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Color Terms and Color Term Acquisition in Damara

A study of color terms in Damara, a Khoisan language spoken in Namibia, tested Berlin and Kay's (1969) theory of color term universals on a new language family (Khoisan) and investigated the extent to which the color term inventory was influenced by neighboring languages and recent social and political changes. The data indicate that Damara's 11 color terms (8 original and 3 loan terms) fit the theory well. The inventory is changing, but it has borrowed terms only to fill in the "missing" universals. Colonial circumstances and bilingualism have apparently influenced the age of color-term acquisition, among other effects.

Berlin and Kay's (1969) theory of color universals marks a significant turning point in the study of linguistic color categories. Before 1969 the observed diversity of color terms across languages was interpreted as strong evidence that color categories were culturally relative. It appeared that languages segmented the physical continuum of the color spectrum into categories without constraint (Gleason 1961). Since 1969 the dominant view has shifted toward belief in color universals. Proponents of color universals ascribe the observed diversity in color terms either to the boundaries of color categories, leaving the foci (the core) of color categories invariant, or to languages' being at different evolutionary stages en route to a universal set of color terms. The shift toward belief in color universals has been sustained by many field studies (see Maffi 1991) with findings broadly consistent with Berlin and Kay's theory. But there has always remained the possibility that data from a language family whose color

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terms had not previously been systematically studied might invalidate the theory's claim to universality. The study we report here aimed to test the theory on a language from such a family: Nama-Damara, a Khoisan language spoken in Namibia in southwestern Africa. The study also aimed to investigate influences on the color-term inventory from neighboring and colonial languages.

Earlier, we had carried out field studies of some of the Bantu languages of southern and central Africa. These studies, reported elsewhere (Davies et al. 1992 on Setswana; Davies et al. 1995b on Chichewa; Davies and Corbett 1994 on Xhosa; and Davies et al. 1994 on Ndebele), gave results that were in general consistent with the theory. They also provide a comparative context for our discussion of the Nama-Damara data.

Background: The Berlin and Kay Theory

The original Berlin and Kay (1969) theory is illustrated by the hierarchy shown in Figure 1. The hierarchy shows the possible sets of "basic" color categories permitted by the theory. The hierarchy constrains possible basic color term inventories synchronically and diachronically. The synchronic constraint is that, if a language has a term for a given color category, then it should also have terms for all the color categories to the left of it on the hierarchy. For instance, no language should have a term for red without also having terms for black and white. There is no implicational relationship between categories that share positions on the hierarchy; so if a language has a term for purple, nothing can be inferred about whether there would be terms for pink, orange, or gray since these categories share the final position on the hierarchy. The diachronic constraint is that the hierarchy describes the evolution of basic color term inventories. According to the theory, all languages start by encoding black and white; they next encode red and then encode either green or yellow, and so on up to stage six, when all 11 universal categories are encoded.

The theory accounts for the observed diversity in linguistic terminology in three ways. First, the universals are universals of the foci of color categories, but not of the boundaries of color categories. Thus, languages can segment the continuum of the color spectrum in different ways by placing the boundaries between categories in different places, provided the positions of the foci are invariant. Second, languages differ because they are at different stages of the evolution of color terms. Third, and most controversially, the

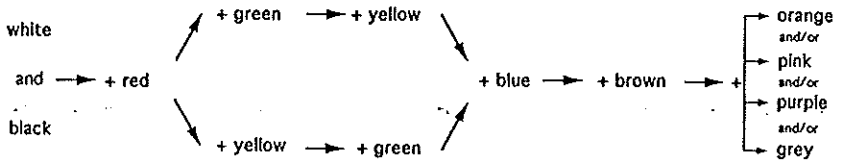

Figure 1
The Berlin and Kay hierarchy of basic color terms

hierarchy constrains just the *basic* color terms permitted: any amount of variation in secondary color terms is allowed. Basic color terms are identifiable as follows: they are simple, and so their meaning is not derivable from the parts of the term (thus, *light yellow* is not basic); their signification is not included in that of another term (thus *maroon* is not basic, as it is included in *red*); their use is not restricted to a narrow range of objects (thus *blonde* is not basic, as its use is mostly restricted to hair); and they are psychologically salient.

These criteria, discussed by Crawford (1982) and Moss (1989), have been criticized by Ratner (1989), Simpson (1991), and Lucy (1992). But, as one of our aims was to test the theory, we accepted the original criteria as a working framework. In practice, the criteria tend to converge: basic color terms are salient and have high interspeaker consistency over what colors they denote. Terms that meet these two criteria also tend to be simple (nonanalyzable). The methods we use in this study and in related ones are aimed at measuring the frequency of use and the level of consensus over the use of each color term in the language. Operationally, we treat any term that is used both frequently, and with consensus, as a basic color term. (For discussions of methods, see MacLaury 1991 and Davies and Corbett 1995.) In addition to establishing which color terms are basic, we also "map" the regions of color space denoted by each basic color term and estimate the position of the best exemplar of each term.

There have been several developments of the theory over the nearly 30 years since its inception, but for our current purposes the only relevant development arises from a major article by Kay and McDaniel (1978). The relevant aspect of that article is the distinction between "primary" color categories (the first six terms on the hierarchy) and "derived" color categories (the last five terms on the hierarchy). Kay and McDaniel argued that primary categories were more fundamental than derived categories, and they supported this proposal by appealing to the underlying neurophysiology. The neurophysiology of the time suggested that primary categories corresponded to "fundamental neurological responses" that were irreducible (DeValois and Jacobs 1968). The force of these conjectures was further strengthened by their correspondence with Hering's (1964[1920]) theory of three psychologically fundamental opponent pairs of primary colors: red-green, yellow-blue, and white-black.

In addition to Kay and McDaniel 1978, there have been other important developments to the theory, particularly Kay et alia 1991. But in testing the theory here, we focus on the original version, for two reasons. First, it is the most stringent version; the 1991 version has relaxed several of the original constraints. Thus, if the data fit the 1969 theory, they will also fit the 1991 theory. Second, apart from making the distinction between primary and derived categories, Kay and McDaniel's important innovations are relevant primarily to languages with fewer than six basic color terms. Our pilot work had shown that Damara was likely to have more than six.

The Nama-Damara Study

Nama-Damara has the largest number of speakers of the Khoisan group. Of the two versions of the language, Damara is spoken in northwestern Namibia by a people physically resembling speakers of neighboring Bantu languages, while Nama is spoken in southern Namibia by the Khoi ("Hottentot"). Most of the data in the present study were collected in Damaraland, and concerned the Damara variety.

It is not known how a Bantu-speaking group came to adopt a Khoisan language. The Damara used to have Khoi as slaves, and one speculation is that the masters acquired the slaves' language. Damara speakers have also been subject to potential influences from neighboring Bantu languages: Ovambo, Kavango, and Herero. Most importantly, there have also been strong influences from three colonial languages: Afrikaans, English, and German. Afrikaans was the dominant language in Namibia until independence in 1991, and it was the medium of education in most secondary schools. Since independence English has replaced Afrikaans as the medium of education, and there is a national campaign to encourage everyone to learn English. This sudden change has not been without its problems. For instance, both students and teachers in higher education and in many schools were required to switch from the use of Afrikaans to the use of English virtually overnight.

Our main reason for studying Nama-Damara was to systematically document the color term system of a Khoisan language and to test the inventory of basic color terms against the theory. But given the diversity of influences from other languages and the changing political context, it looked likely that the color term system might be in transition, probably by borrowing terms from one or more of the available languages. The few case studies there have been of color terms in Khoisan languages suggest that they have three or four color terms. (We have looked at Kwei spoken in northern Botswana; Kwei is consistent with this, as it has four basic color terms.) If Damara fit that description too and had just three or four original basic color terms, then within the Berlin and Kay framework there would be scope for acquiring new color terms by borrowing. One mechanism for this could be the use of English and Afrikaans in schools. Borrowing from neighboring Bantu languages was also a possibility, although our initial investigations suggest that these latter languages, like other Bantu languages in southern Africa, have relatively few original basic color terms.

