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This issue is dedicated to TALMY GIVÓN,

Founding Editor of S.A.L.

STUDIES IN AFRICAN LINGUISTICS

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Studies in African Linguistics
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SYLLABLE WEIGHT AS A PHONOLOGICAL VARIABLE

The Nature and Function of the Contrast Between "Heavy" and "Light" Syllables

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1. Introduction

In general phonological works, a basic dichotomy is commonly drawn between open syllables, i.e. those of the form (C)V, and closed syllables, i.e. those of the form (C)VC. For example, Pike says: "A syllable is checked (or closed) whenever it ends in a contoid...A syllable is free (or open) when it ends in a vocoid. The word 'hast' is a syllable checked by the arresting group [st]. The word 'spa' is a free syllable" [1943: 119, underline his]. In most cases the open/closed contrast is seen not as a simple dichotomy, but rather as an unequal opposition in which one member of the pair--the open syllable--has special status. "A syllable consisting of a consonant plus a vowel represents the most primitive, and without doubt historically the oldest, of all syllable types, the only one which is general in all languages. We call it the open syllable. All languages have open syllables. Very many have only open syllables. No language has only closed syllables" [Malmberg 1963: 129]. An almost identical statement is made by the Russian phonetician Bondarko [1969: 3]: "The combination CV is [the] most common and elementary syllabic pattern. This is supported by a number of facts, both linguistic...and psychological." Cairns [1971: 42] reaffirms the same point: "Given all this evidence, the hypothesis that open syllables are, in some yet-to-be-defined sense, more natural than closed syllables is reasonable...it is not a priori true." Approaching the matter historically, Martinet [1952] and Malmberg [1965] see the tendency toward open syllabicity as an ongoing mechanism of linguistic change. Pulgram [1970] utilizes the principle of open syllabicity as the first of his criteria for determining

syllable boundaries, a step which he justifies on general linguistic grounds. Similarly, Hooper [1972] takes the primacy of open syllables as a linguistic universal in her attempt to set up what in effect would be automatic discovery procedures for assigning syllable boundaries. The distinction between open and closed syllables is also taken for granted in works on language acquisition, speech pathology, speech perception, slips of the tongue, and in synchronic descriptions of language specific allophony rules. It seems fair to generalize from the above that the open/closed dichotomy is one of the most natural, least controversial dichotomies in linguistics and one which by now is familiar to all linguists.[1]

By contrast there is another system of classifying syllables which has been utilized time and time again in synchronic descriptions of individual languages, but which has generally been ignored in typological and theoretical papers on the syllable. This is the classification of syllables on the basis of their internal composition into what are sometimes labelled "long" and "short", other times "heavy" and "light" syllables.[2] In spite of its widespread use, the concept of syllabic quantity--or "weight" as I prefer to call it--is not even mentioned in major works dealing with the syllable such as Fudge [1969], Hála [1961], Hockett [1955], Malmberg [1963], Pike [1943], Pulgram [1970], or

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[1] I, of course, am taking the existence of the syllable for granted and reject as nonsense articles such as Hohler [1966] which purport to do away with it. As Fudge [1969: 264] says, "The reason why syllables are still with us is that they are valid as basic elements of linguistic structure..." (See also Anderson [1969], Fromkin [1970], and Sampson [1970: 602-604]).

[2] I have adopted the terms "heavy" and "light" for this paper and advocate their general usage. In so doing, I am following Allen [1965, 1968, 1969] who argues convincingly that the terms "long" and "short" should be reserved for vowels (and presumably consonants as well) and should not be used for syllables. "The need for employing an unambiguous terminology, which clearly distinguishes syllabic quantity [=weight] from vowel length, cannot be too strongly emphasized" [1965: 92]. The contrast between heavy and light syllables must also be kept distinct from the well-known contrast between strong and weak syllables. The major difference between these two oppositions is that syllable weight is determined intrinsically whereas syllable strength is determined positionally. For an interesting illustration of the interplay between syllable weight and syllable strength, see Miyaoka [1971].

Stetson [1951].[3] I would argue, nevertheless, that syllable weight does indeed constitute a phonological variable of general, cross-language significance. Its neglect by phonologists can only be viewed as a gross and inexplicable oversight. What I propose to do in this paper, then, is to discuss the essential nature of the distinction between heavy and light syllables and to provide a brief survey of selected languages where it is found. Finally I will focus on three Chadic languages (Bolanci, Kanakuru, and Hausa) in order to demonstrate in greater detail how syllable weight participates in rules that account for various phonological and morphological phenomena.

2. The Concept of Syllable Weight

The nature of the heavy/light dichotomy (and the difference between this dichotomy and the open/closed one) is set forth in an important paper by Kuryłowicz. "Cette distinction s'appuie en même temps sur l'opposition e:ē (e étant ici le symbol d'une voyelle quelconque) et sur l'équivalence quantitative ē = et (t = consonne simple ou groupe quelconque)...Grâce surtout à l'équivalence ē = et toute syllabe y peut être mise au nombre de syllabes soit longues soit brèves. Le double fondement de la quantité syllabique prouve en même temps que la quantité n'est pas un caractère du phonème, c.-à-d. de la voyelle, mais bien de la syllabe" [1948: 112-113]. In his paper, Kuryłowicz makes two essential points with regard to syllable weight:

(1) Given the analysis of a syllable as consisting of three parts--onset, peak, and coda--the peak and coda naturally group together as one constituent, the core as opposed to the onset.[4] The analysis of syllables into heavy and light is determined solely by the makeup of the core, the presence, absence, or nature of the onset being in all cases irrelevant.

(2) Syllable weight (i.e. the functional distinction between heavy and lignt syllables) exists only in languages with phonemic vowel length,

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[3]Notable exceptions are Lehiste [1970], which contains important information on linguistic quantity and duration at various levels of analysis, and Vennemann [1972].

[4]The idea of subjecting syllables to immediate constituent analysis is applied in an early paper by Pike and Pike [1947]. The IC cut adopted in this paper, i.e. onset/core as opposed to Pike and Pike's peak/margin, is made for somewhat similar reasons by Cheng [1966].

being based on the structural equivalence of open syllables containing long vowels and closed syllables, i.e. the grouping together of syllables of the form $C\bar{V}$ and CVC as opposed to those of the form CV.

Before proceeding, let me explain the notational conventions adopted in this paper.

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A. Latin (according to Allen [1965 and 1969]):

(a) Composition: open syllables with short vowels are light; all others are heavy, including syllables of the form Cvv, Cvc, and Cvvc. Diphthongs have the same value as long vowels.

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basic principle of equivalence stated by Kuryłowicz, namely vv = vc, operates equally well here, only being further extended to account for the extra dimension. The three degrees of syllable weight are as follows: light syllables consist of those of the form Cv; heavy syllables include those of the form Cvv and Cvc; extra-heavy syllables include those of the form Cvvv and equivalent combinations of v's and c's, e.g. Cvvc and Cvcc. All syllables except the first require a consonantal onset, which, however, has no bearing in determining syllable weight.

(b) Function: "In the phonological hierarchy of Estonian, there are two intermediate levels between the phoneme and the phonological word: the syllable and the disyllabic sequence. Quantity [=weight] is the factor which relates the units within the hierarchy to each other" [1965: 455-56]. Syllable weight and ratios of syllable weights enter into the determination of possible word types and in the specification of the phonetic duration of non-initial vowels and of pitch and intonation contours.

E. Classical Arabic (according to Fleisch [1956]):

(a) Composition: syllables of the form cv are light; those of the form cvv and cvc are heavy. In Arabic, the consonantal onset is obligatory in all syllables. Closed syllables with long vowels, which result from morphological processes, are considered extra-heavy. These "ultra-long" syllables constitute an aberrant type of heavy syllable rather than a true third degree of syllable weight.

(b) Function: Arabic poetic meters are bases on specific arrangements of heavy and light syllables. Accentual rules are also dependent on syllable weight.

F. Gothic (according to Vennemann):

(a) Composition: syllables of the form Cv are light; all others are heavy.[7]

(b) Function: rules of syllable division are dependent upon the

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[7] Vennemann [1971: 104] distinguishes light roots of the form Cv and Cvc from heavy roots of the form Cvcc and Cvvc. As he himself is aware these abstract "roots" are not to be confused with phonological syllables which emerge later in the generative process as a result of the application of syllabification rules.

interplay of syllable weight and accent placement.[8]

4. Syllable Weight in Chadic

Let us now turn our attention to the Chadic language family of norther Nigeria where we find syllable weight entering into the description of a wider range of phenomena than in the case of the languages surveyed above. The three languages to be considered are Bolanci (=Bolewa), Kanakuru (=Dera), and Hausa, all fairly closely related members of the western group of the Plateau-Sahel branch of the Chadic language family (see Newman and Ma [1966]). All three languages are tonal with two phonemic tones: Hi indicated ´ and Lo indicated ` . All have phonemic vowel length and all make some use of the contrast between heavy and light syllables.

4.1. Bolanci (according to Newman [n.d.]):

(a) Composition: light syllables are cv; heavy syllables are cvv or cvc. Long vowels do not occur in closed syllables.

(b) Function: in Bolanci, disyllabic verbs occur with two basic tone patterns: Hi-Hi and Lo-Hi. Unlike most other Chadic languages, where tone of verbs is lexically distinctive, Bolanci verb tone is completely determined on the basis of syllable weight and the nature of the final vowel (either -u or -aa, the choice not being predictable). Verbs ending in -u behave as a single tone class, all being either Hi-Hi or Lo-Hi depending on the dialect.[9] The weight of the first syllable of -aa verbs is also predictable, only verbs of the form SCaa being found. Verbs ending in -u occur with both tone patterns, the sole determining factor being syllable weight. If the initial syllable is heavy, then the verb will have Lo-Hi tone; if the initial syllable is light, the tone will be Hi-Hi. There are no exceptions.

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[8] Contrary to first impression, Sievers' Law is not a direct function of syllable weight in Gothic nor in Vedic (see footnote 19 for a fuller discussion of this point).

[9] There are differences on some points between my data, collected in the Gombe area, and those of Lukas [1970/71], which represent the Fika district; but both data sets equally exhibit the workings of syllable weight.

Heavy		Light			
-u		-u		-aa	
ràamú	'to repair'	tónú	'to sharpen'	dámáa	'to sweep'
sòorú	'to fall'	shɗrú	'to steal'	kúmáa	'to hear'
mòyyú	'to wait for'	móyú	'to see'	bɗáa	'to wash'
lèmɗú	'to lick'	ŋgáɗú	'to eat (meat)'		
wùndú	'to call'				

As in many Chadic languages, what is orthographically represented in Bolanci as a sequence of a nasal plus a stop is often a unit phoneme, e.g. mboza 'speech' (cvcv not *ccvcv), ndi 'to go' (cv not *ccv), and ŋgaɗu 'to eat meat' (cvcv not *ccvcv). In medial position, however, Bolanci always treats these as if they were two elements, with the result that the first syllables of words such as wùndú 'to call', and gàndú 'to lie down' are considered heavy.

Note that in Bolanci the tone pattern of a verb form is determined strictly by the syllable weight of an actually occurring stem and not on the form of an underlying root. Compare, e.g. the tone of the following pairs of verbs where the basic root has initial S̆ while the derived stem begins with S̄.

		Light			
(1a)	ɓólú	'to break' (intr.)	(1b)	ɓòltú	'to break' (tr.)
(2a)	ŋgómú	'to fill' (intr.)	(2b)	ŋgòntú	'to fill' (tr.)

The contrast in u-verbs between those with initial S̄ and those with initial S̆, which determines underlying tone, also has importance elsewhere in the language. In the subjunctive, the stem final -u is obligatorily replaced by a front vowel, -e or -i depending on syllable weight. If the initial S is heavy, then u --→ e; if it is light, then u --→ i. The tone of verbs in the subjunctive is completely determined by the aspect--being Lo-Hi in all cases--and overrides the tonal distinction found in their basic forms.

Heavy

(3) ...kádàa ká sòoré (< sòorú 'to fall') '...lest you fall'

(4) ...ɗóo nì dòndé sùɓà (dòndú 'to wash') '...so that I wash the gown'

Light

(5) ɗóo nì 'yòrí (< 'yórú 'to stay') 'let me stay'

(6) kádàa ká ɓòyí bòokò sá (< ɓówú 'to despise') 'don't despise western education'

4.2. Kanakuru (according to Newman [1972]):

(a) Composition: light syllables are (c)v; heavy syllables are (c)vc. Unlike Hausa and Bolanci, Kanakuru has syllables without consonantal onsets. (As expected, however, the presence or absence of the onset has no effect on syllable weight.) Kanakuru also has a small number of words containing long vowels in closed syllables due to the loss of /h/ between identical vowels, e.g. gáak 'crow', díil 'hoe', and búut 'he-goat' (< *búhút, cf. the plural búkúr̀ín with the Tera word bòkàrá). Since these "extra-heavy" syllables are historically recent, it is too early to determine whether they will be permitted to stay as such and if so how they will influence syllable structure rules.

(b) Function:

(i) Verbal nouns: the tone of verbs in Kanakuru is to a great extent predictable from the class of the initial consonant. If the initial consonant is a voiceless or glottalized obstruent the verb tone is Lo-Hi, if it is a voiced obstruent it is Hi-Lo, e.g.

(7a)	tùpé	'to send'	(7b)	dápè	'to collect'
(8a)	ɓùlí	'to write'	(8b)	gémì	'to fill'
(9a)	pàaré	'to exchange'	(9b)	jáarè	'to comb'

The tone of verbs with initial vowels or sonorants is not predictable, e.g.

(10a)	àɗé	'to eat'	(10b)	átè	'to dip out'
(11a)	màané	'to return (something)'	(11b)	múulè	'to smooth (something)'

Unlike the case in Bolanci, the tone of basic verb forms in Kanakuru is not sensitive to syllable weight. When one turns to verbal nouns,

however--by which I mean lexically derived nominals (cf. Bagari [1971]) as opposed to gerundive forms--syllable weight turns out to be a crucial variable. In determining the tone of verbal nouns formed with the derivational suffix -ək,[10] it is the weight of the initial syllable that matters and not the phonation class of the initial consonant or the tone of the underlying verb. Derived nominals formed with -ək are automatically Hi-Hi if the first syllable is light, Hi-Lo if it is heavy.

			Light
	verb	verbal-noun	
(12)	mòné	mónək	'to forget'
(13)	jóɓè	jóɓək	'to wash'
(14)	ɓìndé	ɓíndək	'to squeeze'
			Heavy
	verb	verbal-noun	
(15)	pàaré	páaràk	'to exchange'
(16)	yáhjè	yáhjàk [yáɣjìk]	'to sift'
(17)	shìmdé	shímdàk	'to thatch'

In contrast with the situation in Bolanci, the prenasals mb, nd, nj, and ŋg in Kanakuru function as unit phonemes even in the middle of words. They are not interpreted as clusters and they do not add to the weight of preceding syllables. The word ɓíndək, for example, has the syllabic shape cv=cvc and thus has Hi-Hi tone, as is expected of words with light initial syllables.

Although the correlation of verbal noun tone and syllable weight is clear enough, the reasons for it are not. It seems strange that the syllables which contrast in syllable weight should carry the same tone while the uniform Cək syllables should differ in tone. One possible explanation is that verbal nouns with initial S̄ originally had Lo-Hi tone, like Bolanci verbs, and only later acquired their present Hi-Lo pattern by a historical flip-flop tone rule.[11] This hypothesis is supported by

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[10] There are other derivational affixes in Kanakuru for forming verbal nouns, but -ək is the most common and, at present, the only one that seems to be productive.

[11] Wang [1967] describes both synchronic and diachronic cases of flip-flop tone rules.

the existence of cognate pairs with opposite tone such as K. bóòk 'mouth', Hausa bàakíi and K. wárìŋ 'nose', Bolanci wùntí. Perhaps a better explanation, however, is to assume that all verbal nouns with -ək have underlying Hi-Hi tone and that the surface forms with Hi-Lo result from the inability of the phonologically weak suffix to sustain its Hi tone after a heavy, stressed syllable.

(ii) Pronouns: another place in Kanakuru where syllable weight manifests itself is in the canonical shape of pronoun sets. The subject pronouns used in the perfective, for example, are all light while the continuous aspect pronouns are heavy.

	Perfective	Continuous
I	nà	nàa
you	kà	kàa
you (f.)	shì	shìjì
he	Ø	shìi
she	Ø	shèe
we	mà	màn
you (pl.)	kà	kàa
they	wù (<*wà)	wùn (< *wàn)

The contrast in Kanakuru between pronoun tense/aspect sets on the basis of syllable weight is of course extremely interesting from a comparative point of view because of the existence of this same type of contrast in present day Hausa and in other Chadic languages. Historical linguistics aside, the most fascinating thing about the heavy-syllable continuous pronoun paradigm is the presence of the second person feminine form shìjì, reminding us of the metrical equivalence in Greek of one heavy to two light syllables and of the fact that the implications of this paper go far beyond the specifics of Chadic linguistics.[12]

4.3. Hausa

(a) Composition: the classification of Hausa syllables into light

[12]This equivalence of two light = one heavy perhaps explains why the Hausa third person feminine independent pronoun 'ítá ends in a short vowel when all the other independent pronouns end in long vowels. Cf. the full paradigm níi, kái, kée, shíi, 'ítá, múu, kúu, súu, 'I, you, you (f.), he, she, we, you (pl.), they'.

and heavy dates back to Klingenheben [1927/28]. The light class includes only syllables of the form cv; the heavy class includes syllables consisting of a consonant plus a long vowel, a consonant plus a diphthong, or a consonant plus a short vowel plus another consonant. The consonantal onset is present in all cases, words orthographically represented with an initial vowel actually containing an initial glottal stop. As Klingenheben recognized, Hausa does not allow long vowels or diphthongs in closed syllables, the maximum number of segments permitted in a syllable being three. Syllables beyond the prescribed limit that result in intermediate structure from the addition of affixal elements are automatically pared down to permissible weight by syllable-overload rules.[13]

(b) Function:

(i) ANSQ (according to Parsons [1955]): "'Abstract Nouns of Sensory Quality' is the name by which I designate a group of some 60 Hausa words that exhibit a remarkable degree of homogeneity at all levels of analysis, phonological, tonological, morphological and semantic" [p. 373]. This class includes such words as záafíi 'heat', tsáamíi 'sourness', gáncíi 'astringent taste', and zúrfíi 'depth'. Focussing strictly on the phonological characteristics of the set, Parsons noted four common phonological features: (a) the words all end in the vowel /ii/, (b) they all have Hi-Hi tone, (c) they are all disyllabic, and (d) their first syllables always contain either a long vowel, a diphthong, or a consonantal coda. Given the availability of the concept "heavy syllable", the canonical shape of ANSQ's can be represented neatly by the abbreviation $\bar{S}$Cii. Note that the heaviness of the first syllable--which is an abstract, classificatory notion involving the equivalence of consonantal and vocalic elements--

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[13] In Hausa syllable overload is normally handled by reducing long vowels to short, e.g. *kain=sa --→ káǹ=sà 'his head', *riigaar ruwaa --→ ríigár rúwáa 'raincoat', *baaw=taa --→ bàw=táa 'slavery' (<báawàa 'slave'). In other Chadic languages, overload situations are usually alleviated by epenthetic schwa insertion and resyllabification, e.g. Ga'anda *cans-ca 'chicken+plural' --→ cà=más=cà 'chickens' (see R. Newman [1971]).

figures just as importantly in the description of this word class as do criteria (a), (b), and (c), which refer to particular phonemes and tonemes and a specific number of syllables.

(ii) Plurals. Pluralization in Hausa is accomplished by means of two distinct processes: stem preparation, and affix insertion. Stem preparation minimally involves deletion of the tones and final vowel of the singular, e.g. ràagóo 'ram', plural stem *raag, plural form ráagúnàa. With some words stem preparation is marked by other, sometimes optional, sometimes obligatory, changes in segmental composition, e.g. táushíi 'drum', pl-stem *tafsh, plural form táfàashée.[14] The plural affixes themselves all contain two elements: a segmental affix and an associated word tone pattern. The affix aa...ee, for example, regularly occurs with Hi-Lo-Hi tone, unaa with Hi-Lo. Hausa has a number of other ways to form the plural, but for the sake of this paper I will limit myself to these two. As has been known for some time the use of one of these affixes rather than the other is related to the tonal structure of the singular. What has not been recognized is that the differences in the surface variants that make up these plural classes are almost entirely predictable if one takes the matter of syllable weight into account.

Plural type aa...ee/Hi-Lo-Hi: disyllabic singular nouns with Hi-Hi tone commonly have corresponding plurals which contain the vowel components aa...ee and the tone pattern Hi-Lo-Hi, e.g.

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[14] The most common changes in the formation of pl-stems--replacement of u by a labial or velar obstruent and the replacment of r by t--represent the reverse of a series of well-known historical changes in Hausa generally referred to as Klingenheben's Law (cf. Schuh, in this number). Some words require the recovery of the historically earlier form in the plural (e.g. fárkée, pl. fátàakée 'trader') while others allow pl-stems built either on the historically earlier segmental structure or on the segmental structure of the present-day form (e.g. ɓáunáa, pl. ɓákàanée or ɓáunàayée 'bush-cow').

	sg	pl	
(18)	káskóo	kásàakée	'bowl'
(19)	jírgí	jíràagée	'train'
(20)	káfáa	káfàafée	'small hole'
(21)	wúrí	wúràarée	'place'
(22)	kíifí	kíifàayée	'fish'
(23)	gáulàa	gáulàayée	'idiot'

The rule for inserting this affix to add aa immediately after the second consonant (C_2) of the pl-stem and ee at the very end of the stem. The tone pattern is always added last. E.g.

	sg	pl-stem		pl
(24)	káskóo	*kask	--→	kásàakée (C_2)
(25)	jírgí	*jirg	--→	jíràagée
(26)	táushí	*tafsh	--→	táfàashée
(27)	júují	*jibj	--→	jíbàajée

Nouns with syllable initial short open vowels, as in (20) and (21), are usually said to employ a suffix aaCee in forming the plural (where C is identical to the stem final consonant). When one recognizes the importance of stem preparation in plural formation, it becomes clear that the reduplicated C one finds on the surface is not part of the affix but rather must be assigned to the pl-stem. The underlying principle seems to be that all pl-stems participating in the construction of aa...ee plurals must have a heavy first syllable. If the first syllable of the singular is already heavy, as in the case of examples (18), (19), (22), and (23), then nothing more is required. If, however, the first syllable is light, then it must be made heavy--and this is done by doubling the stem final consonant. Once the pl-stem has been prepared to the required specification, then the affix can be inserted as described above, namely insert aa after C_2 and add ee at the end, e.g.[15]

[15] One interesting consequence of the above analysis is that these "reduplicated plurals" now become examples of the widespread Afroasiatic internal a-plurals described by Greenberg [1955].

(28)	káfáa	*kaff	--→	káfàafée	'hole'
(29)	wúrí	*wurr	--→	wúràarée	'place'
(30)	dámóo	*damm	--→	dámàamée	'monitor'
(31)	zúgúu	*zugg	--→	zúgàagée	'roll of cloth'

When the plural affix is inserted in pl-stems of the form cvvc (derived from nouns with long open vowels as in examples (22) and (23), the aa added after C_2 and the ee added at the end of the stem end up immediately juxtaposed. In such cases a semivowel /y/ is interposed to act as a phonological buffer, e.g.

(32)	kíifí	*kiif	--→	*kíifàaée	--→	kífàayée	'fish'
(33)	gáuláa	*gaul	--→	*gáulàaée	--→	gáulàayée	'idiot'
(34)	zóomóo	*zoom	--→	*zóomàaée	--→	zóomàayée	'hare'
(35)	súunáa	*suun	--→	*súunàaée	--→	súunàayée	'name'

Note that the /y/ used in the above plurals is strictly epenthetic in origin and has no independent status, neither as part of the plural stem nor as part of the affix.[16]

In order to know how to apply the affix insertion rule to words containing diphthongs, one must first know whether the second component of the diphthong is being interpreted as [-vocalic] and thus acts as C_2 or whether it is [+vocalic], in which case it does not count as C_2, e.g.

	sg	pl-stem		pl		
(36)	ɓáurée	ɓaur [+voc]	--→	ɓáuràayée (C_2)	(not *ɓáwàarée)	'fig tree'

[16] The use of /y/ as an epenthetic C is found elsewhere in Hausa as well, e.g. sháayás/sháayár 'to water' < sháa 'to drink' + the causative suffix ás/ár.

