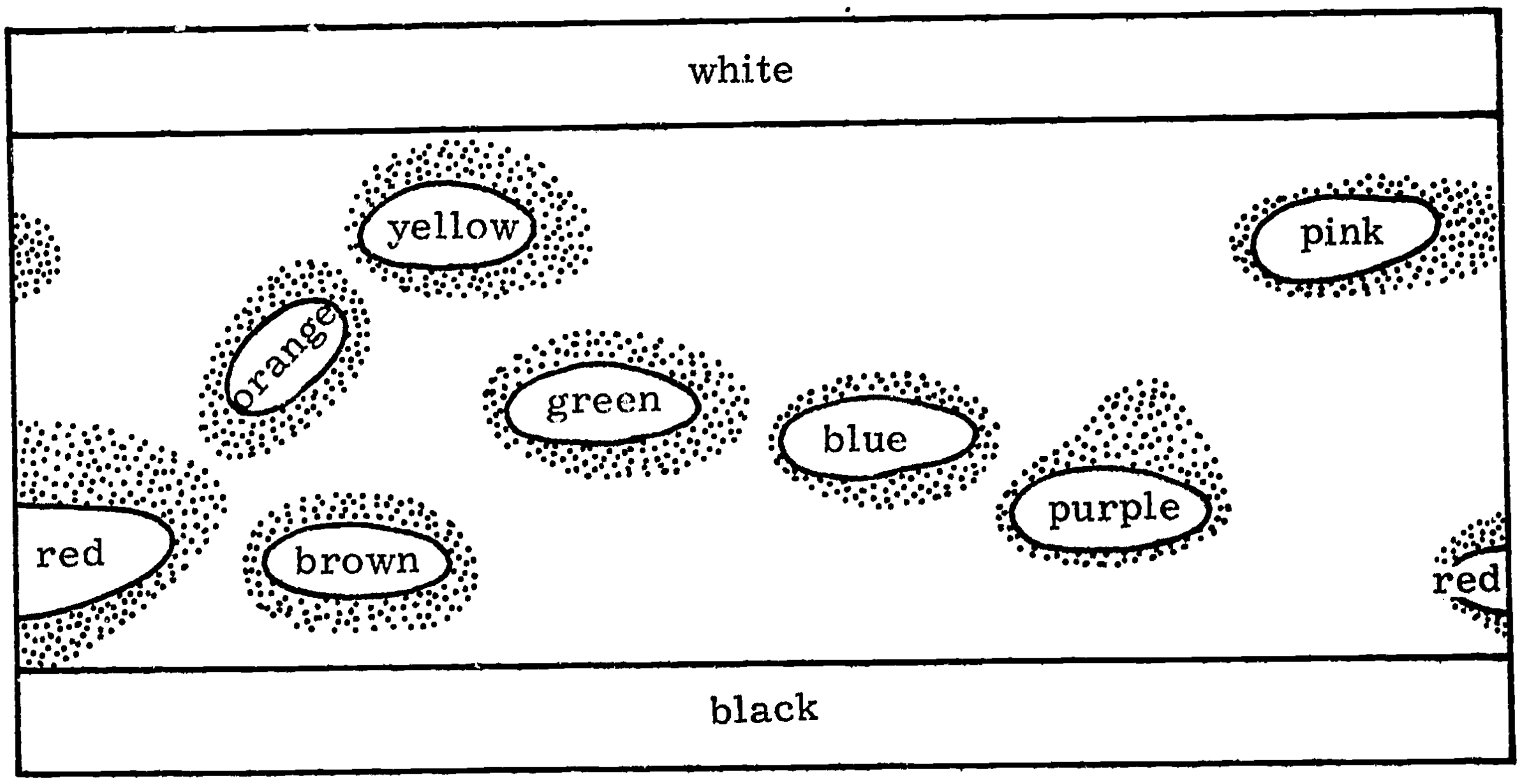


Figure 10

Typical Stage VII Basic Color Lexicon,

Eleven Term System*

* The eleventh category, grey, cannot be depicted on the above diagram given the conventions discussed in note 15.

Table III

Distribution of 80 Basic Color Lexicons Among the Twenty-one Theoretically Possible Types, with Indication of Evolutionary Stage.

Type	No. of Basic Color Terms	Stage	No. of Examples
1	2	I	5
2	3	II	21
3	4	III	10
4	5	IV	13
5	6	V	7
6	7	VI	4
7	8	VII	-
8	8	VII	2
9	8	VII	-
10	8	VII	1
11	9	VII	-
12	9	VII	-
13	9	VII	-
14	9	VII	-
15	9	VII	1
16	9	VII	-
17	10	VII	-
18	10	VII	-
19	10	VII	-
20	10	VII	-
21	11	VII	13
		Total Stage VII	20*
		Grand Total	80

*Catalan, Cantonese, and Vietnamese are Stage VII systems but are not typed. See Section 2.5.

2.3. Supporting data and examples

Our search of the literature for reports on color terminologies is not complete. To date we have gathered reasonably reliable information on 60 languages in addition to the twenty languages for which we have experimental data. The results from all, reliably reported languages are considered here and conform almost totally to our proposed evolutionary sequence. First, we give a few examples of each stage, with emphasis on the earlier, more interesting stages.

2.3.1. Stage I systems

Originally, we had no hope of discovering an extant example of Stage I. We were thus pleasantly surprized to receive from K. F. Koch (1966) the following report on a New Guinea Highland group called the Jalé, whose language has tentatively been affiliated with the Dani (Non-Austronesian) group. In a report made in our seminar, Koch, who was totally unaware of the theory, stoutly resisted our suggestions that Jalé might have more than two true color terms. Jalé is Stage I, having basic color terms only for 'BLACK' and 'WHITE' (see Fig. 11). There are other terms which, in highly restricted contexts, refer to certain hues. These terms, however, are restricted almost exclusively to particular substances or objects, e.g., <u>mut</u> 'red soil', <u>pianó</u> 'name of plant whose leaves are used to rub yarn, dying yarn a green color', etc. Koch reports that when he requested a Jalé native to do something with a 'green' object, by using the term <u>pianó</u>, he was consistently misunderstandood. He subsequently learned to use the term <u>siŋ</u> 'BLACK' or <u>hóló</u> 'WHITE' depending on the degree of brightness that the particular 'green' represented. This was made even more obvious when he reported that the appearance of blood is <u>siŋ</u> 'BLACK', exactly what 'blood (red)' should be at Stage I due to its low brightness. That we should find a Stage I system in Highland New Guinea is consonant with the association of simple color lexicon with simple technological and cultural development.

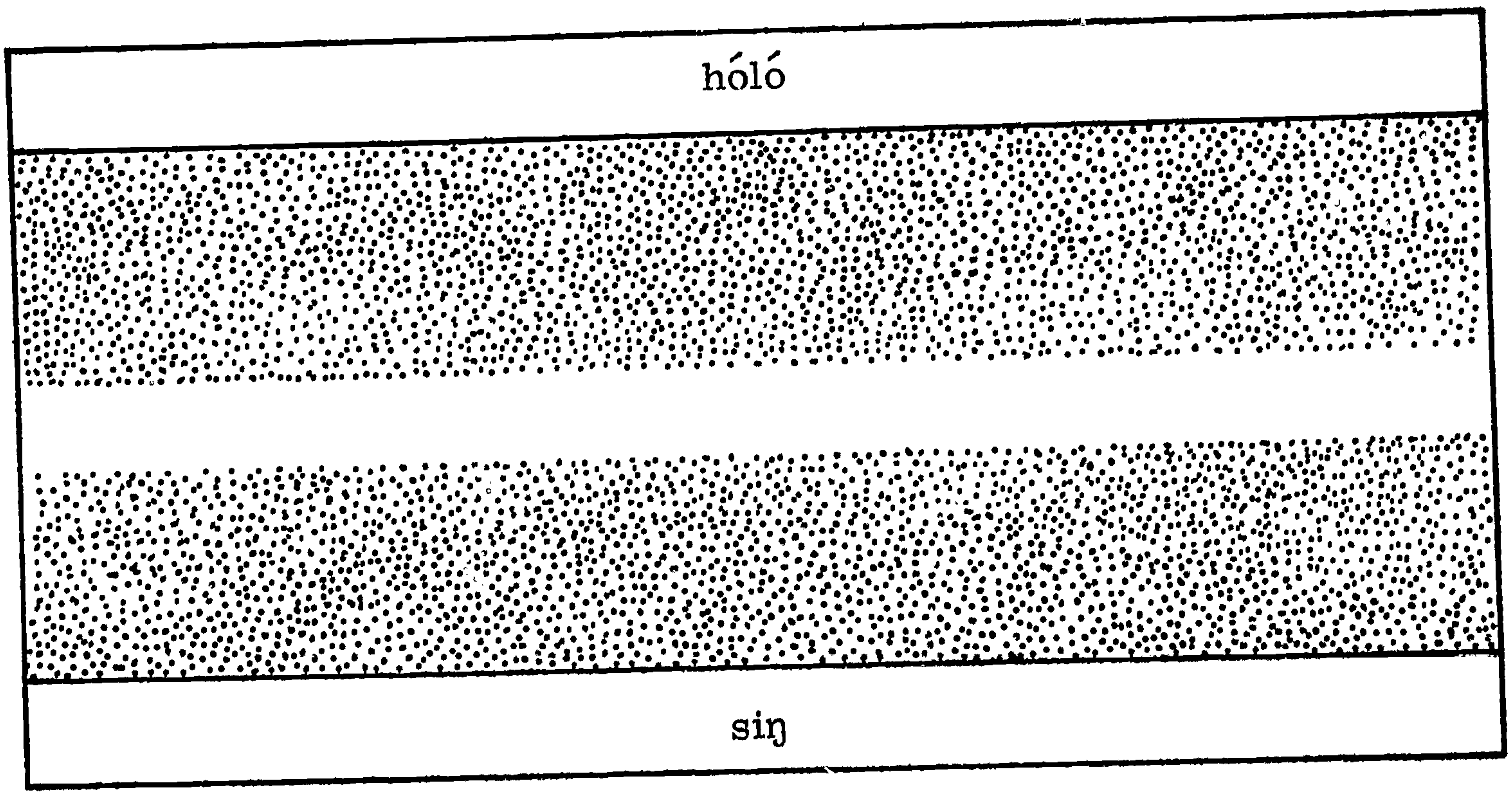


Figure 11

Inferred Color Categories for Jalé,

Representing Stage I

A very interesting variant of Stage I is represented by the Paliyans, a technologically marginal group of Southern India. Our data comes from a recent, unpublished manuscript by P. M. Gardner (1966a) who recently returned from field-work among this group. The Paliyans speak a dialect of Tamil, a major Dravidian language with about 30,000,000 speakers. Plains Tamil has a clear Stage V color terminology, given by Gardner as vel̤ḷai 'white', karuppu 'black', sivappu 'red', paccai 'green', manjal 'yellow' and nīlam 'blue'.

