Synchronic Variability and Diachronic Change in Basic Color Terms
Author(s): Paul Kay
Source: *Language in Society*, Vol. 4, No. 3 (Dec., 1975), pp. 257-270
Published by: Cambridge University Press
Stable URL: http://www.jstor.org/stable/4166830
Accessed: 03/08/2011 13:50

Lang. Soc. 4, 257–270. Printed in Great Britain

Synchronic variability and diachronic change in basic color terms[1]

PAUL KAY

University of California, Berkeley

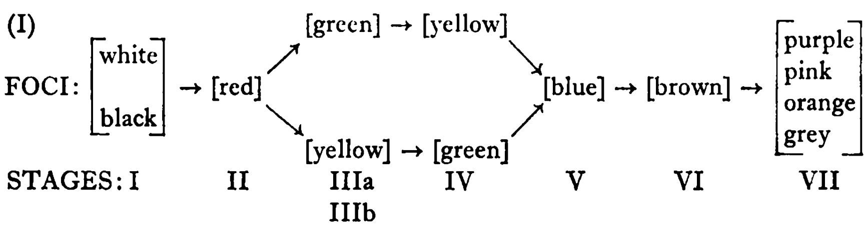
ABSTRACT

The main purpose of this paper is to relate recent findings regarding the evolution of basic color term systems to current research in linguistic variation and language change. More specifically it is to provide in the area of lexical semantics a demonstration of the hypothesis that all linguistic change has its roots in synchronic heterogeneity of the speech community (cf. Weinreich, Labov & Herzog (1968: 188) for a general statement of this position, also many empirical demonstrations already reported, such as those by Labov (1972) and Wang (1969) in phonology and by Bickerton (1973) in syntax). Before taking up this topic, I summarize some recent revisions in the basic color term theory itself. (Ethnographic semantics, color terms, language variation, evolutionary universals in linguistic change.)

Revisions of the basic color term theory

The major data on which the revisions of the basic color term theory are based are contained in four detailed studies of the color term systems of individual speech communities which have been undertaken since 1969 (Berlin & Berlin 1974; Dougherty 1974; Hage & Hawkes n.d.; E. Heider 1972*a*, *b*). Several other reports, cited below, have been influential as have a number of personal communications from scholars familiar with a variety of languages.

(I)



[1] I am indebted for helpful comments on various drafts of this paper to Brent Berlin, Janet Dougherty, John Gumperz, Dell Hymes, William Geoghegan, Chad McDaniel, and Judith Shapiro, none of whom is responsible for any of its faults. Earlier versions of this paper were read in Fall 1974 to the Linguistics and Social Anthroplogy Groups at Berkeley and at the Annual Meetings of the American Anthropological Association in Mexico, D.F. I am grateful for many useful comments from the floor at these sessions.

The original Berlin and Kay hypothesis was that the basic color terms of all languages encode some subset of a set of eleven fixed perceptual foci and that there is a partially fixed temporal order in which these foci are encoded, shown in (1).

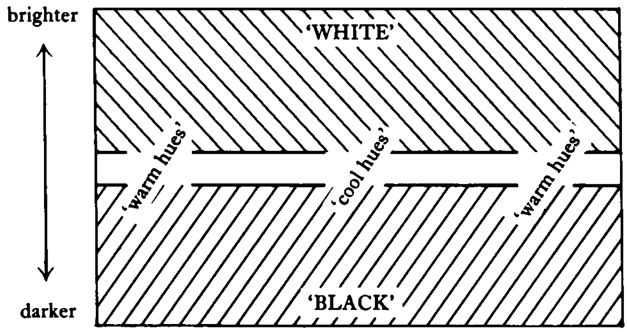
The new data suggest that both the sequence itself and its interpretation need revision. In the original report (Berlin & Kay 1969) while sequence (1) was interpreted as representing the successive encoding in basic color terms of perceptual foci, the discussion of the sequence considered not only the encoding of foci but also the gradual restriction of boundaries as the sequence progresses. It now appears that not only must the sequence itself be slightly altered but more importantly its interpretation must be altered to encompass not only the encoding of new foci but the subtle interaction of foci and boundaries of color categories.