(37) ƙwáurée ƙwawr --→ ƙwáwàarée (not *ƙwáuràayée)[17]
[-voc] C_2

What is particularly interesting in this connection is that syllable final n's also behave as if they were [+vocalic] and thus never act as C_2. So we find that the plurals of words of the form cvn=cvv such as zánkóo 'bird's crest' pattern with those of cvv=cvv nouns such as kíɬfíɬ 'fish' rather than with cvc=cvv nouns such as káskóo 'bowl', e.g.

	sg	pl-stem		pl		
(38)	gúntúu	*gunt [+voc]	--→	gúntàayée (C_2)	(not *gúnàatée)	'short person'
(39)	bángóo	*bang	--→	bángàayée	(not *bánàagée)	'wall'
(40)	dúmɓúu	*dumɓ (< *dúnɓúu)	--→	dúmɓàayée	(not *dúnàaɓée)	'old tool'
(41)	tálɬée (<*tánɬée)[+voc]	*taɬɬ	--→	táɬɬàayée (C_2)	(not *tánàaɬée)	'soup-pot'

To sum up, one can say that all Hausa plurals identifiable as the aa...ee type--whether appearing on the surface as aa...ee, aaCee, or aayee--employ exactly the same affix and exactly the same rule governing affix insertion. In addition they all make use of prepared plural stems with exactly the same canonical shape described in terms of syllable weight. E.g.

	sg		pl-stem	pl			
	example	initial S (S̄C)		(aa...ee/Hi-Lo-Hi)			
(42)	káskóo	cvc	*kask	kásàakée			'bowl'
(43)	dámóo	cv	*damm	dámàamée			'monitor'
(44)	kíɬfíɬ	cvv	*kiɬf	*kíɬfàaée	--→	kíɬfàayée	'fish'
(45)	gúntúu	cvv	*gunt	*gúntàaée	--→	gúntàayée	'short person'

[17]Both examples of Hi-Hi nouns that I have found where the diphthongal ending is treated as [-voc] have /ƙ/ as the word initial consonant. With Hi-Lo nouns taking a related plural affix (not described in this paper), the interpretation of diphthongs and long vowels as ending in a [-voc] segment is much more common, e.g. dúutsèe, pl. dúwàatsúu 'stone' or kwíɬɓìi, pl. kwíyàaɓáa 'flank'.

Plural type uNaa/Hi-Lo:[18] one of the most productive plurals for disyllabic singular nouns with Hi-Lo or Lo-Hi tone employs a suffix of the form unaa, ukaa, or uwaa (for which I am using the cover designation uNaa) and the tone pattern Hi-Lo, where the Hi tone extends over all the syllables in the word except the last, e.g.

	sg	pl	
(46)	ɗáakìi	ɗáakúnàa	'room'
(47)	hùuláa	húulúnàa	'cap'
(48)	rùmbúu	rúmbúnàa	'shed'
(49)	ƙáuyèe	ƙáuyúkàa	'village'
(50)	kàrée (< *kàrnée)	kárnúkàa	'dog'
(51)	bàkáa	bákkúnàa	'bow'
(52)	gàrɨ́ɨ	gárúurúwàa or gárúrrúkàa	'town'
(53)	súlè(e)	súlúllúkà or súlúulúwàa	'shilling'

There are two matters to be accounted for, namely the choice of the suffixal consonant--either n, k, or w--and the presence or absence of reduplication. The use of the suffixal consonant is partially in complementary distribution, partially in free (or dialectal) variation. This can be accounted for by the following simplified rules (omitting details and exceptions). To begin with, we have to group k and w into a single class (K) as opposed to n. Then, if we take unaa as the basic form of the suffix, we can describe the alternation between n and K primarily in terms of a process of dissimilation between the stem final consonant and the suffixal n. If the stem final C is n, r, or y (and sometimes f) then n must be replaced by K (see examples (49), (50), and (52).) With nouns having initial light syllables, the dissimilation of n --> K also applies to stem final l, t, s, and ƙ as well (cf. (53) with (47). Otherwise n is used (eg. (46), (47), (48), (51)). The choice between k and w, on the other hand, is strictly a matter of syllable

[18] The analysis of the uNaa plurals adopted here derives in great part from informal conversations with Parsons at the African Linguistics Conference held at Bloomington, Indiana, in April of this year (1972) and from ideas contained in a manuscript of his entitled "Hausa and Chadic".

weight. If the initial syllable is heavy, then K is realized as /k/; if the initial syllable is light, then K is normally realized as /w/, although /k/ also occurs as a much less common alternative.

Not surprisingly, the presence or absence of reduplication in the plural also turns out to be a function of syllable weight. As in the case of the aa...ee plural, the basic principle seems to be that the initial syllable of the pl-stem must be heavy, and that if it is not already so in the singular, then it must be made so by doubling the stem final consonant, e.g.

	sg	pl-stem	pl	
(54)	ràagóo	*raag	ráagúnàa	'ram'
(55)	ƙáuyèe	*ƙauy	ƙáuyúkàa	'village'
(56)	bàrgóo	*barg	bárgúnàa	'blanket'
(57)	túdùu	*tudd	túddúnàa or túdúndúnàa	'high ground'
(58)	kwábòo	*kwabb	kwábbúnàa	'penny'
(59)	bùnúu	*bunn	búnúunúwàa	'woman's cloth'

In the case of the modified pl-stems with the geminates, the plural affix is also reduplicated, being inserted in truncated uC form after C_2 (optional for the unaa variant) and in full uCaa form at the end of the stem, e.g.

	sg	pl-stem		pl			
(60)	bàkáa	*bakk	---→	*bak-un-k-unaa	---→	/bákúŋkúnàa/	'bow'
(61)	tábòo	*tabb	---→	*tab-un-b-unaa	---→	/tábúmbúnàa/	'scar'
(62)	gàrƒi	*garr	---→	*gar-uw-r-uwaa	---→	/gárúurúwàa/	'town'
(63)	káshỳi	*kass	---→	*kas-uw-s-uwaa	---→	/kásúusúwàa/	'heap'

The double affix insertion rule also applies to the light syllable nouns which allow ukaa as an alternative to uwaa. This is not immediately obvious because of the existence of a general realization rule whereby syllable final velars completely assimilate to all immediately following consonants, e.g.

	sg	pl-stem		pl			
(64)	súlèe	*sull	---→	*sul-uk-l-ukaa	---→	/súlúllúkàa/	'shilling'
(65)	bàtúu	*batt	---→	*bat-uk-t-ukaa	---→	/bátúttúkàa/	'matter'
(66)	kwàrƒi	*kwarr	---→	*kwar-uk-r-ukaa	---→	/kwárúrrúkàa/	'quiver'

5. Summary and conclusions

In this paper, data from three Chadic languages have been presented that illustrate the importance of syllable weight as a linguistic concept. A brief survey of the same phenomenon in a half dozen other languages (three Indo-European, two Finno-Ugric, and one Semitic) shows it not to be a peculiar feature limited to Chadic. Rather, all the materials taken together suggest a wide applicability of Kuryłowicz' principle equating syllable final long vowels with syllabic cores composed of a vowel plus a consonantal coda, and thus a general cross-language validity for the concept of syllable weight as a phonological variable. In closing, let me summarize the basic principles that enter into the description of syllable weight as a phonological variable.

(a) Syllable weight is determined solely by the make-up of the nucleus plus the coda, i.e. the "core"; the syllabic onset never plays a role in determining syllable weight. For this purpose a complex initial cluster and a zero onset are of equal irrelevance. The consonantal coda usually has the same value in determining syllable weight regardless of its internal complexity but one must leave open the possibility that in some languages complex codas might be heavier than simple codas.

(b) In languages with distinctive syllable weight, there will be one and only one type of light syllable, namely, Cv. We would not expect, therefore, to find a language which, for example, grouped Cv and Cvc syllables together as opposed to Cvv and Cvvc.[19]

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[19] According to Edgerton [1934], Sievers' Law in Vedic was a function of syllable weight where, contrary to our expectation, Cvc syllables counted as light. Edgerton's statement of the law can be represented as follows:

$$\begin{bmatrix} y \\ w \end{bmatrix} \longrightarrow \begin{bmatrix} iy \\ uw \end{bmatrix} / \text{ closed } \bar{S}\_\_\_V \quad \text{where cv and cvc are light and all others are heavy}$$

It can be shown, however, that Edgerton's analysis is incorrect, that the conditioning environment for Sievers' Law is not syllable weight, and that his description does not stand as a valid counterexample to our general claim about the shape of light syllables. Approaching the matter with the advantage of a non-specialist's tabula rasa, it becomes immediately obvious that Sievers' Law can be handled in extremely simple terms if one describes the conditioning phonological environment after the insertion

(c) All languages distinguishing syllables on the basis of weight will necessarily have heavy syllables of the form Cvv and Cvc. The existence of heavy syllables of other types and the associated matter of maximum syllable weight must be considered as language specific (or language-family specific) phenomena.

(d) The light/heavy dichotomy and the open/closed dichotomy are distinct.[20] The open/closed dichotomy is limited to languages with phonemic vowel length. Although light syllables are always open, heavy syllables may be both open and closed, and there are times when it may be necessary to distinguish between them on that basis.

(e) Although syllable weight is definitionally dependent upon and empirically related to the matter of vowel length, the distinction between heavy and light syllables cannot be assumed on a priori grounds to be phonologically analyzable in terms of units of duration nor to be phonetically correlated with actual time-length differences.[21]

(f) Given the essence of the contrast between heavy and light syllables, it seems natural to find that syllable weight as a distinctive variable functions most often in the realm of tonal, accentual, and rhythmic phenomena. However, having recognized an inherent naturalness about the heavy/light opposition itself, we can also expect to discover, not only more languages utilizing syllable weight as a phonological

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of syllable boundaries rather than in terms of abstract roots as Edgerton has done. Given a set of syllabification rules that interpret sequences such as Cvyv, Cvvyv, Cvvcyv, Cvvcyv, and Cvccyv as Cv=yv, Cvv=yv, Cvc=yv, Cvv=cyv, and Cvc=cyv--and this is probably needed in the language anyway--then Sievers' Law can be restated simply as

$$\begin{bmatrix} y \\ w \end{bmatrix} \dashrightarrow \begin{bmatrix} iy \\ uw \end{bmatrix} \; / \; = C\_\_\_V$$

i.e. the semivowels y and w immediately preceded in the same syllable by a consonant trigger the epenthetic insertion of their corresponding vowels i and u.

[20] Vennemann [1972], in an otherwise excellent paper, mistakenly fails to preserve the distinction between the two dichotomies and adopts the terms "open" and "closed" for what I am calling "light" and "heavy". In a personal communication, he explains that this was not an oversight, but rather represents an implicit hypothesis to the effect that languages with distinctive vowel length will only distinguish syllables on the basis of weight and never on the basis of openness.

[21] Kim (personal communication) suggest that the contrast between heavy

variable, but also--as we saw in Chadic--a greater range of phonological and morphological environments where the variable has a functional role in linguistic description.[22]

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and light may be more a matter of differences in physiological energy than in time. For an excellent review of recent experimental work on the syllable see Kim [1971].

[22]This is a revised version of a paper presented at the Third Annual Conference on African Linguistics, held at Indiana University, April 7-8, 1972. In developing the ideas in this paper, I have benefited by discussions with William Cook, Warren Cowgill, Chin-Wu Kim, Alvin Liberman, Floyd Lounsbury, Roxana Ma Newman, F. W. Parsons, Franz Rosenthal and Russell Schuh. I would particularly like to thank Theo Vennemann and Joan Hooper for making available prepublication copies of certain of their papers. Research in Nigeria on Bolanci and Kanakuru was supported by an NSF Grant GS-2279.

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TONE IN SOME KIKUYU VERB FORMS[1]

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1. Introduction

This paper deals first and mainly with some processes of tone assimilation governing the tonal configuration of affirmative verb forms in Kikuyu. The first part of the paper deals with tonal assimilations triggered by high and low tone verb stems, pronouns, prefixes and suffixes respectively. With the support of evidence from verb-noun constructions, it is suggested that the assimilation processes in question are most naturally viewed as cyclic and that a linear approach leads eventually to false claims about the nature of the assimilations. Subsequently it is shown that the assimilation rules fall into two classes according to their behaviour in forms where vowel coalescence is operative. More light is shed on this dichotomy by the presentation of a rule of dissimilation operative under rather special circumstances. Various means of expressing the dichotomy are discussed and all found wanting.

The data for this paper has been taken from L. E. Armstrong's Phonetic and Tonal Structure of Kikuyu [1940] and from the Kikuyu-English Dictionary edited by T. G. Benson [1964], the latter serving mainly as a source for verifying the former. All the examples given here are attested in Armstrong or Benson. In a few cases, mostly involving the tone of initial pronouns, the isolation examples cited by Armstrong differ unpredictably from the identical forms quoted later in the book in verb-noun constructions. When in doubt, I have adopted the forms given in the verb-noun examples.

The orthography adopted is that of Armstrong rather than that of Benson, except that /g/ has been used for both Armstrong's /g/ and /ɣ/ on the grounds that this alternation is predictable.[2] The orthographies of the two sources are easily mutually convertible.

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[1]Profound thanks are extended to Herb Stahlke, to whom this paper owes its existence, and also to Larry Hyman and Patrick Bennett for their comments and suggestions.

[2]As discussed in Bennett and Eastman [1971].

Unlike Benson, Armstrong fails to distinguish between contextually conditioned long vowels and underlying geminate vowels, representing both as surface long vowels (V_1V_1). Vowels are long predictably, for example, non-initially before the nasal stops: /mb/, /nd/, /ŋg/, and /nj/. I felt it would only add confusion to alter Armstrong's transcriptions so they reflected this distinction between underlying and derived long vowels, and therefore have, unless indicated, used the forms exactly as given by her. (Armstrong herself warns that her transcriptions of vowel length are not always certain.) When discussing the behaviour of geminate stems, however, I have chosen examples specifically given by Benson as having an underlying long (geminate) vowel.

I have take one drastic liberty with Armstrong's data, that being to reinterpret the tonal system of Kikuyu as a two-level terrace-tone system rather than a system of three level tones as Armstrong would have. Armstrong postulates for Kikuyu three level tones (High, Mid, Low), two rising tones (LM and MH), and a falling tone. All her tonal transcriptions are made in terms of these six tones plus a few special marks. In Benson's dictionary, however, the tonal transcriptions attest four different level tones in simple copulative constructions alone, indicating that Armstrong's three levels are inadequate for an accurate description. Furthermore, according to the transcriptions in Benson, successive pitch drops occur after each L tone across an utterance, indicating that downdrift is operative. In fact, a cursory glance at the transcriptions in Benson makes it clear that while a three-level tonal system would be inadequate for the description of Kikuyu surface forms, a two-level system with downdrift is exactly adequate and even implicit in Benson's transcriptions.

Even without the evidence form Benson, it can be discovered that Armstrong's three-level system is ill-suited to her own data. If there were in fact three level surface tones in Kikuyu, we would expect to find six possible sequences of contrasting tone, that is, the sequences LH, HL, LM, ML, MH, and HL. The sequences LH, ML, and HM are virtually never found, however. If Armstrong's data is reinterpreted under a two-

level terrace-tone system, these gaps are readily explained. In a terrace-tone system, the interval between a H tone and a following L tone is considered to be about twice the interval between a L tone and a following H tone. Hence the continuous drop in pitch across an utterance. The three sequences which do not occur in Armstong's system are exactly those in which these conditions are not met. That is, they are the three which could not occur in a terrace-tone system (unless a deletion had occurred).

Certain regular inconsistencies in Armstrong's data provide further support for a reinterpretation of her tonal transcriptions. This can best be made clear through an example. The string ogorirɛ 'you bought' (o 'you', gor 'buy', irɛ tense ending) is transcribed in isolation by Armstrong as having the tonal configuration LLLM. Whenever the same form is given with a following L tone initial noun, however, as in the string ogorirɛ mociiŋga 'you bought a gun' (tone marks omitted), the tonal configuration of the verb form is given as MMMH rather than LLLM. Armstrong's system forces her to make the claim that the verb form 'you bought' has a different tonal configuration according to whether or not it is followed by a L tone initial noun. In a terrace-tone system, on the other hand, the sequences LM and MH are equivalent. They express the same pitch interval and are both statable as L'H sequences ('=downdrift). In this interpretation, the only difference between Armstrong's two transcriptions of the form 'you bought' is that in the longer utterance the starting pitch is higher than in the isolation form. The same tonal contrast is made in each case.

This inconsistency in the transcription of verb forms is so common in Armstrong as to be completely predictable, and I submit, provides evidence that there are two and not three underlying tones in Kikuyu.

I hope not to belabour this point further, although it is crucial to all that follows, for I think it will be patently clear to anyone who examines the two sources in question that a two-level terrace-tone system is involved.

In my reinterpretation of Armstrong's system, then, sequences described by her as HLM, for example, are treated as the sequence HLH, with downdrift understood after the L tone. Similarly, sequences such as Armstrong's MHL will be expressed as the sequence LHL. A sequence MHMHL in Armstrong is reinterpreted here as the sequence LHLHL, in keeping with a terrace system and corroborated by Benson. The sequence HML occurs only rarely in Armstrong, apparently as a result of a separate downstepping rule. I have not examined this question in detail, however.

Mechanically speaking, Armstrong's system may be converted into a two-level system if:

(a) all M tones which follow L tones (in Armstrong) are regarded as (downdrifted) H tones and

(b) all other M tones are regarded as L tones.

In examples, an acute accent on a vowel is used to indicate H tone and the vowels of L tone syllables are left unmarked. I have attempted to make it clear in every case whether the string in question is an underlying or surface form. In the case of long or geminate vowels and of vowel sequences forming a single syllable, I have adopted the practice of placing tone markings on both vowels of the syllable. For example, the monosyllabic H tone verb stem ðɔɔm will be represented as ðɔ́ɔ́m and not as ðɔ́ɔm, since the latter representation could be mistaken for a contour tone. It is to be understood, however, that all sequences of identical vowels are monosyllabic. Sequences of non-identical vowels which are monosyllabic are joined as V͡V, as they are in Armstrong. Thus the sequence /i͡e/ is monosyllabic, while the sequence /ie/ is disyllabic. Downdrift has not been indicated in the examples and the reader may assume that it occurs between any L tone and a following H tone and nowhere else.

It will be noticed, especially in examples where vowel coalescence is operative, that Kikuyu has vowel harmony. I have not examined the extent or nature of this phenomenon in Kikuyu since only the tonal consequences of vowel coalescence are relevant to this discussion. Specifically, I am interested in vowel coalescence as a process whereby two

or more underlying tone-bearing units are reduced on the surface to a single tone-bearing unit, and the potential loss of contrast this entails.

The reader will also notice that in the discussion of the various verb tenses, reference is made to the tense marker of a tense, meaning the suffix(es) and prefix, if any, which are added to a varb stem to form a specific tense. The prefix a[3] with L tone, and the suffix pair ɪr+ɛ form the tense marker for the Remote Past tense, for example. It is somewhat artificial to regard each tense in Kikuyu as having a separate tense marker, for there are many regularities to be observed in the form of the many tense markers. The prefix a, for example, occurs only in past tenses as do the suffixes ɪr+ɛ; the suffix a seems to be neutral in time reference; the suffix pair ag+a indicates habitual aspect and when combined with the past prefix a indicates, predictably, the Past Habitual tense. Different combinations of the various tense morphemes can be used to form an even greater variety of verb tenses than the thirteen exemplified in Armstrong. What seems unpredictable about the tense markers is their tone. The suffix pair ɪr+ɛ[4], for example, has underlying H tones in the Immediate Past tense

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[3]This widely used prefix is given in Armstrong as aa. It is transcribed by Benson, however, as a, indicating that he considers its length to be derived rather than due to an underlying geminate. Since, in the discussion of tone assimilation rules, transcribing this prefix as aa could easily give rise to confusion, I have departed in this instance from my adopted practice of using Armstrong's transcriptions and will indicate this prefix as a throughout. Similarly, the Remote Future prefix, kaa in Armstrong but ka in Benson, will be given as ka, and the Near Future prefix, ré or réé in Armstrong and ré in Benson, will be transcribed as ré.

[4]Since ɪr and ɛ always occur together, they could be thought to be a single disyllabic morpheme, that is, one suffix instead of two. However, when the reflexive morpheme i is added to a string containing ɪr+ɛ, it is inserted between ɪr and ɛ, giving ɪrɪɛ. This fact suggests the presence of a boundary of some sort between ɪr and ɛ. This is also the case with the other disyllabic endings such as the habitual marker ag+a and the perfect marker eeɪ+ɛ. These, when reflexivized, become agɪa and eeɪɪɛ respectively, again indicating a boundary between the two syllables. It is possible that the final ɛ of ɪr+ɛ and eeɪ+ɛ is underlyingly the same final a which appears

and L tones in the Recent Past tense. The prefix a has L tone in the Remote Past and Past Habitual tenses, but H tone in the Perfect of the Immediate Past. The neutral suffix a also varies in tone from tense to tense. Since I found no reasonable way of predicting the tone which particular prefixes or suffixes would bear in a given tense, I was forced to assume that these tones were underlying and that for each tense it had to be memorized what prefix and what suffix(es) were used and with what underlying tone. This information would constitute the tense marker for a given tense.

Finally, the tenses referred to by Armstrong as the consecutive tenses have not been dealt with here. These tenses are used only in the second and subsequent members of strings of conjoined clauses,[5] and their tonal behaviour differs markedly, though not unpredictably, from that of the other tenses. It seems likely that the tonal system of the consecutive tenses will be derivable from that of the non-consecutive tenses.

2. Assimilation by verb stems

Kikuyu verb stems are basically monosyllabic, their unmarked form being CVC. Stems of the form VC, CV, and rarely V also occur. Geminate vowels may occur in CVC stems, producing minimal pairs such as ðɪga 'dye' / ðiiga 'scrape'. As in all Bantu languages, the monosyllabic stems may be expanded by reduplications or by addition of verbal extensions which alter the meaning of the stem. An example is the causative extension ek which, when added to the stem hat 'be stuck' gives hat+ek 'squeeze, push back'. The precise semantic connection between a basic stem and its various extended forms is not always obvious, but the morphological behaviour of extensions and reduplications is always the same.

a. Assimilation by H tone stems. Any Kikuyu verb stem (indeed, any Kikuyu syllable) may appear with surface H or L tone, according to its

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in all the other verb tenses in Kikuyu, and that it has become ɛ by assimilation to the preceding front vowel. Since these are the only two suffixes containing a front vowel in Armstrong's data, this hypothesis could not be tested further here. I shall continue to assume in any case that ɪr and ɛ are separate suffixes, as well as ag and a, and eet and ɛ.

[5]I owe this piece of information to Patrick Bennett, with thanks.

environment; however, the verb stems fall into two classes according to their effect on a following syllable,[6] be it verbal extension, reduplication, or tense suffix. For example, the stems nɛŋg 'hand over' and tɛŋg 'patch' are seen below in their infinitival forms with the infinitival prefix ko[7] and the neutral suffix a:

(1a) konɛŋgá 'to hand over'
(1b) kotɛŋga 'to patch'

The suffix a has H tone after nɛŋg and L tone after tɛŋg. If the applicative extension er is added to these forms, the result is:

(2a) konɛŋgéra 'to hand over for'
(2b) kotɛŋgɛra 'to patch for' (e > ɛ by vowel harmony)

The syllable following nɛŋg has H tone in both (1) and (2) while the identical morphemes following tɛŋg have L tone. The contrast is the same no matter how many syllables follow the stem, as shown by the following extended forms of the verbs gor 'buy' and rɔm 'follow':

(3a) kogoraŋgerera 'to buy a few more of'
(3b) koromáŋgerera 'to follow a little further'

We conclude that some verb stems cause an immediately following syllable to have H tone, while others do not have this effect.

This phenomenon is common among Bantu languages and has been dealt with in two main ways. In some analyses, such as A. E. Meeussen's Linguistische schets van het Bangubangu,[8] morphemes having this effect of raising a following syllable are interpreted as having underlying L tone and are marked with a diacritic feature [+determinant], which

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[6]This was first suggested in Harries [1954].