However, in Paliyan Tamil, cognates of five of these six terms are retained, but with radically altered meanings. Discrimination is encoded uniquely on the dimension of brightness.[16] Paliyan color terms with their glosses and standard Plains Tamil sources are given in Table IV.

Gardner indicates that there is considerable overlap in usage between each term in the series and its neighbor(s). The effect on the usage of the terms of the extent to which brightness comes from light source as against surface properties is not entirely clear from Gardner's preliminary manuscript. The most extreme terms, velle and karuppu are not reserved exclusively for very extreme degrees of brightness. Gardner says "The usual leaf on a tree is velle on its upper surface and karuppu on its lower surface." (1966a). He also notes, however, that the same leaf may well be nīlam or sihappu (presumably on both sides) if seen in different light.

In any case, whether or not Paliyan can be construed as a perfect examplar of Stage I color lexicon it is certainly a variant of this basic type. For example, "sihappu was elicited for dark shades of red, yellow, green, purple and black" (1966a).

Of particular interest for the general evolutionary hypothesis is Gardner's conviction that these people have a minimum of shared culture. He speaks of "imprecision and lack of elaboration in the most basic aspects of Paliyan subsistence related classifications...highyly idiosyncratic taxonomy...de-emphasis on both verbal communication and formality of expression [sic]" (1966a, see also Gardner 1966b:397-399).[17]

Another example of a Stage I system is taken from W. H. R. Rivers' treatment of the Western tribes of the Torres Straits of New Guinea (including the islands of Mabuiag, Muralag, Badu, Moa and Saibai) (1901). Of the six terms which Rivers elicited as "names in general use", four are clearly descriptive

Table IV

Paliyan and Plains Tamil Basic Color Lexicons

Paliyan			Plains Tamil	
veḷḷe	'illuminated (sometimes 'bright')'	<	*veḷḷai*	'white'
manja	'bright'	<	*manjal*	'yellow'
nīlam	'of medium brightness'	<	*nīlam*	'blue'
sihappu	'dark'	<	*sivappu*	'red'
karuppu	'dark or in shadow'	<	*karuppu*	'black'

expressions formed by the name of some natural object plus a productive suffix -*dgamulnga* most appropriately glossed 'it looks like'. Thus, we see *kulkadgamulnga* 'red and purple' < *kulka* 'blood', *murdgamulnga* 'yellow and orange' < *mur* 'yellow ochre', *ildegamulnga* 'green and blue'< *il* 'gall-bladder, bile', *maludgamulnga* 'blue and green' < *malu* 'sea'. The forms for 'black' and 'white' are less ameable to analysis, the derivation of 'white' being questionable, i.e., *miakalunga* ~ *merkalunga* < *merkai*? 'spirit', *kubikubinga* 'black' < *kubi* 'charcoal, night and darkness'.

If we interpret Rivers correctly, only the terms for black and white can be considered as basic color terms while the remaining expressions are best treated as descriptive phrases. In fact, Rivers notes this when he states that "names for unfamiliar colours were apparently invented for the occasion by adding the usual suffix to the name of some natural object and once or twice a native omitted the termination and simply gave the name of the object" (1901:59).

Murray Island, for which Rivers examined 107 individuals, may also be interpreted as representing Stage I. Unlike the Torres Straits materials, where a "color term" is formed by suffixation, in this group we find color adjectives formed by "reduplication from the names of various natural objects" (1901:56). Thus, there occur *mammam* 'red' < *mam* 'blood', *bambam* 'orange, yellow' < *bam* 'turmeric', *siusiu* 'yellow' < *siu* 'yellow ochre', *sǒskěpusǒskěp* 'green' < *sǒskěp* 'bile, gall-bladder', *bulubulu* 'blue' < English 'blue', *kakekakek* 'white' < ?, *golegole* 'black' < *gole* 'cuttlefish' [sic], *pipi* 'grey' < *pi* 'ashes'. The term for white was the only common expression for which Rivers found it impossible to obtain a derivation, and the derivation he offers for black is suspicious. By eliminating *bulubulu*, clearly a recent English loan, Murray Island falls into Stage I with the Torres Straits data.

One point should be made at this juncture concerning what might be considered as "incipient color categories" and Rivers' contribution in this respect. While Rivers noted several times that "many of these...names were devised on the spur of the moment" (1901:56). he was nevertheless impressed by the apparent high reliability of many of the more common descriptives. He suggests that this material may be taken as illustrative of vocabulary accretion in the domain of color, and that it should not be surprizing that when a new color category is linguistically recognized that it should be labelled by the names of natural objects. Rivers concludes as follows: "It is probable what when primitive man began to use names for colours, he used the names of natural objects either simply or modified in some way, and that definite generic terms have evolved out of these. The Mabuiag vocabulary [Western Torres Straits tribe given above] is a good example of the coexistence of a large number of special names with a few which have become definitely abstract terms for colour [i.e., black and white]". (1901:63-64). This fact is born out in many languages where, for example, the word for red may be seen historically to derive from a form of the word for blood. (Greenberg 1963:154).

2.3.2. Stage II systems [introduction of RED]

Stage II is exemplified by the African languages Tiv, Tonga and a dialect of Shona.[18] P. Bohannan notes that "In Tiv...all green, some blues, and some grays are ii. But very light blues and light grays are pupu. Nyian, which covers brown, also covers all warm colors through red to yellow. The distinction between ii and pupu actually is not in terms of color, but in term of what we would call shade--darkness and lightness. Very light blue, gray, or white are all pupu. Ii means dark and covers all dark colors and black--unless there is a warm color present; brown, red and yellow are all nyian. Tiv can distinguish colors and do color-blind tests, but their culture does not require--or allow--that they make some of the color distinctions that Westerners make. Westerners are the most color-conscious of peoples" (1963:35-36).

A schematic representation of Tiv is seen in Fig. 11.

Shona, a Bantu language of Rhodesia, may represent Stage II, if we interpret the report in H. Gleason correctly. Apparently, there exists a unitary

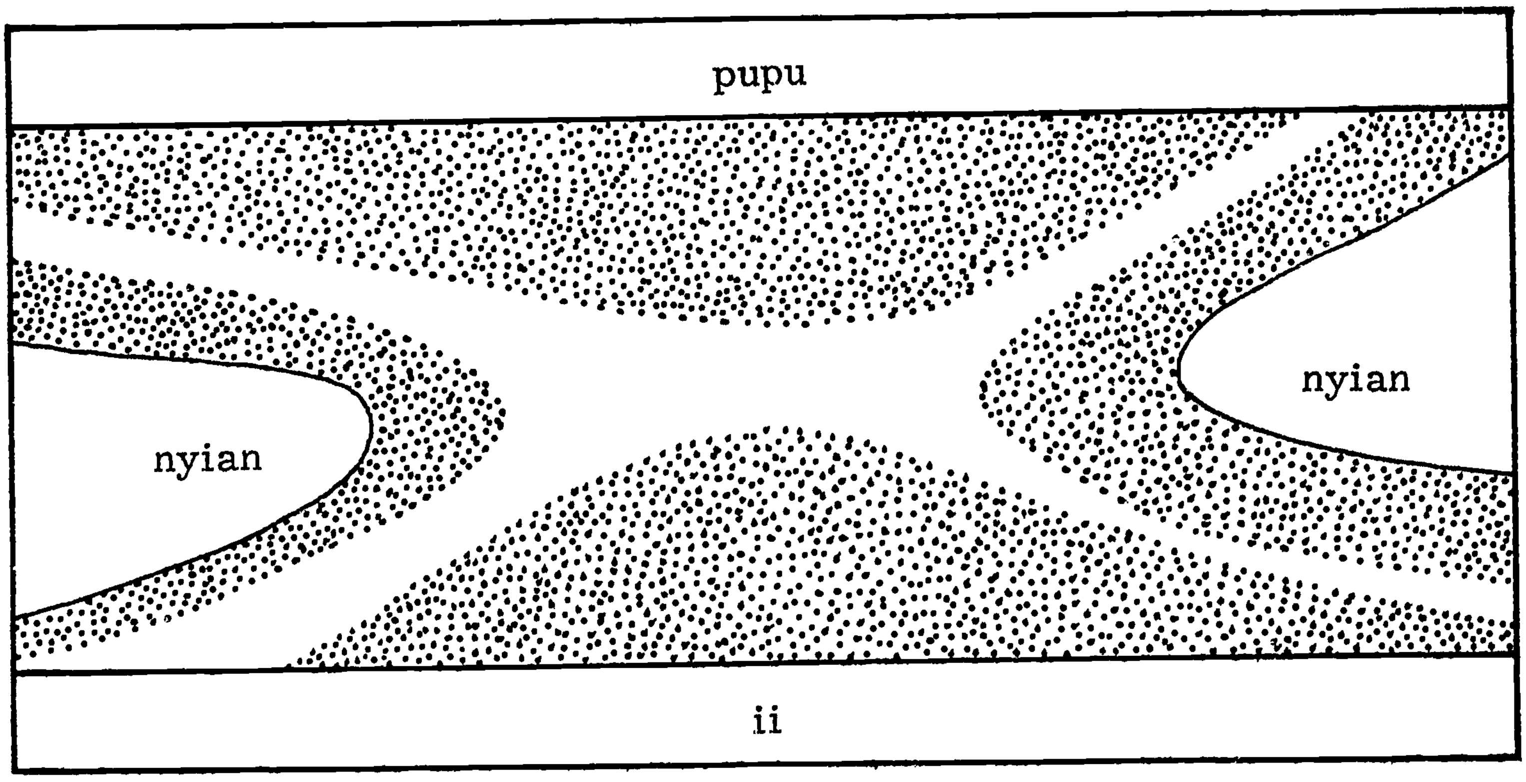


Figure 12

Inferred Categories for Tiv,

Representing Stage II

term including reds and purples. The two remaining terms not only encompass the mid-spectrum hues, but black and white as well. Thus, Gleason notes "interestingly enough, citema also includes black and cicena white" (1961:4)

The basic color terms of the Tonga group studied by Colson consist of three apparently cognate forms with the Shona materials reported above: čisia 'black and all other dark colors', čituba 'white and all other light colors', and čisubila 'red, including oranges and dark yellows'. The apparent cognate pairs citema/čituba and cicena/čisia suggest that the glosses for these forms may be interchanged in Gleason's account.