The first step in testing the Berlin and Kay theory against Damara is to establish the basic color terms of the language. First of all, we conducted some informal preliminary studies using a list procedure on nine informants. They were asked to write down in Damara as many color words as they knew. There were just 11 color terms that were offered by five or more of the informants: *!uri* 'white', *ǂnū* 'black', *ǀapa* 'red', *!am* 'green', *!huni* 'yellow', *ǂhoa* 'blue', *ǂgama* 'brown', *pers* 'purple', *pink* 'pink', *orange* 'orange', and *ǀhai* 'gray'. The first seven terms and the last term are original Damara terms; *pers* 'purple' is a loanword from Afrikaans, and *orange* and *pink* are loanwords from English. These preliminary findings suggested

that Damara had more original color terms than other Khoisan languages do but that it still had room for change by borrowing color terms, and such borrowing may already be in train.

In the main study we used two principal methods, both derived from suggestions made by Berlin and Kay (1969). The first method was a color-naming task, in which informants were asked to name each of a representative set of "tile colors." The data from the naming task can then be used to measure how frequently each term is used across color tiles and across respondents, and also to establish the level of agreement over how to name each tile color. This then provides the basis for "mapping" the region of color space that each term denotes and estimating the best exemplar of each color term (See Davies and Corbett 1994 and 1995, for examples of the use of this method and discussion of alternative procedures; see MacLaury 1991 for a description of a more intensive mapping procedure.) Two samples were used on this task, a sample of rural adults and a sample from the top class of a Damara-speaking secondary school in a rural area. We compared these two samples to see what impact the educational system might be having on the color-term system. This was one way of assessing the degree to which the color-term system was in transition.

The second method we used was a developmental one. It is likely that children will learn the basic color terms of their language before the nonbasic color terms (see Dougherty 1977; Harkness 1973; Mervis et al. 1975). Exposure to basic color terms will be greater than to the nonbasic color terms: parents and teachers will tend to teach the most salient color terms first, and incidental exposure to the basic color terms is likely to be high. Thus, establishing which color terms children know provides an additional means of determining the inventory of basic color terms. We asked schoolchildren with ages ranging from 5 years to 17 years to name a set of 12 tile colors used in other cross-cultural developmental studies (Davies et al. 1995a). This procedure allowed us to establish which color terms were used, the consistency with which color terms were used across informants, and also what developmental changes occurred. It also provided us with a second way to assess the extent to which the color term system was changing through the education system and by borrowing from other languages.

Method

Subjects

There were three main samples of subjects tested: a school-pupil sample that did the 12-tile task, a school-pupil sample that did the full 65-tile task, and a rural-adult sample that did the 65-tile task. All respondents were mother-tongue Damara speakers, but many also had some familiarity with English, German, or Afrikaans.

1. *School pupils, 12 tile colors.* There were 145 pupils tested on the 12-tile task, with ages ranging from 5 to 17 years. These were divided into five age bands: 5 to 6 years (n = 40, mean = 5 years, 11 months); 7 to 8 years (n = 25, mean = 7 years, 2 months); 9 to 11 years (n = 27, mean = 10 years, 1 month);

12 to 14 years (n = 31, mean = 12 years, 10 months); 15 to 17 years (n = 22, mean = 15 years, 5 months). There were approximately equal numbers of boys and girls in each age band. All but 18 of the sample were from schools in rural Damaraland; the remainder were from a school in Katatura, in Windhoek. In all cases, Damara was the main medium of education in these schools. The pupils were taken from grades one to seven. There was an age range of several years within most grades; for instance, in grade one, ages ranged from 5 to 8 years, and in grade seven ages ranged from 13 through to 19 years. Thus although age is correlated with amount of schooling, the correlation is not perfect.

2. *School pupils, 65 tile colors.* There were 28 subjects (17 men and 11 women) with ages ranging from 16 to 22 years (mean = 18 years, 5 months). They were from grade 11 of schools in Okahandja and Khorixas.

3. *Rural adults.* There were 30 people in the adult sample, with ages ranging from 27 to 76 years (mean = 56 years, 6 months); there were 17 women and 13 men.

Stimuli

The stimuli in the color-naming task for adults consisted of 65 colored tiles. These tiles were squares of colored paper (50 mm x 50 mm) mounted on 3-millimeter thick plywood, sprayed with a light film of transparent varnish to protect them from staining during use. The tile colors were an evenly spread sample of color space taken from the Color-Aid corporation range. (Color-Aid is a commercial supplier of standard colored papers; the full technical specification can be found in Davies and Corbett 1994). Figure 2 shows the location of the tile colors in the CIE (Commission Internationale de l'Eclairage) uniform chromaticity diagram, together with the loci of the eight chromatic universal foci, taken from Heider 1971.[2] The achromatic stimuli (white, black, gray) fall toward the center of the plot with coordinates of 0.20, 0.46. CIE color space is three dimensional; here we show just the u'-v' (red-green) plane; this is similar to showing a constant value plane in Munsell. The third dimension is L* (lightness) and is equivalent to Munsell value. The achromatic colors have the same coordinates in (u', v') but vary in L*. (Black has low values on L*, white has high values, and the various grays have intermediate values.) Saturation (Munsell chroma) is represented in this system by distance from the center. Low saturation colors will tend toward the center of the plot, whereas high saturation colors such as universal red, green, blue, and yellow tend to lie toward the periphery of the space (see Figure 2).

The Color-Aid range is made up from 24 "hues": Y (yellow), O (orange), R (red), V (violet), B (blue) and G (green), plus intermediate values designated by combinations of the previous codes; for instance YOY, YO, and OYO are the intermediate hues between Y and O. Each hue also has seven variants, consisting of four "tints" (T1 to T4) and three "Shades" (S1 to S3); the tints have increasing amounts of white added to the hue as their index number increases, whereas the shades have increasing amounts of black added as their index number increases. Thus, for instance, the seven colors O-Hue,

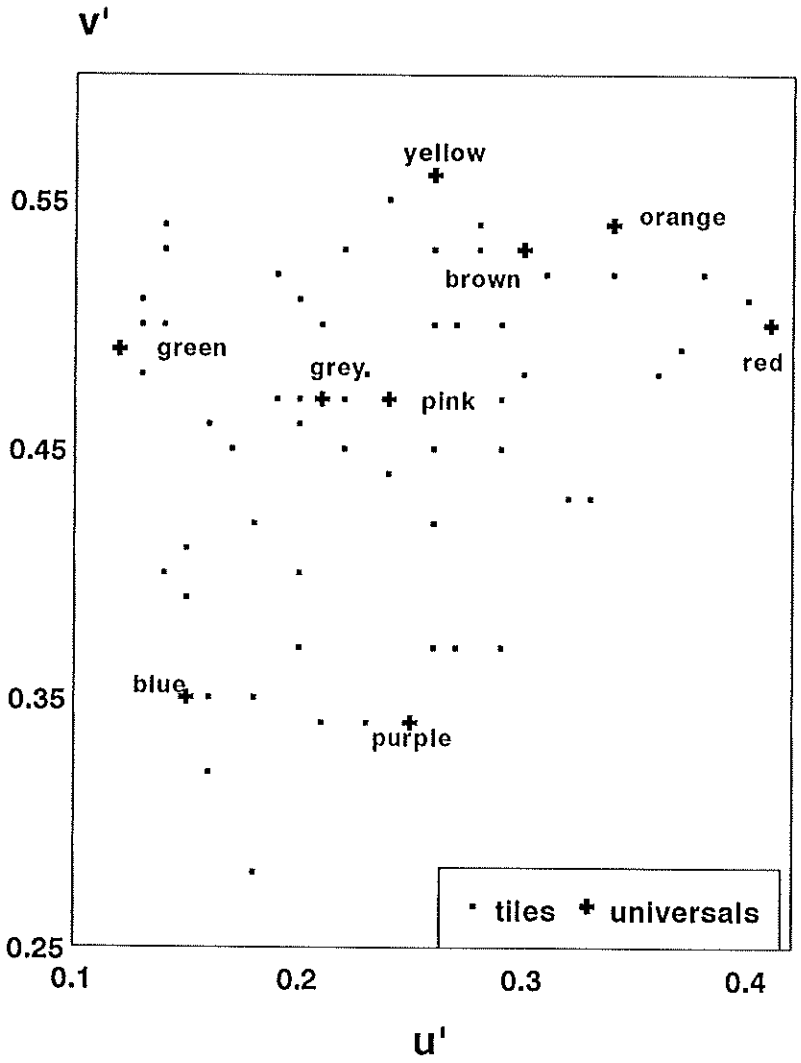

Figure 2
Loci of the tile colors and the universal foci in CIE uniform chromaticity space

O-T1, O-T2, O-T3, O-T4, O-S1, O-S2, O-S3 all have the same hue (orange) but vary in lightness and saturation. In addition, there is also a gray scale and a number of colors of particular significance to painters.