[7]ko is really a morphophonemic transcription of the infinitive prefix, which can appear as ko or ɣo. To avoid confusion, ko will be maintained thoughout.

[8]Annalen van het Koninklijk Museum van Belgische Kongo. Tervuren: Linguistiek, deel 5, 1954. Cited in McCawley [1971].

refers to their raising properties. McCawley [1971] has attempted to show that for Bangubangu at least, this diacritic may be dispensed with if the determinants are regarded as themselves having underlying H tone, which they retain under certain circumstances and lose under others. Thus the effect of determinants can, in this interpretation, be treated as assimilation. McCawley's analysis has both a naturalness and an explanatory value which the diacritic analysis lacks. Evidence from Kikuyu supports and perhaps necessitates an analysis such as McCawley's. We shall attempt to show that in Kikuyu, stems such as nɛŋg and rɔm above, which cause a following syllable to have H tone, are themselves underlyingly H tones, that they raise the tone of a following L tone syllable, and that they subsequently lose their H tone under certain circumstances. These stems will henceforth be marked with an acute accent, indicating underlying H tone. Stems with no raising powers will be referred to as (underlyingly) L toned, and will be left unmarked.

Within this analysis, a rule of Stem Raising will be required whereby a H tone stem raises a following L tone syllable:

(4) Stem Raising:

$$L \rightarrow H \;/\; H \underline{\quad\quad} \atop [+stem]$$

Thus:

(5a) ko+nέŋg+a --> konɛŋgá 'to hand over'

(5b) ko+tɛŋg+a --> kotɛŋga 'to patch'

Reference is made in this rule to the morphological feature [+stem] in order to distinguish this rule from the rule of Pro-Raising, to be discussed shortly, which has a somewhat different environment and different ordering relations.

b. Assimilation by L tone stems. L tone stems in Kikuyu are not defined merely by their inability to raise a following L tone syllable, however. The following examples illustrate the behaviour of H and L tone

stems in the Immediate Past tense. The marker for this tense is the H tone suffix pair ɪr+ɛ́:

	Stem		Imm. Past Verb Form
(6a)	tɛ́m	'cut'	tɛ́mɪ́rɛ́
(6b)	gor	'buy'	gorirɛ́
(6c)	ɓɔ́nd+ɛk	'mend'	ɓɔ́ndɛ́kɪ́rɛ́
(6d)	tɛŋ+ɛr	'run'	tɛŋɛrɪ́rɛ́

Pronouns have been omitted for convenience.

The tense marker ɪr+ɛ́ has H tone in (6) except when it immediately follows a L tone stem, as in (6b), in which case the first syllable of the tense ending has L tone. Both suffixes ir and ɛ have H tone when an extension intervenes between a L tone stem and the tense marker, as in (6d). I propose that the tense marker ir+ɛ be interpreted as having underlying H tone in this tense, and that the L tone on the syllable ir in (6b) be attributed to assimilation triggered by the L tone unextended stem gor. That is, a L tone verb stem assimilates tonally an immediately following syllable in the same way a H tone stem does. We will thus postulate a rule of Stem Lowering, which is the converse of Stem Raising:

(7) Stem Lowering:

$$H \rightarrow L \;/\; L \underline{\quad\quad} \atop [+\text{stem}]$$

Again it has been necessary to specify the morphological feature [+stem], for otherwise the L tone extension er in (6d) would be able to trigger Lowering, giving the incorrect form *tɛŋɛrirɛ́ 'ran'.

There is a restriction on Stem Lowering, however. It does not occur if the stem contains a geminate vowel. Thus the L tone stem niin 'finish' does not cause lowering in the ɪr+ɛ́ tense:

(8) niin+ɪr+ɛ́ → niinɪ́rɛ́ (not *niinirɛ́)

There is no analogous restriction on Stem Raising, however, as shown by the following examples of the Habitual Present tense, whose marker

is the L tone suffix pair ag+a:

(9a) tɛ́m+ag+a --> tɛ́mága 'usually cuts'
(9b) ðɔ́ɔ́m+ag+a --> ðɔ́ɔ́mága 'usually reads'

That is, both tɛ́m and ðɔ́ɔ́m trigger Stem Raising in spite of the fact that the latter stem contains a geminate vowel.[9]

3. Assimilation by pronouns

In Kikuyu non-future tenses, the third person pronouns a 'he' and má 'they' have surface H tone, while the other pronouns, n 'I', o 'you', to 'we', and mo 'you pl.' have surface L tone. Like the verb stems, these pronouns trigger assimilatory raising and lowering processes.

a. Assimilation by H tone pronouns. Example (10) below contrasts the 2nd and 3rd persons singular of the L tone stem gor 'buy' in the habitual (ag+a) tense:

(10a) o+gor+ag+a --> ogoraga 'you usually buy'
(10b) á+gor+ag+a --> ágóraga 'he usually buys'

Similarly, in the 1st and 3rd persons plural:

(11a) to+gor+ag+a --> togoraga 'we usually buy'
(11b) má+gor+ag+a --> mágóraga 'they usually buy'

Evidently a H tone pronoun raises a following L tone syllable just as a H tone stem does. The rule accounting for this raising by pronouns will have to follow Stem Lowering if L tone stems like gor are required

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[9]Mechanically speaking, this difference between Stem Lowering and Stem Raising could be stated as a restriction of the environment of Stem Lowering such that the latter applied only in the case of non-geminate stem vowels. Such a 'solution', however, would be completely lacking in explanatory power. We hope to show later that the failure of geminate L tone stems to trigger Lowering is a consequence of a fundamental difference between the function of H and L tones in general in Kikuyu. It has been necessary to discuss the problem here, however, for it bears heavily on the next topic of discussion, the effect of pronouns on verb stems.

to have L tone at the point Stem Lowering applies. The following derivations illustrate this point:

(12a) á + gor + ír + é
↓ Raising by á
á gór ír é
↓ Stem Lowering NA
*ágóríré 'he bought'

(12b) á + gor + ír + é
↓ Stem Lowering
á gor ir é
↓ Raising by á
ágóiré 'he bought'

The correct output is produced in (12b) by ordering Stem Lowering before raising by the pronoun.

Obviously we would like to be able to treat Stem Raising and raising by pronouns as a single process. However, raising by pronouns is subject to a restriction not exhibited by Stem Raising. We recall that L tone geminate stems like niin 'finish' fail to trigger Stem Lowering. Contrasting the following derivations of the stems gor and niin in the Immediate Past tense, we see that where Stem Lowering fails to occur, raising by pronouns also fails to occur:

(13a) á + gor + ír + é
↓ Stem Lowering
á gor ir é
↓ Raising by á
ágóiré 'he bought'

(13b) á + niin + ír + é
↓ Stem Lowering NA
↓ Raising by á also fails to occur
ániiníré 'he finished'

The failure of pronoun raising to apply in (13b) is not directly due to the fact that niin has a geminate vowel, however. For in the

Present Habitual tense, where the tense suffix has L tone, both niin and gor undergo raising by the pronoun á:

(14a) á + gor + ag + a --→ ágóraga 'he usually buys'
(14b) á + niin + ag + a --→ aníínaga 'he usually finishes'

Regardless of how it comes about that niin fails to trigger Stem Lowering, the fact that niin fails to undergo raising in exactly the environments where it fails to trigger Lowering, and only in those environments, is not likely to be a coincidence. The relevant factor seems to be not whether the stem contains a geminate vowel, but whether it is followed by a L tone. If it is not, as in (13b), raising by pronouns is blocked. Stem Raising does not exhibit this restriction. H tone stems raise an extension whether or not the extension is followed by a L tone, as (15) exemplifies:

(15a) ðɔ́nd + ɛk + ír + é
↓ Stem Raising
ðɔ́ndékírɛ́ 'mended'

(15b) ðɔ́nd + ɛk + ag + a
↓ Stem Raising
ðɔ́ndékaga 'usually mend'

For the moment, then, we will postulate a separate rule of Pro-Raising which will contain this extra restriction. This rule is stated roughly as:

(16) Pro-Raising:

$$L \rightarrow H \;/\; H \underset{[+pro]}{\quad} L$$

As shown earlier, Pro-Raising must be ordered after Stem Lowering.

The restriction of Pro-Raising to the environment ____ L provides important evidence in support of an analysis in which the so-called determinants are regarded as underlying H tones. If verbs like tém 'cut' were really underlying L tone syllables bearing the diacritic feature [+determinant] which caused them to trigger Stem Raising (and

prevented them from triggering Stem Lowering), then we would expect these stems also to fail to undergo Pro-Raising when followed by a H tone suffix such as ɪ́r+ɛ́. That is, we would expect the following derivation:

(17) á + tɛm + ɪ́r +ɛ́ (underlining=determinant)

	Stem Raising NA
	Pro-Raising may not apply
*átɛmɪ́rɛ́	'he cut'

The correct form is átɛ́mɪ́rɛ́. The H tone on tɛ́m in this form cannot be attributed to Pro-Raising as formulated since the latter apparently does not affect L tones followed by H tones. In order to explain the H tone on tɛ́m in this form, the determinant analysis would require that Pro-Raising be reformulated so that determinants could be raised regardless of their following tone, and only non-determinants would be subject to the more restricted environment H____L. The alternative analysis, which has been adopted here, claims [+pro] that the H tone on tɛ́m in the form átɛ́mɪ́rɛ́ is underlying, and thus permits Pro-Raising to be stated in a simpler way.

Secondly, the determinant analysis would have no explanation for the surface H tone on the pronoun á. It would have to claim that á is an element of a different category from tɛ́m in that it causes a following syllable to have H tone and has surface H tone itself. The present analysis avoids this complication by claiming that both a and tɛ́m are underlying H tones which assimilate a following syllable.

b. Assimilation by L tone pronouns. The claim that H tone stems like tɛ́m have underlying H tone which they retain after assimilating a following L tone syllable does necessitate the establishment of a second rule of L tone assimilation triggered by the L tone 1st and 2nd person pronouns. H tone stems, when following these pronouns, have L tone, as shown by the following examples using the H tone stems tɛ́m 'cut' and ðɔ́nd+ɛk 'mend':

(18a)	to + tɛ́m + ír + é	-->	totɛmírɛ́	'we cut'
				(cf. átɛ́mírɛ́ 'he cut')
(18b)	o + ðɔ́nd + ɛk + ír + é	-->	oðɔndɛ́kírɛ́	'you mended'
				(cf. áðɔ́ndɛ́kírɛ́ 'he mended')
(18c)	to + tɛ́m + ag + a	-->	totɛmága	'we usually cut'
				(cf. átɛ́mága 'he usually cuts')
(18d)	mo + ðɔ́nd + ɛk + ag + a	-->	moðɔndɛ́kaga	'you usually mend'
				(cf. áðɔ́ndɛ́kaga 'he usually mends')

Evidently a rule is needed which assimilates H tone syllables to preceding L tone pronouns. Examples (18b) and (18d) show that this lowering must occur after Stem Raising, since it destroys the environment for Stem Raising by lowering the tone of a stem. We know Stem Raising has applied in (18b) to (18d) because the syllable following the stem in H in every case. Barring the use of global rules, derivations (19a) and (19b) below must be adopted for (18b) and (18c) respectively:

(19a) o + ðɔ́nd + ɛk + ír + é

↓ Stem Raising

o ðɔ́nd ɛ́k ír é

↓ Lowering by o

oðɔndɛ́kírɛ́ 'you mended'

(19b) to + tɛ́m + ag + a

↓ Stem Raising

to tɛ́m ág a

↓ Lowering by to

totɛmága 'we usually cut'

The rule whereby H tone stems are lowered by a preceding L tone pronoun seems to be identical to the previously established rule of Stem Lowering except for the fact that the latter refers specifically to stem vowels. We would like to have a general rule to the effect that H --> L / L ____. However, such a rule would be able to apply to strings like o + tɛŋ + ɛr + ír + é to produce *otɛŋɛrirɛ́ instead

of the correct otɛŋɛríré 'he ran'. That is, if a general lowering rule were adopted, verbal extensions would be able to trigger that rule unless some means were adopted for preventing this. Otherwise, two lowering rules will be required, each referring to morphological categories or to boundaries. Neither solution is especially appealing, but the latter will be adopted for the moment. It will be seen shortly that the lowering process triggered by the pronouns is subject to a restriction analogous to that on Pro-Raising, a fact which provides further evidence for the postulation of a second lowering rule called Pro-Lowering:

(20) Pro-Lowering:

$$H \longrightarrow L \;/\; L \underset{[+pro]}{\quad}$$

This rule, we recall, must follow Stem Raising.

4. Assimilation by prefixes

a. Assimilation by H tone prefixes. We are now in a position to consider the more complex verb tenses in Kikuyu, those marked by a prefix as well as suffix(es). Verbal prefixes always follow the pronoun and precede the stem.

The Near Future tense is marked by the H tone prefix ré and the H tone suffix á. Like the H tone pronouns, the prefix ré causes a following L tone syllable to become H, as the following example illustrates:

(21) ré + tɛŋ + ɛr + á --> rétéŋɛrá 'will run'

In the future tenses in Kikuyu, all pronouns have underlying L tone, that is, the tonal distinction between 3rd person and 1st and 2nd person is obliterated and Pro-Lowering is therefore operative in all persons. This means that ré is nearly always subject to Pro-Lowering, thus seldom appearing with its underlying H tone. We have the following derivations:

(22a) o + ré + tɛŋ + ɛr + á

Stem Lowering NA

Raising by ré

o ré téŋ ɛr á

Pro-Lowering

oretéŋɛra 'you will run'

(22b) a + ré + gor + á

↓ Stem Lowering

a ré gor a[10]

↓ Raising by ré

a ré gór a

↓ Pro-Lowering

aregóra 'he will buy'

The raising caused by ré is subject to the same restriction as Pro-Raising: the syllable to be raised must be followed by a L tone. Thus stems with geminate vowels, which fail to trigger Stem Lowering also fail to undergo raising by ré, as shown in (23):

(23) o + ré + niin + á --> oréniiná 'you will finish'

Notice that in (23) Pro-Lowering has also failed to apply to lower the tone of ré. That is, we do not get *oreniiná. This example is crucial in two ways. First, it supports an analysis in which ré has underlying H tone, for we have no other source to which to attribute the H tone on ré in (23). Secondly, it suggest that Pro-Lowering is subject to a restriction analogous to that placed on Pro-Raising. That is, the syllable to be lowered by Pro-Lowering, in this case ré, must be followed by a H tone or the rule does not apply. Since niin in (23) has not triggered Stem Lowering and is consequently followed by a H tone, thus inhibiting raising by ré, ré itself is not followed by a H tone and apparently for this reason may not be lowered by the pronoun. It is easy to see why this restriction on Pro-Lowering did not appear earlier: H tone stems are always followed by a H tone, and in the one environment, illustrated by (23), in which a H tone prefix fails to raise a following syllable, it also fails to undergo

[10]In actual fact, Stem Lowering here produces a rising tone on á unless a noun follows the verb, in which case the first syllable of the noun bears the H tone from á and á itself is fully lowered to a by gor. This question will be dealt with fully later.

Pro-Lowering. More evidence will be presented later for this restriction, and for the consequent reformulation of Pro-Lowering as:

(20') Pro-Lowering:

$$H \dashrightarrow L \;/\; L \underset{[+pro]}{\_\_\_\_} H$$

Since the raising triggered by ré occurs in exactly the same environment as Pro-Raising, we would hope, in the name of significant-generalization-about-the-language, to treat the two as a single process and to effect them by a single rule. It is difficult to see how this could be done in a meaningful way, since we have found it necessary to mention morphological categories in our assimilation rules. Within the present analysis, it would be necessary to formulate a raising rule which would be triggered by pronouns and prefixes, but not by stems or extensions. For the sake of the discussion, I am going to assume the existence of such a rule, which will be called P-Raising (short for Pro-Prefix-Raising). P-Raising will raise L tones which are followed by a L tone and preceded by a H tone prefix or pronoun. Example (22b), repeated below as (24), shows that P-Raising would have to follow Stem Lowering and precede Pro-Lowering:

(24) o + ré + gor + á
↓ Stem Lowering
o ré gor a
↓ P-Raising
o ré gór a
↓ Pro-Lowering
oregóra 'you will buy'

b. Assimilation by L tone prefixes. As one might expect at this point, the behaviour of L tone prefixes is analogous to that of H tone prefixes. This is exemplified by the Remote Future tense, which is marked by the prefix ka and the suffix a, both with L tone. ka, like the pronoun o, lowers a following H tone syllable, as shown in (25):

(25) o + ka + tɛ́m + a

↓ Stem Raising

o ka tɛ́má

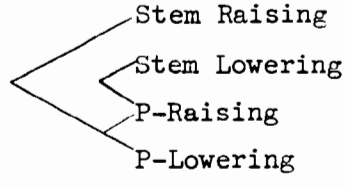
↓ Lowering by ka

okatɛmá 'you will cut'

The L tone on tɛm in (25) cannot be attributed to Pro-Lowering by o, for we know that Pro-Lowering affects only an immediately following syllable. It does not, for example, apply to a string like o+niin+ír+ɛ́ to produce *oniiniré 'you finished', or to a string like o+ré+tɛ́m+á to give *oretɛmá 'you will cut'. The correct forms are oniiníré and oretɛ́má respectively. We conclude that the L tone on tɛm in (25) is therefore due to assimilation to the prefix ka.

Since the only syllables subject to assimilation by ka are H tone stems, and since H tone stems are always followed by H tones, it is impossible to test whether lowering by ka is subject to the restriction discovered earlier on Pro-Lowering, namely that the syllable to be lowered must be followed by a H tone. Since this condition will always be met in the case of lowering by prefixes, one could safely treat prefix-lowering and Pro-Lowering as a single process and propose a rule of P-Lowering, analogous to that of P-Raising. (Neither of these rules has been formulated for the simple reason that I have found no reasonable way of doing so, and intend to put both out of their misery as soon as possible.)

c. Summary. As derivation (25) shows, P-Lowering must follow Stem-Raising. Derivation (24) above showed that P-Lowering must also follow Stem Lowering and P-Raising. We thus have the following ordering relations:



The first two rules are converses of each other, as are the last two. All four are expressible as assimilations of tone. The fact that P-Raising

must intervene between the two lowering rules further removes the possibility of collapsing Stem Lowering and P-Lowering.

5. Assimilation by H tone suffixes in V NP sequences

a. The rule. The types of tone assimilation we have been discussing operate across word boundaries in Kikuyu as well as within verb forms. Three of the verb tenses in Armstrong cause the first syllable of a following noun to become H, provided it is followed by a L tone. The tenses causing this raising are the Remote Past (prefix a, suffixes ír+é), the Past Habitual (prefix a, suffixes ág+á), and the Near Future (prefix ré, suffix á). All three tenses have in common that their tense marker consists of prefix and H tone suffix(es). The Immediate Future tense (prefix ko, suffix á) should also fall into this group, but there are no relevant examples in Armstrong. The effect of these tenses on a following noun is illustrated in (26ff.):

(26a) nd + a + hét + ok + ír + é ## mocie
ndahetókíré mocie 'I passed a homestead'

(26b) nd + a + gor + ír + é ## ndɛɛgwa
ndagoriré ndéégwa 'I bought an ox'

(27a) nd + a + ón + ág + á ## njogu
ndoonágá njógu 'I used to see elephants'

(27b) nd + a + haand + ág + á ## marigo
ndahaandágá márigo 'I used to sell bananas'

(28a) nd + ré + tɛ́ + á ## mahuti
ndɛɛté máhuti 'I shall throw away rubbish'

(28b) nd + ré + rɛ́ɛ́ + hɛ + á ## marigo
ndeerééhé márigo 'I shall bring bananas'

In each case, the first syllable of the noun has H tone. Contrast the following examples from other verb tenses, where the first syllable of the noun is not raised:

(29) má + hét + ok + ír + é ## moðuuri
máhétókíré moðuuri 'They passed an elder'

(30) n + and + ek + ag + a ## maroa
nandekaga maroa 'I usually write letters'

(31) nd + á + hét + ok + a ## mogɛɛndi
ndahétóka mogɛɛndi 'I have just passed a traveller'

(32) below illustrates that even in the tenses where this raising by suffixes may occur, it is blocked if the syllable to be raised is not followed by a L tone:

(32) nd + a + gor + ír + é ## ngokó
ndagoriré ngokó 'I bought a chicken'

If raising by the suffix é had occurred in (32), the noun 'chicken' would have the form *ngókó. In (33) below, it is seen that, with the same verb form ndagoriré, a noun having final H tone does undergo raising provided that noun is tri-syllabic, i.e. provided the final H tone on the noun does not immediately follow the syllable to be raised:

(33) nd + a + gor + ír + é ## mokaandá
ndagoriré mokaandá 'I bought a rope'

Raising by suffixes, then, is apparently subject to the same restriction as raising by pronouns and prefixes: it occurs only in the environment H ____ L.

It is not clear why it should be only those tenses marked by both a prefix and a H tone suffix which should cause this raising in a following noun. There is certainly some interaction between prefixes and suffixes in Kikuyu which at least partly determines the tonal configuration of the tense marker as a whole, but I have not been able to find any expressible generalizations. My proposals with regard to the raising properties of suffixes are made in the hope that some natural explanation can be found for the fact that raising by H tone suffixes occurs only in tenses which also have a prefix.

b. Ordering of Suffix Raising. There is every reason to expect raising by suffixes to be treatable as an assimilation like the other raising processes. Example (34) below shows that if this is to be the case, raising by suffixes will have to precede Stem Lowering.

(34) nd + ré + gor + á ## matuumbé
ndeegóra mátuumbé (nd+r> nd) 'I shall buy eggs'

Since Stem Lowering lowers the suffix á in this form, the assimilation rule whereby this suffix raises the first syllable of matuumbé will have to precede Stem Lowering, barring the use of global rules. (34) would have the following derivation:

(35) nd + ré + gor + á ## matuumbé
↓ Suffix Raising
á mátuumbé
↓ Stem Lowering
gor a mátuumbé
↓ P-Raising
ré gór a mátuumbé
↓ P-Lowering
nd re gór a mátuumbé
↓ later rules
ndeegóra mátuumbé 'I shall buy eggs'

Raising by suffixes will have to precede Stem Raising also, for it is not triggered by suffixes whose H tone is derived via Stem Raising, whether or not a suffix is present. For example, in (36) below, the suffix a has derived H tone due to a preceding H tone stem, but Suffix Raising has not occurred:

(36) nd + a + ɔ́n + a ## njogu
ndɔɔná njogu 'I saw an elephant'

But since raising by suffixes precedes both Stem Raising and Stem Lowering, it will not be collapsible with P-Raising because P-Raising has to follow Stem Lowering. If Suffix Raising has to be made a separate rule from P-Raising, it will have to mention some morphological feature or boundary in order to distinguish it from P-Raising, whose ordering relations are different. Except for this feature or boundary, the statement of the rule of Suffix Raising would be identical to P-Raising. This is obviously undesirable. Suffix Raising is functionally identical

to P-Raising, and differs only in its ordering relations to Stem Raising and Stem Lowering. To formulate a separate rule of Suffix Raising, conditioned by yet another morphological feature is to condone an undesirable proliferation of nearly identical assimilation rules. By referring to four different morphological categories in three different raising rules, the present analysis makes the claim that the raising triggered by each of these categories is distinct from that triggered by any of the others. In a very real sense, this distinction, based on ordering and morphological category, is spurious. In an equally real sense it is false, for we have no reason to claim, for example, that á causes raising because it is a pronoun, or é because it is a suffix. What we really want to say is that á and é cause raising because they have underlying H tone. The fact that á is a pronoun and é a suffix means that they cause raising in a more restricted set of L tones (specifically those followed by a L tone) than if they were stems. The same relationship holds between Stem Lowering and P-Lowering.