On very speculative evidence, we may interpret Kirchoff's report (1883: 546) on certain Australian languages as State II systems, having definite color names for only white, black and red. This fact, however, is tentative in that it is impossible to determine if any of the terms are descriptives. Some of Rivers' materials indicate that the term for red, oti, elicited by Kirchoff from several Queensland natives, is really the word for blood which would make these groups Stage I.

Other State II groups for which we have early historical data are the Tshi of West Africa; fufu 'white', tuntum 'black' and koko 'red', the Todas of India's Nilgiri Hills, the Bantu reported in Buchner (1883) and a New Caledonian group.[19]

The Nasioi of Bougainville are a clear contemporary example of Stage II if the term for red is indeed a basic term and not simply a descriptive. Otherwize, they are Stage I. E. Ogan reports: "I worked a total of twenty-six months among Nasioi speakers. The only words I heard in regular use which might be described as "color terms" were kakara 'white', mutaŋa 'black, dark' and ererеŋ 'red'. The etymology of the last word is clear: ereŋ 'blood'. I know of no such etymology for the other two words" (1967). Nasioi is a non-Malayo-Polynesian language.

2.3.3. Stage III systems [Introduction of GREEN]

Apparent Stage III terminologies are Hanunóo, Bassa and Ibibio.[20] We use Ibibio as the examplary case of Stage III, since E. Kaufman gathered the data using our experimental method.

Ibibio basic color terms glossed 'WHITE', 'BLACK', 'RED' and 'GREEN' and are seen displayed in Fig. 13.

Hanunóo, also Stage III, is a minor variant of this stage. The term for 'BLACK' in Hanunóo, (ma)biru ranges over black, violet, indigo, blue, dark green, dark gray and deep shades of other colors and mixtures; 'WHITE' (ma)lagti? ranges over white and light tints of other colors and mixtures; 'RED' (ma)rara? includes maroon, red, orange, yellow, and mixtures in which these qualities are seen to predominate; 'GREEN' (ma)latuy includes green and mixtures of green, yellow and light brown.

Bassa, a member of the Kwa branch of the Niger-Congo family found in Liberia, is also probably Stage III. According to Gleason (1961:4) Bassa has one term including purples, greens, and blues while another term encompasses reds, yellows and oranges. As Gleason's chart refers only to non-neutral hues, we assume that Bassa also has terms for neutral 'BLACK' and 'WHITE'. The appearance of purple as well as blue in 'GREEN' show Bassa to be an extreme form of the major variant of Stage III.

2.3.4. Stage IV systems [Introduction of YELLOW]

Stage IV is represented by many languages of the world. For Africa we find this stage attested in a dialect of Shona distinct from that reported above with terms for 'BLACK' nema, 'WHITE' čena, 'RED' cuku, 'GREEN' pfumbu and 'YELLOW' šara.[21] Ibo and Urhobo, Nigerian languages, probably represented pure examples of Stage IV until recent times. In Ibo we find basic terms for 'BLACK' oǰi, 'WHITE' nzu, 'RED' uhui, and 'YELLOW' odo. The aborigi-

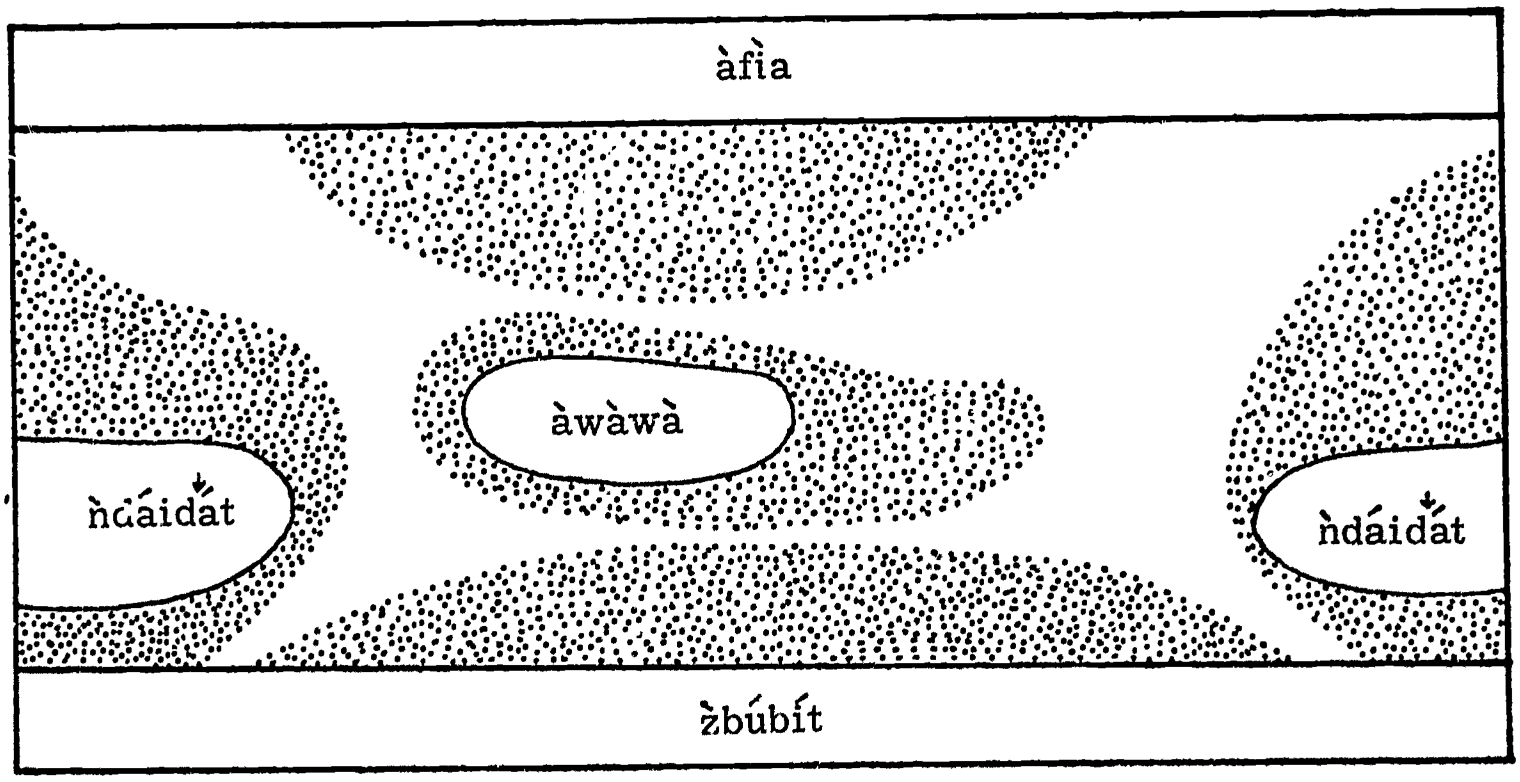


Figure 13

Ibibio, Representing Stage III

nal term for 'GREEN' has apparently been replaced and we find merely a descriptive phrase agwokwondu meaning roughly 'it has the color of leaves'. In Urhobo we find basic terms for 'BLACK' ɔbyibi, 'WHITE' ɔfuafu, 'RED' ɔbabare, and 'YELLOW' odo. The term for 'GREEN' has apparently been lost under pressure from English and replaced by the English loans grini 'green' and blu 'blue'.

In North America we find Stage IV represented by Eskimo, with terms for 'BLACK' girnitak, 'WHITE' gakurktak, 'RED' aupaluktak, 'GREEN' tuŋayuktuk, and 'YELLOW' quksutak. (Graburn, 1967).

In Central America we find Stage IV systems in many of the aboriginal languages of the area. To our knowledge, all of the Mayan languages of Mexico and Guatemala exhibit Stage IV color terminology. We have chosen Tzeltal, a Mayan language of Chiapas, Mexico, as the exemplary case of Stage IV as we have collected rather extensive data from this language utilizing the experimental methods discussed earlier.[22]

Tzeltal has five basic color terms which are ʔihk' 'BLACK', sak 'WHITE', cah 'RED', yaš 'GREEN' and k'an 'YELLOW'. The distribution of these terms may be seen in Fig. 13.

The treatment of the category yaš 'GREEN' in Tzeltal is of particular interest in that some of the data suggest that this language may now be transitional from Stage IV to Stage V.

Of the 40 Tzeltal informants for which we have gathered experimental data, 31 indicate that the focal point of yaš falls precisely in the area of the spectrum which corresponds to English green. In general usage, the maximum extension of yaš includes greens, blue-greens, blues and some blue purples. However, when greater specification of yaš is requested, many informants restrict the term almost exclusively to greens and some blue greens. 'Blues' and 'purple blues' are recognized as a distinct area on the spectrum and are designated by a descriptive phrase, ʔihk'ʔihk'tik šyašal 'blackish green' or simply ʔihk'ʔihk'tik 'blackish'. In at least one instance, an informant referred to