E. Heider (1972*a*, *b*) was the first person since 1969 to study the color words of a large number of informants from a speech community whose language, considered as a homogeneous whole, constitutes an early system – the Dugum Dani of New Guinea, stage I. She found that there were indeed just two color terms used reliably by all informants and that these might reasonably be glossed as black and white or dark and light – as reported by K. Heider (1965) and later by Berlin & Kay (1969). She also found, however, two facts not envisaged by either K. Heider or Berlin and Kay but subsequently confirmed in other controlled studies of simple systems: (*a*) the dark term, *mili* includes cool hues (blues and greens) while the light term *mola* includes warm colors (reds, yellows, browns, purples, pinks) so that the boundary between *mili* and *mola* is roughly that shown in (3) rather than that hypothesized in Berlin & Kay (1969: 17) and reproduced as (2); (*b*) the focus of these terms is quite variable across informants and in fact the most popular focus for *mola* is not in white but in red. Sixty-nine per cent of Dani focal responses for *mola* were in or near English focal red. It is thus inaccurate to say that two-term systems make a simple brightness contrast. Rather such systems contrast dark and cool hues on the one hand against light and warm hues on the other. Within these categories it appears that foci may be variable across informants and across languages, about which more below. This reformulation is supported by recent data on other early systems which limitations of time prevent my discussing here (cf. Berlin & Berlin 1974; Hage & Hawkes n.d.; Dougherty 1974). It is also confirmed by previously existing data such as Conklin's on Hanunóo (1955), a stage IIIa system in which the black term, *-biru*, includes blue and appears to be a reflex of a Proto-Polynesian root meaning blue, $^{*}bi[l]u^{c}$ (Dempwolff 1937: 27).

The above points affect only the interpretation of sequence (1) but not the sequence itself. There is a further point involving blue that affects the interpretation of the sequence in the same way and also the ordering.

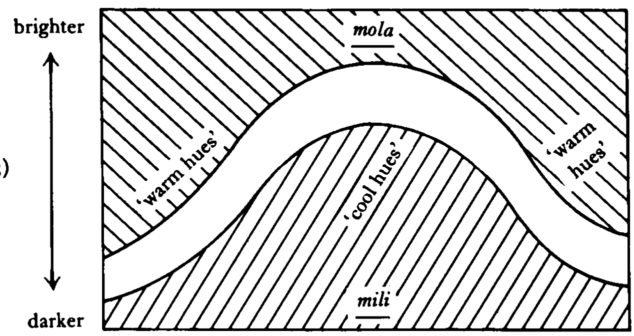
Berlin & Kay (1969: 42) noted that Japanese *ao* 'blue' appears on the basis of internal reconstruction to be older than *midori* 'green', and that moreover there

(2)



'WHITE'/'BLACK' color system as hypothesized by Berlin and Kay (1969)

(3)



An actual 'WHITE'/'BLACK' color system as reported by E. Heider for the Dani
mola = 'WHITE'
mili = 'BLACK'

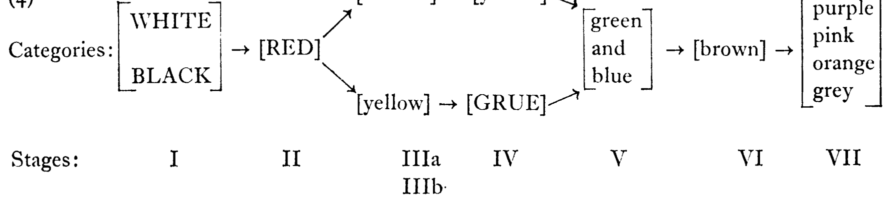
is evidence that *ao* once included greens as well as blues. This suggested that at an earlier stage Japanese would have had a GRUE term (*ao*) with the focus in blue and would thus have violated the hypothesized sequence of encoding of foci by having encoded blue before green. We were not then willing to abandon sequence (1), which specified green before blue, on the basis of this single inferential counter-example. Since that time, however, further cases in which blue is encoded before green or contemporaneously with green have come to light. Berlin & Berlin (1974) report that Aguaruna *wiŋka* GRUE has virtually all (97 per cent) of its focal responses in blue. In addition it may be recalled that Berlin & Kay (1969: 10f.) report that approximately one-fourth of forty Tzeltal informants placed focal *yaš* in blue; similarly Heinrich (1973) indicates that Eskimo *tungu-* 'GRUE' is focused in both green and blue (never in blue-green) with some (most?) informants showing a preference for blue. Dougherty (1974) reports Futunese *wiwi* GRUE focused in both green and blue, preponderantly the latter.[2] As these authors point out, the new data require a revision of the theory to allow the blue focus to be encoded before or simultaneously with the

[2] D. Snow (1971) and H. Broch (1974) also report basic color term status for blue but not green in Samoan and Slavy respectively.

green focus. To be sure, as Berlin and Berlin indicate there are no data suggesting that both green and blue are ever encoded before yellow; that is, there are no basic color systems with black, white, red, green and blue foci encoded although there are systems with black, white, red, yellow and blue foci encoded and probably systems with black, white, red, yellow and green foci.

