132-135. Colour Terms

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1. The World Color Survey

The following four maps show the distribution of colour terms in some of the world's languages, based on the World Color Survey. This project, a collaboration of researchers at the University of California, Berkeley, and the Summer Institute of Linguistics (SIL), collected color-naming data from 110 languages being studied by SIL linguist-translators in the late 1970s. For further details on methods and results of the World Color Survey see Kay et al. (1991), Kay and Berlin (1997), Kay et al. (1997), Hardin and Maffi (1997), Kay and Maffi (1999).

2. Basic colour term concepts

In recent models of the universals and evolution theory of basic color terms, stemming originally from Berlin and Kay (1969), three kinds of **universal color categories** are recognized (Kay and McDaniel 1978, Kay et al. 1991, Kay et al. 1997, Kay and Maffi 1999): primary color categories, composite (disjunctive) color categories, and derived (intersective) color categories.

2.1. Primary color categories. First, there are the six **primary colors** recognized in the widely accepted theory of **color opponency** (Hering 1964 [1920], Jameson and Hurvich 1968, Hurvich 1982):

Black
White
Red
Yellow
Green
Blue

These are the two pairs of fundamental opponent chromatic colors <Red, Green> and <Yellow, Blue> and the single pair of fundamental achromatic colors <Black, White>. Black and white are not opposed in the same sense as the chromatic pairs. For example, we can see a combination of black and white (gray) but there is no sensation consisting of the combination of red and green or of blue and yellow. (That blue and yellow pigments can

be mixed to produce a green pigment is not relevant; there are no bluish yellow or yellowish blue *sensations*.)

We will refer to the six colors black, white, red, yellow, green and blue as **primaries**.

2.2. Composite color categories. Secondly, there are **composite categories** consisting of fuzzy unions of the primaries. (Color categories are modeled as fuzzy sets, that is, sets whose membership is a matter of more or less. For non-technical discussion of fuzzy sets, fuzzy intersection, fuzzy union, and related concepts in relation to color categories, see Kay and McDaniel (1978); for technical discussion of fuzzy sets and fuzzy logic, see Zadeh (1996).)

By far the most widespread composite in the ethnographic present is green-or-blue or "grue" (see Map 134). Over half the languages in the World Color Survey contain a grue term. Other major composite terms documented in the World Color Survey are, using "/" for fuzzy union, Black/Green/Blue, White/Red/Yellow, Black/Blue, Red/Yellow, Yellow/Green/Blue, and Yellow/Green. (There is one, somewhat unclear, instance of a probable White/Yellow term in Waorani, an isolate of Ecuador.)

There are also what we might call *minor composites*. For example, in systems that lack terms for purple and brown, these colors are often included in the black term. Similarly, in systems restricted to the primaries, non-primary shades such as brown, purple, pink, orange and gray are characteristically either split between two adjacent primaries or covered by a single adjacent primary.

2.3. Derived color categories. The third type of widespread color category are the derived (intersective) categories, which are experienced as mixtures of the primaries. These are based formally on fuzzy intersections of primaries. Gray is experienced as a mixture of Black and White, pink of White and Red, orange of Yellow and Red, purple of Blue and Red, and brown (arguably) of Yellow and Black.

3. An evolutionary sequence of basic color systems

Figure 1 presents both a typology and an evolutionary sequence of basic color systems covering 101 of the 110 World Color Survey languages. (The color lexicons of the remaining nine languages are composed mostly of terms denoting categories

appearing in Figure 1. Limits of space preclude further discussion here; see Kay and Maffi 1999.)

Basic color lexicon types are shown in square brackets and evolutionary stages are represented by columns, labeled with Roman numerals. For example, stage I contains a single type, consisting of two terms, one a composite of White, Red, and Yellow and the other a composite of Black, Green, and Blue. (There are no stage I languages in the World Color Survey sample. Stage I is shown here for theoretical completeness.)

Arrows indicate observed evolutionary transitions between types. Arabic numerals within brackets indicate the number of World Color Survey languages conforming to the corresponding color lexicon type. Arabic numerals placed between basic color lexicon types indicate the number of World Color Survey languages transitional between the two types.

Derived categories are not considered in the typology presented in Figure 1. Usually, derived categories appear only after stage V, where each primary has received a separate term, but there are many exceptions. Creating a type for every resulting combination would lead to pointless complexity. Composite terms are characteristic of the earliest stages of development. Evolutionary development consists essentially in a succession of increasingly fine partitions of the perceptual color space. The vast majority of World Color Survey languages, 83%, belong to a type or transitional type along the single evolutionary trajectory I > II > $III_{Green/Blue}$ > $IV_{Green/Blue}$ > V.