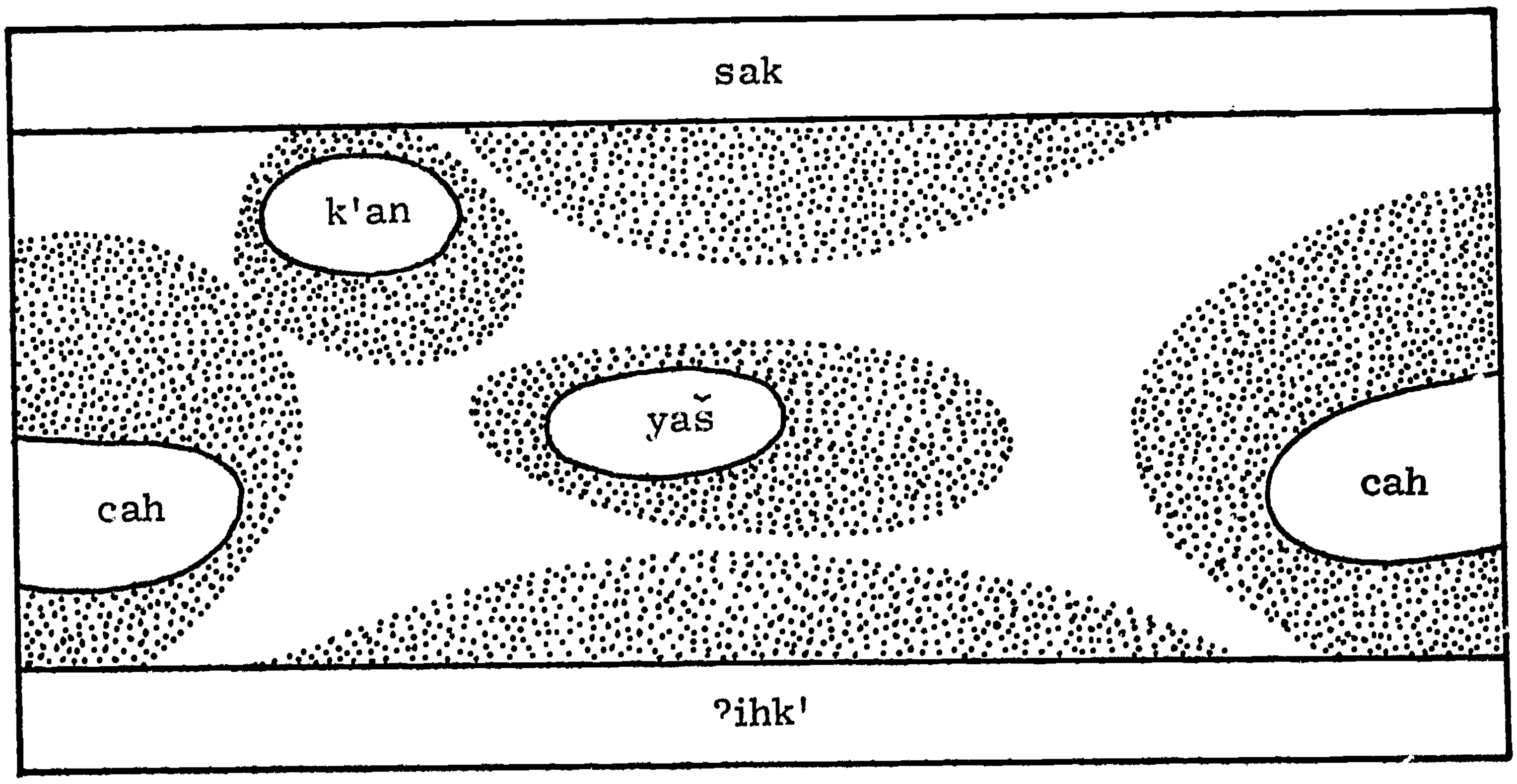


Figure 14

Tzeltal, Representing Stage IV

this area by the Spanish term asul 'blue'.

The remaining 9 informants in our sample of 40 have essentially the same maximal extension of yaš as the previous 31 individuals (i.e., over greens and blues) but the foci of the category is squarely in the blue area. When greater specificity was requested for the greens and blue-greens, descriptive phrases were often utilized, e.g., saksaktik šyašal 'whitish green'.

How might these data concerning the foci of 'GREEN' in Tzeltal best be interpreted? Our most plausible explanation is one which suggests that Tzeltal may be moving from Stage IV to V and the ambiguity of the foci for yaš reflects this transitional period. It is apparent to all Tzeltal speakers that yaš includes two major perceptual centers, green and blue. In contact with speakers of Spanish over the last 400 years, this fact has most likely been accentuated many times. Speakers of Tzeltal respond by reducing the extension of yaš in instances where specificity is required either to greens (for most informants) or to blues (for the minority) and treat the remaining area with descriptive phrases. Tzeltal may continue for many generation to rely on such descriptives to designate what is clearly an incipient color category best glossed as 'blue'. It is our prediction, however, that as Tzeltal speakers become more exposed to Spanish in the schools yaš will eventually be restricted entirely to greens and that asul or some other Spanish term will be encoded for the perceptual category 'blue', making Tzeltal a legitimate V system.

2.3.5. Stage V systems [Introduction of blue]

Thus far, Stage V color lexicons have been found only in Africa and Southern India, although Mandarin may also, on further research, prove to be Stage V as well. We have already discussed Stage V Plains Tamil (see above) which exhibits terms for 'white' vellai, 'black' karuppu, 'RED' sivappu, 'green' paccai, 'YELLOW' manjal and 'blue' nīlam.[23] The inferred distribution of these terms is seen in Fig. 15.

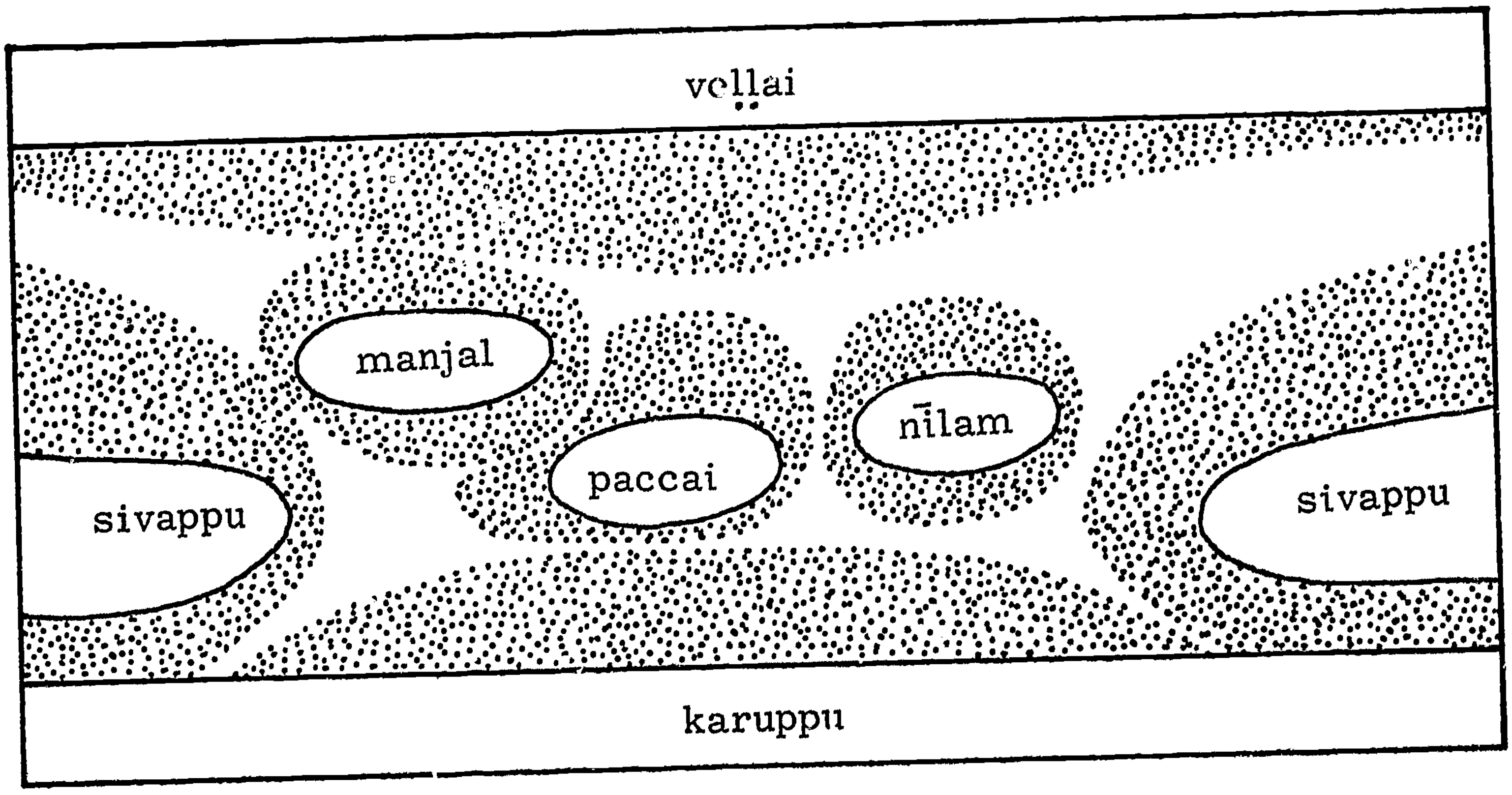


Figure 15

Inferred Categories for Plains Tamil,

Representing Stage V

In Africa, Stage V vocabularies are found for the Nupe, the Massai, Bedauye and at least some dialects of Hausa.[24] The basic color terms of these African languages are presented in Table V.

2.3.6. Stage VI systems [Introduction of brown]

Stage VI systems are rather sparsely represented in our sample but thus far we have found examples in Southern India, Africa, and North America. The color terminology of Nez Perce, an Indian language of the state of Washington, is depicted in Fig. 15.[25]

Stage VI is also seen for some dialects of Malayalam of Southern India, e.g., vellá 'white, kadupə 'black', čuwáppə 'RED', paččá 'green', manná 'YELLOW' nilá 'blue', tavíta 'brown' (Goodman 1963:9-10).

We have at least two examples of this stage in Africa, the Bari and the Siwi. Bari terms are -kwe 'white', -ruo 'black', -tor 'RED', -ngen 'green', -forong 'YELLOW', -murye 'blue' and -jere 'brown'. Siwi terms are aztuf 'white', amilal 'black', ozgahh 'RED', owrarr 'green', lasfarr 'YELLOW', asmawee 'blue' and lasmarr 'brown'.[26]

2.3.7. Stage VII systems

Stage VII is represented by 20 of the 80 languages in our sample, and varying types of this stage are found widely in the world's languages. It may eventually prove possible to establish some partial ordering of terms as described for the preceeding stages. We cannot, at this time, however, offer a sequence for the appearance of basic color terms after stage VI. Many more languages must be examined in detail, both synchronically and historically, before we can present a more definite report in this regard.