These facts about color foci have an important implication, namely that the operative element in the sequence at stage III is neither the focus green nor the focus blue but the *category* GRUE. That is, the category GRUE may be accorded a basic color term either before or after the yellow focus is encoded, but GRUE is never split into green and blue and labeled with two basic color terms until after the yellow focus is named at the basic level. These facts are summarized in (4),

(4)

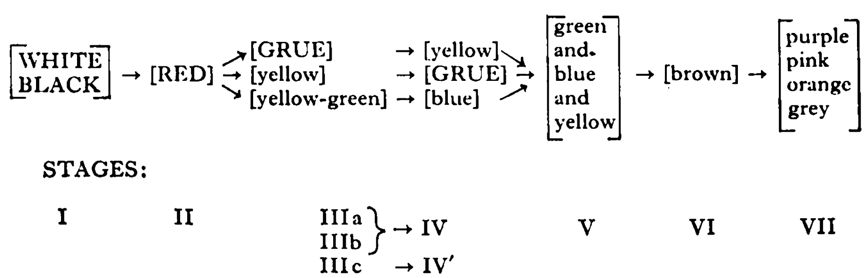


which is to be interpreted as follows: Stage I consists of two basic categories: WHITE, which includes white, very light shades of all colors, all warm colors, and may have its focus in either white, red, or pink and BLACK which includes black, some very dark browns and purples, all but the lightest blues and greens, and which probably has variable focus in black and in dark greens and blues. At stage II RED is marked by a basic color term and includes all warm colors with the focus in English focal red; this stage represents no departure from stage II as described in Berlin & Kay (1969) except that RED can be considered to have come out of WHITE rather than to have emerged in part from WHITE and in part from BLACK. At stage III either the yellow focus is accorded a basic color term (IIIb) or the category GRUE is accorded a basic term (IIIa). In the latter case the focus may be either in blue or in green or perhaps in both, but there is no evidence that in any language the focus of GRUE is in what we would call 'blue-green'.[3] At stage IV stage IIIa systems add yellow and stage IIIb

[3] A third possibility, at present remote, suggests itself for stage III. The Hanunóo basic terms (Conklin 1955), Dani secondary terms (E. Heider 1972*b*) and some fragmentary data from several Miwok languages (E. Callahan personal communication) suggest that possibly at this stage a yellow focus may be encoded which extends over the greens. If this does indeed happen sometimes at stage III, then one would expect at stage IV for a blue term to emerge with the yellow-green category still focused in yellow and then for the latter yellow-green category to split at stage V producing a standard stage V system. The sequence would then be generalized as follows to account for these cases. M. Haas reports that Creek, a Muskogean language, has (or had) basic terms for white, black, red, yellow-green, and blue; thus Creek would have a stage IV′ system (personal

systems add GRUE, so that all stage IV systems contain terms for WHITE, BLACK, RED, GRUE, and yellow, with foci as described for stage III. Then at stage V, GRUE is split into green and blue. Stages VI and VII remain unchanged from Berlin & Kay (1969) with the following reservation. Berlin & Kay (1969: 42ff.) cited the premature appearance of grey in two Uto-Aztecan languages (Hopi and Papago); since then, this has been confirmed for other Uto-Aztecan languages, reconstructed for proto-Uto-Aztecan by Hill & Hill (1970) and corroborated by Nichols (1974: 250–81). Grey is also prematurely present in Samal (Austonesian, Philippines) as noted by Geoghegan (personal communication) and reported in Berlin & Kay (1969: 44), in Yir-Yoront [Australia] (B. Alpher, personal communication), in several Athabascan languages (Durbin 1974), in Zapotec (R. MacLaury personal communication) and in Natchez (M. Haas, personal communication). Thus the possibility mentioned by Berlin & Kay (1969: 45) that grey may appear as a wild card is supported by new data.

(i) CATEGORIES:



communication). Professor Haas also reports that Natchez, a language – now dead – that may have been a distant relative of the Muskogean family, had basic terms for white, black, red, yellow-green, blue and grey. Natchez would then have had a stage IV′ system also, as well as showing premature grey (cf. above). The remaining languages of the southeastern United States on which Haas reports, including all the members of the Muskogean family and some languages not in this family, have 'normal' color systems, i.e. contain either a term for GRUE or one each for blue and green.