There were 12 tile colors used in the naming task for the pupils. Eleven of these tiles constituted a subset of the 65 tiles used in the naming task for the adults. They were chosen to be as close to the universal foci as possible, within the constraints of the Color-Aid system. The remaining tile (B-S2) in

the pupils' task was an instance of blue, as was tile BGB-T3 from the adults' task; these tile-colors had been originally selected by Berlin and Kay as good exemplars of the Russian terms *goluboj* 'light blue' and *sinij* 'dark blue'. Both tile colors were acceptable instances of the English term *blue*. Although the use of these two blue tile colors was not strictly relevant to our purposes, we left them in the set in order to be able to compare the Damara-speaking pupils with comparable samples from other language-speakers for whom we already had data. (See, for instance, Davies et alia 1995 on Setswana-speaking children.)

Procedure

All informants were tested by the same native-speaker of Damara. The procedure was essentially the same for the 65-tile task and the 12-tile task. The pupils were tested in their classrooms under natural light, avoiding shade or direct sunlight. The adults were tested in a variety of settings, but always under natural light. Some were tested outside, some in their homes, and some in public buildings. Again, direct sunlight and shade were avoided. Subjects were shown each of the tile colors (either 12 or 65), one at a time, on a piece of gray cloth, in random order. They were asked in Damara, "What do you call this color?" All responses, including don't knows, were recorded. The task took about 20 to 30 minutes for the 65-tile task, and less than five minutes for the 12-tile task.

Results

Glosses

The glosses that we give for the color terms used were provided by the Damara-speaking authors (Xoagub and Xoagub) and confirmed by another mother-tongue Damara speaker at the University of Namibia. The glosses are also consistent with Rust 1969, except that ǃ*hai* is not translated as 'gray' in Rust.

School Pupils (12 Tiles)

The pupils' responses were first of all scored as "correct" if they responded with an appropriate color term, irrespective of the origin of the term. A term was deemed appropriate if it corresponded with the Damara terms given by our Damara-speaking consultants or if it was an appropriate English, Afrikaans, or German term. Thus, for instance, both *ǃhuni* 'yellow' and *yellow* were scored as correct responses to the tile Y-Hue, and either the Afrikaans term *pers* 'purple' or *purple* were counted as correct responses to the tile V-Hue.

All of the age bands scored on average close to the maximum possible correct score (12): the mean scores ranged from 10.9 for the youngest group to 11.8 for the oldest group. Since there were no major changes across the age bands, we have pooled the data across the groups. These data are shown in Table 1, which summarizes the responses given to each of the 12 tiles across all the pupils.

Table 1
Frequency (F) of responses to each tile across the pupil sample.

Tile	Term	F	Term	F	Term	F	Don't know	Errors
White	!huni	128	white	15			1	1
Black	ǂnū	130	black	13			1	1
RO-Hue	ǀapa	133	red	11			0	1
YG-Hue	!am	129	green	14			1	1
Y-Hue	!huni	123	yellow	19			1	2
B-S2	ǂhoa	114	blue	23			5	3
BGB-T2	ǂhoa	101	blue	40			2	2
O-S3	ǂgama	120	brown	12	ǀhai	4	8	5
V-Hue	pers	121	purple	6	pink	3	10	8
R-T4	pink	113	ǀapa	9	ǀapara	5	12	20
YO-Hue	orange	131	pers	2			9	0
Gray-4	ǀhai	129	gray	16			0	0

For each tile, we give: the most frequent term used to name the tile and the term's frequency (the total number of pupils who used the term for that tile); the second most frequent term and its frequency; the third most frequent term, provided it was used by more than one person to name the given tile, and its frequency; the number of null responses; and the number of incorrect responses. In practice, the most frequent term for each tile was a correct term, and this was also so for the second most frequent response in the majority of cases. The exceptions are for the tiles R-T4 (most frequent response, *pink*), where the second most frequent term was ǀ*apa* 'red', and YO-Hue (most frequent response, *orange*), where the second most frequent response was *pers* 'purple'.

The set of most frequent terms (Table 1's second column) consists of just those 11 terms that pilot work had suggested as the major contenders for the basic color term slots in Damara: *!uri* 'white', ǂ*nū* 'black', ǀ*apa* 'red', *!am* 'green', *!huni* 'yellow', ǂ*hoa* 'blue', ǂ*gama* 'brown', *pers* 'purple', *pink* 'pink', *orange* 'orange', and ǀ*hai* 'gray'.

Rural Adults (65 Tiles)

Respondents sometimes used simple terms (for instance *!uri* 'white' or *pers* 'purple') to name tiles, and sometimes used compound terms. Simple terms were generally the most frequent term to name a given tile and were often the "dominant" term: that is, at least half the sample used the term to name the same tile. Compound terms consisted of a simple color term plus a modifier (for instance, ǀ*gā* ǀ*hai* 'light gray'). There were general modifiers such as *!khae* 'dark', ǂ*gā* 'light', ǀ*gaisa* 'strong', and *!gāsa* 'bright'; specific modifiers such as *blom* 'flower' (as in *blom* ǀ*apa* 'flower red'); and color-term modifiers such as ǀ*hai !am* 'gray green'. Although compound terms were

Table 2

Terms given to each of the 65 titles, the frequency (F) with which the terms were used, and the frequency with which the simple form of a term was modified (in brackets) for rural adults.

Code	Term	F	Code	Term	F	Code	Term	F
Y-Hue	!hue	20 (0)				S2	!am	18 (11)
	geel	7 (2)					groen	7 (7)
	yellow	2 (0)					green	
YOH-Hue	orange	19 (13)	T4	orange	15 (12)	S2	!am	18 (18)
	!huni	6 (0)		!huni	7 (4)		groen	5 (4)
	geel			geel	6 (6)		green	4 (4)
YO-Hue	orange	25 (9)	T3	orange	20 (5)	S3	!am	17 (9)
	geel	3 (0)		!huni	7 (1)		groen	7 (0)
	!am	2 (1)		geel	2 (2)		green	4 (2)
OYO-Hue	orange	16 (1)						
	ǀapa	8 (8)						
	orange	3 (1)						
O-Hue	orange	23 (9)	S1	ǂgama	21 (3)	S3	ǂgama	20 (2)
	ǀapa	4 (2)		bruin	5 (5)		bruin	7 (3)
				brown	2 (2)		brown	3 (1)
ORO-Hue	orange	13 (6)	T3	orange	15 (15)	S3	ǀhai	14 (14)
	ǀapa	10 (3)		pink	5 (3)		pers	3 (3)
	rooi	6 (6)		ǀapa	4 (3)		rooi	3 (3)
RO-Hue	ǀapa	13 (7)	T3	orange	18 (17)	S3	ǂgama	11 (2)
	orange	9 (9)		pink	9 (9)		ǂnū	6 (1)
	rooi	7 (7)		ǀapa	2 (2)		brown	2 (4)
ROR-Hue	ǀapa	17 (17)	T3	pink	16 (4)	S3	pers	12 (10)
	rooi	8 (7)		pers	6 (4)		pink	4 (4)
				!huni	2 (0)		orange	3 (0)
R-Hue	ǀapa	13 (1)	T4	pink	24 (0)	S3	ǂnū ǀapa	9 (0)
	pers	6 (4)		pers	3 (3)		ǂgama	6 (1)
	pink	2 (2)[1]					ǀhai	4 (0)[2]
RVR-Hue	pers	22 (16)	S3	pers	24 (4)	S3	pink	17 (3)
	cerise	2 (0)					pers	10 (7)
RV-Hue	pers	23 (13)	T2	pers	22 (7)			
	ǀapara	4 (0)		ǀapa	3 (0)			
	orange	2 (0)		purple	2 (2)[3]			
VRV-Hue	pers	26 (3)				S3	pink	17 (16)
	purple	3 (0)					pers	11 (4)
V-Hue	pers	19 (6)						
	purple	5 (1)						
	!am	4 (4)						

[1]And rooi 2 (2), red 2 (0).
[2]And pers 4 (4).
[3]And pink 2 (2).