Noting only languages in our experimental sample, we may suggest tentatively that Urdu is "early" Stage VII having terms for black, white, red,

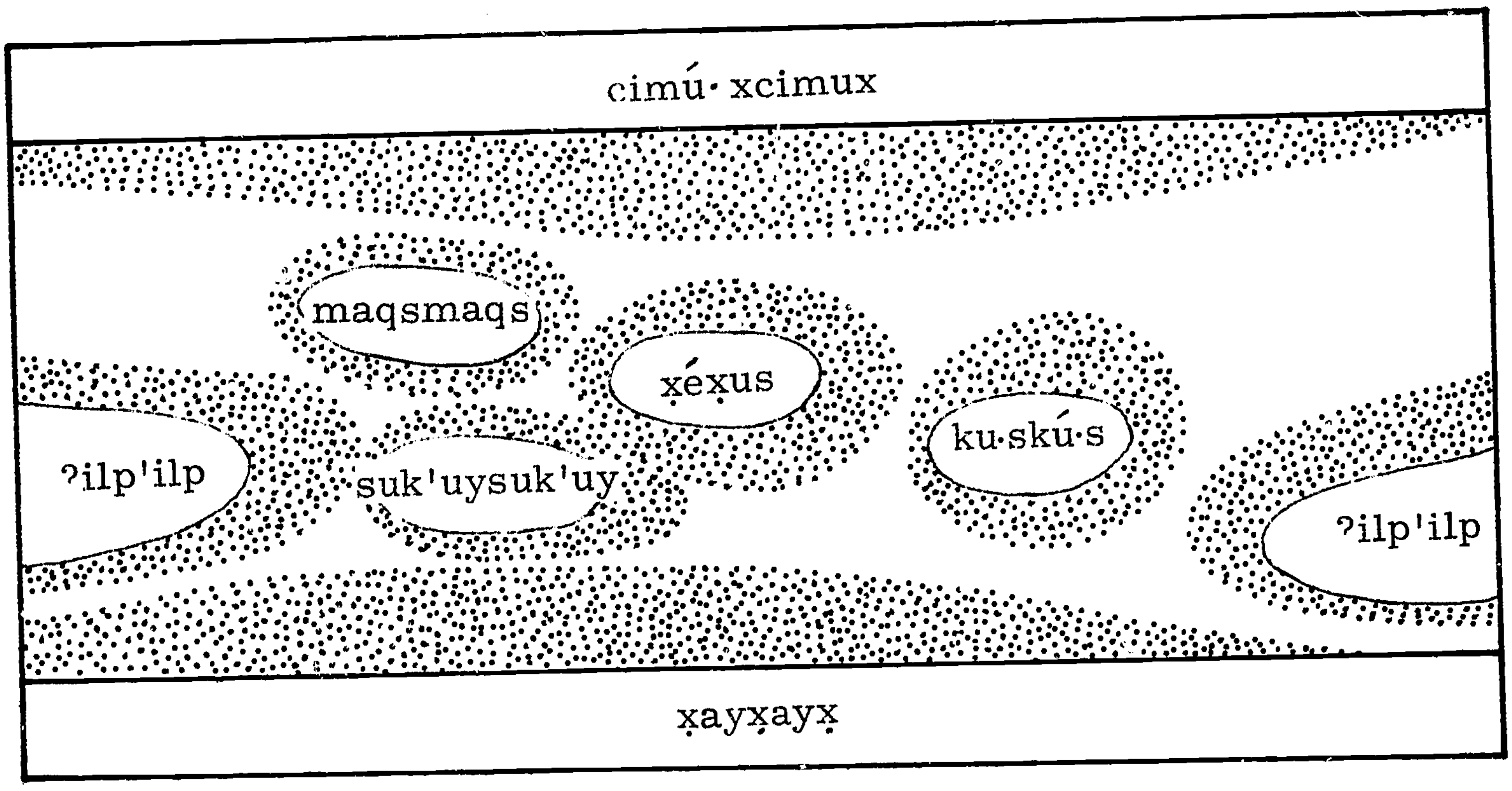


Figure 16

Inferred Categories for Nez Perce,

Representing Stage VI

Table V

Basic Color Terms in Four Stage V African Languages

Gloss	Massai	Bedauye	Hausa	Nupe
white	eborr	era	baḳi	bǒkùn
black	erok	hadā́l	fari	zùkò
RED	enyki	adaro	ja	dzúrú
green	mbusth	sṓtay	algashi	álígà
YELLOW	ngirro	asfa	rawaya	wọ̌njiṇ
blue	ainyori	delī́f	shuḍi	dòfa

green, yellow, blue, brown, and purple, but lacking orange, pink and grey. Likewise, Cantonese has yet to add brown, purple or orange to its basic inventory. (cf. section 2.5.). Tagalog lacks a term for orange as does Vietnamese. Finally, Catalan lacks pink and orange terms.

Hungarian presents a special case. It has basic terms for the ten basic categories exclusive of red and two basic terms for red. Should this finding be born out on further research, it may be possible to suggest additional developmental stages other than those already mentioned. Similarly, Russian, as well as several other Slavic languages is reported to have two basic terms for blue.

A total summary of the available data relevant to the evolutionary hypothesis is given in Table VI. All interpretable reports found are summarized in this Table which gives for each language listed, its stage, type, and the source of the data. (The actual categories for each color lexicon type are given in Table 1). All languages examined confirm the evolutionary hypothesis in each detail except as noted in section 2.5. English, a typical Stage VII eleven term system has been depicted in Fig. 10.

2.4. Internal reconstruction of basic color terms

The principles of internal linguistic reconstruction outlined by Edward Sapir (1916), and employed by Romney (1967) in his treatment of Yuman kinship suggest that several of the languages in our sample have only recently acquired basic color terms characteristic of Stage VII. Korean is an interesting example which illustrates the effect of foreign influence on the formation of new color terminology. Korean has basic color terms (bound forms accompanied by a suffix meaning roughly 'color') for 'BLACK', 'WHITE', 'RED', 'GREEN', and 'YELLOW'. These expressions are clearly indigenous Korean forms. Terms for pink, orange, (chestnut) brown, brown, green, blue, purple and grey, however, are of obvious Chinese derivation as can be observed in the following forms: Old Korean terms -- kamata 'BLACK', hayata 'WHITE', palgata 'RED'

Table VI

Classification of 80 Languages in terms of Evolutionary Stage of Basic Color Lexicon

Stage I (BLACK, WHITE)

Language	Area	Source
Jalé	New Guinea	K. - F. Koch, (1966)
Murray Island	New Guinea	Rivers (1901)
Ngombe	Africa	Stapleton (1903)
Paliyan	South India	Gardner (1966a)
Torres Straits	New Guinea	Rivers (1901)

Stage II (BLACK, WHITE, RED)

Language	Area	Source
Arawak	South America	van Wijk (1959)
Baganda	Africa	van Wijk (1959)
Bantu	Africa	Rivers (1901)
Bulu	Africa	von Hagen (1914)
Ila	Africa	Smith (1907)
Kongo	Africa	Stapleton (1903)
Lingala	Africa	Anderson (1966)
Nasioi	Bouganville	Ogan (1967)
Ndembu	Africa	Turner (1966)
[New Caledonia group]	South Pacific	Rivers (1901)
Ngbandi	Africa	Lekers (1908)
Pomo	California	Corson (1966)
Poto	Africa	Stapleton (1903)
[Queensland group]	Australia	Rivers (1901)

Table VI (Page 2)

Language	Area	Source
Sango	Africa	Anderson, (1966)
Shona	Africa	Gleason (1961)
Tiv	Africa	Bohannan (1963)
Todas	India	Rivers (1901)
Tonga	Africa	Colson (1966)
Tshi	Africa	Rivers (1901)
Yibir	Africa	Kirk (1905)

Stage III (BLACK, WHITE, RED, GREEN)

Bagirmi	Africa	Gaden (1909)
Bangui	Africa	Stapleton (1903)
Bassa	Africa	Gleason (1961)
Batak	Malaya	van Wijk (1959)
Bullom	Africa	Nylander (1814)
Hanunóo	Philippines	Conklin (1955)
Ibibio	Africa	E. Kaufman (1966)
Poul	Africa	Faidherbe (1882)
Somali	Africa	Kirk (1905)
/Xam	Africa	Bleek (1956)

Stage IV (BLACK, WHITE, RED, GREEN, YELLOW)

Chinook Jargon	Canada	T. Kaufman (1967)
Eskimo	Canada	Graburn (1967)
Ewe	Africa	Migeod (1908)
Daza	Africa	Le Coeur (1956)
Duhomeen	Africa	Delafosse (1894)
Ibo	Africa	Goldberg (1966)

Table VI (Page 3)

Language	Area	Source
Papago	Southwest U. S.	O'Neale and Dolores (1943)
Shona	Africa	Goldberg (1966)
Songhai	Africa	Prost (1956)
Tzeltal	Mexico	Berlin (1967)
Tzotzil	Mexico	Collier (1963)
Urhobo	Africa	Goldberg (1966)
Wolof	Africa	Rambaud (1903)

Stage V (black, white, RED, green, YELLOW, blue)

Bedauye	Africa	Reinesch (1895)
Hausa	Africa	Robinson (1925)
Masai	Africa	Hinde (1901)
Mandarin	China	McClure (1966)
Nupe	Africa	Banfield (1915)
Samal	Philippines	Geoghegan (1967)
Plains Tamil	South India	Gardner (1966a)

Stage VI (black, white, RED, green, YELLOW, blue, brown)

Bari	Africa	Owen (1908)
Nez Perce	Northwest U. S.	Aoki (1967)
Malayalam	South India	Goodman (1963)
Siwi	Africa	Walker (1921)

Stage VII (all eight-, nine-, ten- and eleven- term lexicons)

Arabic	Lebanon	Kay (1967)
Bulgarian	Europe	Forman (1967)

Table VI (Page 4)

Language	Area	Source
Catalan	Europe	Corson (1967)
Cantonese	China	Stross (1967)
Dinka	Africa	Nebel (1948)
English	U. S.	Berlin and Kay (1967)
Hebrew	Israel	McClaren (1967)
Hungarian	Europe	Madarasz (1967)
Indonesian	S.E. Asia	Madarasz(1967)
Japanese	Japan	McClure (1967)
		Steger (1967)
Korean	Korea	Madarasz(1967)
Nandi	Africa	Hollis (1909)
Russian	Soviet Union	Slobin (1967)
Spanish	Mexico	Stross (1967)
Swahili	Africa	Madarasz(1967)
Tagalog	Philippines	Frake (1967)
Thai	Thailand	Forman (1967)
Urdu	India	McClaren (1967)
Vietnamese	Vietnam	Madarasz (1966)
Zuni	Southwest U. S.	Lenneberg & Roberts (1953)

norata 'YELLOW', and parata 'GREEN'. Chinese loans -- punhon-sek 'pink' tyn-sek 'orange', kal-sek 'brown', pam-sek '(chestnut) brown', nok-sek 'green', tšon-sek 'blue', tša-sek 'purple', and ke-sek 'grey'.