Haas has also called to my attention the possibility that Proto-Indo-European may have had a term for yellow-green.

> ...the reconstruction for both [yellow and green, P.K.] is *ĝhel- and our word yellow comes from this. This information comes from Buck (1949)... Buck was not thinking in terms of a single term for yellow-green, but on p. 1058 he speaks of 'IE *ĝhel- in words for bright, shining colors, esp. "yellow, green", also "white" and "blue" '. And on p. 1059 he says 'A considerable group of the words for "yellow" [in the daughter languages, M.H.] are cognate with others for "green" ' (M. Haas personal communication).

These data are suggestive. We have not yet, however, had a report of a language of stage IIIc (or IV′) where the explicit claim is made that the signification of the color terms has been determined by systematic use of controlled stimulus materials. Until a report of this kind is in hand, stages IIIc and IV′ remain interesting but unproven possibilities.

In sum, the major revisions of the theory are (a) recognition of the integrity of the light-warm, dark-cool, and GRUE categories in early systems and (b) recognition of the role played by category boundaries as well as foci in the evolutionary sequence.

Relation to current research on linguistic variation and language change

The original basic color term theory was conceived within the received tradition that considers the proper object of linguistic study to be Saussurian *langue* or Chomskian linguistic competence. (The *langue/parole* and linguistic competence/linguistic performance distinctions are essentially the same, except that Chomsky admits sentential structure to competence while de Saussure exiled it to *parole*. Also, of course, Chomsky emphasizes the psychological aspect of language while de Saussure emphasized the social.) According to Chomsky

> Linguistic theory is concerned primarily with an ideal speaker–listener, in a completely homogeneous speech community, who knows its language perfectly...This seems to me to have been the position of the founders of modern general linguistics, and no cogent reason for modifying it has been offered (1965: 3f.).

One might argue whether this was in fact the position of the men to whom Chomsky was referring (whoever they might be). Sapir and Bloomfield, for example, both spoke explicitly about variation, although one should add in Chomsky's defense that when describing languages or proposing grammatical formalisms these scholars and their students were monolectalists. If one equates linguistic theory to grammatical theory and considers syntax the core of grammar, then Chomsky's position was supportable, though not unarguable – in any case persuasive to many – in 1965. (Consider, however, the historical summary of proto-variationist viewpoints in Weinreich, Labov & Herzog (1968), references in Hymes (1964a: 426–7), and Hymes' (1964b) discussion of the limitations of Chomsky's view of language and their historical antecedents. I am indebted to John Gumperz and Dell Hymes for illuminating discussions of these issues.)

But since the mid-sixties, the 'homogeneous speech community' has been found to be not just an idealization but a myth. Empirical studies of changes in progress due principally to the influence of Labov, have demonstrated repeatedly that linguistic change has its source in synchronic variation, that is, in heterogeneity of the speech community. In the words of Weinreich, Labov and Herzog, 'Not all variability and heterogeneity in language structure involves change; but all change involves variability and heterogeneity' (1968: 188). The doctrine that diachronic change implies synchronic variation has received numerous convincing demonstrations, e.g., by Labov (1972) and Wang (1969) in phonology and by Bickerton (1973) in syntax (see also the various articles in Bailey & Shuy (1974)). Linguistic change has been shown to result from the redistribution of synchronic linguistic variants in a population across speakers, styles, and linguistic environments. New variants replace old ones neither instantaneously nor so gradually as to be unobservable. An excellent and very early statement of this principle was made by Vogt:

> At any moment, between the initiation and the conclusion of these changes, we have a state characterized by the presence of more or less free variants... What therefore in a history of linguistic system appears as a change will in a synchronic description appear as a more or less free variation...(Vogt (1954: 367) quoted in Wang (1969: 16)).

To this must be added the recent finding that linguistically 'free' variants involved in changes are most often socially conditioned as well as being subject to types of linguistic conditioning not hitherto countenanced by linguistic theory, e.g., 'natural conditioning' – Stampe (1972), quantitative conditioning – Labov (1969), and lexical conditioning – Wang (1969).

What are the implications of this development in the general theory of linguistic change for our little theory of evolution of basic color term systems? First, we can predict in a broad way that in a language in which the color term system is undergoing change there will be inter-speaker variation. Secondly, since not all aspects of a language change at the same time (for example the vowel system may be changing at a time when the consonantal system is relatively stable; cf. Labov (1972: 517)), we will expect some languages to show minimal inter-speaker variation in color terminologies while others will show considerable inter-speaker variation. More specifically, within the context of the general theory of linguistic variation and change, we may make the following predictions about variation in synchronic basic color lexicons.