6. The cycle

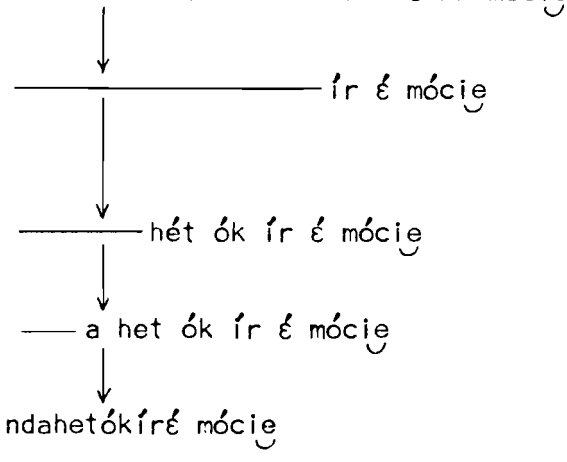
a. What the cycle solves. We are prevented by the tight ordering relations holding among the proposed assimilation rules from abandoning morphological conditioning and from making any further generalizations formally. It is this fact which leads one to reject linear ordering and to suggest that the raising and lowering processes are cyclic. Reconsider derivation (35), repeated here as (37):

(37) nd + ré + gor + á ## matuumbé

	Suffix Raising
á mátuumbé	
	Stem Lowering
gor a mátuumbé	
	P-Raising
ré gór a mátuumbé	
	P-Lowering
nd re gór a mátuumbé	
	later rules
ndeegóra mátuumbé	'I shall buy eggs'

The rules have applied from right to left in the order raising, lowering, raising, lowering. Similarly, consider the derivation of the sentence 'I passed a homestead':

(38) nd + a + hét + ok + ír + é ## mocie̯



Again, raising and lowering seem to have proceeded from right to left across the string.

If the tone assimilation process were regarded as cyclic, that is, if the assimilation rules were allowed to apply cyclically from right to left, morpheme by morpheme across strings such as those in (37) and (38), the redundancy implicit in the linear analysis could be eliminated. There could be a single rule of raising to the effect that L tones are raised when preceded by H tones and followed by L tones, unless the H tone causing the raising is on a stem, in which case the raising occurs regardless of the tone following the affected syllable. That is:

(39) Raising:

$$L \longrightarrow H \;/\; \underset{\langle\text{-stem}\rangle}{H} \_\_\_\_ \langle L \rangle$$

Similarly, a single lowering rule could be stated:

(40) Lowering:

$$H \longrightarrow L \;/\; \underset{\langle\text{-stem}\rangle}{L} \_\_\_\_ \langle H \rangle$$

What these rules say is that if the syllable causing the tonal assimilation is a verb stem, the following syllable is assimilated unconditionally, as in the previous rules of Stem Raising and Stem Lowering. If the syllable causing the assimilation is not a stem, that is, is a prefix, suffix, or pronoun, the following syllable is assimilated only if it is itself followed by a syllable of its own tone, as in P-Raising, P-Lowering and Suffix Raising. That is, an underlyingly H tone syllable will always be lowered by a preceding L tone stem, but will be lowered by a preceding L tone non-stem only if it is immediately followed by another H tone. This analysis seems to make the appropriate morphological distinction, namely that the raising powers of stem vowels are greater than those of non-stem vowels. The fact that assimilations by suffixes precede and condition assimilations by prefixes and pronouns, is reflected in a cyclic analysis by the fact that the cycle applies from right to left across the string. In the linear analysis, this right to left progression could not be stated and had to be viewed as accidental, just as the near identity of the several linear raising and lowering rules had to be viewed as accidental.

b. Mechanics of the cycle. The cycle we are proposing differs radically from the type of cycle proposed by Chomsky and Halle in Sound Pattern of English. First, it would not operate from innermost to outermost syntactic information. The first difference is, of course, partly a reflection of the second. This cycle does, however, require information other than the purely phonological characteristics of the string. Specifically, it must know whether a given tone-bearing unit is a stem, and it must be sensitive to morpheme boundaries obtaining, for example, between stems and suffixes in order that each morpheme trigger assimilations on a different cycle.

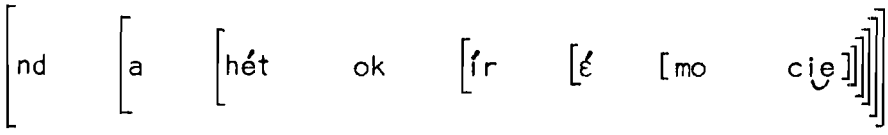
The syntactic bracketing for the string in (38) would be something like:

(41)

$$\Big[_{VP}\ \Big[_{V}\ [nɑ]_{pro}\ [á]_{pre}\Big[_{V}\ [_{V}hét]_{V}ok\ \Big]_{V}\ [fr]\ [ć]\ \Big]_{V}\ \Big[_{NP}\ [mo]\ [cię]\ \Big]_{NP}\Big]_{VP}$$

The input to the tone assimilation cycle, on the other hand, would be bracketed more or less as in (42):

(42)



Either an enormous readjustment rule would have to be created to change (41) into (42), or we could accept the obvious: the input to the cycle is not a syntactically bracketed string because this cycle is not syntactically conditioned. The bracketing in (42) is morphemic, that is, the cycle applies to one morpheme (or lexical entry) at a time. It is perhaps worth noting that there seems to be no reason to expect a tone assimilation cycle--or any cycle, for that matter--to be syntactically conditioned and to operate from innermost to outermost syntactic bracketings. Derivation (43) below illustrates the application of the cycle to the string in (37):

(43) [nd [ré [gor [á matuumbé

Cycle 1 - Raising

á mátuumbé

Cycle 2 - Lowering

gor a mátuumbé

Cycle 3 - Raising

ré gór a mátuumbé

Cycle 4 - Lowering

nd re gór a mátuumbé

Later rules

ndeegóra mátuumbé 'I shall buy eggs'

In (43), only one of the two assimilation rules has been able to apply on a given cycle. This is an obvious consequence of the fact that the string in question is made up entirely of monosyllabic morphemes, that is, morphemes composed of a single tone-bearing unit. In strings of monosyllabic morphemes, the two assimilation rules will be mutually exclusive on any given cycle. Hence such strings cannot provide a clue to any ordering relations obtaining between Raising and Lowering. It will be noticed, however, that the bracketing in (42) treats the extension ok as part of the stem hét rather than as an independent morpheme.

Semantically, this claim seems accurate. We noted earlier that the semantic relationship between an extended stem and its nonextended counterpart is not predictable, so that extended forms of a stem would constitute separate lexical entries. Phonologically, this is also exactly the claim we want to make, for extensions have no assimilatory powers, but always undergo assimilation to the stem. In fact, one of the reasons we were required to state morphological features in the earlier formulations of the assimilation rules was to prevent extensions from causing assimilations.[11] Within the cyclic interpretation this would be prevented by having Raising precede Lowering. This is illustrated by the following derivation for the string in (42):

(44) [nd [a [hét ok [ír [é mocie

Cycle 1 - Raising

é mócie

Cycle 2 - no rules apply

Cycle 3 - Raising

hét ók ír é mócie

Cycle 4 - Lowering

a het ók ír é mócie

Cycle 5 - no rules apply

ndahetókíré mócie 'I passed a homestead'

[11]It will also have been noticed however, that except for the verbal extension ok and the noun prefix mo, the bracketing in (42) is also syllabic, a fact which could point toward a cycle which is syllabically rather than morphemically conditioned. Such an analysis would have the advantage of requiring only phonological information about the string, but special readjustments would have to be made for syllables like extensions which do not cause assimilations. I rejected the syllabic analysis on the grounds that it would lack adequate explanatory power unless these 'readjustments' expressed the lesser morphemic status of the syllables not causing assimilation. To do so, however, these readjustment rules would have to incorporate into the syllabic analysis the information on the morphemic status of the syllables, and perhaps justify doing so. This information is inherent in the morphemic analysis. The morphemic analysis does fail to express the doubtless intimate relationship between the tonal structure of Kikuyu and the overall monosyllabicity of Kikuyu morphemes, but I feel this relationship must be expressed in some way other than a syllabically conditioned tonal cycle.

In (44), if Raising precedes Lowering, then on Cycle 3 (the stem cycle) the extension ok will already have H tone at the point at which Lowering gets its chance to apply on that cycle, and thus the extension will be unable to cause Lowering. If hét were a L tone stem, it would itself trigger Lowering, which would then apply vacuously. If the rules are stated in such a way that each rule gets only one chance to apply on a given cycle,[12] then the stem cycle would end with this vacuous application of Lowering. By ordering Raising before Lowering, then, it seems possible to account for the inability of extensions to cause assimilations, provided the extensions are treated as part of the stem. Treating extensions in this way seems to imply that they have a somewhat lesser status than other entities like prefixes or pronouns, a claim which is supported by the fact that extensions have no assimilatory powers.[13]

The environmental restrictions on assimilation are an interesting example of how underlying contrasts are preserved in this system. According to the environments we have discovered, with the exception of syllables immediately following stems, no syllable may have its underlying tone altered unless that tone is preserved on the following syllable. If assimilation by verb stems were subject to this restriction, however, the possibilities for assimilation by prefixes and pronouns would be a good deal more limited than they are. In (23) above, we saw that the failure of verb stem assimilation to occur precluded all further assimilations in the left hand end of the string. As it is, the system guarantees that a verb stem will always be followed by a syllable of its own tone. This means that for the cycle immediately following the stem cycle, the right hand side of the environment in (39) and (40) will always be met. The

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[12]It will be seen below that the failure of L tone geminate stems to assimilate a following syllable can also be attributed to this restriction that the rules get only one chance to apply on a given cycle.

[13]This claim has received consideration elsewhere, specifically in Bennett and Eastman [1971] where it is proposed that the formation and interrelation of extended stems be effected in the lexicon rather than transformationally in the syntactic component.

only syllable whose underlying tone may be lost completely through assimilation, and not preserved on a following syllable is the syllable immediately following a verb stem. This may be either a verbal extension, whose underlying tone is known to be L anyway, or it may be a suffix. Even this latter loss is seldom of consequence: the paired suffixes (e.g. ɨr+ɛ) always have the same underlying tone on both morphemes, so that the second of the pair always manifests the tone of the first even if the latter is assimilated to a verb stem. Loss of underlying tone is more of a threat to a single suffix (e.g. a) assimilated unconditionally to a verb stem; but even this is often prevented, first by the fact that, as will be discussed below, utterance final monosyllabic H tone suffixes do not lose their H tone altogether when assimilated, but rather preserve it in the form of a rising tone, and secondly by the fact that the suffix has the chance to pass its underlying tone to a following noun.

It has been shown that by treating the tone assimilation in Kikuyu as cyclic, the raising and lowering triggered by pronouns, prefixes, stems and suffixes may be expressed as a single process, whereas a non-cyclic analysis is forced to describe each of these assimilations as a separate rule conditioned by morphological category or boundary. It has been argued that an analysis which treats these assimilations as separate processes first ignores the right to left progression of assimilation and secondly draws artificial distinctions whose only external motivation is rule ordering and which thus make the claim that there are, for example, four distinct processes of raising rather than one.

7. Further evidence in support of a cycle

Other facts from Kikuyu support the proposal of a cycle. There are at least two additional cases which in a non-cyclic analysis would require the addition of morphologically conditioned rules, but which apparently can be accounted for naturally by a cyclic analysis.

a. Final rising tones. In note 10 it was mentioned that when a L tone stem lowers a following H tone suffix, a rising tone on the suffix results if that suffix is utterance final. If the suffix is not utterance final, its own underlying tone is realized on the following syllable, if possible,

and the suffix acquires L tone by Lowering. These two cases are illustrated in (45a) and (45b) respectively: (ˇ = rising tone)

(45a) o + ré + gor + á --→ oregóră 'you will buy'

(45b) o + ré + gor + á ## morooðí --→ oregóra mórooðí 'you will buy a lion'

A similar situation is encountered in a class of nouns referred to by Armstrong as the mote class, whose utterance final form in affirmatives has final rising tone. An example is the noun 'lion' in (45b). When these nouns are not utterance final, when they are followed by an adjective, for example, the first syllable of the adjective has H tone and the final syllable of the noun has L, not rising tone. Hence:

(46a) ndaðɔ́ndɛ́ka mociiŋgă 'I've just mended a gun'

(46b) ndaðɔ́ndɛ́ka mociiŋga mókoro 'I've just mended an old gun'

We know that the H tone on mókoro 'old' is not underlying, first because it has not caused raising of a following syllable, and second because after a noun of Armstrong's moondo class, whose unmarked form has level L tones, this H tone does not appear:

(47) moheendɔ mokoro 'an old rope'

Concord prefixes such as mo above, like verbal extensions, apparently always have basic L tone and fail to trigger assimilations. We therefor attribute the H tone on mókoro in (46b) to Raising, triggered by an underlying H tone on the final syllable of a preceding noun, mociiŋgá 'gun'. The L tone on the final syllable of mociiŋga in (41b) would be attributed to Lowering triggered by the underlying L tone on the preceding syllable ciiŋg, just as the L tone on the suffix a in (45b) is due to Lowering triggered by the stem gor. In other words, the behaviour of mote class nouns with respect to a following noun. There is every indication that the two should be treated as a single process. In botn cases, a rising tone occurs when Lowering applies to an utterance final H tone syllable, while if the same syllable is not utterance final, its underlying tone is borne by a following syllable. We therefore postulate that in its underlying form the noun 'gun' has

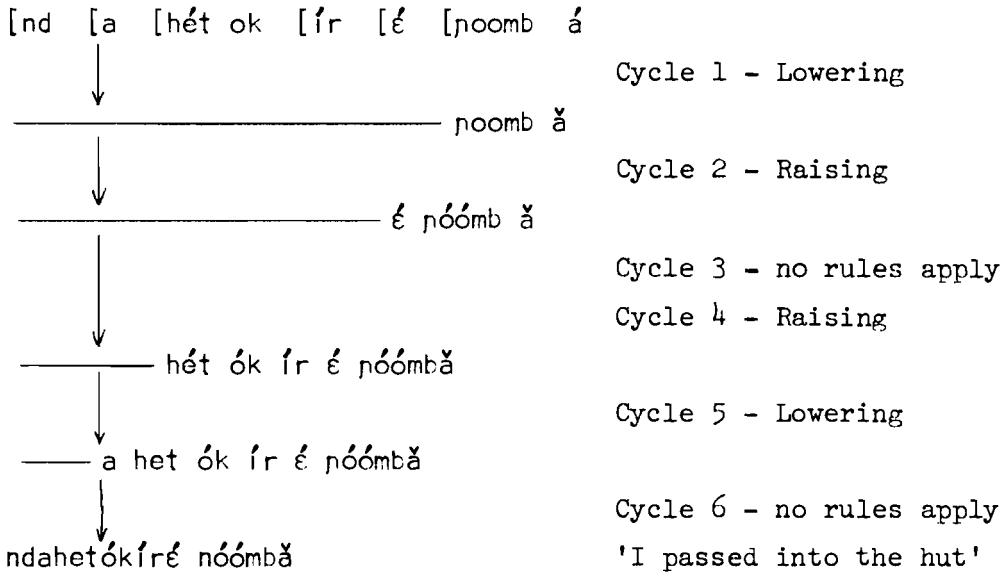
final H tone, and that in (46a), Lowering triggered by the noun stem results in a rising tone on the noun suffix á if that suffix is utterance final. And just as the verbal suffix á in (45b) raises the following syllable, so the noun suffix á in (46b) raises the following syllable mo. In a non-cyclic interpretation, the constraints imposed by linear ordering would prevent these two cases of assimilation in nouns and adjectives from being accounted for by previously existing rules. A new rule would be required to account for the initial H tone on the adjective mókoro in (46b) and another to account for the final L or rising tone on the noun mociiŋga in (46). Both these rules would have to precede the rule of Suffix Raising and thus precede the other four rules necessitated by the linear analysis. (48) below provides an illustration of this. Here, the stem of the disyllabic noun ɲoombá 'hut' is raised by the preceding H tone verbal suffix:

(48) nd + a + hét + ok + ír + é ## ɲoombá
ndahetókírέ ɲóómbă 'I passed into the hut'

In (48), the raising of the syllable ɲóómb by the suffix é obliterates the L tone to whose influence we attribute the final rising tone on ɲóómba 'hut'. In a linear analysis, the lowering triggered by ɲoomb would have to be effected by a rule preceding Suffix Raising. This rule would not be collapsible with Stem Lowering or P-Lowering, for these both must follow Suffix Raising. Similarly, a rule whereby the final syllable of ɲoombá raises a following syllable would have to be added to the head of the list.

Without belabouring the point, it seems clear that the redundancies implicit in a linear interpretation will increase as longer strings are considered. Within a cyclic interpretation, this problem is eliminated. Since the cycle proceeds from right to left along the string, any tonal assimilations caused by nouns will be effected on the cycle(s) prior to assimilations triggered by verbal suffixes. Within the cyclic analysis, (48) above would have the following derivation:

(49)



b. Né forms. A second relevant case is that of the clitic né, which can be tacked onto the front of affirmative verb forms in most tenses to produce a second affirmative form which is used in many contexts. The né form of the verb is used, for example, in yes/no questions and in emphatic contexts. It may be that in actual use this né form is the more common of the two affirmatives. The addition of né to a verb form produces several tonal effects one of which is to raise a following L tone syllable when possible. It seems likely at this point that raising by né can be incorporated into the cycle as well, though I have not examined the question in detail. In a non-cyclic interpretation, another raising rule would be required to account for the né forms.

The addition of these two cases to the list of tone assimilation processes in affirmative verb forms provides further evidence that without a cycle a ridiculous proliferation of nearly identical tone rules would result.

The cyclic Raising and Lowering rules as formulated in (39) and (40) are converses of each other, a fact which would lead one to suspect they are collapsible by alpha notation. Since it does not seem possible for both Raising and Lowering to apply on the same cycle, perhaps there could be one gigantic, iterative rule something like:

(50) $\alpha H \dashrightarrow -\alpha H \;/\; \underset{\langle \alpha \text{stem} \rangle}{-\alpha H} \_\_\_\_ \langle \alpha H \rangle$

We will see later during the discussion of vowel coalescence that this is not possible, for there is a fundamental difference in the way Raising and Lowering react to vowel adjacency, a difference which would make it impossible and incorrect to treat them as identical processes.

8. Interaction of tone rules and vowel coalescence: the immunity phenomenon

a. Raising of adjacent vowels. Since Kikuyu has both vowel initial and vowel final verb stems, and since all prefixes are vowel final and all suffixes vowel initial, there is considerable interaction between vowel coalescence rules and the rules governing tone alterations in verb forms. As mentioned in the introduction, we do not intend to examine the actual processes of vowel coalescence, but only to consider them inasmuch as they influence tone rules. Generally speaking, when a series of adjacent vowels coalesces into a single syllable, the resulting syllable bears the tone of the first syllable in the input string. This is undoubtedly an oversimplification for the language as a whole, but it does serve as a rule of thumb for the verb forms we are considering.[15]

In what follows, it will be temporarily assumed that vowel coalescence is a single, post-cyclic rule. Some alternatives will be discussed briefly later.

In a string like á + tɛŋ + ɛr + ag + a 'he usually runs', Raising, we recall is triggered by the pronoun á, and the first syllable of tɛŋ thereby acquires H tone, giving the output string átéŋɛraga. When the vowel initial, L tone stem and+ek 'write' is used in this environment, the result is:

(51) á + and + ek + ag + a --→ áándékaga 'he usually writes'

Notice that in this form it is the extension following the stem and which has been raised by the pronoun á, whereas in the form átéŋɛraga, only the stem has been raised. Similarly in the Perfect tense (prefix á, suffix a), the second person singular form of teŋ+ɛr has the following derivation:

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[15]There is one counterexample to this claim in Armstrong, that being one form from the Perfect of the Immediate Past (prefix á, suffix a). According to Armstrong, the underlying string o+á+án+ek+a produces the surface form wáánéka 'you have just spread'. Here the vowels o+á+án seem to have coalesced to wáán instead of waan as our rule of thumb would predict.

(52) o + á + tɛŋ + ɛr + a

↓	Cycle 1 - no rules apply
	Cycle 2 - Raising
——á téŋɛr a	
↓	Cycle 3 - Lowering
o a téŋɛr a	
↓	Later rules
watéŋɛra	'you have just run'

The corresponding form for the vowel initial stem and+ek is:

(53) o + á + and + ek + a --→ waandéka 'you have just written'

Once again, with a vowel initial stem, Raising has affected the syllable following the stem (i.e. the extension ék in (53)), whereas with a consonant initial stem, only the stem itself is affected. Evidently, Raising can affect not just a following syllable, but also a syllable which is two (underlying) syllables away if the intervening syllable is vowel initial. In other words, in a string of the form $V_1C_1V_2C_2V_3$ where V_1 triggers Raising, only V_2 is raised. But in a string of the form $V_1V_2C_1V_3$ where V_1 triggers Raising, V_3 is raised. As a third example, consider the third person singular of tɛŋ+ɛr in the Remote Past (a - ír+é) tense:

(54) á + a + tɛŋ + ɛr + ír + é --→ áátéŋɛríré 'he ran'

As expected, tɛŋ has been raised by the pronoun á even though a L tone prefix intervenes between á and tɛŋ, for the intervening prefix is composed only of a vowel. The corresponding form of and+ek is:

(55) á + a + and + ek + ír + é --→ áándekíré 'he wrote'

Here Raising by a has <u>not</u> affected ek, apparently because ek is not followed by a L tone.

It seems, then, that a H tone element is able to ignore vowels which are adjacent to it in the underlying string and affects only the first CV syllable following it (provided the rest of the SD of the rule is met). There seems to be a reason for this. If in (54) above, Raising

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However, for the analogous string o+á+ét+a 'you have just called', the output is wɛɛtá, indicating that the vowels o+á+ét have coalesced to produce wɛɛt, as the rule would predict. This suggests the form wáánéka is exceptional.

were to apply to raise only the following underlying syllable, a, the intermediate string á+á+tɛŋ+ɛr+ír+é would result. If vowel coalescence rules applied to this string, the result would be *áátɛŋɛríré, that is, the effects of Raising by á would be obliterated. Apparently the Raising rule contains a provision against this happening.

Raising by stems and suffixes also shows this effect. When a H tone vowel final verb stem is followed by a monosyllabic suffix such as a, Raising, as we might expect, skips over this adjacent vowel and raises the first syllable of a following noun, as illustrated in (56):

(56) [nd [á [ré [a mo [gatɛ́

↓ Cycle 1 - Lowering

gatɛ̌

↓ Cycle 2 - no rules apply

↓ Cycle 3 - Raising

ré a mó gatɛ̌

↓ Cycle 4 - no rules apply

↓ Cycle 5 - Lowering

nd a ré a mó gatɛ̌

↓ Vowel coalescence

ndaréá mógatɛ̌ "I have just eaten bread'

Similarly:

(57) a + ka + nú + a ## njɔɔhí --→ akanua njɔ́ɔ́hǐ 'he will drink beer'

In (56) and (57), the vowel final verb stem has ignored the presence of the vowel initial suffix and has raised the first syllable of the following noun. In (58) below, it is seen that the H tone suffix á, when adjacent to a vowel initial noun, raises not the first underlying syllable of that noun, but the second:

(58) nd + a + hét + ok + ág + á ## ikoombe

↓

ndahetókágá íkóombe 'I used to pass a granary'

If the noun in (58) had been consonant initial rather than vowel initial, the syllable koomb would not have been raised, as (27b), repeated here

as (59), shows:

(59) nd + a + haand + ág + á ## marigo
ndahaandágá márigo 'I used to plant bananas'

The general Raising rule, then, is characterized by the fact that in a string $V_1V_2C_1V_3$ where V_1 triggers Raising, V_3 is affected, provided the SD of the rule is otherwise met, i.e. provided that V_3 is followed by a L tone or that V_1 is a stem vowel. In this way, the effects of Raising may not be obliterated by vowel coalescence.

b. Lowering of adjacent vowels. Lowering does not display this immunity to adjacent vowels. Consider the 2nd person singular form of the H tone vowel initial verb án+ek 'spread' in the Immediate Past (ír+é) tense:

(60) o + án + ek + ír + é --→ wanékíré 'you spread'

Notice that Lowering by o in this form has not affected the syllable following the stem. That is, we do not get *wanekíré. Schematically this means that in a string $V_1V_2C_1V_3$ where V_1 triggers Lowering, V_3 has not been affected. Similarly, in the prefix a, suffix ír+é tense, the 2nd person singular of án+ek is:

(61) o + a + án + ek + ír + é --→ waanékíré 'you spread'

Again, the extension ek has not been lowered. (We have assumed in (60) and (61) that ek has derived H tone due to Raising by án.) In (61), both o and a could have triggered Lowering, but neither has caused lowering of ek. In effect, in (60) and (61), the effects of Lowering have been obliterated by vowel coalescence. According to our rule of thumb regarding vowel coalescence, whether or not Lowering applied to the string in (61), the correct form would still be produced after vowel coalescence had applied, for o+a+án would coalesce to produce waan with L tone.