Cantonese Chinese is also only recently Stage VI, judging by internal reconstruction of its color vocabulary. In dictionaries of 100 years ago, the term for 'pink' sui does not occur. The present meaning can be shown to be best translated as 'water colored'. The terms lok 'jade colored' and la:m 'artificial blue' are also recent category labels which now segment GREEN. We may, therefore, reconstruct a Stage IV Cantonese with the following terms: bak 'WHITE', hek 'BLACK', hoŋ 'RED', ceŋ 'GREEN' and woŋ 'YELLOW'.

That we find fui 'grey' is somewhat anomalous. However, there is some evidence that it refers to 'ashes', and, if so, can be eliminated.

The internal reconstruction for the African Creole Swahili is relatively interesting in that it may be Stage II, having ancient terms only for 'BLACK' ñeusi, 'WHITE' ñeupe and 'RED' ñekundu. The term for green kidǰani may be new in that it might be glossed as 'leaf green'. The remaining terms are descriptives or loan words, i.e., kidǰivu 'grey' < 'ashes', kičunwa 'orange' < 'orange fruit', hudhuruni 'brown' < Arabic 'brown', kimandǰano 'yellow' < 'turmeric', bulu 'blue' < English 'blue', urudǰwani 'purple' < Persian 'purple'.

The appearance of new terms in some of the European languages is also indicative that on internal evidence these languages reconstruct to earlier stages. Bulgarian, for example, has borrowed terms oranzh <French orange, moravo < possibly Venitian moraẑo. Similarly, on internal evidence, the Hungarian terms for pink rózazin, barna 'brown, lila 'purple' and noronč 'orange' appear to be late loans from present-day Indo-European languages.

2.5. Problematic cases

While the vast majority of all eighty languages examined to date conform to our notions on the universality of color term foci as well as the evolutionary sequence of basic color terms, there are four problematic examples for which we require more data.

The first problem is presented by Catalan. Catalan is clearly Stage VII but there appears to be some doubt, at least for the informant consulted, that the term for black is a basic, rather than secondary, color term. Corson (1966) reports that his Catalan informant realized that English 'black' was not a 'kind of grey' but consistently maintained that Catalan negre was a kind of gris 'grey'. This is the only example in our data where the status of black as a basic color term is questionable, and more data is clearly needed from additional Catalan speakers.

Our data from Cantonese and Mandarin Chinese present several problems that effect to some extent the evolutionary hypothesis. We have, as indicated above, treated Mandarin as an example of Stage V, with terms for black, white, RED, green, YELLOW and blue. There is also a term for grey which is the same as the word for 'ashes'. For one informant (McClure 1967) this term is reported as basic; for several other informants (Madaraz 1967) grey is given as a tertiary form. Given these discrepancies, and the pattern pressure from the remaining data, we treat Mandarin as tentatively Stage V and plan to obtain more data on this language in future research.

The problem with Cantonese is analogous. There exist terms for white, black, RED, green, YELLOW and blue (which would make it Stage V) but as well terms for pink and grey. There is no term for brown, this category being included in yellow (Stross 1967). There is reason to require more data for this language, however, in that several of the forms (pink, blue, grey) appear to be very recent and their status as basic terms is as yet unclear.

Japanese also presents a problem with respect, not to its current state; but to its internal reconstruction. On internal evidence, the term for Japanese 'blue' ao(i) is of apparent greater antiquity than 'green' midóri(iro). Moreover, there is some evidence that ao(i) had an extension at one point in time over greens and blues. Should this be the case, we would have a situation whereby the unitary term GREEN (at Stage IV) has a focal point in 'blue' and eventually reduces to blues exclusively with the later appearance of the term for 'green' (at Stage V). If these conjectures are born out by further work, we would have no alternative but to treat Japanese as a counter-example to the evolutionary sequence of the categories blue and green. However, alternative and equally plausible interpretations can be made which conform to the theory here presented. Final decision of the matter must await further research.

Finally, Vietnamese must be mentioned in that it appears to lack a term for 'blue' but has basic terms for black, white, red, green, yellow, pink, purple, brown, and grey.

In sum, of the 80 languages considered (i) there is no counter example to the finding of universality of the eleven basic color category foci and (ii) there are just two serious candidates for counter-examples to the evolutionary ordering--(a) the absence of brown in Cantonese, and (b) the absence of blue in Vietnamese.

3. Summary and indications for future research

Our results to date show that (i) there exists universally a total inventory of eleven basic color categories from which the eleven or fewer basic color terms encoded in any given language are always drawn. (ii) There is a fixed partial ordering of the basic 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.(iii) This sequence is an evolutionary one.

One unanswered question, to which we now return, is the explanation of the particular ordering found. Why this sequence rather than some other? We suspect the answer lies in an area beyond our competence, human physiology, particularly neuro-physiology. Our results suggest that the partial ordering 1 also be interpreted as one of psychophysical salience, e.g., that psychophysically (and pre-linguistically) black and white are more salient than red, red than green, and so on. We hope that human neuropshysiology has now at hand, or may soon produce, a solution to this problem.

Another approach to the topic considered here is suggested by the work of R. Jacobson and M. Halle concerning universal developmental phonology (1962). The developing system is seen as one of an increasing number of (binary) contrasts, arranged to some extent hierarchically (taxonomically) and to some extent as a cross-cutting (paradigmatic) system. In these terms the early stages of development of basic color vocabulary can be conceptualized as follows.

Stage I (BLACK, WHITE) introduces the basic contrast of brightness. At Stage II, (BLACK, WHITE, RED) the contrast warm-hued versus cool-hued is introduced. Warm-hued is the marked member (RED) while cool hues are still categorized in terms of brightness properties alone. Note that RED has essentially the same signification as 'warm-hued' or 'warm-colored'. Stage III, introduces GREEN (normally including various blues), thus marking the previously unmarked cool hues. Stage III, (especially the major variant) is seen in Fig. 17. The system is not perfectly paradigmatic owing to the limitation on the brightness and warmth dimensions implied by the hue value.

The emergence of YELLOW at Stage IV is harder to deal with in these terms and suggests either that the analogy with the Jacobsonian phonological theory is spurious or that the answer lies at a deeper level than we have been able to probe. In any case, at the present state of our ignorance, the field is open for all attempts to explain the particular sequence in which basic color foci become lexically encoded.

The present report, as noted in the introduction, is of a most preliminary nature. As many questions have been raised as answered, probably more. Particularly we think the present results suggest additional research in the following areas: (i) further replication with monolingual informants from a variety of languages,[27] (ii) finer grained historical and comparative work, in-

	WHITE	BLACK	RED	GREEN
Hue	-	-	+	+
(hueless and) bright	+	-	unmarked	unmarked
(hued and) warm	unmarked	unmarked	+	-

Figure 17.

Stage III System in Terms of a

Developmental Paradigm

cluding a full-scale study of Indo-European color terms, (iii) studies in a variety of languages on the order in which children acquire color terms,[28] (iv) careful attempts to correlate stage of color lexicon development with various indices of cultural/technological complexity, (v) experimental studies to determine whether the "salience ordering" interpretation of 1 can be supported by non-verbal response data, (vi) a more comprehensive check of the existing literature for all useable reports of color terminologies.

NOTES

1. We thank the members of the research seminar for their active collaboration in this study and comments on the present report. They include Christopher Corson (Catalan and Pomo), Sylvia Forman (Bulgarian and Thai), Keith Kernan (Samoan, but not included in the report), Paul Madarasz (Hungarian, Indonesian, Mandarin, Korean, Swahili and Vietnamese), Katherine McClaren (Hebrew and Urdu), Erica McClure (Mandarin and Japanese), Peter Steager (Japanese) and Brian Stross (Cantonese and Spanish). We also thank Charles C. Frake who is responsible for the Tagalog materials and Elain Kaufman for collecting the Ibibio data. The authors are responsible for data on English, Arabic and Tzeltal. We are grateful to our colleages in the Department of Anthropology, University of California, Berkeley, for their critical remarks on an earlier version of the manuscript. In addition, we have benefited from the useful comments of Wallace L. Chafe, Harold C. Conklin, George L. Cowgill, Christopher Day, A. Richard Diebold, Jr., Pricilla Diebold, Marshall E. Durbin, John L. Fischer, Joseph Greenberg, Dell H. Hymes, Terrence Kaufman, Richard Lee, Floyd Lounsbury, Nicholas A. Hopkins, Duane Metzger, Barbara MacRoberts, Eugene Ogan, Patricia Porth, John M. Roberts, David M. Schneider, Thomas A. Sebeok, Dan I. Slobin and the late Morris Swadesh.

2. For example, Verne Ray claims "...there is no such thing as a natural division of the spectrum. Each culture has taken the spectral continuum and has divided it upon a basis which is quite arbitrary" (1952:252). In perhaps the most influential of standard linguistics texts in the United States, H. A. Gleason notes, "There is a continuous gradation of color from one end of the spectrum to the other. Yet an American describing it will list the hues as red, orange, yellow, green, blue, purple, or something of the kind. There is nothing inherent either in the spectrum or the human perception of it which would compel its division in this way" (1961:4).

3. Throughout this discussion, when we speak of color categories in a given lexicon, we refer to the meanings of native lexemes in terms of the three psychophysical dimensions hue, saturation, and brightness. It has been demonstrated, e.g., by Conklin (1955) that color lexemes may well include, along with information concerning these particular psychophysical dimensions, other sorts of information, e.g., succulence versus dessication. Similarly in Tzeltal, secondary color lexemes indicate not only features of surface texture but refer as well to features of shape and consistency.

Moreover, it has been argued, to our minds quite convincingly, that to appreciate the full cultural significance of "color words" it is necessary to appreciate the full range of meanings, both referential and connotative, and not restrict oneself arbitrarily to hue, saturation and brightness. We thus make no claim, in fact we specifically deny, that our treatment of the various color terminologies presented here is an ethnographically revealing one. This study is admittedly etic rather than emic: the data are abstracted and removed from their proper cultural context. However, we will not accept the stricture offered by some ethnographers that such an abstraction always and necessarily renders data meaningless. The high degree of pattern found in the data is sufficient justification of the process dictating its selection. We thus interpret the pattern found in our results as representing legitimate linguistic and cultural universals. Given the well known variability in the structure which various lexicons impose on their "field properties", it appears that our choice of semantic dimensions for cross-linguistic investigation was a fortunate one.