(5) a If all speakers are at a given stage *n* with respect to basic color terms, the most salient secondary color terms will be those that become basic at stages $n+1$, $n+2$, and so on.

b The relative degrees of salience of the secondary terms should, in so far as they may be assessed, follow the ordering of the predicted evolutionary sequence (4). (For example, if all informants are at stage I with respect to basic terms we would expect the most salient secondary term, if there is any, to be RED, the next most salient to be either GRUE or yellow, and so on.)

c In a speech community undergoing change in basic color lexicon, not all speakers will be at the same stage with respect to basic color lexicon, but each speaker will be classifiable as to stage.

d In a community undergoing change in basic color lexicon, the totality of stages represented will be contiguous in the sequence (4).

e In a community undergoing change in basic color lexicon, difficulties in classifying speakers as to stage will involve only stages adjacent in the sequence (4).

f In a community undergoing change in basic color lexicon the basic color terms added at later stages are present as secondary terms for speakers at earlier stages.

g In a community undergoing change in basic color lexicon, stage of speaker will correlate with various social factors depending on the local social situation, but there should be a pervasive correlation with age (cf. Labov 1972: 519 ff.).

Berlin investigated in detail forty Tzeltal speakers and found that all informants had stage IV basic color lexicons in Tzeltal despite the fact that these informants represented the full range from monolingualism to complete Tzeltal–Spanish bilingualism (Berlin & Kay 1969: 10, 31 ff.). This contrasts with the Aguaruna, Binumarien and West Futuna cases to be discussed below, each of which has speakers at stages III, IV, and V. This observation confirms our first general prediction: that some early color systems will be diachronically relatively stable and show minimal synchronic heterogenity while others in the process of change will show considerable inter-speaker variation.

The data most directly relevant to predictions (5) a and b are those of E. Heider (1972*a*, *b*) from the Dugum Dani, a non-Austronesian language of Highland New Guinea. Heider reports that 'the language...lacks basic chromatic color terms' (1972*a*: 12). 'There were only two color terms ('mili' and 'mola') which were used by all informants' (1972*b*: 451). These may be glossed roughly as BLACK and WHITE bearing in mind the fact that the majority of informants picked focal red as the focus for the term we gloss WHITE. Heider goes on to report an 'unexpected' finding that 50 per cent of her informants ($n = 40$) had a term for red, 45 per cent for yellow and 28 per cent for blue. These glosses are supported by data from term to stimulus mappings for forty informants on a color chip array constructed by taking every other hue for all brightnesses of the array used by Berlin and Kay. These secondary foci are predicted by sequence (4) and the degrees of salience, as evidenced by the number of speakers using the term, also fit the sequence. Thus predictions (5) a and b are confirmed in these data. The Dani data do not offer evidence pro or con regarding the other predictions (5) c–f. Prediction (5) g will be considered below.

Berlin and Berlin have not tabulated incidence or any other index of salience for Aguaruna secondary color terms. (Aguaruna is a Jivaroan language of Eastern Peru.) For their stage III informants they report secondary terms, some of quite variable focus, that range over yellow, yellow-green, green, brown, and purple as well as a term which literally means 'ripe', is of very broad reference, and is probably not truly a color term at all. These facts accord with prediction (5) a. It is B. Berlin's impression that the purple term is better established than the brown term as regards both the frequency with which it is offered by informants and the narrowness of its focus and range (personal communication). This datum controverts prediction (5) b. Apparently (5) b is a prediction that we may expect to be borne out on the average, but not necessarily in each particular case. The fifty-five Aguaruna informants tested by Berlin and Berlin displayed basic color term systems corresponding to stages IIIa (thirty-four informants), IV (five informants) and V (sixteen informants). Predictions (5) c and (5) d are thus confirmed. Berlin and Berlin do not discuss in their paper problems of assigning informants to stages, but B. Berlin reports that such problems as did arise always involved the assignment of the informant to one of two adjacent stages (personal communication); this report supports prediction (5) e. Prediction (5) f is also borne out by the Aguaruna data: all basic color terms which are added to the stage IIIa set by stage IV and stage V informants occur frequently as secondary color terms for stage IIIa informants. Discussion of prediction (5) g will be postponed until after the Binumarien and Futunese data are discussed individually.