Table 2 *(continued)*

Code	Term	F	Code	Term	F	Code	Term	F
VBV-Hue	pers	24 (21)	T4	pers	24 (9)			
	ǂhoa	4 (1)		pink	3 (3)			
	blue	2 (2)						
BV-Hue	ǂhoa	12 (8)				S2	ǀhai	11 (8)
	pers	8 (6)					ǂhoa	10 (10)
	blou	7 (0)					pers	5 (5)
BVB-Hue	pers	16 (15)				S3	pers	24 (18)
	blou	6 (6)					orange	2 (2)
	ǂhoa	4 (0)						
B-Hue	ǂhoa	21 (0)	T1	ǂhoa	16 (10)			
	blou	7 (5)		blou	7 (3)			
	blue	2 (1)		blue	7 (6)			
BGB-Hue	ǂhoa	21 (7)	T3	ǂhoa	18 (2)			
	blou	7 (2)		blou	7 (7)			
	blue	2 (2)		blue	3 (1)			
BG-Hue	!am	12 (12)	T1	ǂhoa	20 (5)	S2	ǂhoa	19 (17)
	ǂhoa	9 (5)		blou	7 (7)		blou	5 (5)
	blou	7 (6)						
GBG-Hue	groen	8 (7)				S2	ǂhoa	13 (6)
							blue	6 (6)
							blou	6 (6)
G-Hue	!am	21 (7)					!am	17 (14)
	groen	8 (2)					groen	7 (7)
							green	4 (3)
GYG=Hue	!am	20 (2)	T4	!am	20 (14)		!am	18 (18)
	groen	7 (2)		groen	7 (6)		groen	4 (4)
				green	3 (3)		grys	4 (4)
YG-Hue	!am	21 (4)				S3	!am	17 (14)
	groen	8 (5)					groen	6 (6)
							green	4 (4)
YGY-Hue	!am	17 (8)				S3	!am	20 (13)
	groen	8 (6)					groen	5 (4)
	green	5 (5)					green	2 (2)
Sienna	ǂgama	17 (0)	Rose	pink	13 (9)	Black	ǂnū	19 (0)
	bruin	7 (4)		pers	11 (6)		swart	7 (0)
	brown	6 (3)		cerise	2 (0)		black	3 (0)
White	!uri	17 (0)	Gray1	ǀhai	20 (16)	Gray2	ǀhai	21 (2)
	wit	7 (0)		grys	7 (4)		grys	6 (4)
	white	5 (0)					vaal	2 (0)
Gray4	ǀhai	19 (1)	Gray6	ǀhai	20 (4)	Gray8	ǂnū	12 (8)
	grys	7 (1)		grys	6 (5)		ǀhai	8 (7)
	gray	3 (2)		gray	3 (3)		swart	4 (2)

used commonly, unlike simple terms no particular compound term was ever a dominant term for a given tile.

The terms used to name each tile are summarized in Table 2. For each tile, we give the frequency (number of times) that a term was used for the three most frequent terms, provided the term was used by more than one person. We have collapsed the compound terms onto the simple form in the following way. First, all compound terms based on a simple term plus a general modifier such as *!khae* or a specific modifier such as *bottel* 'bottle' are counted as instances of the simple color term, unless a particular compound term was the dominant term. Second, all compound terms consisting of two simple color terms were treated as instances of one of the simple forms: which was the "base" form was decided, first, on the basis of word order and, second, on the basis of the distribution of terms used across the respondents. The base term was the second term. The word-order criterion was supported by the distribution criterion: the base simple form was used in the simple form by some respondents, whereas the secondary simple term was never used alone for that particular tile. As well as the frequency for the base simple term, we give the total number of times that the term was modified in brackets. For instance, the tile Y-Hue was named *!huni* 'yellow' by 20 informants and always in the simple form, as indicated by the zero in brackets; seven informants named the tile *geel* 'yellow', two of whom used it in modified form as the base of a compound term as indicated by the score in brackets. Thus *geel* 'yellow' was used five times in simple form (the total, seven, less the number of modified instances, two).

Table 3 summarizes the color terms used, collapsed over the tile colors. Here we give the total number of times each term was used (summed across tiles and informants) for each term that scored at least five. The terms are ordered by their frequencies. It can be seen that most of the terms that our pilot work had suggested were contenders for the basic color slots have relatively high scores. Ten of these contenders are among the first 12 terms; the two "intruding" terms are the Afrikaans terms *groen* 'green' and *blou* 'blue'. The two Afrikaans terms are unlikely to be basic since there are corresponding, but higher-scoring, original Damara terms in the set: *!am* 'green' and ǂ*hoa* 'blue'.

In order to be basic, a term must be salient, and there must be agreement over what it denotes. Frequency of use is a partial indicator of salience; high scores suggest high salience, but they also reflect the distribution of colors in the stimulus set: the likelihood that a term will be elicited. The low scores of *!uri* 'white' and ǂ*nū* 'black' are probably due to lack of opportunity to deploy them, rather than lack of basicness. (This contention is supported by similar results with the same tiles in studies of several other languages.) Both terms have high scores for the corresponding focal exemplars of the two terms, the tiles White and Black. Thus *!uri* 'white' and ǂ*nū* 'black' both show good agreement for at least one tile. *!huni* 'yellow' also has a relatively low score, but it too has at least one tile (Y-Hue) for which it has a high score. Unlike the data for *!uri* 'white' and ǂ*nū* 'black', the low score for *!huni* 'yellow' may not be due to the tile set; rather, it may reflect the relatively broad use of *orange*, a fact we shall return to later.

Table 3

Summary of terms given to the 65 tiles by the rural adults: the total number of times (F) each term was used, the number of tiles for which a term was the most frequent term, and the number of tiles for which each term was dominant.

Term	Gloss	Frequency	Most frequent	Dominant
pers	purple	297	11	10
!am	green	248	13	12
orange	orange	182	9	8
hoa	blue	172	8	6
pink	pink	116	5	4
!hai	gray	109	6	4
groen	green	93	1	0
apa	red	78	3	1
gama	brown	77	4	3
blou	blue	53	0	0
nū	black	47	1	1
!huni	yellow	42	1	1
green	green	36	0	0
grys	gray	36	0	0
rooi	red	33	0	0
blue	blue	29	0	0
bruin	brown	21	0	0
geel	yellow	20	0	0
!uri	white	17	1	0
Total (19)		1706	66	51

Table 3's fourth column shows a measure of consensus across informants over what a term denotes. It shows the number of tiles for which each term was the most frequent term. It can be seen that there are 12 terms that have scores greater than zero: these are the 11 contenders for the basic slots suggested by the pilot work, plus the Afrikaans term *groen* 'green'. Column five shows a stricter measure of consensus: the number of tiles for which each term was dominant. (At least half the respondents used the given term for the same tile.) Now it can be seen that *groen* 'green' scores zero, while the 11 contenders all have at least one tile for which they are dominant.

School Pupils (65 Tiles)

Table 4 summarizes the tile-naming data for pupils in the same way as Table 2 does for the adults. In general, the distribution of responses across the tiles is similar to the adult group. For 57 out of the 65 tiles, the most frequent term is the same for both groups. For four of the remainder (YOY-T4, RO-Hue, BVB-Hue, and Gray8), more or less the same sets of terms are used for each tile but the relative frequencies change. For instance, for YOY-T4, *!huni* 'yellow' and *orange* are the two most frequent terms for both groups but *orange* is the most frequent term for the adults, whereas *!huni* 'yellow' is

Table 4

Terms given to the 65 tiles, the frequency (F) of use, and the frequency with which the simple form was modified (in brackets) for the pupils