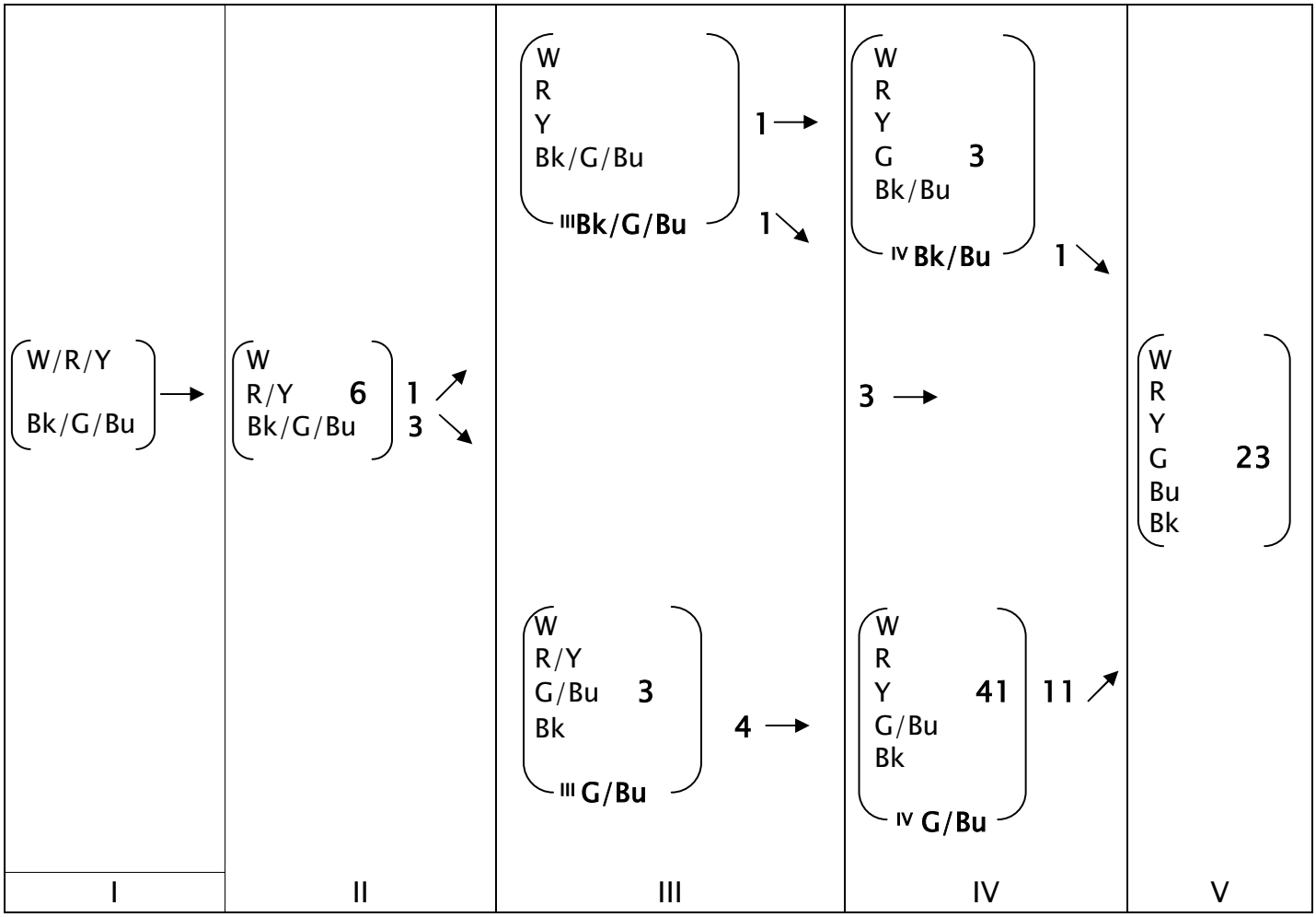

Figure 1. A Typological and Evolutionary Scheme Covering Most World Color Survey Languages (Source: Kay and Maffi 1999, Figure 3.)