Binumarien is a non-Austronesian language of Highland New Guinea. Of the thirty-six Binumarien stage IIIb informants, twenty-one possess a secondary term for green, sixteen one for blue, and nine possess one for both. There are no other secondary terms, all other low frequency color terms being synonyms for basic color terms. Since the stage IV informants of this language show a preference for placing the GRUE focus in green, these statistics accord perfectly with predictions (5) a, (5) b and (5) f. Predictions (5) c and (5) d are confirmed in that there are thirty-six informants at stage IIIb, eight informants at stage IV and one informant (a fourteen year old) at stage V. Two informants are unclassifiable as between stages IIIb and IV as it was impossible to determine for them whether the GRUE category was contained in BLACK, which would make them IIIb, or whether their GRUE contrasted with BLACK, which would make them stage IV. This is a typical sort of classification problem, which confirms prediction (5) e and supports the evolutionary sequence. (Hage and Hawkes report a single informant whose classification represents a problem to the sequence as a whole but only in a quite minor respect. This nine year old has a normal stage IV system except that she includes purple in the range of GRUE.)

The data from West Futuna, a Polynesian outlier language, reported by Dougherty also confirm all predictions except (5) b, for which there are no relevant data. Stage IIIa speakers have as secondary terms the two terms for yellow that emerge at stage IV as basic terms. The same is true for stage IIIa and IV informants with respect to English *blue*, which becomes a basic term at stage V. (A single informant of the forty with a basic term for yellow uses Aniwan *féroféro* for yellow, a term otherwise unattested for West Futuna. The remainder use either *hléo* or *yéla* both of which occur frequently as secondary terms for stage III informants.) Predictions (5) a and f are thus confirmed. There are no Futunese data relevant to prediction (5) b. Predictions (5) c and (5) d are confirmed by the fact that all informants are classifiable as stage IIIa (five informants), IV (eighteen informants), or V (twenty-two informants). Prediction (5) e is confirmed by the fact that there are several interesting problems regarding classification of informants as stage IIIa versus stage IV and also as between stages IV and V but none in assigning an informant to at least one stage (the reader is referred to Dougherty's paper for details).

We now consider prediction (5) g regarding the social correlates of evolutionary stage of basic color nomenclature. As predicted, we find varying social correlates depending on local conditions. Berlin and Berlin report that for Aguaruna speakers contact with Hispanic culture in general and degree of proficiency in the Spanish language in particular are the major correlates of and causes of movement along the color term sequence. For Binumarien, Hage and Hawkes report that males are more familiar with Neo-Melanesian than females; seven of the eight Binumarien informants with stage IV or V systems are males. While the Aguaruna and Binumarien data support the hypothesis of language contact as a source of innovation in color term evolution, the West Futuna data controvert this hypothesis. Dougherty reports that her stage V informants are almost all women, and that women are on the average less traveled than men and have less knowledge of Neo-Melanesian and other foreign languages. Innovativeness in color lexicon in West Futuna seems negatively correlated with degree of exposure to more advanced color systems.

With regard to age, we find the predicted pervasive correlation between age and color stage in those cases where data are available. The Dani data are equivocal. E. Heider did not make age estimates but split her sample into 'adults' and 'children'. She reports that adults did not use more chromatic terms than children. She does not say whether children used significantly more chromatic terms than adults. Caution suggests that we assume from the lack of explicit statement to the contrary that Dani children do not use significantly more chromatic terms than Dani adults. It has, however, been observed that children acquire full knowledge of their color lexicon relatively late with respect to many other aspects of language (Istomina 1963; Hoppman n.d.; Hage & Hawkes n.d.). This poses a problem for the comparison of matched child and adult samples for color terminology systems; there is no way of knowing whether the number of terms controlled by children is artificially lowered because the children have not yet learned all the color terms they will eventually learn. Thus it could well be the case that if the Dani who are now children use about the same number of chromatic terms as members of their parents' generation, they may nevertheless eventually use more chromatic terms than their parents. To sum up, the Dani data as reported are unclear on the issue of a correlation between age and use of color terms.

The reports of the remaining three speech communities offer age estimates for each informant. Hage and Hawkes do not discuss the operational basis of their age variable, but Berlin & Berlin (personal communication) and Dougherty (personal communication) emphasize that their informants do not keep track of their ages and that the age estimates are consequently very rough. Internal evidence in the Hage and Hawkes data, consisting of a disproportionate number of ages that end in the digits zero and five, as well as general ethnographic knowledge of Highland New Guinea, suggest that the Binumarien age data also represent rather wild guesses. A further complication is that the Binumarien data include young children while the Aguaruna and Futunese data exclude young children. Binumarien informants under the age of fifteen have consequently been excluded from the following calculations.