There seems to be an important functional difference between Raising and Lowering in that the former has the capacity to skip over any number of adjacent vowels, while the latter does not.

This fact about Lowering provides a possible explanation for a problem encountered at the beginning of this paper: the fact that L tone stems do not cause Lowering if they contain a geminate vowel, whereas H tone geminate stems are not inhibited in this way. When a H

tone geminate stem such as ðóóm 'read' appears in a string of the form $C_1V_1V_2C_2V_3$ where V_1V_2 are geminate H tone stem vowels, Raising triggered by V_1 would raise V_3. In a L tone geminate stem like niin 'finish', Lowering would be triggered by the first stem vowel and would affect only the adjacent vowel, which in this case happens also to be part of the stem. Since a rule gets to apply only once on a cycle, the second vowel would never get the chance to trigger Lowering. In other words, in a string $C_1V_1V_2C_2V_3$, where V_1V_2 are geminate L tone stem vowels, V_1 triggers Lowering and only V_2 is lowered. In the light of the functional difference between Raising and Lowering in vowel coalescence environments, the difference in the behaviour of H and L tone geminate stems is just what we would expect, and is explicable in terms of more general properties of the Raising and Lowering rules themselves.

The fact that Raising is insulated in such a way that its effects may not be obliterated by Vowel Coalescence, while Lowering is not so insulated, suggests that the tonal system is biased in favor of the preservation of H tones. There is at least one other piece of evidence in support of this observation. We discussed earlier the fact that utterance final H tones, when subjected to Lowering, do not disappear, but rather become rising tones. That is, utterance final H tone syllables may acquire L tone by assimilation to a preceding syllable, but they also retain their underlying H tone, and the result is a rising tone. This rising tone, it will be recalled, does not occur if the underlying H tone is not utterance final and thus has had the chance to pass its H tone onto a following syllable. By contrast, underlying L tones, whether or not they are utterance final, may be completely assimilated (i.e. obliterated) by a preceding H tone. There are at least two cases, then, (i.e. vowel adjacency and utterance finality) in which underlying H tones are guaranteed survival on the surface while underlying L tones may disappear completely. A good deal more research will be needed before an explanation of this phenomenon may be arrived at, but it does support the hypothesis that L tone is the unmarked tone in Kikuyu, and that the system is weighted in favour of preserving the marked cases whose presence may not be assumed. The additional fact that Raising precedes

Lowering in the cycle may not be irrelevant to such a hypothesis.

c. Dissimilation. There is another rule in Kikuyu which casts light on the nature of the distinction between Raising and Lowering. This is a rule of dissimilation. The best illustrations for this rule come from the Perfect of the Immediate Past tense, formed by the H tone prefix á and the L tone suffix a. In the presence of L tone pronouns, this tense behaves as the rules predict. This is illustrated below with the L tone verb tɛŋ+ɛr 'run' and the H tone verb ðɔ́nd+ɛk 'mend':

(62a) [to [á [tɛŋ ɛr a

↓ Cycle 1 - no rules apply

Cycle 2 - Raising

á téŋ ɛr a

↓ Cycle 3 - Lowering

to a téŋ ɛr a

↓ Vowel coalescence

twatéŋɛra 'we have just run'

(62b) [to [á [ðɔ́nd ɛk a

↓ Cycle 1 - Raising

ðɔ́nd ék a

↓ Cycle 2 - no rules apply

Cycle 3 - Lowering

to a ðɔ́nd ék a

↓ Vowel coalescence

twaðɔ́ndéka 'we have just mended'

Similarly, with the non-extended stems gor 'buy' and tém 'cut' we get the predicted forms twagóra 'we have just bought' and twatémá 'we have just cut'.

In the 3rd person, where both pronoun and prefix have H tones, our rules produce the following derivations:

(63a) [á [á [tɛŋ ɛr a

Cycle 1 - no rules apply

Cycle 2 - Raising

——á tɛ́ŋ ɛr a

Cycle 3 - no rules apply

Vowel coalescence

áátɛ́ŋɛra 'he has just run'

(63b) [á [á [ɔ́nd ɛk a

Cycle 1 - Raising

————ɔ́nd ɛ́k a

Cycle 2 - no rules apply

Cycle 3 - no rules apply

Vowel coalescence

*ááɔ́ndɛ́ka 'he has just mended'

(63b) is incorrect. The correct form is ááɔndɛ́ka, that is, the stem ɔ́nd has lost its H tone. Similarly, the simple H tone stem tɛ́m has the corresponding form áátɛmá 'he has just cut' instead of *áátɛ́má as our rules would predict. The L tone verb gor has the expected form áágóra in this tense.

Evidently a new rule will be necessary to account for the L tone on the second syllable of ááɔndɛ́ka and áátɛmá, for here an underlying H tone syllable has lost its H tone between two H tones, indicating that a process of dissimilation is operative. The L tone on the stems in the two forms just quoted cannot be attributed to assimilation because the underlying strings for these forms contain no L tones to which the stem could assimilate.

A few immediate observations may be made about this dissimilation process. First, dissimilation does not occur when a L tone pronoun precedes the H tone prefix, as shown in (62). To express this fact, we could either mention a H tone pronoun in the SD of the dissimilation rule, or we could order that rule after Lowering had applied on the last cycle of (62b), and then state that dissimilation is triggered by a prefix with H tone. In this way, the rule would be unable to apply to the string in (62b).

Secondly, dissimilation does not apply to just any H tone stem located between two H tones. In the Immediate Past (ír+é) tense, for example, dissimilation does not occur even when a H tone stem is preceded by a H tone pronoun. That is:

(65) á + ðɔ́nd + ɛk + ír + é --> áðɔ́ndɛ́kírɛ́ 'he mended'

We do not get *áðɔndɛ́kírɛ́ as we would have if dissimilation had not occurred in the derivation of the string in (65). This means that a H tone pronoun alone cannot trigger dissimilation. Rather, the presence of a prefix is somehow crucial to the operation of the rule. In fact, at least part of the raison d'être of the dissimilation process could be to maintain a distinction between strings like (66a) and (66b) below which, due to vowel coalescence, would be identical if dissimilation were not operative in (66b):

(66a) á + án + ek + ír + é --> áánékírɛ́ 'he spread (today)'
(66b) á + a + án + ek + ír + é --> áánekírɛ́[16] 'he spread (before yesterday)'

Thirdly, dissimilation does not occur in strings containing a L tone verb stem as (64b) showed. We could express this fact by restricting the environment of dissimilation so that it applied only to H tones followed by H tones, in which case it could never apply to underlying L tone stems even if they did have derived H tone, for L tone verb stems are always followed by L tones.

To sum up, the three factors which in one way or another are crucial to the operation of the dissimilation process are:

1. a H tone pronoun
2. a prefix
3. a H tone following the syllable to be dissimilated.

These facts permit one to conclude that the new rule is a last-cyclic or post-cyclic rule, since it applies only to the lefthand end of the string. We may also conclude that unlike our other rules, Dissimilation will be genuinely morphologically conditioned, for a

[16]Notice that in (66b) it is the verbal extension ek which acquires L tone rather than the stem. This fact is to be discussed shortly.

statement of Dissimilation will perforce mention the feature [+prefix] or a boundary indicative of the presence of a prefix. (67a) and (67b) below show two possible formulations of Dissimilation, both of which would apply post- or last-cyclically:

(67) Dissimilation:

(a) $H \longrightarrow L \;/\; \begin{bmatrix} +pro \\ +H \end{bmatrix}\ [+pref]\ \_\_\_\_\ H$

(b) $H \longrightarrow L \;/\; \begin{bmatrix} +pref \\ +H \end{bmatrix}\ \_\_\_\_\ H$

No apologies are made for the rather bizarre fact that this rule is conditioned by the presence of a prefix and is inoperative in tonally identical strings which do not contain a prefix. There is at least one other rule in Kikuyu which is governed by the presence of a prefix, any prefix, that being the rule governing the shape of the first person pronoun. Before a non-prefixal vowel, this pronoun has the surface form [nj]; before a vowel initial prefix followed by a verb, it has the form [nd].[17] The fact that this pronoun has a different form when followed by a prefixal vowel than it does when followed by a stem vowel indicates that, as in the case of Dissimilation, reference would have to be made to the presence of a prefix in the formulation of the rule governing this alternation. Evidently, tense prefixes have rather special powers in Kikuyu.

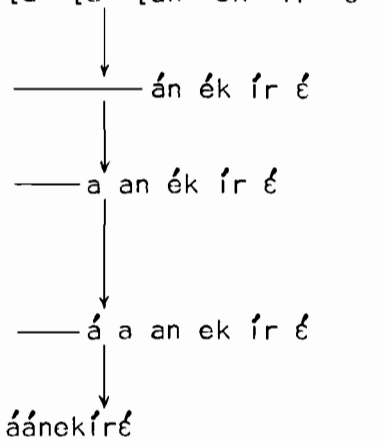
In what follows, evidence will be presented which will indicate choice between the two formulations of Dissimilation given in (67).

Dissimilation appears to pattern with Raising as regards its interaction with adjacent vowels. In (62) above, it was shown that the underlying string o + a + án + ek + ír + é produced the surface form waanékíré 'you spread', indicating that Lowering by o or a had not been able to apply to the extension ek. The corresponding 3rd person form, á + a + án + ek + ír + é has the surface form áánekíré 'he spread'. We know from (62) that the L tone on ek in the string just quoted cannot be due to Lowering triggered by the presence of the prefix a. It must rather be attributed to

[17]Patrick Bennett, who I thank for providing this information

Dissimilation triggered by the presence of a prefix (a), a H tone pronoun (á), and a H tone following the syllable to be dissimilated. If it is the case that Dissimilation is responsible for the L tone on the second syllable of the string ááneklré, then we must have the following derivation:

(68) [á [a [án ek lr é



Cycle 1 - Raising

án ék lr é

Cycle 2 - Lowering

a an ék lr é

Cycle 3 - no rules apply

Dissimilation

á a an ek lr é

Vowel coalescence

ááneklré 'he spread'

Notice that Dissimilation has applied to the intermediate string á a an ék lr é and the syllable ek has been affected. This means that in a string of the form $V_1V_2V_3C_1V_4C_2V_5C_3V_6$ where Dissimilation is triggered by the prefix V_2 (a), V_4 has been lowered. Dissimilation is able to skip over the intervening adjacent vowel of the stem an.

A second example comes from the Immediate Future tense, whose tense marker is the prefix ko and the H tone suffix á. We know that ko has underlying L tone, for it has not raised the first syllable of the stem tɛŋ+ɛr in (69):

(69) ó + ko + tɛŋ + ɛr + á --→ ókótɛŋɛrá 'you will run' (not *ókótéŋɛrá)

In this tense, all the pronouns except n 'I' have surface H tone. This would seem to contradict our earlier claim that pronouns have underlying L tone in future tenses; however, there is evidence indicating that the pronouns are indeed underlyingly L in the ko

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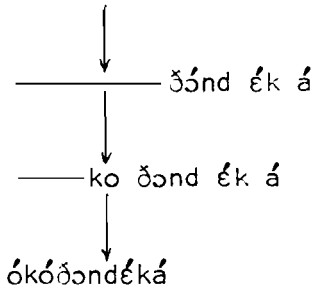
on the first person pronoun, warns that the conditions on the nd form are actually somewhat more complex than stated here. The prefix remains crucial, however.

tense, and that ko itself has a H tone prefix, the remnant of a lost vowel. The tone of this prefix is assigned to those pronouns which are syllabic (that is, all but the 1st person sg.) and is lost when the pronoun is non-syllabic (as in n 'I'). There are two pieces of evidence in support of this hypothesis. First, the 3rd person pronouns a (sg.) and ma (pl.) have the forms ɛɛ and mɛɛ in the ko tense and in no other tense. There is no explanation for this alternation unless we assume that a and ma have been affected by some other vowel preceding ko. Secondly, as it happens, this same tense prefix ko appears preceded by the vowel ɛ in forms like the negative relative otɛkoruga 'he who isn't going to be cooking'. I propose, then, that the prefix of the ko tense is at some point in the derivation the form ɛ́ko (or perhaps é͡ko), and that a rule, which I shall hereafter presuppose, deletes the underlying vowel ɛ́ after the pronouns n, o, mo, to, and coalesces it with a and ma to give ɛɛ and mɛɛ. This same rule, presumably, assigns the tone of ɛ́ to the vowel of the pronouns, and when no vowel is present, as in the case of n 'I', this H tone is lost. It may turn out that this explanation has no significance at all in a synchronic description of the language. It is not crucial here, though useful in explaining the unusual behaviour of the pronouns in the ko tense. I note in passing that the Present Consecutive tense, whose prefix is ka displays this same tonal effect on the pronouns, and a similar explanation can likely be found. We shall assume in what follows that H tone has already been assigned to the pronouns in the ko tense at the point at which the tone assimilation rules begin to apply.

If the ko tense of the verb ðɔ́nd+ɛk 'mend' is subjected to the cycle, the following derivation results:

(70) [ó [ko [ðɔ́nd ɛk á



Cycle 1 - Raising

ðɔ́nd ɛ́k á

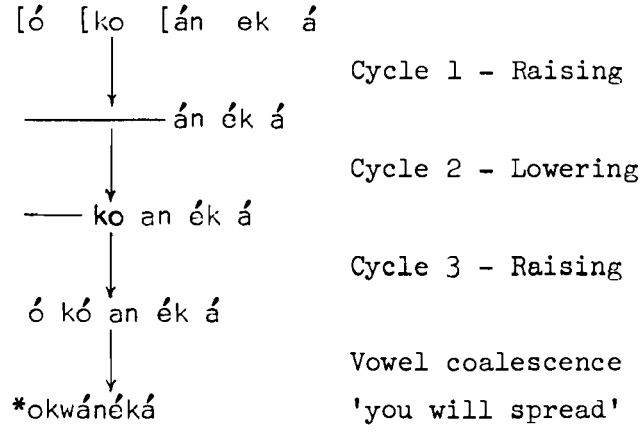
Cycle 2 - Lowering

ko ðɔnd ɛ́k á

Cycle 3 - Raising

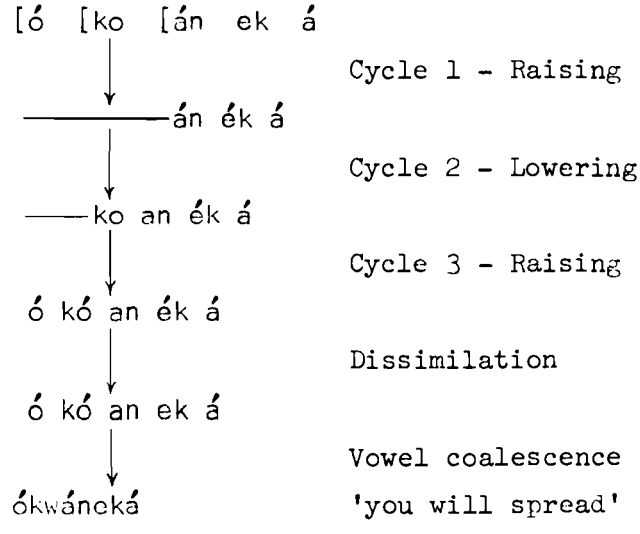
ókóðɔndɛ́ká 'you will mend'

(71)



The correct form for (71) is ókwáneká with L tone on the verbal extension ek. This L tone cannot be attributed to Lowering by ko, since we know Lowering can affect only an immediately following vowel, in this case án and not ék. The L tone on ek in (71) must be due to Dissimilation, triggered by the presence of a prefix, a H tone pronoun and a H tone following the syllable to be dissimilated. This means that in a string of the form $V_1V_2C_1V_3$, Dissimilation triggered by V_1, a prefixal vowel, has affected V_3, a verbal extension, and skipped over V_2, a stem vowel. We may thus range Dissimilation alongside Raising as regards its immunity to adjacent vowels. The string in (71) would have the following correct derivation:

(72)



Notice that both Lowering and Dissimilation have been triggered by ko in derivation (72). If Lowering had not occurred on Cycle 3,

Raising by ó on Cycle 4 would have been blocked, since ko would have been followed by a H tone. The effects of Lowering have otherwise been obliterated in (72) by Raising on Cycle 4 and by vowel coalescence.

To return to the original point, a split seems to have emerged between Raising and Dissimilation on the one hand and Lowering on the other as regards immunity to adjacent vowels. We would like to find a reason for this split. Why, for example, do Dissimilation and Lowering not pattern together, since both change H tones to L tones?

The one thing Dissimilation and Raising have in common to the exception of Lowering is that both apply to strings beginning with a H tone, that is, both are triggered by H tones. Lowering, on the other hand, deals with strings beginning with a L tone. If this is the relevant factor, we are led to postulate that there are two types of tone rules in Kikuyu, those which are immune to adjacent vowels and those which are not; and that the former type are triggered by H tones and the latter by L tones. To say a rule is immune to adjacent vowels is to say that it affects the first CV syllable following the syllable which triggers the rule in the underlying string, and ignores any intervening vowels. Rules which are non-immune affect the first vowel following the triggering syllable, regardless of whether a consonant intervenes.

9. Formalization of the immunity phenomenon

a. By complicating the Raising and Dissimilation rules. One way this distinction between immune and non-immune rules could be formalized is to make Raising and Dissimilation sensitive to a following consonant. Raising would then be restated as:

(73) $L \longrightarrow H \;/\; \underset{\langle \text{-stem} \rangle}{H} \quad V_0^n \; C \; \_\_\_\_ \; \langle L \rangle$

and Dissimilation as one of:

(74a) $H \longrightarrow L \;/\; \begin{bmatrix} +H \\ +pref \end{bmatrix} \quad V_0^n \; C \; \_\_\_\_ \; H$

(74b) $H \longrightarrow L \;/\; \begin{bmatrix} +pro \\ +H \end{bmatrix} [+pref]\ V_0^n\ C \_\_\_\_ H$

Lowering, on the other hand, would continue to apply in the environment $L \underset{\langle -stem \rangle}{\_\_\_\_} H$. According to (73), in a form like:

(75) á + a + tɛŋ + ɛr + ír + é

Raising by a would directly affect the stem tɛŋ to give the intermediate string á a téŋ ɛr ír é. Later á and a would coalesce to áá.

b. By complicating the vowel coalescence rules. Suppose that in the derivation of the string in (75) above, the coalescence of á and a were to occur before Raising on the last cycle so that the hybrid syllable áá would raise tɛŋ. If this were the case, the problem of adjacent vowels would not arise in connection with (75) and no reformulation of Raising would be necessary to derive the correct output. Such a solution would give rise to an analysis in which sequences of vowels of which the first is a H tone, such as the sequence á+a in (75), would coalesce prior to the application of rules triggered by H tones (immune rules) while coalescence of vowel sequences of which the first is a L tone would coalesce after the application of rules triggered by L tones. Since Dissimilation and Raising would apply to strings already having undergone vowel coalescence, their effects could not be obliterated by vowel coalescence. Lowering, in this analysis, would apply to strings which had not yet undergone vowel coalescence, and Lowering would thus be susceptible to having its effects obliterated by vowel coalescence. This analysis would claim, for example, that on Cycle 2 of derivation (76a) below, vowel coalescence followed Lowering, while in derivation (76b), vowel coalescence preceded Raising on Cycle 2.

(76a) [o [án ek ír é

↓ Cycle 1 - Raising

—— án ék ír é

↓ Cycle 2 - Lowering

o an ék ír é

↓ Vowel coalescence

wanékíré 'you spread'

(76b) [á [and ek ag a

Cycle 1 - no rules apply

Cycle 2 - vowel coalescence

áánd ek ag a

Cycle 2 - Raising

áándékaga 'he usually writes'

If such an anlaysis were adopted, Raising would not have to be reformulated. It would still be the converse of Lowering. Instead, there would have to be two rules of vowel coalescence, one which preceded Raising (and thus preceded Lowering) and one which followed Lowering. The former would apply to sequences of vowels of which the first had L tone. In this analysis, it would be necessary to incorporate the first vowel coalescence rule into the cycle, since it would be crucially ordered with respect to each application of Raising. The second vowel coalescence rule would not have to be made cyclic, for it would not interact at all with any of the tone assimilation rules.

The claims made by such an analysis are dubious. One of those claims would be that vowel coalescence was a tonally conditioned process. Another would be that some radical functional difference held between the two rules of vowel coalescence which resulted in their having quite different character and status within the tonal system. These are startling claims for which there would be little support: the actual formulation of the two putative vowel coalescence rules would be almost the same, and both would produce the same effect in terms of syllabification. Their only difference would be the point in the derivation at which they applied and the manner in which they applied (one cyclically and one not). Even if it worked, which is not clear at the moment, the analysis proposing rules of vowel coalescence would require the splitting of a single process into two rules and the drawing of a distinction solely on mechanical grounds. The only advantage this analysis would have is that it would permit the simpler, original formulation of Raising and Dissimilation and would preserve the symmetry between Raising and Lowering.

c. By abstracting questions of tone from questions of vowel coalescence: attempt 1. There are good reasons to favour an analysis in which vowel coalescence applies independently from the tone assimilation cycle. The assimilation cycle involves the interaction of morphemes, while vowel coalescence involves that of segments. The assimilation cycle is determined by the presence of boundaries, vowel coalescence obliterates boundaries. Perhaps most unnatural of all would be the claim that vowel coalescence were tonally conditioned. In fact, we might like to find a way of abstracting all questions of tone from the treatment of vowel coalescence.

If the first analysis proposed is adopted, whereby Raising and Dissimilation are made sensitive to a following consonant and vowel coalescence is stated as a single, post-cyclic rule, we are still unable to abstract tonal considerations from the formulation of vowel coalescence. It would still be necessary to add a clause to the vowel coalescence rule stating that the tone of the first vowel in the sequence is preserved. This is a direct consequence of the fact that the rules of tone assimilation have had to be stated in terms of segmental features of vowels.

Another consequence of the first analysis proposed is that Raising as formulated in (73) above cannot be termed, strictly speaking, a true assimilation or spreading phenomenon, for it skips over an intervening underlying tone-bearing unit. If we could say, however, that when Raising was triggered by á in a string like á + a + tɛŋ + ɛr + ír + é it raised both the adjacent vowels (i.e. a) and the vowel of the next CV syllable, then Raising could be expressed as a true assimilation, and the rule coalescing the vowels á and a would not have to make any tonal adjustments whatever. To do this, Raising could be expressed as a conjunction of two rules, the first of which would raise all vowels adjacent to the vowel doing the raising, and the second of which would raise the vowel of the first CV syllable following the

vowel doing the raising. This would be formalized approximately as:

(77) $$L \dashrightarrow H \;/\; H \langle\text{-stem}\rangle \left\{ \begin{array}{l} \_\_\_\_ V_0^n \; C\langle L\rangle \\ C \;\_\_\_\_\langle L\rangle \end{array} \right\}$$

The second conjunct would always apply, while the first would only apply if there were vowels adjacent to the vowel triggering the raising. Similarly, Lowering could be expressed in such a way that it lowered not just the first vowel following the one triggering the lowering, but all adjacent vowels, so that in a string like o + á + án + ek + a, Lowering would affect both á and án to give the string o + a + an + ék + a. Then the rule coalescing o+a+an would likewise have to make no tonal adjustments, for it would be applying to strings of vowels all of which would have the same tone. To do this, Lowering would be expressed as a disjunction of two rules, one of which would apply to all adjacent vowels up to the first consonant following the vowel doing the lowering and the other of which would apply to the vowel of the first CV syllable following the vowel doing the lowering. This possible formulation of Lowering is shown in (78):

(78) $$H \dashrightarrow L \;/\; L \langle\text{-stem}\rangle \left[\begin{array}{l} \_\_\_\_ V_0^n \; C \; \langle H\rangle \\ C\_\_\_\_\langle H\rangle \end{array} \right]$$

This solution has the advantage that it permits Raising and Lowering to be expressed as assimilation, and it completely abstracts tonal considerations from the statement of vowel coalescence by guaranteeing that the input to vowel coalescence will always be strings of vowels all having the same tone. It is not a satisfactory solution, however, for it seems to create great redundancies in the cycle. Derivation (79) illustrates how the reformulated Raising and Lowering rules would apply:

(79) [o [á and ek a

↓ Cycle 1 - Raising

——á ánd ék a

↓ Cycle 2 - Lowering

o a and ék a

↓ Vowel coalescence

waandéka 'you have just written'

That is, due to the cyclic applications of Raising and Lowering as formulated in (77) and (78), the stem and in (79) has had its tone altered twice, from L to H and back to L.

d. Attempt 2. An alternative proposal[18] would be to formulate a post-cyclic rule which would spread the tone of a vowel to any following adjacent vowels prior to the application of vowel coalescence rules. Vowel coalescence would then apply and would need to make no changes in tone. This rule would, in a sense, prepare a string for the application of vowel coalescence. Derivation (80) illustrates how such a rule would work:

(80)

[á [á [and ek a	
↓	Cycle 1 - no rules apply
	Cycle 2 - Raising
——á and ék a	
↓	Cycle 3 - no rules apply
	Post-cyclic spreading
á á ánd ék a	
↓	Vowel coalescence
áándéka	'he has just written'

This putative rule of post-cyclic spreading, which we shall baptise Adjacent Assimilation, would be formulated roughly as:

(81) Adjacent Assimilation:

$$V \longrightarrow \alpha H \; / \begin{bmatrix} V \\ \alpha H \end{bmatrix} \_\_\_\_$$

and it would apply iteratively.