4. The color term maps

Four color term maps are presented. They tabulate the data from the 110 World Color Survey languages and comparable data from nine additional languages (Berlin and Kay 1969; Xu 1994). The World Color Survey sample hardly overlaps with the standard sample of the *World Atlas of Language Structures* and care should be exercised in comparing the color maps with other maps in this atlas.

The four color term maps address four major types of questions a reader might have regarding the distribution of a basic color term system in the world:

(i) What is the basic evolutionary stage? That is, how many non-derived (i.e., either composite or primary) terms does the system contain? This amounts to assigning each language to a column in Figure 1.

(ii) How many basic color terms (including derived terms) does the system contain?

(iii) How are the "cool" primaries green and blue treated?(iv) How are the "warm" primaries red and yellow treated?

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4.1. Map 132: Number of Non-Derived Basic Color Categories.

Because there is sometimes synonymy in basic color terms, it is more revealing to tabulate the number of *categories* that are encoded by basic color terms than to count the number of basic color terms *per se*. The number of non-derived basic color categories encoded in basic color terms is a feature with self-explanatory integer values, with the exception that we define values 2, 4, and 6 to represent color lexicons judged to be intermediate between two types which encode the adjacent whole numbers of non-derived basic color categories.

@	1.	3 categories		10
@	2.	Between 3 and 4 categories		3
@	3.	4 categories		9
@	4.	Between 4 and 5 categories		1
@	5.	5 categories		56
@	6.	Between 5 and 6 categories		11
@	7.	6 categories		29
			total	119

The most frequent type in this sample of mainly unwritten contemporary languages is one with five non-derived basic color categories encoded. Languages with fewer than five non-derived basic color categories encoded as separate terms tend strongly to occur in the tropics.

4.2. Map 133: Number of Basic Color Categories. This feature is similar to the preceding except that in this case (1) all basic color categories, including derived categories, are counted and (2) *ranges* of numbers of categories form the values of the feature.

@	1.	3, between 3 and 4, or 4 categories	20
@	2.	Between 4 and 5, 5, or between 5 and 6 categories	26
@	3.	6 or between 6 and 7 categories	34
@	4.	7 or between 7 and 8 categories	14
@	5.	8 or between 8 and 9 categories	6
@	6.	9, between 9 and 10, or 10 categories	8
@	7.	More than 10 categories	11
		total	119

As on the previous map, a tendency may be observed for the number of basic color categories encoded to vary inversely with distance from the equator.

4.3. Map 134: Green and Blue. Given the typology of Figure 1, and the fact (not noted there) that Green and Yellow can be associated, there are six ways green and blue can be encoded.

(i) Green and blue each get a basic color term (as in English, for example).
(ii) A green-or-blue category gets a basic color term ("grue").
(iii) A black-or-green-or-blue category gets a basic color term.
(iv) A black-or-blue category gets a basic color term and green gets a separate basic color term.
(v) A yellow-or-green-or-blue category gets a basic color term.
(vi) There is a term for yellow-or-green and a term for blue.

In addition, we need a seventh value, not applicable, for languages in which either the green sensation or the blue sensation (or both) fails to be included in any basic color term.

@	1.	Green and blue		30
@	2.	Green-or-blue ("grue")		67
@	3.	Black-or-green-or-blue		15
@	4.	Black-or-blue and green		2
@	5.	Yellow-or-green-or-blue		2
@	6.	Yellow-or-green and blue		1
@	7.	Either green or blue (or both) not included in any basic colour term		2
			total	119

The most frequent way of encoding green and blue in this sample of languages is in a grue term.

4.4. Map 135: Red and Yellow. Given the typology of Figure 1, and (as before) the fact that Green and Yellow can be associated, there are four ways red and yellow can be encoded – as well as a value "not applicable".

(i) Red and yellow each gets a basic color term.
(ii) Red-or-yellow is a basic color term.
(iii) Red gets a separate basic color term and yellow-or-green-or-blue is encoded as a basic color term.
(iv) Red is a separate basic color term and yellow-or-green is encoded as a basic color term.

@	1.	Red and yellow		97
@	2.	Red-or-yellow		15
@	3.	Red and yellow-or-green-or-blue		3
@	4.	Red and yellow-or-green		1
@	5.	Either red or yellow (or both) not included in any basic color term		3
			total	119

Red and yellow are much less frequently encoded in a single composite than green and blue. In fact, no language has to our knowledge been reported – in the World Color Survey or elsewhere – that gives separate basic color terms to green and blue while retaining a red-or-yellow composite.