Code	Term	F	Code	Term	F	Code	Term	F
Y-Hue	!huni	17 (14)				S2	!am	10 (10)
	geel	6 (2)					green	5 (4)
	yellow	4 (0)					groen	4 (4)
YOY-Hue	!huni	11 (5)	T4	!huni	14 (13)	S2	!am	13 (13)
	orange	9 (8)		orange	7 (7)		groen	8 (8)
	geel	4 (3)		yellow	4 (2)		orange	3 (3)
YO-Hue	orange	14 (2)	T3	orange	14 (8)	S3	!am	14 (13)
	!huni	8 (2)		!huni	11 (5)		orange	6 (5)
				yellow	2 (2)			
OYO-Hue	orange	8 (2)						
	yellow	6 (6)						
	!huni	4 (4)						
O-Hue	orange	18 (1)	S1	ǂgama	17 (7)	S3	ǂgama	14 (3)
	ǀapara	3 (0)		bruin	6 (6)		bruin	6 (6)
				brown	2 (2)		brown	5 (3)
ORO-Hue	orange	17 (5)	T3	orange	12 (8)	S3	ǂgama	13 (13)
	ǀapa	10 (1)		red	8 (8)		orange	2 (2)
				ǀawara	5 (0)		pers	2 (2)
RO-Hue	orange	18 (0)	T3	orange	7 (7)	S3	ǂgama	14 (14)
	ǀapa	8 (0)		ǀapa	6 (6)		orange	2 (2)
				pink	4 (4)			
ROR-Hue	ǀapa	15 (9)	T3	pink	9 (2)	S3	pers	7 (7)
	rooi	10 (2)		orange	9 (9)		ǂgama	5 (5)
				red	3 (1)		orange[1]	4 (0)
R-Hue	ǀapa	13 (5)	T4	pink	10 (3)	S3	ǂgama	16 (13)
	red	8 (0)		red	5 (3)		pers	8 (1)
	rooi	3 (1)						
RVR-Hue	pers	9 (7)	S1	ǀawa	6 (4)	S3	red	6 (6)
	violet	7 (7)		ǀ awara	5 (0)		violet	6 (6)
				pers	4 (3)		pers	5 (5)
RV-Hue	pers	20 (16)	T2	pers	22 (17)			
	maroon	3 (0)		violet	4 (2)			
	ǀawa	2 (2)						
VRV-Hue	pers	10 (4)				S3	pink	10 (1)
	violet	4 (3)					red	8 (8)
	ǀapara[2]	3 (2)					pers	4 (3)
V-Hue	pers	15 (2)						
	violet	8 (0)						
	purple	3 (0)						

[1]Also ǂapa 4 (4).
[2]Also ǀapa 3 (3).

Table 4 *(continued)*

Code	Term	F	Code	Term	F	Code	Term	F
VBV-Hue	pers	11 (10)	T4	pers	12 (12)			
	blue	8 (8)		violet	6 (5)			
	ǂhoa	4 (3)		blue[3]	3 (3)			
BV-Hue	ǂhoa	10 (9)				S2	violet	8 (8)
	pers	7 (7)					pers	7 (7)
	blou	6 (5)					ǂhoa	6 (6)
BVB-Hue	ǂhoa	14 (11)				S3	pers	12 (11)
	blou	6 (5)					blue	12 (12)
	pers	4 (4)						
B-Hue	ǂhoa	22 (8)	T1	ǂhoa	13 (13)			
	blue	4 (1)		blue	11 (1)			
	blou	2 (0)		blou	3 (3)			
BGB-Hue	ǂhoa	18 (10)	T3	ǂhoa	15 (14)			
	blou	7 (5)		blou	7 (7)			
	blue	2 (2)		blue	5 (5)			
BG-Hue	!am	10 (10)	T1	ǂhoa	16 (1)	S2	ǂhoa	13 (13)
	ǂhoa	7 (7)		blau	7 (6)		green	5 (5)
	groen	7 (7)		blue	3 (1)		groen	4 (4)
GBG-Hue	!am	13 (7)				S2	ǂhoa	13 (12)
	blue	9 (9)					green	4 (4)
	blou	3 (3)					blou[4]	3 (3)
G-Hue	!am	17 (8)					!am	14 (14)
	groen	6 (4)					green	6 (1)
	green	3 (1)					groen	3 (1)
GYG-Hue	!am	17 (11)	T4	!am	16 (15)	S1	!am	10 (10)
	groen	9 (9)		groen	8 (1)		ǂhoa	5 (5)
	green	2 (2)					yellow	5 (5)
YG-Hue	!am	13 (4)				S3	!am	11 (11)
	green	9 (9)					green	4 (4)
	groen[5]	3 (3)					gray	4 (4)
YGY-Hue	!am	18 (17)				S3	!am	10 (10)
	groen	8 (7)					groen	8 (7)
	green	2 (1)					green	3 (2)
Sienna	ǂgama	19 (10)	Rose	pink	15 (13)	Black	ǂnũ	18 (0)
	bruin	7 (2)		ǀapa	5 (0)		black	7 (0)
				pers[6]	3 (3)		swart	3 (0)
White	!uri	18 (5)	Gray1	ǀhai	15 (12)	Gray2	ǀhai	22 (14)
	wit	6 (0)		gray	9 (1)		grys	3 (1)
	white	4 (0)		grys	3 (1)		gray	2 (0)
Gray4	ǀhai	17 (1)	Gray6	ǀhai	17 (16)	Gray8	ǀhai	10 (5)
	grys	7 (5)		gray	6 (2)		ǂnũ	6 (2)
	gray	4 (1)		black	2 (0)		swart	5 (0)

[3]Also blou 3 (3). [4] Also !am 3 (3), blue 3 (3). [5] Also !huni 3 (3). [6] Also red 3 (3).

the most frequent term for the pupils. There are perhaps more significant differences between the two groups for the remaining four tiles. First, ORO-S3 has ǂ*gama* 'brown' as its most frequent term for the pupils, whereas the adults have ǀ*hai* 'gray' as the most frequent term, and they do not use ǂ*gama* 'brown' for that tile at all. Second, the adults have *pers* 'purple' as the dominant term for RVR-Hue, whereas just four of the pupils use *pers*. There is no dominant term for the pupils; rather, they use either ǀ*awa* 'red' or ǀ*awara* 'orange' about equally. Third, the adults use ǀ*hai* 'gray' as the most frequent term for BV-S2, whereas the pupils do not use this term for BV-S2 at all. Last, the pupils use ǃ*am* 'green' as the most frequent term for GBG-Hue, whereas the adults do not use ǃ*am* at all for that tile; there is no real agreement among the adults over which term to use, but *groen* 'green' with a score of just 8 is the most frequent term.

Table 5 summarizes the data in Table 4 collapsed across tiles, and the terms are given in the same order as for the rural adults (Table 3) for comparison. The relative frequencies of the terms in the two tables are similar to each other, although the absolute scores tend to be much lower for the pupil sample. Nine of the ten highest-scoring terms are the same for both samples, but there is some variation in the rank orders between the two sets of ten terms. The nine common terms, ordered by their frequencies in Table 3, are *pers* 'purple', ǂ*hoa* 'blue', ǃ*am* 'green', *orange*, *pink*, ǂ*gama* 'brown', *groen* 'green', ǀ*apa* 'red', ǀ*hai* 'gray', and ǃ*huni* 'yellow'. These nine terms were identified as likely basic terms in both the introduction and in the adult data. The remaining two contenders for the basic color term slots, ǃ*uri* 'white' and ǂ*nū* 'black', are ranked 20 and 16 respectively, in a similar way to the adult data. But no term other than the 11 candidates for the basic term slots is ever the most frequent term for a tile. In contrast, all 11 contenders are both the most frequent term for at least one tile, and they are also the dominant term for at least one tile. Thus the data are broadly consistent with the data from the adults.

Comparison of Levels of Consensus in the Pupil and Adult Samples

Although the distribution of terms over tiles is broadly similar for the two groups, the adults show more agreement than the pupils over which terms to use. This can be seen, first, by comparing the most frequent scores for each tile: high scores on average indicate high levels of consensus. In general, these scores (as a percentage of the sample size) are lower for the pupils than for the adults. The mean scores for the most frequent term averaged across tiles, as a percentage of the maximum possible score, are 48.9% for the pupils and 58.7% for the adults. Second, the lower level of consensus among the pupils, compared to the adults, can also be seen in the lower number of tiles with a dominant term. Comparing the dominance scores in Tables 3 and 5, it can be seen that there are just 31 tiles with a dominant term for the pupils (Table 5 total), compared to 51 for the adults (Table 3 total). Further, considering individual tile colors, in most cases the dominance score is lower for the pupils than for the adults. The difference is particularly notable for *pers* 'purple' and ǃ*am* 'green'. These two terms have the two highest scores for the adults, whereas for the pupils, *pers* 'purple' is just the third-

Table 5

Summary of terms given to the 65 tiles by the pupil sample: the total number of times each term was used, the number of tiles for which a term was the most frequent term, and the number of tiles for which each term was dominant.