If the only advantage of a rule of Adjacent Assimilation were that it rendered more elegant the formulation of vowel coalescence, it would have little justification. However, it has at least one other advantage. It would enable us to adopt the simpler of the alternative formulations of Dissimilation given in (76a) and (76b) above. Consider the partial derivation below of the form 'he spread':

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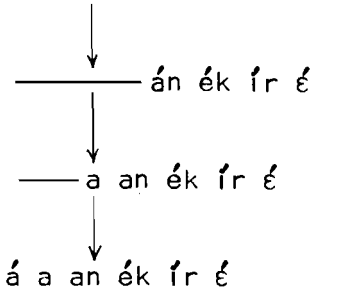
[18] which was the gift of Herb Stahlke.

(82) [á [a [án ek ír é



Cycle 1 - Raising

án ék ír é

Cycle 2 - Lowering

a an ék ír é

Cycle 3 - no rules apply

á a an ék ír é (intermediate string)

Raising on Cycle 3 has no effect in this form, for the syllable it would affect (i.e. ék) already has H tone. The final output for this string is ááánekíré, indicating that Dissimilation has applied to lower the extension ék. If Dissimilation is to apply to the intermediate string produced in (82), it will have to mention in its SD both the presence of a prefix and of a H tone pronoun. That is, we would have to accept the formulation given in (76b). This formulation would claim that the tone of the prefix itself is not relevant to the application of the Dissimilation rule. Consequently, Dissimilation would not be expressed as a genuine process of dissimilation. Yet we know that in every case where a prefix is preceded by a H tone pronoun, that prefix will end up with H tone either through Raising or through vowel coalescence. In other words, in surface forms, a syllable which undergoes Dissimilation is, in fact, preceded by a prefix with H tone and followed by a H tone. This generalization is missed in the formulation of Dissimilation given in (76b) and repeated here as (83):

(83) $H \rightarrow L \; / \; \begin{bmatrix} +pro \\ +H \end{bmatrix} \; [+pref] \; V_0^n \; C \; \_\_\_\_ \; H$

Adopting the environment in (83) is tantamount to looking ahead in the derivation and saying that when a prefix is going to have H tone, Dissimilation occurs. The environment we wish to state is that given in (76a) and repeated here as (84):

(84) $H \rightarrow L \; / \; \begin{bmatrix} +pref \\ +H \end{bmatrix} \; V_0^n \; C \; \_\_\_\_ \; H$

Derivation (82) showed this formulation is impossible if the prefix a does not have H tone at the point at which Dissimilation applies. Supposing, however, that the putative rule of Adjacent Assimilation applied to the intermediate string á a an ék ír é produced in (82) prior to the application of Dissimilation. It would turn the intermediate string just quoted into á á án ék ír é. That is, the prefix a would acquire H tone prior to the application of Dissimilation, but after the assimilation cycle. Then Dissimilation could be formulated as in (84) and the correct claim would be made. We have, then, at least two reasons for postulating a post-cyclic rule of Adjacent Assimilation. First, the vowel coalescence rule will not have to make tonal adjustments, and secondly, a misleading environment for Dissimilation is avoided. More important than these two mechanical considerations is the claim that in a correct analysis the tonal consequences of vowel adjacency are to be regarded as distinct from the segmental ones. This claim is made in the expectation that more evidence will be revealed in support of the hypothesis that tonal features and segmental features may be distinct and may operate in different ways.

In point of fact, once this separation of the tonal consequences from the segmental consequences of vowel coalescence is accepted, it becomes less relevant whether the segmental alterations of vowel coalescence are effected pre- or post-cyclically. If the segmental alterations were to be made pre-cyclically, some way would have to be found to preserve the morpheme boundaries holding between the adjacent vowels in strings like the one in (82) in order that the correct number of cycles be triggered. In fact, it does not seem impossible that the changes in vowel quality and syllabicity resulting from vowel coalescence in Kikuyu be effected pre-cyclically without destroying the morpheme boundaries which condition the cycles. This providing we are willing to accept the existence in Kikuyu of non-syllabic entities which are tone-bearing units and have the status of morphemes. But the tonal consequences of vowel coalescence clearly could not be effected pre-cyclically in strings like (82), since the

cycle works with the underlying tone of each morpheme. The post-cyclic rule of Adjacent Assimilation would have to remain in such an analysis, and any pre-cyclic rule of vowel coalescence would necessarily be unable to make tonal adjustments.

The Adjacent Assimilation rule does not eliminate the problem encountered earlier with regard to Dissimilation and Raising, that is, the fact that both must skip over adjacent tone-bearing units and thus cannot be treated as true spreading phenomena. This is not a trivial problem. In the environment we have adopted for Raising, that is, H $V_0^n C$ ____ ⟨L⟩, the mention of the intervening vowels is ⟨-stem⟩ tantamount to a statement that the rule does not affect vowels which are going to undergo coalescence, i.e. tone-bearing units which are going to cease to be tone-bearing units. There should be some simple way of expressing this generalization--it is not, after all, an unusual constraint--without sacrificing the statement of Raising as a spreading phenomenon. Having come up with no feasible alternatives within the present theory, I am forced to accept the less than satisfactory formulations of Dissimilation and Raising given in (73) and (74) and repeated in (85):

(85a) Raising:

$$L \dashrightarrow H \;/\; H \underset{\langle \text{-stem} \rangle}{\quad} V_0^n \; C \;\_\_\_\; \langle L \rangle$$

(85b) Dissimilation:

$$H \dashrightarrow L \;/\; \begin{bmatrix} +\text{pref} \\ +H \end{bmatrix} V_0^n \; C \;\_\_\_\; H$$

10. Conclusion

In this paper, the view has been presented that Kikuyu has a two-level terrace-tone system characterized by the fact that, in affirmative verb-noun constructions at least, an underlying syllable is tonally assimilated to a preceding syllable under certain conditions. It has been proposed that the rules governing this assimilation operate cyclically, morpheme by morpheme from right to left across the string.

A post-cyclic rule of Dissimilation, operating in a highly specific environment has been postulated. The interaction of these rules with processes governing adjacent vowels was examined and a second post-cyclic rule governing the tonal consequences of vowel adjacency was proposed. Finally, an inadequacy in the formulation of Dissimilation and Raising was pointed out in the hope that a more revealing statement of these processes, and of the difference between them and Lowering, may be arrived at. The question of why the tonal system of Kikuyu should be weighted in favour of the preservation of underlying H tones in the first place was left in the lap of the reader.

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RULE INVERSION IN CHADIC[1]

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1. Introduction

In Vennemann [to appear] a mechanism of grammar change, called rule inversion, is described. Reduced to essentials, rule inversion takes place when a historical change *A > B / X___Y is reflected by a synchronic rule B --> A / X___Y. This will typically be the case when the environment conditioning the change *A > B appears in a lexically basic form, e.g. the singular of a noun, but not in a less basic form, e.g. the plural of a noun. The etymologically original A will alternate with the derived B, but since the A alternate appears in the "conceptually more complex morpho-syntactic category" (Vennemann [to appear], p. 4), the B alternate will be taken as basic and A will be derived synchronically from it.

The principal empirical evidence for the existence of rule inversion comes from linguistic changes which take place after the original change(s), but which would have no conceivable motivation if the synchronic rules replicated the original diachronic process(es). The main such subsequent changes are regularization of an alternation and loss of an alternation.[2] Suppose that both t and k palatalize to č in singular forms but are retained in plurals. If the synchronic rules continued to derive the č's in singulars from underlying t and k respectively, we would expect the alternations to remain stable. It is frequently the case that such alternations do not retain their etymological patterns, however.

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[1]I would like to thank Theo Vennemann for encouraging me to write this paper. It is through discussions with him that I have begun to make sense of the syncrhonic alternations described here. I would also like to thank Paul Newman for furnishing me with a manuscript of his forthcoming monograph, The Kanakuru Language. Professor Newman was also kind enough to make comments on an earlier version of this paper.

[2]Andersen [1969] has called the process of regularizing an alternation under these circumstances extension of a morphophonemic process. He has called retrenchment and eventual loss of such alternations curtailment of a morphophonemic process.

The rule inversion hypothesis claims that in the synchronic grammar, after the sound changes have taken place, there are two inverse rules which derive the plural alternates from the singulars, viz. č --> k and č --> t. Note, however, that formulated as inverse rules the alternations of some č's with k and others with t creates a conceptually anomalous situation. That is, there is nothing in the synchronic facts to tell the speaker of this language why some č's alternate with t and some with k. Conceptual anomalies are part of the basis of linguistic change. The anomaly will be resolved either by regularization of the alternation such that č always alternates with t or k but not both, or by disappearance of the alternation altogether and extension of č to all lexically related forms. In fact both types of change are observed.

In what follows, I will describe a number of cases of rule inversion resulting from consonant changes in two Chadic languages, Kanakuru and Hausa. The Kanakuru sound changes are described in Newman [1970], and a synchronic Kanakuru phonology is found in Newman [1973]. I have described the sound changes themselves as occurring in somewhat wider environments than given in Newman [1970] through extrapolation from the synchronic account. The synchronic account suggested here does not differ in essentials from that given in Newman [1973]. It should be pointed out that Newman had already formulated the synchronic Kanakuru phonology as requiring inverse rules purely on internal grounds before rule inversion was elaborated as a bona fide and widespread type of language change.

The Hausa sound changes described here were first systematically laid out in Klingenheben [1928]. I have gleaned further data relevant to these changes from standard Hausa references, particularly Bargery [1934] and Abraham [1962], as well as from my own work on Hausa. To my knowledge, this is the first discussion suggesting that the synchronic alternations in Hausa must be accounted for by inverse rules.

2. Kanakuru

a. The Kanakuru sound changes

Stop consonants in Kanakuru weakened to corresponding sonorants in phonologically specifiable environments. The etymological stops have yielded the following sonorant reflexes:

(1) *T > r (*T = *ŧ, *d, *ɗ)

*K > ɣ (*K = *k, *g)

*P > w (> ɓ in some dialects) (*P = *p ~ *f, *b, *ɓ)

Certain nouns and verbs, while undergoing the expected weakening in their singular forms, have retained stops in plural forms with no apparent phonetic motivation. I will return to these alternations after describing the more regular alternations resulting from the sound changes in (1).

The evidence for weakening comes both from comparative evidence and from stop/sonorant alternations in the contemporary language. After specifying the environments in which weakening took place, I will argue that in a synchronic grammar of Kanakuru, all the alternations must be viewed as operating in just the opposite direction from the historical changes, i.e. they are inverse rules.

Newman ([1970], p. 43) states that weakening affected "intervocalic non-nasal obstruents". Judging from synchronic alternations, the intervocalic weakening applied not only to word medial stops, but also to word final stops when followed by a vowel across a morpheme boundary. Word initial stops have not been affected.[3]

(2) *T > r

'to die'	muri	cf. Hausa mutu
'eye'	yero	cf. Hausa idoo
'four'	parau	cf. Hausa fuɗu
'it's not a louse'	woi jaŋkar u	jaŋkat 'louse'

[3]Mysteriously, the change failed to operate in one intervocalic environment, viz. with a preceding short vowel and a following e, e.g. kape 'to sow'. Note the doublet duwi (< *duɣi < *duki) 'to beat' but duše (< *duče < *duke) 'to pound (in a mortar)' (cf. Hausa duuka 'to beat', daka 'to pound (in a mortar)'). Newman [1970] mentions a second intervocalic environment where the change did not operate, viz. before epenthetic ə as in jupəle 'to tumble'. I believe that this ə is without structural import and is needed solely to prevent an obstruent from abutting with a sonorant. This is a common restriction in Chadic languages. Newman notes that these ə's are extremely short.

*K > ɣ		
'to build'	ɗəɣi	cf. Hausa ɗaakii 'hut'
'the okra'	garaɣ-i	garak 'okra'
'blind'	buum < *buɣum	cf. Tangale fugum , Karekare mbugum
*P > w		
'to spit'	ƭuwi	cf. Hausa ƭoofa
'room'	gaawi	cf. Bolanci gabi
'cloud'	awe	cf. Pero yeɓe
'he is not seated'	wo-šii šaraɓ u	šii šarap 'he is seated'

(This last example is from a dialect where *P > w > ɓ .)

Weakening also took place in certain non-intervocalic environments. In particular, the second of two abutting consonants became sonorant. Again, word initial stops were not affected, but initial stops in certain enclitic suffixes, especially pronouns, were weakened since these enclitics are phonologically part of the word to which they are suffixed. Synchronically, the sonorant alternates in these enclitics appear only if the preceding consonant disagrees with respect to the feature [coronal], i.e. *T > r only after labials and velars, *P > w and *K > ɣ only after alveolars.

(3)			
	'to buy'	ɗibəre[4]	cf. Ngizim ɗəbdə 'to sell'
	'he washed (it) for her'	a joɓ-ro	but a pan-ƭo --> [pando] 'he transplanted (it) for her'
	'he cured her'	a jaŋ-re	but a al-ƭe --> [alde] 'he saw her'
	'wing'	bobuwa[4] < *bobuɣa	cf. Hausa fiffikee
	'your hand'	ar-wo < *ar-ɣo	but a ɓak-ke 'he ignored you'

[4]As noted in fn. 3, the ə (--> u in the env. of w) probably has no structural significance. It was introduced after, or as part of, the weakening of the stop which it precedes.

'he saw you'	a aɪ-ɣe	but a jaŋ-ke --> [jaŋge] 'he cured you'
		a dup-ko 'he mixed (it) for you'
		a wum-ko --> [wumgo] 'he rubbed (it) for you'
'fish'	širuwo[4]	cf. Lame kirvi

(By an accident of Chadic history, there are no enclitic suffixes beginning with a labial stop which would be subject to the p/w alternation.)

Some syllable final stops have also been subject to weakening[5] *T > r before [-coronal] consonants. This has taken place both within words and across word boundaries.

(4)	'stones'	guwar-ŋgin	guwaɬ 'stone'
	'he stole a bow'	a šir pek	but a šiɬ ɬiŋa 'he stole a sheep'

*K > ɣ in some syllable final environments, e.g. gumbaɣla 'toad', yaɣjək 'sifting', yiliɣ-no 'my tongue'. However, there are conflicting examples, e.g. a duk-ro 'he beat (it) for her', a šak-ɬəru 'he founded it', a ɓak lowei 'he ignored the boy'. The conditions which caused or prevented weakening here are obscure.

I have found no examples of p/w alternates in syllable final position. Only the p variant appears.

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[5]Before nasals the following alternations occur (obligatorily within words, optionally across word boundaries):
*T > n / ___ [+cor, +nas], e.g. ar- 'hand' + ni 'his' --> [an-ni], a kuɬ noki or a kun noki 'he refused his mother' but ar-mai 'your hand';
*K > ŋ / ___ [-cor, +nas], e.g. *a ɓak-mai --> [a ɓaŋ-ŋai] 'he ignored you (pl)' but yiliɣ-no 'my tongue'; *P > m / ___[+nas], e.g. *a duw-no --> [a dum-no] 'he mixed (it) for me', a ɬup mori or a ɬum mori 'he spit the oil'. More investigation will be required to discover whether the historical process producing these alternations went through a development *stop > sonorant > nasal or whether the stops were changed directly into nasals as a sub-part of the overall weakening process. These nasal alternations are clearly relevant to the subject of rule inversion but they will not be further discussed here.

The above account, with some minor details omitted, summarizes the consonant changes that have taken place in Kanakuru. The interplay between the weakening and non-weakening environments has yielded synchronic alternations. Some such alternations have already been illustrated in (2)-(4). Note also the following paradigms, which show the complex interplay between syllable final and syllable initial alternations:

(5)	arək	'hand'	yilik	'tongue'
	ar-wo < *ar-ɣo	'your hand'	yiliɣ-no	'my tongue'
	at-to	'her hand'	yilik-ko	'your tongue'
	diye-ro	'her grandmother'	bo-wo < *bo-ɣo	'your father'

b. Kanakuru synchronic alternations as inverse rules

In generative phonology, alternations such as those seen above are accounted for by choosing one form as underlying and deriving the correct phonetic output from it by rule. In some cases, synchronic rules may reflect diachronic processes. In the case of Kanakuru, however, the synchronic rules are the inverse of the diachronic process, i.e. whereas diachronically "softening" took place, synchronically the rules producing the alternations noted here are "hardening" rules and the sonorant variants are underlying. We can trace the history of the Kanakuru changes as follows:

Stage I: Stops weakened in the environments described above. Whether weakening took place in all those environments at once or in successive stages is irrelevant for our purposes.

Stage IIa: For the majority of lexical items, sonorants had now replaced etymological stops in the more "basic" syntacto-semantic forms. For example, the verb muri < *mutI 'to die' now had the verbal noun form muru and moreover retained the r in many of its other forms. Only if the r appeared before a non-nasal alveolar would t reappear (verbs in -i drop the final -i when not utterance final so there are utterances where r might abut with another alveolar). The appearance of a historically derived variant in lexically basic forms is the basis for rule

inversion. Thus, the sonorants r, ɣ, and w were now underlying in many lexical items.

For a period, these sonorants probably alternated with the stops from which they were etymologically derived. However, with the sonorants being basic, lexical items had to be specifically marked as to whether the alternation was with a voiced, a voiceless, or a glottalized variant. The alternations were gradually regularized so that in contemporary Kanakuru all the phonological sonorant/stop alternations involve voiceless stop alternates, no matter what they were etymologically, e.g.

(6a)	'neck'	duri	cf. Bolanci dido
	'her neck'	dut-to	
(6b)	'to mix'	duwi	cf. Margi dzaɓə
	'he mixed it for you'	a dup-ko	

(No examples of etymological *g alternating with ɣ have been found.)

Stage IIb: The weakening of stops to sonorants not only resulted in neutralization of original stop contrasts; in the case of *T > r and *P > w, it resulted in neutralization of stops with the pre-existing *r and *w (no *ɣ existed prior to the *K > ɣ change). For a period, the etymological sonorants probably retained their identity by failing to alternate with stops. But non-alternating sonorants needed special lexical marking in the same way that the different stop alternates did, and since such special marking is conceptually anomalous, etymological sonorants were also brought into the sonorant/stop alternation pattern.[6]

(7)	'oil'	mot	cf. Bolanci mor
	'the oil'	mor-i	
	'lice'	jaŋkat	cf. Ngizim jaŋkar
	'not lice'	woi jaŋkar u	

[6]This change of *r > t in word final position is not a "historical sound law" as implied by Newman ([1970] p. 44). It is what is traditionally referred to as an analogical replacement.

'hot'	gərgət	cf. Tera gərgər
'not hot'	woi gərgər u	
'he stole a sheep'	a šit tiŋa	
'stealing'	širi < *čiri	cf. Ngizim kərə

I have not yet identified any examples of etymological w's in automatic alternation with p (but see examples of "hard" plurals below).

In words like mot 'oil', jaŋkat 'lice', etc., final t appears in the citation form (= basic form) of the word, yet this t alternates with r. Such words are not counter-examples to my claim that the sonorant/stop alternation in contemporary Kanakuru is an inverse rule where sonorants are underlying. Word final is a position of neutralization where stops and sonorants cannot contrast either phonetically or underlying. At the deepest level these word final consonants are archiphonemes, unspecified for the feature [sonorant].

We have seen that regarding the contemporary Kanakuru consonant alternations as an inverse rule where sonorant --> stop rather than the historical process stop --> sonorant explains the regularization of the alternations giving only voiceless stops as alternates of sonorants. It also explains why etymological sonorants now alternate with stops.

Consider now the following sentences:

(8a)	a wupə-ro	'he sold (it) to her'	(< wupe 'to sell')
(8b)	a gup-ro diɣil	'he forged a hoe for her'	(< guwi 'to forge')
(8c)	ši kukə-mai	'he is learning (it)'	(< kuke 'to learn')
(8d)	ši duŋ-ŋai	'he is beating it'	(< duɣi 'to beat')
	(cf. also a duk-ro	'he beat (it) for her')	

If we were to take the stops as underlying in all cases and derive the sonorants from them, there would be no way to distinguish the medial consonant in the verb root in (8a) from that in (8b) and the medial consonant in the verb root in (8c) from that in (8d) for the purposes of

epenthetic ə insertion. The presence of ə after the medial consonants of the verbs in (8a) and (8c) results from a condition on the formation of words in Kanakuru preventing obstruents from abutting with sonorants (cf. fn. 3). Likewise, by not distinguishing k and ɣ underlyingly, we would have no way to predict which words have velars which assimilate to a following nasal, as seen in (8d).

The inverse rules just described are of particular interest since they exemplify inverse rules that have become productive phonological processes. More typical are inverse rules which level variability in alternations but remain restricted to specific lexical items. Kanakuru also has such lexically speicific inverse rules. Certain nouns and verbs have plural forms which replace a sonorant in the singular with a stop in the plural. (Plural verb forms are used with transitive verbs which have plural objects and with intransitives which have plural subjects.)

(9)

Verbs	Singular	Plural	
'to tie'	ɗowe	ɗope	cf. Hausa ɗamre
'to shoot'	boi < *buwi[7]	bupe	cf. Karekare basa
'to get out'	pui < *puwi	pupe	cf. Ngizim fuwə
'to die'	muri	muti	cf. Hausa mutu
'to go out'	pori	poɗe	cf. Hausa fita
Nouns			
'father'	boŋ	bopin	cf. Hausa uba
'chicken'	yaawe	yaapiyan	cf. Tangale yaɓɛ
'gazelle'	šere	šeɗiyan	cf. Dira kite 'duiker'
'shoe'	taa < *taya	takin	cf. Hausa taaka 'to step on'
'duiker'	boo < *bowo	bokiyen	cf. Tangale bɔɓo, Kofyar paap

An explanation for why stops in plurals were not always changed to sonorants as they were in the singular awaits discovery. It is clear,

[7]Besides the sound changes described here, Kanakuru also underwent a change which converted all alveolar and alveo-palatal spirants to y (--> w in the env. of a round vowel). See Newman [1970].

however, that singulars characterized by "soft" consonants which are paired with plurals characterized by "hard" consonants represent an old alternation pattern, not a new development. Were the alternations a new development (a rather implausible hypothesis under any circumstances), we would expect the hard/soft alternations to be perfectly regular. But whereas most r's in the singular alternate with ɗ's in the plural, in the word 'die' (< *muti), we find r alternating with t. The odds are vanishingly small that Kanakuru speakers would single out this one word for an r/t alternation rather than r/ɗ, where this one word is one where it happened that the etymological stop which yielded r was *t. We can only assume that the t in the plural alternate of 'die' is a historical retention and that ɗ's in plurals where the etymological consonant is not *ɗ (e.g. the word for 'to go out') are recent replacements occasioned by what has traditionally been called analogical leveling.