4. The relation designated '$<$' is defined as follows. For any distinct a, b $\in$ $\{$white, black, ..., grey$\}$, $a < b$ just if for any language L, if b is lexically encoded in L, then a is lexically encoded in L. For example, green $<$ brown indicates that any language which has a basic color term for brown will have a basic color term for green. Thus '$<$' is irreflexive, assymmetric and transitive (these are also the properties of 'less than' among the real numbers). It

will be argued below that '<' can also be given the additional interpretation 'becomes lexically encoded earlier in the history of every language (than)'.

5. That is, there are twenty-one possible basic color lexicons given (i) the ordeing 1 and (ii) the plausible and empirically valid assumption that a one-term color lexicons make no sense. If a color lexicon could encode any number of the eleven basic categories (including zero), there would be a 2^{11}=2,048 possibilities. If we exclude lexicons of zero and one term, but do not impose the constrains of ordering 1, there are still 2^{11}-12= 2,036 possibilities. There are thus 2015 more lexicons allowed if the constraints of ordering 1 are not introduced; none of these 2015 has been found to occur in our larger sample of 80 languages. (See Evolution of basic color terms especially Table III and surrounding discussion.)

6. A concern with the evolution of color terminology may be traced to the early work of W. E. Gladstone (1858) and Lazarus Geiger (1867). Our attention was called to these materials after the present theory had been developed through a reading of W. H. R. Rivers' Torres Straits researches. Rather than discuss in detail the contributions of these writers, we quote from Rivers, who offers a concise statement of the ideas current at that time. (An excellent summary is also found in Segall, Campbell and Herskovits, 1967).

"The colour vision of primitive races has excited interest mainly in its philological aspect and has been considered especially in relation to the hypothesis that there has been considerable modification of the colour sense in man within historical times. This question was first raised by Gladstone [1858:(3) 457], who from a close study of the epithets for colour used by Homer came to the conclusion that the people of that age could have distinguished little more than differences of brightness and darkness. Geiger [1867:16] later advanced the view that there had been a definite evolution of the colour sense in man; that at one period of his existence he had distinguished nothing more than differences of brightness; that red had been the colour first distinguished and that the discrimination of other colours had developed in the same order as that of the arrangement of the colours in the spectrum, the power of seeing blue and violet having been the last to develop. These views of Geiger were based entirely on philological evidence derived from a wide study of ancient literature. He was supported by Magnus [1877] also on philological grounds, but it was generally held that these writers were not justified in their conclusions and that the close relation between language and sense which these authors supposed to exist was far from being a fact. It was also found by Virchow... [1870] and others that savages might have exactly the same peculiarities of colour nomenclature which are found in ancient literature and might yet have a well-developed colour sense..."(1901:48).

As noted above, we also have found no evidence relating differences in color nomenclature to differences in perceptual ability.

The most recent and intriguing cross-cultural comparison of color terminologies is that of van Wijk (1959). Noting the discrepancies in the structure of color lexicons in the languages of the world, van Wijk attempts to show that the differences are based on the relative importance of the brightness vs hue dimensions in color perception. He attempts to show that societies near the equator have color lexicons which focus primarily on the brightness dimension while societies nearer the poles focus predominantly on hue. In van Wijk's words, "...it is striking that the brightness terms occur in the regions close to the equator...it is in these regions that the average intensity of light is greatest. The average intensity decreases as one reaches the higher latitudes. Peoples living in the higher latitudes generally use a color [i.e., hue] nomenclature, peoples living in the tropics roughly speaking have brightnes nomenclatures, as far as we can judge from the available data. These circumstances lead us to the hypothesis that optological characteristics of perceptions of light are originally conditioned by the properties of the light, in such a manner than an optological system with specific brightness terms is formed where the intensity of light is greatest, and an optological system with specific colour terms is formed where the intensity of light is significantly less and the wavelength of the light [i.e, hue] is of correspondingly greater importance" (1959:131).

Interesting as van Wijk's thesis may be, it leaves much to be desired as an explanation of the pattern described in this report. One of the most serious problems with his treatment is the failure to report terms for neutral hues in languages which are supposed to be examples of terminologies based on hue considerations. Certainly, these language must possess terms which reflect at least the contrasts in brightness marked by the categories BLACK and WHITE.

A more refined version of van Wijk's thesis might characterize tropical systems as brightness dominated and temperate systems as brightness plus hue dominated. Such a reformulation would bring the theory into conformity with the facts as a rough correlational statement. Still the correlation would be far from perfect and the explanation in terms of geographical differences in the mean intensity of sunlight still insufficient. The major point missed by van Wijk is that brightness is a major dimension of contrast in <u>all</u> color systems. As a color system introduces hue contrasts, the importance of brightness does not diminish - the systems simply becomes more complex. For example, the relatively late foci brown, pink, and grey, which are absent from just those tropical terminologies van Wijk wishes to characterize as brightness dominated, are based almost exclusively on brightness contrasts. At the time of introduction of these terms, foci of virtually itentical hue are already present in the lexicon: respectively yellow, red, black/white.

7. The complete set of color chips may be obtained from the Munsell Color Company, 2441 North Calvert Street, Baltimore, Maryland, 21218, U. S. A. at approximately $ 100.00 per set. Munsell code specifications for the chips utilized in our stimulus materials may be obtained from the authors on request.

8. See, for example, Conklin (1962, 1964), Frake (1962, 1964), Metzger and Williams (1963), Black and Metzger (1965).

9. cf. Conklin (1962).

10. Lounsbury's (1964a, 1964b) work on generation-skewed kinship systems may have a related significance. Although he does not present his findings within a fully explicit theory of lexical definition, he shows that recursive rules are involved in specifying the signification of many kinship terms.

11. However, verbal reports of color terminologies, especially those from the earlier literature, must still be interpreted with care. One not infrequently encounters statements such as, "The natives have no words for green and blue." This statement is ambiguous between (i) a lexicon in which neither the green nor blue centers have become encoded and (ii) a lexicon in which the green center has been encoded while the blue has not, with the boundary of the 'green' category very likely including most blues. Needless to say, statements of this sort can also be given a wide variety of interpretations quite at odds with our scheme. Consequently, reports containing such ambiguities have been excluded from consideration.

There remain a fairly large proportion of the reports in the existing literature, which can, now that we know the universal basic categories, be unequivocally interpreted. These reports usually convey the meaning of color words from exotic languages by means of English, or other European language, glosses. Without knowledge of the eleven universal categories, such reports are difficult or impossible to interpret and compare. Given this knowledge, the vast majority can be assigned a unique interpretation in terms of objective color measurement.

12. By "loss of a basic color term" we mean here "proceeding from the state

of having some term for a given category to having no term for that category". We do *not* mean that languages never "lose" color terms in the sense that, say, a native form encoding a given category is replaced by a foreign form. In Bisayan, for example, *beldi* 'green' (< Spanish *verde*) no doubt is the result of replacement of an earlier Bisayan form rather than the encoding, under Spanish influence, of a previously non-encoded category.

13. In 'Language L' we include previous stages of L that would commonly be called by different names. For example, if L is Modern English (and the moment is the present) L also includes Middle English, Old English, Anglo Saxon, Proto-Germanic, Proto-Indo-European, and so on.

14. That is, about a score at the outside, hence, perhaps no more than a few hundred forms. Cf. Wallace Chafe (1967).

15. In this and subsequent diagrams, the following conventions are used. (i) The upper and lower bands of the diagram represent a row of forty chips of neutral hue and brightness nine and one respectively, (that is pure white and pure black). The reason for this is that the rectangular color chart used as stimulus may be thought of as a two dimensional projection of the surface of the color solid (which latter has roughly the shape of two fat ice-cream cones joined at the ice-cream). The stimulus chart bears approximately the same relation to the color solid as a Mercator projection does to a hollow globe. In particular, just as the North and South poles are "stretched" in a Mercator projection along the entire length of the upper and lower edges of the map, so in our two dimensional color chart the vertices of the two cones (i.e., the pure white and pure black points) are represented by the superior and inferior edges of the chart, or, at lest, should theoretically be so represented In fact, as mentioned above (Figure 1), neutral hues were actually presented. to subjects as a separate array. However, in discussing the results, it is

easier to treat white and black as the upper and lower edges of the hue-brightness chart.

(ii) Unstippled areas of all figures containing the name of a category denote the focus of that category. (iii) Stippled areas indicate presumed maximal extensions of a category. (iv) Unmarked areas are those whose category affiliations, if any, are in doubt.

The reader's attention is drawn to the fact that WHITE and BLACK are identical to white and black in regard to foci. They differ only in terms of boundaries. The same holds for RED/red, GREEN/green, and YELLOW/yellow introduced below. Given our convention of referring always to foci in general discussion, whatever holds for white holds for WHITE, etc., unless the context clearly indicates that boundaries are at issue.

16. Gardner's terminology is a bit unorthodox in that he makes an analytical distinction between brightness due to the intensity of the light source (which he calls "illumination") and brightness due to the properties of the reflecting surface (which he calls "brightness"). He notes that the Paliyans classify these together on the dimension niram.

17. The Paliyan data invite another speculation, plausible but lacking in direct support. Several lines of evidence, including the distinct physical differences between Paliyans and Plains Tamil speakers, indicate that the Paliyans may at one time have spoken a language unrelated to Tamil and perhaps to anything else. Parallels can be seen in the loss of their native language of various Pigmoid groups, e.g., the acceptance of Bantu by the Pigmies of the Central Congo. We may speculate that the original language of the Paliyans contained terms for BLACK and WHITE, i.e., for two degrees of niram 'brightness'. In learning Tamil, the Paliyans encountered additional terms for the quality of reflected light and simply accepted the Plains Tamil meanings of these in so far as the dimension of brightness was concerned. Note that (i) the Paliyan terms for

the extremes of brightness are cognate with the Plains Tamil terms for white and black, (ii) the Paliyan terms for secondary degrees of brightness and darkness are respectively the Plains Tamil terms for yellow and red (note in Figure 3 that yellow and red are the brightest and darkest of the basic categories other than white and black); and (iii) whereas Plains Tamil lacks a term for grey, blue is taken in Paliyan as the middle-brightness category. (Note in Figure 3 that blue is par excelence the middle-brightness category other than grey).

18. For the Tiv, see P. Bohannan (1963:35-36), for Tonga we have taken the data of Elizabeth Colson (1966); the Shona data are from Gleason (1961:4).

19. For the Todas data, see Magnus (1880); for Tshi, see Riis (1853). The Bantu material is reported in Buchner (1883), and the New Caledonia report is found in Moncelon (1886). All are summarized in Rivers (1901).