Term	Gloss	Frequency	Most frequent	Dominant
pers	purple	177	9	3
!am	green	171	15	6
orange	orange	123	9	5
ǂhoa	blue	172	8	5
pink	pink	116	4	1
ǀhai	gray	85	4	1
groen	green	93	0	0
ǀapa	red	89	3	1
ǂgama	brown	104	6	5
blou	blue	53	0	0
ǂnũ	black	32	1	1
!huni	yellow	78	3	2
green	green	50	0	0
grys	gray	16	0	0
rooi	red	33	0	0
blue	blue	70	0	0
bruin	brown	20	0	0
geel	yellow	23	0	0
!uri	white	18	1	1
purple	purple	10	0	0
swart	black	10	0	0
brown	brown	9	0	0
apara	orange	36	0	0
gray	gray	31	0	0
cerise	cerise	5	0	0
wit	white	6	0	0
white	white	5	0	0
Total (27)		1613	63	31

ranking score, and *!am*, though the highest score, is only half the size of the adults' score.

Use of Translation Equivalents

One reason for the pupils' lower consensus scores, relative to the adults', may be that the pupils are more likely to use English or Afrikaans terms than the adults. For instance, some pupils use the English term *violet* while others use the term *pers* for tiles such as RVR-Hue and VRV-Hue. Both terms are apt descriptors, but the use of both makes it harder for a term to meet the dominance criterion. In the latter case, however, low consensus is not due to disagreement over the denotation of terms, but to the availability of equivalent terms. In order to assess whether the use of equivalent terms

from different languages is sufficient to account for the lower consensus scores for the pupils relative to the adults, we combined the scores for translation equivalents for each tile and then recalculated the dominance score for each term. For instance, in Table 4, for the tile Y-Hue the terms *!huni*, *geel*, and *yellow* are all translation equivalents; here we will denote them as tokens of yellow. The frequency for yellow is thus 17 + 6 + 4, or 27. Table 6 shows the dominance scores for sets of translation equivalents for the adult and pupil samples. There are three sets of dominance scores given that vary in their criteria for dominance. The first score is for terms that were used by at least half a sample to name a given tile; the second score is for terms that were used by at least three-quarters of a sample to name a given tile; and the third score is for terms that were used by at least nine-tenths of a sample to name a given tile. The adults still have higher total dominance (50%) scores than the pupils, but the difference is less than that found in Tables 3 and 5: the difference was 20 and is now just 6. The adults also have higher scores for the stricter criteria for dominance (75% and 90%), but the differences are small, particularly for the 90% criterion. Thus it appears that most of the difference in consensus between the two samples can be accounted for by the fact that the pupils use equivalent terms from different languages more often than the adults do.

Table 6

Dominance scores for combined translation equivalents for three criterion levels for the adult and the pupil samples.

	Dominance criterion					
	Adults			Pupils		
Term	50%	75%	90%	50%	75%	90%
white	1	1	1	1	1	1
black	2	1	1	1	1	1
red	2	1	0	2	2	1
green	12	11	10	12	8	5
yellow	1	1	1	3	1	1
blue	8	7	5	8	5	5
brown	4	3	3	5	3	3
purple	10	8	0	7	2	1
pink	4	1	0	1	0	0
orange	8	2	0	5	1	0
gray	3	3	3	4	4	3
Total	55	39	24	49	28	21

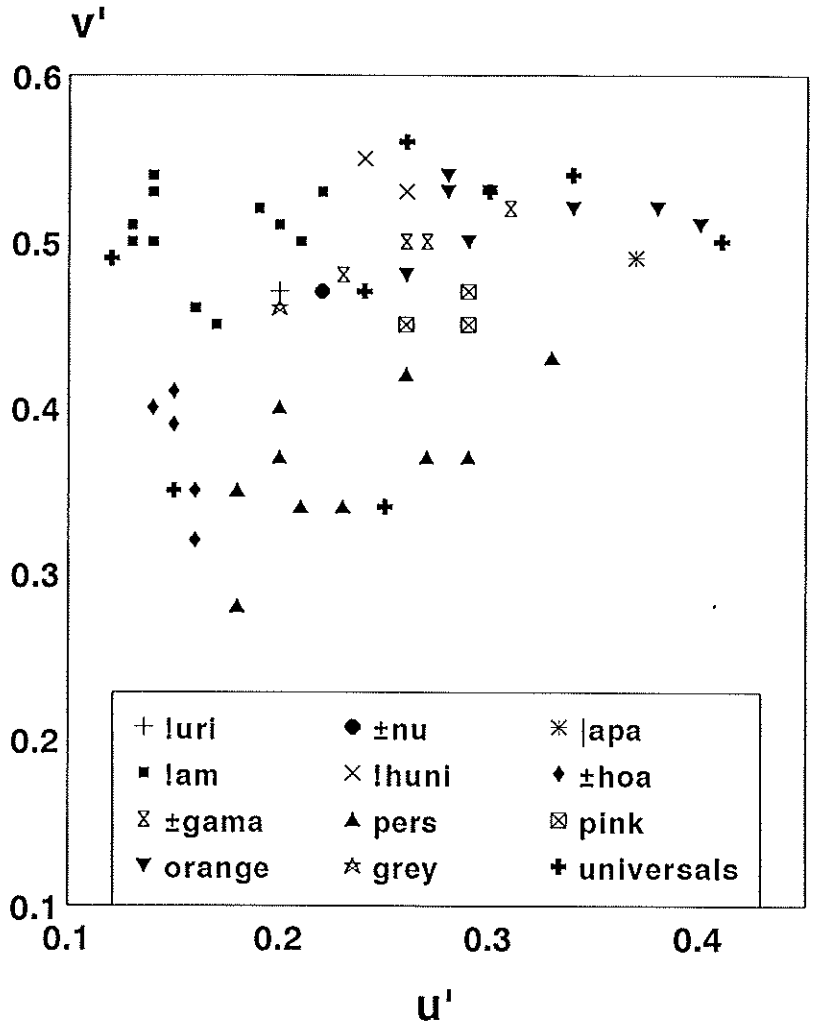

Figure 3
Location of tiles with a dominant term in CIE uniform chromaticity diagram for the adult sample

Mapping Color Terms in Chromaticity Space

Figure 3 shows the locus of each tile with a dominant term in CIE uniform chromaticity space for the adult sample. The particular dominant term for each tile is indicated by the symbol used for the locus. The loci of the eight chromatic universals are also shown. (White, black, and gray would fall at [0.20, 0.47], [0.20, 0.46], and [0.22, 0.47], respectively; they are not shown.) Comparison with Figure 2 reveals that the regions of color space denoted by