Other evidence that "plural hardening" is an old alternation is seen in the following singular/plural pairs miyo 'wife' (pl) mišan, and tiŋa 'sheep' (pl) tiŋgan (cf. Ngizim təmaaku). The alternation seen in 'wife' is the only synchronic survival reflecting a sound change *S > y in all environments (cf. fn. 7). The non-existence of s/y alternates elsewhere in the language precludes the possibility that Kanakuru speakers could have formed the plural mišan as a later analogical development, since there is no model for it.[8] The ŋ/ŋg alternation found in 'sheep' is likewise an alternation not found elsewhere in the language.

It is equally clear that the sonorant/stop alternation between singulars and plurals is an inverse rule in contemporary Kanakuru. First, the stops found in the plurals do not always reflect their etymologies,

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[8]Paul Newman, in personal communication, has suggested that the y in miyo may etymologically be *y, cf. Ngizim mai 'mother'. This does not affect the argument here but only complicates the facts. The y/š alternation in the word for 'wife' must date from a time when not only were there sonorant/stop alternations in singulars and plurals, but also some plurals having y/alveolar fricative alternations. It would not be unexpected for the latter alternation to spread to words where the y was not etymologically *S in the same way p has now spread so as to alternate with w's which are from etymological *w (as in the word 'to get out' in (9)), not etymological *P.

as can be seen in the examples in (9). In fact, with the exception of the verb 'to die', where r alternates with ɬ, the alternations are always w/p, r/ɗ, and ɣ/k.[9] Second, plural hardening in Kanakuru is typical of many inverse rules in that it involves an alternation which is both phonetically unmotivated and requires arbitrary marking of those lexical items which undergo it. Such rules are subject to replacement by more regular processes which do the same semantic or syntactic work. Newman [1970, 1973] does not mention alternates to the "hard" plurals. However, in the Kanakuru list in Kraft [to appear], all words given with hard plural forms are also given with a non-hardened variant using a suffix -ŋgin, e.g.

(10)	'hen'	yaawe	yaapiyen or yaawiŋgin
	'gazelle'	šere	šeɗiyen or šereŋgin
	'bow'	ruɣa	rukən or ruwaŋgin
	'billy goat'	buuɬ < *buɣuɬ	bukərin or buriŋgin

Of the plural form in -ŋgin, Newman ([1973], p. 7-1) says, "This is by far the most common plural suffix and also the most productive at present, as evidenced by its use with recent loanwords." We can add that its productivity is further evidenced by its use as a replacement for plurals formed in more conservative speech by an inverse rule.

To summarize, Kanakuru has undergone massive weakening of stops to corresponding sonorants, but the weakening occurred only in specific environments, the result being stop/sonorant alternations in the contemporary language. The synchronic rules must all be considered <u>inverse rules</u> for a number of reasons: loss of etymological contrasts in stops alternating with sonorants, extension of alternations to words containing etymological sonorants, replacement of "hard" plurals with more regular plural forms containing sonorants.

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[9]Between identical vowels, ɣ has been lost. We therefore see in some cases that Ø alternates with k (ɬaa/ɬakin 'shoe'). In the word for 'duiker', k now alternates with Ø where Ø < w < *ɓ between two o's. As a general rule, however, w < *P or *w has not been lost between identical vowels (cf. [kowoɬ] 'mucous').

The inverse rules are all morphophonemic in the sense of Vennemann [to appear] and Andersen [1969]. However, they are of two types: the first involves productive alternations which take place in (morpho)phonologically specifiable environments (environments mentioning only segments and/or boundaries but not lexical categories or specific lexical items). Though the original phonetic motivation for this rule (weakening of stops) has been lost, the rule has become stabilized and has even been extended to sonorants not originally part of the alternation. I should point out in passing that the fact that the rule was extended because of conceptual motivation (reduction of irregularity), not phonetic motivation (a natural process of obstruent weakening), is the evidence that the rule is no longer phonological, but rather morphophonemic (see Vennemann [1971] for discussion of changes involving conceptual as opposed to phonetic processes).

The second type of alternation yields stops in plural forms corresponding to sonorants in singulars. The alternation is being curtailed as can be seen by the replacement of "hard" plurals by more regular plural types.

The reason for extension in the one case and curtailment in the other is clear, viz. the former operates unexceptionally in the appropriate environments while the latter requires special lexical marking on the items undergoing the alternation.

3. Hausa

Hausa has undergone a series of sound changes weakening consonants to the corresponding sonorants in syllable final position. The entire series of changes is now generally referred to as Klingenheben's Law since the changes were first systematically described in Klingenheben [1928]. The changes which took place are as follows:

(11) $*K > w \;/\; \_\_\_\$$[10] $\quad (*K = *k, *g, *\hat{k})$

[10] The symbol $ represents a syllable boundary. Since no more than two consonants can occur in sequence in Hausa, the environment / ___$ abbreviates / $\_\_\_\left\{\begin{matrix} C \\ \# \end{matrix}\right\}$.

*T > r̃ / ___$ (*T = any alveolar obstruent; r̃ = "trilled r", which contrasts phonetically with r, a "retroflex flap")

*P > w / ___$ (*P = *p ~ *f, *b, *ɓ, *m)

We know from dialect evidence that these changes happened historically in the order from top to bottom in (11), since the latter changes have only partially taken place or have not taken place at all in some dialect areas (cf. Klingenheben [1928], Schuh [1972]). We will be concerned here only with the dialect where the entire series of changes is complete.

Evidence for the changes is found in synchronic alternates, dialect variants, and comparative evidence. (In conformity with the standard orthography, syllable final w will be represented u):

(12) *K > w

'poverty'	talaucii	cf. talaka 'poor person'
'a twin'	batauyee	cf. tagwaaye 'pair of twins'
'tusk'	hauree	cf. hakoorii 'tooth'

(13) *T > r̃

'Audu's gown'	riiga-r̃ Audu	cf. ta Audu 'that of Audu, Audu's'
'to count'	kirga < *kir̃ga	cf. kididdiga 'to reckon'
'five'	biyar̃	cf. Karekare baadu
'pagan'	ar̃nee	cf. dialectal asnee

(The alveolar fricatives s and z have usually not changed before labials or velars, e.g. askaa 'razor', cazbii 'prayer beads' in all areas.)

(14) *P > w

'barking (of dog)'	haušii	cf. dialectal hapšii or hafšii
'needle'	alluur̃aa	< Arabic 'al'ibra
'to sit'	zauna	cf. zama 'to remain'; dialectal zamna

'mosquito'	sauroo	cf. dialectal sabroo or samroo

In the dialect in question, *m > w only before sonorants (cf. the last two examples). Before obstruents, *m remains nasal but assimilates to point of articulation: ranta 'to lend' (cf. dialectal ramta); ʤiŋkii 'sewing' (cf. dialectal ʤimkii). Word final, m is retained or else becomes ŋ, e.g. mutum or mutuŋ 'person'.

Klingenheben's Law applied only to syllable final consonants. There are in Hausa a number of morphological processes which insert vowels between abutting consonants. When the first of the abutting consonants is one which was weakened by Klingenheben's Law, insertion of a vowel between the consonants results in alternation between a sonorant and the corresponding obstruent (or nasal in the case of m). The most common alternations of this type are found in plurals formed by insertion of -aa- between medial abutting consonants (usually accompanied by change of the final vowel of the singular to -ee). Thus, we have a singular askaa 'razor' with a corresponding plural asaakee where there is no alternation, but with ɓaunaa 'buffalo' we find the plural ɓakaanee, giving evidence that the singular is from *ɓaknaa.

In traditional generative grammar, such alternation could easily be accounted for by having underlying k with a synchronic rule to yield w exactly as the diachronic event did. This would be wrong. Note first of all, that to set up underlying /ɓaknaa/, we would have to set up an abstract form that would be impossible as a phonetic form because of the syllable final /k/. While we would not want to rule out, a priori, all abstract underlying forms, we should always ask whether such abstractions are established because of the realities of the language or because of the linguist's pursuit of elegant solutions. In the present case, there is good evidence that underlying /k/ in ɓaunaa and other words in (12) and (15) is not a reality of Hausa. In the first place, the way that contemporary Hausa deals with syllable final velars introduced in borrowings or resulting from productive derivational processes is not to change them to [w], but to completely assimilate them to the following

consonant, i.e. the phonetic result is a geminate consonant. This is seen in borrowings, e.g. lacca English 'lecture', littaafii 'book' Arabic al kitābi, and in reduplicated forms, e.g. daddaka 'to pound well' < daka 'to pound (in a mortar)', bubbuga 'to beat well' < buga 'to beat', etc. (cf. kaŋkaama 'to catch (many)' < kaama 'to catch').

Stronger evidence that underlying /k/ in baunaa is not a synchronic reality in Hausa is seen from the direction of changes observed in the formation of plurals. The language is losing those plural forms where obstruents alternate with sonorants. Thus, a common alternative to the plural bakaanee is baunaayee. (In this type of plural, if the first syllable has a long vowel nucleus, -aa- is found after the medial consonant and a suffix -yee is added.)

In a synchronic grammar of Hausa, the alternates reflecting Klingenheben's Law must be accounted for by an inverse rule which derives obstruents from sonorants. As in Kanakuru, the Hausa alternations are typical of inverse rules in that the historically derived variant is found in the lexically basic form (here, the singulars of nouns). Further, these inverse rules in Hausa require special lexical marking for items undergoing them and express an apparently arbitrary phonological relationship (underlying w may become [k, g, ƙ, or w] depending on the word). Clearly, such rules are conceptually undesirable and we would expect the language to eliminate them just as Kanakuru is eliminating its hardened plurals.

Following are a few more examples of singulars containing a sonorant derived historically from an obstruent (or m) via Klingenheben's Law. Plural types other than the -aaCee type are included. In the word for 'trader', I know of no regularized variant.

(15)

	Singular	Plural		Regularized plural
'heart'	zuuciyaa	zukaatàa	or	zuuciyooyii
'Tuareg'	buuzuu	bugaajee	or	buuzaayee
'trader'	faƙkee	fatàakee		?

	Singular	Plural	Regularized plural
type of tree	kař̃goo	?	kař̃aagee[11]
'rubbish heap'	juujii	jibaajee or	juujaayee
'young man'	saurayii	samaarii or	saurii

Further evidence that these alternations must be accounted for by inverse rule is seen in the word gwauroo 'bachelor' which has the plural alternates gwauraayee and gwagwaaree. This second alternate has to be an analogical reformation resulting from the neutralization of *P and *K in syllable final position. The -u- in gwauroo comes from *P, not *g, as can be seen in the dialect variants gwabroo or gwamroo.

Whereas the evidence in Kanakuru indicates that all sonorant/stop alternations should be accounted for by inverse rules, the situation is not quite so simple in Hausa. Consider the following forms:

(16)				
	fař̃kee	'trader'	fataucii	'trading'
	sarkii	'emir, king'	sarautaa	'ruling'
			sarauniyaa	'queen'
	kuturuu	'leper'	kutuř̃taa	'leprosy'
	makaafoo	'blind man'	makauniyaa	'blind woman'

In these examples, the etymologically older consonant appears in the lexically basic form while the corresponding sonorant is seen in the derived forms. (In the word for 'trader' we are concerned with the k/w correspondence, not the ř̃/t one also found here.) I argued above that the alternate in the less basic form, say the t in the plural fataakee, should be derived from the alternate in the basic form, here, the ř̃ in the singular, fař̃kee. Following the same line of argumentation, it appears that the syllable final -w- in the less basic fatauci should be derived from the underlying k in the basic form, fař̃kee. Such a synchronic rule k --> w / ___$ would exactly parallel the diachronic event.

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[11] Although neither Abraham [1962] nor Bargery [1934] give a plural alternate *kaTaagee, it is certain that the ř̃ here derives from *T. Trilled ř̃ is found only as a result of Klingenheben's Law or in borrowed words. Borrowing is ruled out in this case since other dialects which have l instead of ř̃ as the reflex of *T have kalgoo for this word. These dialects do have ř̃ in borrowings, however, e.g. bař̃kaa 'blessing' (< Arabic) in all dialects.

While the theory being advocated here does not in principle exclude from a synchronic grammar both rules which reflect the direction of a historical change and rules which are the inverse of that change, such a solution must be ruled out for the Hausa examples in (16). Note that if we used a rule k --> w / ___$ to derive faɬauciì from underlying */faƙakciì/, we would have to set up exactly the same type of abstract underlying form that was ruled out above for ɓaunaa. Recall that underlying /ɓaknaa/ was ruled out because a /k/ --> w analysis in this instance is supported neither by productive synchronic rules affecting syllable final velars nor by change in plural forms observed in the language.

In fact, it is not uncommon in languages to find what we may call lexical correspondences. These are sets of words which are etymologically related, but which can no longer be related by synchronically generative rule. Such lexical correspondences may result from extensive borrowing from related languages or borrowing from an earlier period in the history of the language. Thus, we find pairs like English 'foot'/'ped-al' and 'father'/'pater-nal' where f- and p- form lexical correspondences. Lexical correspondences may also result from earlier phonological alternations which have lost their productivity,[12] leaving pairs of lexical items which are no longer relatable by rule in the synchronic grammar. Thus we have English 'drink'/'drench' and 'stink'/'stench'. Hausa pairs like faƙkee/faɬaucii are of the latter type.

At present, I have no firm notion about how such pairs of lexical items should be related in a synchronic grammar. Although we would like to show that faƙkee and faɬauciì are lexically related in a way that, say, faƙkee and kaasuwancii 'trading' (< kaasuwaa 'market') are not, it is apparent that we do not want to relate them by generative rule. To state such relations, Vennemann [to appear] has proposed what he calls via rules. These are rules of the form 'x is related to y via z' where

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[12]The rule relating ɓaunaa to ɓakaanee, etc. is not productive either, in the sense that it would not apply to borrowings, for example. It is generative, however, in the sense that it is a morphophonemic rule relating morphophonemic alternates in a systematic way.

x and y are lexical correspondences of the type being discussed and z is a statement of a correspondence. Thus, z may state a correspondence k --> w ("k corresponds to w") by which we can relate fařkee and fataucii without deriving the latter directly from the former. Note that this theory implies a lexicalist view of grammar, such as that outlined in Chomsky [1970]. Thus, the words fařkee and fataucii would both appear in the lexicon and would be related by statements of lexical correspondence, not generative rule. Since this is the case, the t in fataucii could not be derived from ř by the generative inverse rule I proposed above any more than w can be derived from k. We will therefore need a via correspondence ř --> t, identical in form, but not in function, to the generative rule deriving the plural form fataakee from fařkee.

Obviously, these claims about how fařkee and fataakee are related are not nearly as elegant as would be a solution where the two words were derived from underlying /fatkee/ and /fatakcii/ (or better, /fataktii/) by generative synchronic rules which add shafts to the arrowheads of Klingenheben's Law. But evidence of the type given in favor of rule inversion, and also evidence from semantic change, as, for example where the etymologically related forms, hauree and haƙoorii now mean 'tusk' and 'tooth' (cf. (12)), demonstrate that elegant solutions which recapitulate historical facts are not always the solutions most in accord with evidence afforded by synchronic states.

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TONE-VOWEL HEIGHT CORRELATION AND TONE ASSIGNMENT IN THE PATTERNS OF VERB AND NOUN PLURALS IN HAUSA[1]

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0. The purpose of this paper is twofold: (a) to formulate a set of rules which determine the assignment of tones in the patterns of verb and noun plurals; and (b) to discuss the relationship between the tone of the final vowel and the degree of the vowel height, in other words, the relationship between the suprasegmental and segmental features in the final syllable of verb and noun plurals in Hausa.

It will be shown in particular that the height of the tone on the final syllable corresponds with the phonetic quality of the vowel. At the same time the quality of this final vowel together with the corresponding tone determine the presence or absence of tonal contrast or tone spreading in the patterns of verb and noun plurals in Hausa.

0.1. I have chosen [+H] and [-H] symbols to indicate the pitch height; [+H] for a high tone, [-H] for a low tone. Throughout this paper the marks ´ and ` are used to designate high and low tones respectively. As syllables are juxtaposed in speech the tones of a word could be the same, e.g. háalíi 'character', or could be different, e.g. dóokìi 'horse'; in this case a tonal contrast is present in the pattern. The tonal contrast is shown by a connecting line: ⌉_ for a high-low tone sequence, and ⌊‾ for a low-high tone sequence.

0.2. The rules proposed in this paper are based on high, mid, rounded distinctive features for vowels:

	i	e	a	ɔ	u
high	+	+	-	+	+
mid	-	+	-	+	-
rounded	-	-	-	+	+

[1]The work on this paper was completed in the Phonology Laboratory at the Department of Linguistics, University of California, Berkeley. I wish to express my gratitude to Professor William S-Y. Wang who made the facilities of the laboratory available for this research, encouraged me in my work and commented on the original version of it. I am also indebted to Mr. Robert Krones for his patience and kind help in the use of the Linc-8 computer, Hardware Pitch Extractor, by means of which this study became implemented.

0.2.1. I find it useful to divide all Hausa vowels into [+high] and [-high]. I wish to stress that I am introducing this division solely for the needs of this paper. While [+high] vowels can be subdivided into [+mid] /e,o/ and [-mid] /i,u/ vowels, the feature [-high] can be attributed to the vowel /a/ only.

0.2.2. The feature [mid] is opposed to other more "extreme" vowel heights like 'pure' high and [-high] vowels. In addition the feature [mid] in correlation with the feature [rounded] is responsible for the tone spreading in the pattern.

0.2.3. The feature [rounded] was chosen to differentiate both the [+high, -mid] vowels and [+mid] vowels. The [+high, -mid] vowels are [+rounded] /u/ and [-rounded] /i/. As final vowels at the suprasegmental level they function in the same way: both have [+H] tone. At the segmental level, however, [-rounded] /i/ palatalizes certain preceding consonants, while [+rounded]/u/ labializes them.

Appearing as final [+mid] vowels, [+rounded] /o/ and [-rounded] /e/ function differently at both levels. At the segmental level the [-rounded] /e/ palatalizes certain preceding consonants; the [+rounded] /o/ labializes them. At the suprasegmental level they differ again. The [-rounded] /e/ behaves as a "pure" [+high] vowel: it appears with the [+H] tone, and causes the tonal contrast in the pattern just as the other "extreme" ([-mid]) vowels do. The [+mid, +rounded] vowel /o/ causes the tone to spread within the pattern. From this point of view the [+mid, +rounded] vowel /o/ differs from all other vowels.

0.3. The sumbol [S] is used to represent any possible kind of syllable: with short vowel CV, with long vowel CVV, or closed syllable CVC. It should be noticed that every syllable in Hausa begins with a consonant.

Since I am discussing in this paper the correlation of the tone and vowel height it seems to be appropriate to combine the suprasegmental and segmental features into a single matrix: suprasegmental features are written with capital letters, segmental features with lower-case ones.

1. The verb

1.0. To exemplify the rules and above mentioned correlations the following paradigm of endings and tone patterns of monosyllabic, bisyllabic, trisyllabic, and quadrisyllabic verbs in all Grades (1-7) and Forms (A,B,C) has been composed:[2]

	Grade	1	2	3	4	5	6	7
	endings	-aa	-aa/-ii	-a	-ee	-ar	-oo	-u
Form A	1 syl.		–		–		–	
	2 syl.	⌐	⌐	⌐	⌐	– –	– –	⌐
	3 syl.	⌐¯	⌐¯	⌐¯	⌐¯	– – –	– – –	⌐¯
	4 syl.	–⌐¯	–⌐¯	–⌐¯	–⌐¯	– – – –	– – – –	–⌐¯
	endings	-aa	-ee/-ii		-ee	-ar+da	-oo	
Form B	1 syl.		⌐⊖					
	2 syl.	⌐⊖	⌐⊖		⌐⊖	– –	– –⊖	
	3 syl.	⌐¯⊖	–⌐¯⊖		⌐¯⊖	– – –	– – –⊖	
	4 syl.	–⌐¯⊖	– –⌐¯⊖		–⌐¯⊖	– – – –	– – – –⊖	
	endings	-a	-i		-e	-ar+da	-oo	
Form C	1 syl.		–			– –	– –	
	2 syl.	⌐	⌐		⌐			
	3 syl.	⌐_	_⌐		⌐/⌐_	– – –	– – –	
	4 syl.	–⌐_	– –⌐		–⌐/–⌐_	– – – –	– – – –	

[2]The term Grade was introduced in Parsons [1960:29] for "two or more morpnologically distinct forms which occur only in complementary distribution to one another and represent but a single lexical item." Concerning Forms he writes (Parsons [1960:22-23]): "all transitive verbs in Hausa are characterized by having three potentially distinct forms with following

1.0.1. The tones of object pronouns are designated in the paradigm by a crossed circle. As to the "person-aspect indicator" it plays no role in the assignment of tones in the pattern of the verb. Therefore though it is always required before the verb, it is not included in the paradigm. This absence of a "person-aspect indicator" should not be confused, however, with the verb in imperative.[3]

The case of the intensive form although not distinguished separately in the paradigm, is considered in the rule 3.

1.0.2. Eight rules for the tone assignment in the patterns of the verb are derived from the above shown paradigm:

(1) High tone rule:

$$S \longrightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \# \_\_\_\_ \#$$

(2) Progressive tonal contrast rule:

$$\begin{bmatrix} S_{2/3} \\ -high \end{bmatrix} \longrightarrow \begin{bmatrix} S \\ -\alpha H \end{bmatrix} / \begin{bmatrix} S_{1/2} \\ \alpha H \end{bmatrix} \_\_\_\_ \# \text{ -object}$$

(3) Tone repetition rule:

$$S \longrightarrow \begin{bmatrix} S \\ \alpha H \end{bmatrix} / \_\_\_\_ \begin{bmatrix} S \\ \alpha H \end{bmatrix} S \begin{bmatrix} S \\ -high \end{bmatrix} \#$$

(4) Tone-vowel height correlation rule:

$$\begin{bmatrix} S \\ +high \end{bmatrix} \longrightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \_\_\_\_ \#$$

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distribution: Form A, used whenever there is no object word, Form B, used whenever there is a pronominal object following, Form C, used whenever there is a nominal object following immediately after the verb."

[3]The tone pattern of the verbs in imperative is low-high for bisyllabic verbs, and low-low-high for trisyllabic verbs in all Grades and Forms with exceptions of Grade 1, Form C and Grade 2, Form B which have all tones low. The imperative will not be discussed further in this paper.

(5) Regressive tonal contrast rule:

(a) $S \longrightarrow \begin{bmatrix} S \\ -H \end{bmatrix} / \_\_ \_\_ \begin{bmatrix} S \\ +H \\ +high \end{bmatrix} \#$

(b) $S \longrightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \_\_ \_\_ \begin{bmatrix} S{:}CVC \\ \underline{\quad} \end{bmatrix} \# + \begin{bmatrix} da \\ -H \end{bmatrix}$

(6) Tone spreading rule:

$$S \longrightarrow \begin{bmatrix} S \\ +H \\ +\text{"down-step"} \end{bmatrix} / \_\_ \_\_ \begin{bmatrix} S \\ +high \\ +mid \\ +round \\ +H \\ +\text{"down-step"} \end{bmatrix} \#$$

(7) Tone lowering of [-high] vowel before a noun object:

$$\begin{bmatrix} S \\ -high \end{bmatrix} \longrightarrow \begin{bmatrix} S \\ -H \end{bmatrix} / \_\_\_\_ \# \text{ +noun object}$$

(8) Object pronoun rule:

$$\text{object pronoun} \longrightarrow [-\alpha H] / \begin{bmatrix} S \\ \alpha high \end{bmatrix} \quad \# \_\_\_\_$$

1.1. High tone rule.

(1) $S \longrightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \# \_\_\_\_ \#$

Rule (1) places a high tone on every one-tone pattern verb. This rule applies to all monosyllabic verbs with a one-tone pattern. It also contains the statement restricting the occurrence of the low tone in the one-tone pattern verb: the low tone never occurs in a one-tone pattern verb used with a "person-aspect indicator".