As noted, the age data to be analyzed are subject to error from a large number of undisclosed sources. Unless the overall effect of these various, presumably uncorrelated, sources of error happens accidentally to correlate with development of color lexicon, we should expect correlations between age of speaker and stage of color lexicon to be artificially depressed. That is, the most cautious expectation would be that correlations reported below *underestimate* those actually existing in the populations under study.

Bearing in mind these caveats, we consider the correlations between age and stage of basic color lexicon shown in Table 1. The pervasive correlation predicted in (5) g in fact appears. T-tests for differences in mean ages for informants of color terms stages III, IV, and V show the following results. Aguaruna stage V speakers are significantly younger than stage III speakers and also significantly younger than stage IV speakers. Stage IV and V speakers combined are significantly younger than stage III speakers. There is no significant difference between stage IV and stage V speakers.

For Futunese we find that stage V speakers are significantly younger than stage IV speakers and also significantly younger than stage III speakers. Stage V speakers are significantly younger than those of stages III and IV combined. The Futunese data contain the only reversal in the absolute predicted order of mean ages to be found among these groups. Futunese stage IV speakers are slightly older than stage III speakers, but the difference is not statistically significant and so may be attributed to sampling error.

For Binumarien, Hage and Hawkes report accurately that stage IV and V systems 'are possessed exclusively by a subset of younger members of the population'. The range of ages of stage IV and V informants is from eight to eighteen years. The mean ages conform to the predicted sequence; earlier stage informants are older than later stage informants. There is only one informant at stage V and this is a fourteen year old. Stage IV informants are significantly younger than those of stage III. (Informants of stages IV and V combined are also significantly younger than those of stage III, but the stage V data are not shown in Table 1 because all stage V speakers are juveniles, i.e. younger than fifteen years old.)

TABLE 1. *Significant differences in mean ages of adult speakers of basic color term stages III, IV and V in Aguaruna, Futunese and Binumarien*

Language	Stage	Number of speakers	Mean age	Standard deviation of ages	Significant differences in mean age between speakers of different stages	Level of significance attained (one-tailed t-test of difference between independent means)
Aguaruna	IIIa	34	33.32	12.84		
	IV	5	22.30	14.04		
	V	16	21.44	9.80		
					$\overline{III}-\overline{IV} = 11.02$	$P(t_{37} \geqslant 1.77) < 0.05$
					$\overline{III}-\overline{V} = 11.88$	$P(t_{48} \geqslant 3.27) < 0.005$
					$\overline{III}-(\overline{IV \cup V}) = 11.88$	$P(t_{53} \geqslant 3.50) < 0.0005$
Futuna	IIIa	5	45.00	15.41		
	IV	17	48.32	16.05		
	V	21	35.14	10.79		
					$\overline{III}-\overline{V} = 9.86$	$P(t_{24} \geqslant 1.70) < 0.05$
					$\overline{IV}-\overline{V} = 14.41$	$P(t_{37} \geqslant 3.43) < 0.005$
					$(\overline{III \cup IV})-V = 12.81$	$P(t_{41} \geqslant 3.11) < 0.005$
Binumarien	IIIb	19	41.32	16.33		
	IV	6	27.83	3.49		
					III–IV = 13.49	$P(t_{23} \geqslant 1.99) < 0.05$

All the significant differences point in the same direction – that younger speakers have more advanced basic color term systems than older speakers. Considering the approximate nature of these age estimates, a statistical pattern as consistent as the one we have found would seem to support strongly prediction (5) g.[4]

Summary

We have derived predictions about synchronic variability in basic color term systems from the interaction of the general postulate that diachronic change always implies synchronic heterogeneity in the speech community with our knowledge of the results of linguistic change in basic color lexicons embodied in the evolutionary sequence (4). Testing these predictions against the available data on the distribution of color lexicons in actual speech communities, we have found the predictions confirmed. Speech communities may contain speakers of several adjacent evolutionary stages. Individual speakers are virtually never hard to place in the sequence, but sometimes hard to place in one of two adjacent stages. The pattern of elevation of secondary terms to primary terms follows the predicted sequence. Stage of basic color lexicon correlates with a variety of social indices in different societies, but there is an overall tendency for speakers with more advanced basic color term systems to be younger. We thus find confirmation in the domain of color words for the doctrine that linguistic change implies synchronic heterogeneity in the speech community.