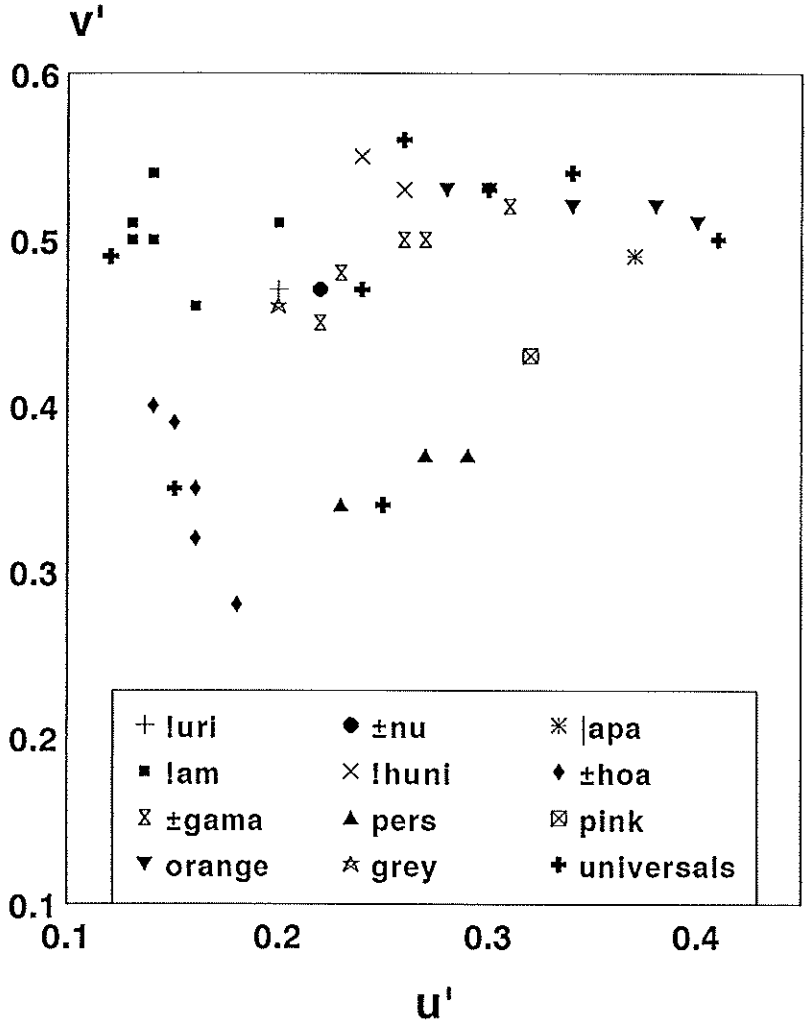

Figure 4
Location of tiles with a dominant term in CIE uniform chromaticity diagram for the pupil sample

each of the 11 terms shown in Figure 3 are close to the loci of the corresponding universal focus. In most cases, the universal focus does not fall in the center of the region included in a category. Rather, the focus is displaced "centrifugally" toward the outside of the color space. This is because the foci are usually the most saturated instance of a given category, and saturation increases with distance from the center of the plot (white, black, gray). The exceptions are the foci of the achromatic terms, which all have zero saturation, and of pink, which is also a low saturation color. For instance, the

region included in *!am* 'green' (toward the top left of the plot) is adjacent to the locus of green. The poorest fit with the universal loci is for *ǀapa* 'red'; the universal red is closer to instances of *orange* than to the single tile with the dominant term *ǀapa* 'red'.

Figure 4 shows the equivalent data to Figure 3 for the pupil sample. In general, the plot resembles the adults' plot, though with fewer data points, since the pupils had a smaller number of tiles with dominant terms. Perhaps the most notable difference is that the single tile with *pink* as its dominant term is displaced considerably from the universal pink, and this tile has *pers* 'purple' as its dominant term in the adult sample.

The Best Exemplar of Each Term

Table 7 gives the tile that is the best exemplar of each of the 11 categories, together with its CIE coordinates and the corresponding coordinates of the universal foci, for the adult sample and the pupil sample. We operationally define the best exemplar as the tile that has the highest frequency for a given term. For the adult sample the tiles G-Hue and YG-Hue have the same frequencies (21), but since YG-Hue is used in the simple form more often than G-Hue, we have taken YG-Hue as the best exemplar.[3] It can be seen by comparing the CIE (u', v') coordinates in Table 7 that the best exemplar of each term falls close to the corresponding universal focus, but best exemplars are generally closer to the center of the chromaticity diagram than universal

Table 7

CIE coordinates for the 11 universal foci and the best exemplar of each Damara term, for the pupil and the adult samples.

	Universal		Pupils			Adults		
Term	u'	v'	Tile	u'	v'	Tile	u'	v'
!uri	.21	.47	White	.20	.47	White	.21	.47
ǂnu	.21	.47	Black	.22	.47	Black	.22	.47
ǀapa	.41	.50	ROR-Hue	.37	.49	ROR-Hue	.37	.49
!am	.12	.49	G-Hue	.13	.5	YG-Hue	.13	.51
!huni	.26	.56	Y-Hue	.24	.54	Y-Hue	.24	.54
ǂhoa	.15	.35	B-Hue	.16	.32	B-Hue	.16	.32
ǂgama	.30	.50	Sienna	.27	.5	O-S1	.31	.52
pers	.25	.35	RV-T2	.27	.37	VRV-Hue	.26	.37
pink	.24	.47	Rose-Red	.32	.43	R-T4	.29	.45
orange	.34	.54	RO-Hue	.40	.51	YO-Hue	.30	.53
ǀhai	.21	.47	Gray2	.20	.47	Gray2	.20	.47

foci are. For instance, the best exemplar of *!am* 'green' is YG-Hue, which has a higher u' value (0.13) than the universal focus for green (0.12); this lower score means that green is further from the center (toward the left) than YG-Hue. In the case of red, however, which falls to the right of the plot, the centrifugal displacement is shown in the higher u' values for universal red than for the best exemplar of *ǀapa* 'red', ROR-Hue.

It can be seen that for five of the first six terms in the table—Kay and McDaniel's "primary terms" (*!uri* 'white', *ǂnū* 'black', *ǀapa* 'red', *!huni* 'yellow', ǂhoa 'blue')—the best exemplar of each term is the same for both adults and pupils. The exception is for *!am* 'green', but even in this case G-Hue (the best exemplar for the pupil group) also has joint equal top score with the best exemplar for the adult group (YG-Hue), as noted earlier. In contrast, the only one of the last five terms in Table 7 (Kay and McDaniel's "derived terms") to have a common best exemplar across both samples is *ǀhai* 'gray', which has the tile Gray2 as the best exemplar in both cases. The seriousness of the discrepancies between the two samples can be assessed by comparing the relative scores in Tables 2 (adults) and 4 (pupils) for the tiles that are given as the best exemplars for the two samples in Table 7. The discrepancy is least serious for *ǂgama* 'brown'. Although the best exemplar differs in the two cases, the pupils' best exemplar (Sienna) has *ǂgama* 'brown' as its dominant term in the adult sample, and conversely, the best exemplar for the adults (O-S1) also has *ǂgama* 'brown' as its dominant term in the pupil sample. The discrepancy for *pers* 'purple' is more marked, in that although RV-T2 (the best exemplar for the pupil sample) has *pers* 'purple' as its dominant term in the adult data, VRV-Hue (the best exemplar for the adult sample) does not have *pers* 'purple' as its dominant term in the pupil data. *Pers* is the most frequent term for VRV-Hue for the pupil sample with a score of 10, compared to a score of 26 for the adults. In the case of *pink*, both Rose Red (the best exemplar for the pupils) and R-T4 (the best exemplar for the adults) have *pink* as their most frequent term, but *pink* is only dominant for the respective best exemplars. The greatest discrepancy is for *orange*. The best exemplar for the pupil sample is RO-Hue, but this tile has *ǀapa* 'red' rather than *orange* as its most frequent term for the adult sample; *orange* is the second most frequent term, however, with a score of 9. On the other hand, YO-Hue (the best exemplar for the adult sample) does have *orange* as its most frequent term with a score of 14.

Discussion and Conclusions

The data from the three samples converge to suggest that Damara has eight original color terms and three loan terms: *!uri* 'white', *ǂnū* 'black', *ǀapa* 'red', *!am* 'green', *!huni* 'yellow', *ǂhoa* 'blue', *ǂgama* 'brown', *pers* 'purple', *pink* 'pink', *orange* 'orange', and *ǀhai* 'gray'. In the 12-tile task with the pupils (Table 1), each of the 11 terms was the most frequent term for one tile (two in the case of *ǂhoa* 'blue'). In the 65-tile color naming task, most of the 11 terms were among the most frequently used terms for both the adult (Tables 2 and 3) and the pupil sample (Tables 4 and 5). Of the 11 terms, *ǂnū* 'black', *!huni* 'yellow', and especially *!uri* 'white' had relatively low frequencies of use, all

outranked by the Afrikaans terms *groen* 'green' and *blou* 'blue'. But these two Afrikaans terms had lower scores than their translation equivalents, the original Damara terms *!am* 'green' and ǂ*hoa* 'blue'. As well as for frequency of use, there was high consensus within all samples over the referential range of each of the 11 terms. This consensus is shown in the 12-tile task by the fact that each term (except ǂ*hoa* 'blue') was the most frequent term for just one tile and was used only infrequently for all other tiles. Thus the terms were used with high specificity. The critical indicator of consensus in the 65-tile task is that there was at least one tile for which each of the 11 terms was dominant (at least half the sample used that term for the given tile), and no other term was dominant for any tile.