20. Hanunóo is from Conklin (1955), Bassa from Gleason (1961) and Ibibio from E. Kaufman (1966).

21. The data from this dialect of Shona, Ibo and Urhobo are from G. A. Goldberg (1966).

22. The Tzeltal data were taken in the field from 40 informants ranging from total Tzeltal monolinguals to perfect Tzeltal-Spanish bilinguals. While a high intensity lamp was utilized as the constant light source for the languages examined in the seminar, sunlight was utilized in collecting the Tzeltal materials for practical considerations. Color terminology in Tzotzil, Tzeltal's closest relative, has been studied by George Collier (1963). While Collier's methods were not the same as those employed in the research reported here, it was clear from his report that Tzotzil represents Stage IV as well. Administra-

tion of our experimental procedure to two Tzotzil informants corroborates this finding, the foci of categories in Tzeltal and Tzotzil being almost identical.

23. See above, section 2.3.1.

24. References for the Nupe are Banfield (1915), Massai data are reported in Hinde (1901), Bedauye materials are in Reinesch (1895) and Hausa terms are found in Robinson (1925). Much of our African materials come from a bibliography generously compiled by Philip Anderson (1966).

25. Data are from Aoki (1967).

26. For Bari, see Owen (1908); for Siwi see Walker (1921).

27. The Tzeltal experimental work is enlightening in this regard and lends considerable validity to our earlier findings.

28. See, for example, the work of Z. M. Istomina (1963) on Russian children.

BIBLIOGRAPHY

Anderson, Philip

1966 Color category systems in some African languages. Unpublished ms. Berkeley.

Aoki, Harumo

1967 Personal communication.

Banfield, A. W. and J. L. Macintyre

1915 A grammar of the Nupe language, London, Society for Promoting Christian Knowledge.

Berlin, Brent

1967 Tzeltal color terminology. Unpublished ms. Berkeley

Berlin, Brent and Paul Kay

1967 English color terms. Unpublished ms. Berkeley.

Black, Mary and Duane Metzger

1965 Ethnographic description and the study of law. In the Ethnography of Law. L. Nader (ed.) American Anthropologist. Special Publication.

Bleek, Dorthea F.

1956 A Bushman dictionary. New Haven: American Oriental Society.

Bohannan, P.

1963 Social Anthropology. New York. Holt, Rinehart and Winston.

Buchner,

1883 Das Ausland

Chafe, Wallace

1966 Explorations in the Theory of Language. Unpublished ms.

Collier, George

1963 Color Categories in Zinacantan. Harvard honors thesis. Unpublished ms.

Colson, Elizabeth

1966 Personal communication.

Conklin, Harold C.

1955 Hanunóo color categories. Southwestern Journal of Anthropology 11:339-344.

1962 Lexicographical Treatment of Folk Taxonomies. IJAL 28: 119-141

1964 Ethnogeneological method. In W. Goodenough (ed.) Explorations in Cultural Anthropology.

Corson, Christopher

1967 Seminar paper on color categories. Dept. of Anthropology University of California, Berkeley. Unpublished ms.

Delafosse, M.

1894 Manuel Dahoméen. Paris, Ernest Leroux.

Ervin, Susan M.

1961 Semantic shift in bilingualism. American Journal of Psychology, 74:233-241.

Faidherbe, L. L. C.

1682 Grammaire et vocabulaire de la langue Poul. Paris, Masonneve et Libraires.

Forman, Sylvia

1967 Seminar paper on color categories. Dept. of Anthropology University of California. Berkeley. Unpublished ms.

Frake, Charles O.

1967 Tagalog color terms. Stanford. Unpublished ms.

Gaden, H.

1909 Essai de la grammaire de la langue Baguirmienne. Paris Ernest Leroux.

Gardner, P. M.

1966a Personal communication.

1966b Symmetric Respect and memorate Knowledge: The Structure and Ecology of Individualistic Culture. Southwestern Journal of Anthropology 22:389-415.

Geiger, Lazarus

1880 Contributions to the History of the Development of the Human Race. London: Trubner and Company.

Geoghegan, William

1967 Personal communication.

Gladstone, W. E.
1858 Studies on Homer and the Homeric Age. London Oxford University Press.

Gleason, H. A.
1961 An Introduction to Descriptive Linguistics. New York: Holt, Rinehart and Winston.

Goldberg,
1966 Ibo, Shona and Urhobo color terms. Unpublished ms. Berkeley.

Goodman, John Stuart
1963 Malayalam color categories. AL 5(5):1-12

Graburn, N. H. H.
1967 Eskimo color terms. Unpublished ms. Berkeley.

Greenberg, J. H.
1963 The Languages of Africa. Pub. 25, Indian Univ. Research Center in Anthro., Folklore and Linguistics.

Hinde, (Mrs.) Hildegarde
1901 The Masai Language. (London, Cambridge University Press).

Hollis, A. C.
1909 The Nandi; their language and folklore. (Oxford, Clarendon Press).

Istomina, Z. M.
1963 Perception and naming of color in early childhood. Soviet Psychology and Psychiatry 1:37-45.

Jacobson, Roman and Morris Halle
1962 Fundamentals of Language. Mouton, The Hague.

Kaufman, Elaine
1966 Ibibio color categories. Unpublished ms. Berkeley.

Kaufman, Terrence
1966 Chinook Jargon color terms. Unpublished ms. Berkeley.

Kay, Paul
1967 Lebanese Arabic color terms. Unpublished ms. Berkeley.

Kirchhoff,
1833 Die Wissenschaft. Ergebnisse d. Vega expedition Ed, I 5.42.

Kirk, J. W. C.
1905 A grammar of the Somali language. Cambridge University Press.

Koch, K.-F.
1966 Personal communication.

Le Coeur,
1956 Grammaire et texted Teda-Daza. Dakar. Institute Français D'Afrique Noir-IFAN.

Lee, Richard
1967 Personal communication

Lekers, P. Benjamin

1952 Dictionaire Ngbandi. Tervurer. Commision de Linguistique Africaine.

Lenneberg, Eric H. and Roberts, John M.

1956 The language of experience: A study in methodology. Memoir 13 of IJAL.

Lounsbury, Floyd

1964a A formal account of the Crow and Omaha-type kinship terminologies. In Explorations in Cultural Anthropology: Essays Presented to George Peter Murdock, W. H. Goodenough, ed. New York, McGraw Hill. pp 351-393.

1964b The structural analysis of kinship semantics. In Proceedings of the Ninth International Congress of Linguistics. (Cambridge, Mass.). The Hague. Mouton pp 1073-1093.

Madarasz, Paul

1967 Seminar paper on color categories. Dept. of Anthro. University of California. Berkeley. Unpublished ms.

Magnus,

1877 Die geschichtliche Entwickelung des Farbensinnes. Leipzig

McClaren, Kathrine

1967 Seminar paper on color categories. Dept. of Anthro. University of California. Berkeley. Unpublished ms.

McClure, Erica

1967 Seminar paper on color categories. Dept. of Anthro. University of California, Berkeley. Unpublished ms.

Metzger, Duane and Gerald D. Williams
1963 A formal ethnographic analysis of Tenejapa Ladino weddings. American Anthropologist 65:1073-1101.

Migeod, Frederick W. H.
1908 The Mende Language. London, Kegen, Paul, Trench, Trubner & Co. Ltd.

Moncelon,
1886 Bulletin de la Société d'Anthropologie. IX. Paris, p. 708.

Nebel,
1948 Dinka grammar. Verona, Missioni Africane.

Nylander, Gustavus R.
1814 Grammar and vocabulary of the Bullom language. London. Ellerton and Henderson.

Ogan, E. 1967 Personal communication

O'Neale, Lila M. and Juan Dolores
1943 Notes on Papago color designations. AA 45(3):387-97.

Owen, Roger C. R.
1908 Bari grammar and vocabulary. London. J. & E. Bumpus Ltd.

Prost,
1956 La langue Sonay. Dakar. IFAN.

Rambaud, J. B.
1903 La langue Walof. Paris. Imprimerie Nationale.

Ray, Verne F.

1952 Techniques and problems in the study of human color perception. SJA 8:251-259.

1953 Human color perception and behavioral response. Trans. New York Acad. of Sciences, ser. 2, 16(2):98-104.

Reinesch,

1895 Worterbuch der Bedauye-sprache. Wein. Alfred Holden.

Riis,

1853 Elemente de Akwapim-dialects der Cdschi-sprache. Basel.

Rivers, W. H. R.

1901 Introduction and vision. In A. C. Haddon (ed.), Reports on the Cambridge Anthropological Expedition to the Torres Straits, Volume II Physiology and Psychology, part I.

Robinson,

1925 Hausa dictionary. London. Cambridge University Press.

Romney, A. Kimball

1967 Internal reconstruction of Yuman kinship terminology. Studies in Southwestern Ethnolinguistics ed. Dell H. Hymes with William E. Bittle. Mouton & Co. The Hague. Paris. pp. 379-388.

Sapir, Edward

1916 Time perspective in aboriginal American culture: A Study in method. In David Mandelbaum (ed.) Selected Writings of Edward Sapir in Language, Culture and Personality. Berkeley and Los Angeles: University of California Press, 1949.

Segall, M. H., D. T. Campbell and M. J. Herskovits
1966 The influence of culture on visual perception. Indianapolis. Eobbs-Merrill.

Smith, Edwin W.
1907 A handbook of the Ila language. London. Cxford University Press.

Slobin, Dan I.
1967 Personal communication.

Stapleton,
1903 Comparative grammar of the Congo languages. Eolobo. B. M. S. Press.

Steager, Peter
1967 Seminar paper on color categories. Dept. of Anthropology. University of California. Berkeley. Unpublished ms.

Stross, Erian
1967 Seminar paper on color categories. Dept. of Anthropology. University of California. Berkeley. Unpublished ms.

Turner, Victor
1966 Colour classification in Ndembu ritual. In Anthropological approaches to the study of religion. Eanton, ed. Association of Social Anthropology Monography.

Virchow,

1878 Zeitsh. f. Ethnol. Bd. X.

1879 Zeitsh. f. Ethnol. Bd. XI.

von Hagen,

1914 Lehrbuch der Eulu-sprache. Berlin. Druck and Verlag von Gebr. Bodetzki Hofbuchhandlung.

Walker, W. Seymour

1921 The Siwi language. London. Kegan, Paul, Trench, Truber & Co. Ltd.

Wijk, H. A. C. W. van

1959 A cross-cultural theory of colour and brightness nomenclature. Bijdragen tot de Taal-, Landzen Volkenkunde 15. 2: 113-137. The Hague.