REFERENCES

Berlin, B. & Berlin, E. A. (1974). Aguaruna color categories. Paper presented to American Anthropological Association Annual Meeting. Mexico, D.F. To appear in *American Ethnologist.*

Berlin, B. & Kay, P. (1969). *Basic color terms: their universality and evolution.* Berkeley: University of California.

Berlin, B., Kay, P. & McDaniel, C. (forthcoming). The psychological significance of basic color terms.

Bickerton, D. (1973). The nature of a Creole continuum. *Language* **49.** 640–70.

Broch, H. B. (1974). A note on the Hare Indian color terms based on Brent Berlin and Paul Kay: *Basic color terms, their universality and evolution. Anthropogical Linguistics* **16.** 192–6.

Buck, C. D. (1949). *A dictionary of selected synonyms in the principal Indo-European languages.* Chicago: University of Chicago Press.

Chomsky, N. (1965). *Aspects of the theory of syntax.* Cambridge, Mass.: M.I.T.

[4] All the tests of significance performed are technically based on the assumption that informants were sampled randomly from their respective populations. This assumption is almost surely violated in all three languages, as the samples were probably drawn more on the basis of convenience than on any other. It is possible that the ethnographers' convenience systematically selected informants in such a way as to exaggerate the correlation of age and basic color term stage, but since this seems *a priori* quite implausible the burden of proof would appear to be on whoever might wish to make this argument.

Conklin, H. D. (1955). Hanunóo color categories. *Southwestern Journal of Anthropology* **11.** 339–44.
Dempwolff, O. (1971) (1937). *Comparative phonology of Austronesian word lists.* Anonymous translation from the German. Copyright by Ateneo de Manila University.
Dougherty, J. (1974). Color categorization in West Futuna: variation and change. Paper presented to American Anthropological Association Annual Meeting. Mexico, D.F.
Dubin, M. (1974). Athabaskan color terms. Paper presented to American Anthropological Association Annual Meeting. Mexico, D.F.
Hage, P. & Hawkes, K. (n.d.). Binumarien color categories. (Mimeo.) 32 pp.
Heider, E. R. (1972*a*). Universals in color naming and memory. *Journal of experimental psychology* **93.** 10–20.
—— (1972*b*). Probabilities, sampling and ethnographic method: The case of Dani colour names. *Man* **7.** 448–66.
Heider, K. G. (1965). *The Dugum Dani: A Papuan culture in the West New Guinea highlands.* (Ph.D. Thesis. Harvard.)
Heinrich, A. C. (1973). Systematics of Canadian Eskimo colour terminology. (Ms.) 381 pp.
Hill, J. H. & Hill, K. C. (1970). A note on Uto-Aztecan color terminologies. *Anthropological Linguistics* **12.** 231–70.
Hoppman, M. (n.d.). Acquisition of basic color terms. (Mimeo.) 20 pp.
Hymes, D. (ed.) (1964*a*). *Language in culture and society.* New York: Harper and Row.
—— (1964*b*). Directions in (Ethno-)Linguistic theory. *American anthropologist* **66.** 6–56.
Istomina, Z. G. (1963). Perception and naming of color in early childhood. *Soviet psychology and psychiatry* **1.** 37–45.
Labov, W. (1972). On the mechanism of linguistic change. In J. J. Gumperz & D. Hymes (eds), *Directions in sociolinguistics.* New York: Holt, Rinehart and Winston.
McDaniel, C. (1974). Basic color terms: their neurophysiological basis. Paper read to American Anthropological Association Meeting. Mexico, D.F.
Nichols, M. P. (1974). *Northern Paiute historical grammar.* (Ph.D. thesis. Berkeley: University of California.)
Shuy, R. W. & Bailey, C.-J. N. (eds) (1974). *Towards tomorrow's linguistics.* Washington, D.C.: Georgetown University Press.
Snow, D. L. (1971). Samoan color terminology: A note on the universality and evolutionary ordering of color terms. *Anthropological linguistics* **13.** 385–90.
Stampe, D. (1972). *A dissertation on natural phonology.* (Ph.D. thesis. Chicago: University of Chicago.)
Vogt, H. (1954). Contact of languages. *Word* **10.** 365–74.
Wang, W. S.-Y. (1969). Competing changes as a cause of residue. *Language* **45.** 9–25.
Weinreich, U., Labov, W. & Herzog, M. I. (1968). Empirical foundations for a theory of language change. In E. W. Lehman & Y. Malkiel (eds), *Directions for historical linguistics.* Austin: University of Texas.