In addition to being used frequently and with high consensus, in most cases the region of color space included in each term abuts on the universal focus (Figures 2 and 3). Moreover, in most cases the best exemplars of each term are close to the corresponding universal foci in chromaticity space (Table 7). The match between the universal foci and the best exemplars of Damara color terms is particularly clear for the six primary terms (*!uri* 'white', ǂ*nū* 'black', ǀ*apa* 'red', *!am* 'green', *!huni* 'yellow', ǂ*hoa* 'blue') and for ǀ*hai* 'gray'. The corresponding loci in chromaticity space are close to each other, and the best exemplar of the terms is the same for the adult sample and the pupil sample in most cases. The match is less good for the four of the derived terms: ǂ*gama* 'brown', *pers* 'purple', *pink* 'pink', and *orange* 'orange'. For ǂ*gama* 'brown' the adult sample and the pupil sample choose different tiles as the best exemplar. Even so, both tiles are close to the universal focus. For the remaining three terms (*pers* 'purple', *pink* 'pink' and *orange* 'orange'), there is a discrepancy between the best exemplars chosen by the two samples. In each case, the tile chosen by the adult sample is closer to the corresponding universal focus than the tile chosen by the pupils. And for each term, the best exemplar chosen by the pupil sample shows a "red shift": the exemplars are displaced from the universal foci by having higher u' (toward the right) and lower v' (toward the center). The reasons for this discrepancy are unclear. It is possible that the pupils' choices are influenced by what they are taught at school, since they were all from the same form in the same school, and all had more years in school than most Namibians. This explanation seems unlikely, however, given the lower levels of consensus shown by the pupils relative to the adults. Many of the adults had no formal education at all, and the rest had little.

If we regard the 11 color terms as the basic color term inventory, they fit the Berlin and Kay (1969) theory well. The inventory is a standard stage-six system. But the three loan terms (*pers* 'purple', *orange*, and *pink*) are used with less consensus than the eight original Damara terms. There is also less agreement over the best exemplars of these terms between the adults and the pupils who did the 65-tile task. Furthermore, the best exemplars of these three terms for the pupils are displaced from the corresponding universal foci toward red. The relative uncertainty with which the three loan terms are used can also be seen in the 12-tile task for the pupils (Table 1). The highest number of errors and of "don't know" responses were made to the purple, pink, and orange tiles. The general uncertainty over how to use these

three terms might reflect their recent acquisition by Damara.[4] Thus the data are also consistent with Damara's being a stage-five system in transition to a stage-six system by borrowing from English and Afrikaans. The original eight-term system is also consistent with Berlin and Kay's model.

The study was designed so that one strand of evidence for identifying which color terms were basic would come from the developmental facet of the study. We expected to be able to measure the temporal order of color terms' acquisition by cross-sectional sampling of children from ages 5 to 17, for the 12-tile task. The youngest group made the most errors, and most of these errors were for the three loan words. But even the youngest group made very few errors in all. To get a clear picture of the temporal ordering of acquisition, we would need to include younger children in the sample.

The fact that even the Damara five-year-olds could name most of the colors correctly contrasts with equivalent data from Setswana-speakers in neighboring Botswana. There we found that children younger than five years seemed to know no color terms at all, and five-year-olds made many mistakes (Davies et al. 1995a). It was on that basis that we thought we could capture most of the color term acquisition period in Namibia, with a sample starting at five years of age. In retrospect, it seems to us that the concept of color has greater salience to Damara speakers in general than for our Setswana-speaking informants (Davies et al. 1992). There are fewer basic color terms in Setswana than in Damara, and the level of consensus over what the basic color terms denote is less in Setswana than in Damara. The greater salience of color in general includes earlier acquisition of basic color terms by Damara-speaking children compared to their Setswana-speaking neighbors.

We did find, however, that the Setswana-speaking children (aged five to nine) used many English color terms, and it is likely that with the rapid expansion in education in Botswana, and the use of English as the medium of education in secondary schools, Setswana may be borrowing English color terms. Our impression, supported by our Namibian colleagues, is that speaking Afrikaans was enthusiastically encouraged before independence, whereas the colonial language in Botswana (English) was less encouraged. It may be profitable to study color terms in rural speakers of Nama (Damara's "twin" language) in order to test the generality of the spread of loan terms from colonial languages, and the speculation about the relative age of Damara color terms. It is likely that some of the southern Nama-speaking groups have come into less contact with colonial influences than people from Damaraland.

It is important not to overlook the fact that Damara has not borrowed terms from neighboring Bantu languages (Herero, Kavango, and Ovambo). Since the colonial languages were associated with government and employment, importation of terms from these pervasive languages is not surprising. But the lack of borrowing from neighboring Bantu languages is also consistent with Berlin and Kay's theory. Our observations suggest that the Bantu languages have fewer basic color terms than Damara. Thus expansion of the Damara inventory has nothing to gain by such borrowing. On the

other hand, there is something to gain from borrowing from Afrikaans or English, where color-term inventories are larger.

Berlin and Kay's original work has often been criticized for using bilingual informants. Although all of our informants were first-language Damara speakers, most of them also spoke Afrikaans and/or English with some degree of fluency. But the main penetration of Afrikaans and English appears to be where there is no original Damara color term. Although this observation might seem trivial at first glance, it actually gives important support to Berlin and Kay's evolutionary theory. It appears that Damara has only borrowed color terms for the "missing" universals, whereas in principle it could have substituted loan terms for any or all of the original terms. There is perhaps scope for a subtler effect of bilingualism. There is some evidence that bilingualism produces a semantic shift in the location of category boundaries (Ervin 1961). So it is possible that some of the differences we found among our various samples of informants (children versus adults, young adults versus rural adults) might reflect varying degrees of bilingualism. But the critically important point remains that the variations we found were consistent with the original Berlin and Kay theory.

Notes

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1. Like other Khoisan languages, Damara makes extensive use of click consonants in its phonetic system. We indicate these using the prevailing system in Namibia: ǀ (dental); ǁ (lateral); ǂ (palatal); ! (alveolar).

2. There are several CIE color spaces. Here we briefly describe two: the CIE (Y, x, y) space and the CIE uniform chromaticity space. The former is useful because there are published tables of Munsell and OSA colors which give their (Y, x, y) coordinates (for example, Newhall et al. 1943, on Munsell). Colors with the same CIE coordinates will appear the same, whether from Munsell, OSA, Color-Aid, or any other system. Thus this allows "translation" between different systems: colors from one system with similar (Y, x, y) coordinates will be perceived as similar colors. Most commercial colorimeters measure color in these CIE coordinates. But the CIE uniform chromaticity space is more useful psychologically. It represents colors in a readily interpretable spatial format that maps onto the phenomenology of color space more closely than CIE (Y, x, y). The basic structure of both spaces is similar to Newton's classic color circle.

Within the CIE system the total color is made up from red, green, and blue components, and the proportions of these three must sum to one. The CIE chromaticity coordinates can thus be thought of as the proportions of red (x), and green (y), in each color; a third coordinate, lightness (Y), makes up the CIE tri-stimulus values. By implication, the proportion of blue light (z) is given by 1 - (x + y). Stimuli with the same coordinates will look the same. The main drawback of the CIE (Y, x, y) space is that it is not a perceptually equal space; that is, equal distances in the space do not correspond to equal perceptual distances. The CIE (L*, u', v') system represents colors in a transformed space that is approximately perceptually equal. In this uniform chromaticity space u' is a transformation of x, and v' is a transformation of y. For

instance, in Figure 2 the universal blue has coordinates of (u′ = 0.18, v′ = 0.19). The proportion of blue is 1 - (0.18 + 0.19) = 0.63. Thus, as would be expected, the universal blue has a high proportion of blue in it, and blue colors are to be found towards the origin of the graph (low u′ [red] and v′ [green]). On the other hand, red colors have high proportions of red in them (u′) and are to be found toward the right of the space. The positions of the eight chromatic universal foci in Figure 2 can be used to interpret the remaining regions of the CIE chromaticity diagram. (See Hunt 1987 for further information on the CIE system.)

3. GYG-Hue was also close to being the best examplar, with a frequency of 20.

4. On the other hand, the relative uncertainty might be a general property of derived terms relative to primary term. Corbett and Davies (1995) found that derived terms tend to score less well on measures of basicness than primary terms, in a range of languages with standard 11 term inventories.

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