1.2. Progressive tonal contrast rule.

(2) $\begin{bmatrix} S_{2/3} \\ -high \end{bmatrix} \longrightarrow \begin{bmatrix} S \\ -\alpha H \end{bmatrix} / \begin{bmatrix} S_{1/2} \\ \alpha H \end{bmatrix} \_\_\_\_ \# \text{ -object}$

Rule (2) states that with the final vowel [-high] (and without an object) the successive syllables of the bisyllabic and trisyllabic verbs

should be tonally contrasted. Thus:

Grade 1 bisyllabic verb has the pattern +H -H 
Grade 1 trisyllabic verb has the pattern +H -H +H 
Grade 2 bisyllabic verb has the pattern -H +H 
Grade 2 trisyllabic verb has the pattern -H +H -H 
Grade 3 bisyllabic verb has the pattern -H +H 
Grade 3 trisyllabic verb has the pattern -H +H -H 

Two possibilities are exemplified here: (1) the pattern begins with a high tone while the following second tone is low (Grade 1 pattern); (2) the pattern begins with a low tone while the second tone is high (Grade 2 and Grade 3 patterns). In trisyllabic verbs the third syllable is contrasted with the second one. In this way, the pattern of trisyllabic verb begins and ends with the same tone, high or low, according to its Grade. The tonal contrast has a progressive direction. The rule of tonal contrast has a progressive direction. The rule of tonal contrast is obligatory, and characterizes the patterns of Basic Grades (Grades 1, 2, 3) in Form A (without an object).

1.3. Tone repetition rule.

(3) $S \dashrightarrow \begin{bmatrix} S \\ \alpha H \end{bmatrix} \; / \; \underline{\quad} \; \begin{bmatrix} S \\ \alpha H \end{bmatrix} \; S \; \begin{bmatrix} S \\ -high \end{bmatrix} \; \#$

Rule (3) assigns the same tone to the first and second syllables of a quadrisyllabic verb with the [-high] final vowel. The repetition of the tone at the beginning of the pattern with the following contrast of successive syllables demonstrates either that the verb is more than trisyllabic or indicates an intensive form of a trisyllabic verb. In each case the verb has an extended pattern. Thus the pattern of more than trisyllabic verb has to be regarded as extended. An extended pattern begins and ends with the same tone, high or low, e.g. rágárgàzáa [¯⎍⎍] 'to shatter', Grade 1, dùrgùrgúzàa [_⎍⎍] 'to eat much of', Grade 2 verb. Considering the tonal structure, the quadrisyllabic verb and the intensive form of trisyllabic verb have the same four-tone pattern, and the same tone

is spread on the first two syllables, e.g. rágárgàzáa [¯⌄¯] 'to shatter', Grade 1 quadrisyllabic verb, tántámbàyáa [¯⌄¯] 'to make inquiries', intensive form of Grade 1 trisyllabic verb támbàyáa [¯⌄¯].[4]

The analysis of the syllabic structure of Grade 2 verbs (see Pilszczikowa [1969:11-13]) demonstrates that 24 out of the 25 quadrisyllabic verbs are of derivative origin. Both, this analysis, and the current discussion lead to the conclusion that the extended pattern indicates a derivative origin of the verb.

1.4. Tone-vowel height correlation rule.

(4) $\begin{bmatrix} S \\ +high \end{bmatrix} \rightarrow \begin{bmatrix} S \\ +H \end{bmatrix} \; / \; \underline{\quad} \; \#$

1.4.1. Rule (4) states that the tone of the final syllable corresponds with the degree of the vowel height in this syllable. Examples:

Grade 2 Form B,	yáa sàyée shì	'he bought it'
Grade 2 Form C,	yáa sàyí dóokìi	'he bought a horse'
Grade 7 (intr.)	sún tàarú	'they met together'

It should be noticed here that when the [+high, +mid, -rounded] vowel /e/ appears in the final syllable it behaves as an "extreme" vowel in that it receives [+H] tone and causes a tonal contrast as "extreme" [+high] vowels do.

1.4.2. As a special subcase of rule (4), we find (4'):

(4') $\begin{bmatrix} S \\ +high \\ +mid \\ +round \end{bmatrix} \rightarrow \begin{bmatrix} S \\ +H \\ +\text{"down-} \\ \text{step"} \end{bmatrix} \; / \; \underline{\quad} \; \#$

Example:

Grade 6, yáa dáawóo dàgà Nyàméy 'he returned from Niamey'

It is interesting to note that [+H] tone of final [+high, +mid, +rounded] vowel /o/ has a pitch of about 110-115 Hz. while the [+H]

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[4]The intensive form (see Pilszczikowa [1969:19]) is formed by extending the tone pattern of the verb by one more tone. Thus a bisyllabic verb with two-tone pattern becomes trisyllabic and acquires a three-tone pattern, a trisyllabic verb with a three-tone pattern becomes quadrisyllabic and

tone of other [+high] final vowels is about 125-135 Hz.[5] This indicates that the pitch range of the [+H] tone in verbs with the final vowel /ɔ/ is somewhat lower than the [+H] tone in verbs with any other final [+high] vowel. In cases of [+high, +mid, +rounded] vowel /o/ the [+H] tone is influenced by [+mid, +rounded] quality of the vowel. This phenomenon can be regarded as a kind of "downstep" or "new-high". What happens here is an observable effect of vowel quality on the pitch: a correlation of high tone on [+high] vowel; [+H, +"downstep"] tone on the [+high, +mid, +rounded] vowel.

1.4.3. As to the pitch-vowel height correlation, the phenomenon itself is not unknown. In the Foochow dialect of Chinese, high tones morphophonemically raise vowels from low to mid and from mid to high (see Wang [1967]). Different explanations for this phenomenon existing in Foochow and in other languages are suggested. B. Mohr, who discusses the correlation between pitch and vowel height in a general framework, points out the following two tendencies in his explanation (Mohr [1969:23]):

(a) "It has been assumed--and still is, for example, in Ladefoged [1964], Wang [1969 a, b], Lehiste [1969]--that the high tongue position of the high vowels raises the larynx since the tongue is attached to the superior part of hyoid bone, and some of the laryngeal muscles to the inferior part, and that this

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acquires a four-tone pattern, with the Grade remaining unchanged. Compare: HL --→ HLH (káamàa --→ kákkàamáa); LH --→ LHL (nèemáa --→ nènnéemàa); HLH --→ HHLH; LHL --→ LLHL.

[5]Examples: yáa zóo (110, 105 Hz.)'he came'; mún zóo (105, 100 Hz.) 'we came'; súkà zóo (140, 90, 110 Hz.)'they came'; kǐkà dáawóo (140, 90, 110, 80 Hz.)'you (f.) came back'. In cases of nouns with the final vowel /o/ the pitch does not rise higher than 125 Hz., e.g. túuwóo (120, 120 Hz.) 'guinea-corn mush'; wàndóo (92, 120 Hz.) 'pants'; tsóofóo (125, 122 Hz.) 'old'. The exception in the analyzed material was the noun bángóo 'wall' with first syllable closed by nasal; it has 130, 123 Hz. With other [+high] final vowels the pitch on the nouns in isolation rises 130-145 Hz. Compare kǐifǐi 'fish' 146, 137 Hz. Thus the "downstepping" phenomenon takes place both in the patterns of the verb and of the noun in Hausa. The range 80-205 Hz. was employed by a speaker from Dogondoutsi, Niger.

elevated larynx position which stretches these laryngeal muscles is directly reponsible for the increased tension of the vocal folds and the increased rate of vibration.

(b) "Another explanation suggested in House and Fairbanks [1953] is based on the hypothesis that tensions in the tongue musculature during the production of high vowels when the tongue is relatively far away from its neutral position, are conveyed to the laryngeal musculature which in turn controls vocal folds tension. The relative closeness to the neutral position of the tongue during the production of low vowels would allow for a fairly low degree of muscle tension, thus allowing for a smaller degree of vocal fold tension and lower pitch."

In conclusion Mohr [1969:32] expresses an opinion that what has to be assumed is "an as yet unspecified correlation between tongue height and rate of vocal fold vibration to account for the intrinsic pitch levels of vowels."

I would not like to prolong this outline on the diverse approaches to the pitch-vowel height correlation any longer. There is no doubt that suprasegmental and segmental features are interdependent in some languages. Hausa is the case where this phenomenon evidently appears in a peculiar manifestation. To my knowledge in the literature of the subject this problem has not been posed until now. I think that its study can greatly contribute to the better understanding of the entire Hausa tone system.

1.5. Regressive tonal contrast rule.

(5a) $$S \longrightarrow \begin{bmatrix} S \\ -H \end{bmatrix} / \_\_\_\_ \begin{bmatrix} S \\ +H \\ +high \end{bmatrix} \#$$

Rule (5a) states that tones of non-final syllables are contrasted with the tone of the final [+high, +H] syllable. This rule assigns a low tone to all but the final syllable of the verb. In this case the tonal contrast is regressive. (See examples of rule 4.)

It should be noticed, however, that this rule does not apply to Grade 4 verbs. The reason is that Grade 4 verbs do not exhibit their own tone pattern. Instead they utilize the pattern of Grade 1 verbs.

(5b) $$S \dashrightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \_\_\_\_ [\underline{S:CVC}] \ \# \ + \begin{bmatrix} \underline{da} \\ -H \end{bmatrix}$$

The regressive tonal contrast rule in (5b) applies to verbs in Grade 5. It assigns [+H] tone to every syllable of the verb with final closed syllable. The tones of the verb are contrasted with the tone of the particle dà commonly used with verbs in Grade 5, e.g. náa <u>sánád dà</u> shí 'I informed him', náa <u>sánád dà</u> Sani 'I informed Sani'.

1.6. <u>Tone spreading rule</u>.

(6)

$$S \dashrightarrow \begin{bmatrix} S \\ +H \\ +\text{"down-step"} \end{bmatrix} / \_\_\_\_ \begin{bmatrix} S \\ +\text{high} \\ +\text{mid} \\ +\text{round} \\ +H \\ +\text{"down-step"} \end{bmatrix} \ \#$$

Rule (6) applies to verbs in Grade 6. It states that the tone of word-final [+high, +mid, +rounded] vowel /o/ spreads all over other preceding syllables. In other words, the "downstepped" high tone of the final "non-extreme" vowel conditions the tones of all other syllables. The tone spreading has a regressive direction. Thus the rule contains a restriction concerning the occurence of tonal contrast in the pattern with "non-extreme" [+mid, +rounded] vowel.

The term "extreme" in this paper specifies that the pitch level is either far above or below some idealized pitch median, the [-mid] is the case of such vowels. For the feature "extreme" I here utilized Wang's definition of the feature "high" (Wang [1967]).

The rule of tonal contrast (5a) does not operate with final [+mid, +rounded] vowel /o/. It pertains only to cases with "extreme" vowels in the final syllable (see also pp.). From this point of view, the [+high, +mid] but [+rounded] vowel /o/ differs from that of [+high, +mid] but [-rounded] vowel /e/. The latter functions as "extreme" vowel.

1.7. Tone lowering of [-high] vowel before a noun object.

(7) $\begin{bmatrix} S \\ -high \end{bmatrix} \rightarrow \begin{bmatrix} S \\ -H \end{bmatrix} / \_\_\_\_ \#$ +noun object

Rule (7) states that before a noun object the [-H] tone is attributed to the final [-high] vowel of the verb. Here again an evident correspondence between the tone and vowel height appears. It occurs before a noun object and in this case the low tone and the shortening of the vowel in the final syllable of the verb are simultaneous. Compare yáa dánkàrà táabàa (Form C) 'he pressed tobacco down', yáa dánkàráa shí (Form B) 'he pressed it down'.

It should be noticed that the same high-low-low pattern before a noun object is commonly attested for Grade 4 verbs, e.g. dóokìi yáa dáùkè káfàa 'the horse is lame'. In this case the Grade 4 utilizes the pattern of Grade 1. But Grade 4 verbs can also have high-low-high pattern before a noun object thus showing the tendency to keep the same pattern in all Forms as other Secondary and Tertiary Grades. Examples: yáa dáùkée hánkàlínsù 'he hoodwinked them' (Abraham [1962:202]); án kúràashée rúuwáa dàgà ràndáa 'tne dregs of the water were removed from the pot' (Pilszczikowa [1969:16,78]). On high-low-high pattern see more in Parsons [1971/72: 53-54].

1.8. Object pronoun rule.

(8) object pronoun --> [-αH] $/ \begin{bmatrix} S \\ \alpha high \end{bmatrix} \#$ ____

Rule (8) attributes the tone contrasting the degree of final vowel height of the verb to the object pronoun. The high tone is attributed to the object pronoun used with the verb in Grade 1, e.g. yáa káamàa shí 'he seized him'; yáa dánkàráa shí 'he pressed it down'. In this case the final vowel of the verb is [-high]. In turn, the low tone is attributed to the object pronoun used with verbs in Grade 2 and Grade 6, e.g. yáa hàrbée shì 'he shot him'; yáa tàrbàyée shì 'he asked him' (Grade 2 verbs); yáa káawóo shì 'he brought it' (Grade 6 verb). The final vowels of the verbs in

Grade 2 and Grade 6 are [+high]. The contrast between the degree of final vowel height of the verb and the tone of the object pronoun is progressive.

1.8.2. In my opinion the object pronoun in Hausa has to be considered as a verb pronominal suffix in spite of the fact of its separate appearance in writing. According to Abraham [1959] and Wängler [1963] the main stress in Form B in case of trisyllabic verbs is shifted on the syllable before the object pronoun strongly binding the verb and its object pronoun.

It is obvious, and the paradigm on page 401 confirms it, that from the tonal analysis perspective there is no difference between the tone pattern of bisyllabic verbs with their object pronoun (Form B), and trisyllabic verbs of Basic Grades without an object (Form A). A bisyllabic verb with its object pronoun form a three-tone 'triangle' pattern. It is of interest to notice that the bisyllabic verbs in their intensive form have also a three-tone 'triangle' pattern. Hence the three-tone pattern with a 'triangle' shape appears in trisyllabic verbs (Form A), bisyllabic verb plus object pronoun (Form B), and bisyllabic verbs in their intensive form. Examples:

Grade 2 bisyllabic verb + object pronoun, yáa hàrbée shì
Grade 2 intensive form of bisyllabic verb, hàhhárbàa
Grade 2 trisyllabic verb (Form A), sàráutàa

The preceding discussion demonstrated that bisyllabic verbs have to be considered as of special interest here, therefore I would like to devote some more attention to them now.

2. Bisyllabic verb

2.0. Only four out of the eight rules defining the tone patterns of the verb pertain to the bisyllabic variety. These rules are: tone-vowel height correlation rule (4), regressive tonal contrast rule (5), regressive tone spreading rule (6), and object pronoun rule (8).

2.1. Tone-vowel height correlation rule. For bisyllabic verbs the rule is:

(9) $\begin{bmatrix} S \\ \alpha high \end{bmatrix} \rightarrow \begin{bmatrix} S \\ \alpha H \end{bmatrix} / \_\_\_\_ \#$

We see that in case of bisyllabic verbs the rule is applicable not only to the verbs with the [+high] final vowel, but also with [-high] and [+high, +mid] final vowels:

(9a) $\begin{bmatrix} S \\ -high \end{bmatrix} \rightarrow \begin{bmatrix} S \\ -H \end{bmatrix} / \_\_\_\_ \#$

Ex. yáa káamàa shí
'he seized him' (Grade 1 Form B)

(9b) $\begin{bmatrix} S \\ +high \end{bmatrix} \rightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \_\_\_\_ \#$

Ex. yáa nèemée tà
'he sought her in marriage' (Grade 2 Form B)
yáa nèemí máatáa
'he committed adultery' (Grade 2 Form C)
wátàa yáa kàamú
'the moon is in eclipse' (Grade 7)

(9c) $\begin{bmatrix} S \\ +high \\ +mid \\ +round \end{bmatrix} \rightarrow \begin{bmatrix} S \\ +H \\ +\text{"down-} \\ \text{step"} \end{bmatrix} / \_\_\_\_ \#$

Ex. yáa dáawóo dàgà Másàr
'he returned from Egypt' (Grade 6 Form A)

In all examples the tone corresponds with the degree of the vowel height: [+high] vowels have [+H] tone; the [-high] vowel /a/ has [-H] tone; and [+high, +mid, +rounded] vowel /o/ has a not-so-high [+H, +"downstep"] tone. Thus the phonetic quality and pitch level of the final vowel are correlated. As was noted before, the vowel /e/ behaves as "extreme" vowels do.

2.1.1. There are exceptions in application of this rule to bisyllabic verbs. The tone and vowel height are not correlated in Grade 2 (Form A), Grade 3 and Grade 4. The tone pattern of Grade 2 and Grade 3 is low-high, while the final vowel is [-high] /a/, e.g. nèemáa 'to

look for' (Grade 2 Form A); fìtá 'to go out' (Grade 3). The tone pattern of Grade 4 is high-low, while its final vowel is [+high] /e/, e.g. káamèe 'to take forcibly'. However, these exceptions do not change in any way the validity of the outlined rule: the low-high pattern of Grade 2 (Form A) and Grade 3 reveals a reverse order of the high-low pattern of Grade 1.[6] Compare káamàa (grade 1), nèemáa (Grade 2 Form A--in other Forms the tones and vowel height are correlated). As to the Grade 4, it does not exhibit its own pattern and more often utilizes the pattern of Grade 1.

2.2. Regressive tonal contrast.

(10a) $$S \dashrightarrow \begin{bmatrix} S \\ -\alpha H \end{bmatrix} / \underline{\quad} \begin{bmatrix} S \\ \alpha H \\ -mid \end{bmatrix} \#$$

The rule for bisyllabic verbs in (10a) states that the tone of non-final syllable is contrasted with the tone of [-mid] vowel in the final syllable. Thus the tonal contrast pertains only to cases with "extreme" vowels in the final syllable. Examples:

Grade 1 Form B,	yáa káamàa shí	'he seized him'
Grade 2 Form B,	yáa nèemée tà	'he sought her in marriage'
Grade 2 Form C,	yáa nèemí máatáa	'he committed adultery'
Grade 7,	wátàa yáa kàamú	'the moon is in eclipse'

[6]It seems pertinent to note here that while Grade 1 verbs are used with both indirect and direct objects, Grade 2 verbs have a more restricted usage appearing with the direct object only. (See Pilszczikowa [1969:100-101]). Perhaps the reverse order of tones in the low-high pattern of Grade 2 verbs in comparison with the high-low pattern of the primary, fundamental Grade 1 could be explained as a reflection of this more specialized and more restricted usage of Grade 2 verbs. This topic still requires more research.

Two heights for mid vowels probably should be distinguished in Hausa: [+mid 1] for [+rounded] vowel /o/ and [+mid 2] for [-rounded] vowel /e/. The level of the [+mid 2] final vowel /e/ is sufficiently high to produce a tonal contrast only in cases when the final vowel is of "extreme" quality; the final vowel should be [+high] or [-high] or at least [+mid 2].

(10b) $$S \rightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \underline{\quad} \begin{bmatrix} S{:}CVC \\ \hline \end{bmatrix} \; \# \; + \; \begin{bmatrix} da \\ +H \end{bmatrix}$$

For example:

náa sánád dà Aúdù

'I informed Audu'

2.3. Tone spreading rule.

$$S \rightarrow \begin{bmatrix} S \\ +H \\ +\text{"down-step"} \end{bmatrix} \; / \; \underline{\quad} \; \begin{bmatrix} S \\ +high \\ +mid \\ +round \\ +H \\ +\text{"down step"} \end{bmatrix} \; \#$$

For example:

Grade 6, yáa dáawóo dàgà Masar

'he returned from Egypt'

2.4. Object pronoun rule.

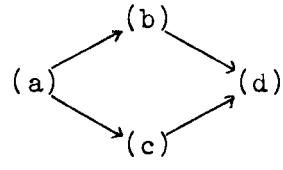
(11) $$\text{object pronoun} \rightarrow [-\alpha H] \; / \; \begin{bmatrix} S \\ \alpha high \\ \alpha hi \end{bmatrix} \; \#\underline{\quad}$$

In comparison with rule (8) the object pronoun rule for bisyllabic verbs (11) has an additional substantiation: the tone of the object pronoun is contrasted not only with the quality of the verb final vowel but, at the same time, with the tone. The tone

of the object pronoun is low when it follows the verb with [+high, +H] final vowel: yáa hàrbée shì 'it (the scorpion) stung him' (Grade 2); yáa káawóo shì 'he brought him' (Grade 6). On the contrary, the tone of the object pronoun is high when it follows the verb with a final [-high, -H] vowel, e.g. yáa káamàa shí 'he seized him' (Grade 1). The contrast is progressive.

The order of composition of such a pattern can be presented as follows:

(a) tone-vowel height correlation rule;
(b) tonal contrast rule or
(c) tone spreading rule;
(d) the object pronoun rule (in case of transitive verbs).



2.5. As it was shown above, only four of the eight rules defining the tone patterns of the verb apply to the bisyllabic variety. And none of them is entirely new. Two rules, the tone-vowel height correlation rule and the object pronoun rule, have to be marked out as having an additional substantiation in their application to the patterns of bisyllabic verbs.

Discussing further the peculiarities of bisyllabic verbs I wish to note: (i) while the progressive tonal contrast appears only beyond, the regressive tonal contrast takes place only within the verb-stem boundary; (ii) the tone spreading is usually regressive.

All that was said before seems to indicate that bisyllabic verbs display an older stage in the development of the tone system of the verb in Hausa in comparison with trisyllabic verbs. Therefore their

analysis is of special interest and of greatest importance. Quadri-syllabic verbs can be quite easily detected as being of derivative origin.

2.6. Summarizing all concerning the verb, it has to be said:

i. The tone assignment is dependent on the length of the tone pattern and the quality of the final vowel. One-tone pattern verbs have a high tone. Two- and three-tone pattern verbs (with [-high] final vowel) have all syllables tonally contrasted, while four-tone pattern verbs with final vowel [-high] have the first tone repeated on the first two syllables of the verb.

ii. The assignment of the tone on the final vowel depends on the degree of vowel height. The supra-segmental feature of pitch and the segmental feature of vowel height are correlated. This is especially clear at the bisyllabic verb level.

iii. The tonal contrast plays an extremely important role in the assignment of tones in the pattern of the verb. Whether the tonal contrast is present in the tone pattern of the verb depends first of all on the quality of the verb final vowel. It appears only in patterns when the final vowel is of "extreme" quality or at least [+mid 2]. Tone spreading occurs when the final vowel is of "non-extreme" [+mid 1, +rounded] quality.

iv. The tone of the object pronoun is determined by the degree of vowel height (and by the tone in case of bi-syllabic verbs) in the final syllable of the verb. It is contrasted with the vowel height and in the case of bisyllabic verbs also with the tone of the verb final vowel. The contrast is progressive in this case.

3. Noun plurals

3.0. The number of classes of noun plurals in diverse studies on the subject depends on the criteria applied. Thus some authors distinguish

ten or even more of such classes. The classification Kraft [1965] gives seems to be well suited for the purpose of this study. To recall, he distinguishes four major classes and several minor categories or classes.

Major classes (Kraft [1965:272-273]):

Class 1: plurals are characterized by all high tones and an -oo...ii ending, e.g. hányàa 'road', pl. hányóoíi.

Class 2: plurals are characterized by a -u...aa with all tones high except the final -aa, e.g. (a) kèekée 'bicycle', pl. kéekúnàa; (b) àbù 'thing', pl. ábúbúwàa; (c) kàrée 'dog', pl. kárnúkàa.

Class 3: plurals are characterized by an -aa...ee ending with a high-low-high tone pattern, e.g. (a) súunáa 'name', pl. súunàayée; (b) mùtûm 'man', pl. mútàanée.

Class 4: plurals are characterized by all low tones except for a final high tone -ai, -ii, -uu suffix, e.g. (a) àbóokíi 'friend', pl. àbòokái; (b) sáabóo 'new', pl. sàabàbbíi; (c) kújèeráa 'chair', pl. kùjèerúu.

Minor classes (Kraft [1965:285-287]):

Class 5: plurals are characterized by a high-low-high (or falling-high) tone pattern with the following vowel and consonant patterns in the final two syllables: (a) aaCaa pattern, (b) aaCuu pattern, (c) Caa pattern. E.g. (a') sírdìi 'saddle', pl. síràadáa; (b') ídòo 'eye', pl. ídàanúu; (c) yáaròo 'boy', pl. yáàráa.

Class 6: plurals are characterized by a variety of tone patterns with an -aCii termination, where the -a may be long or short, high or low tone. E.g. (a) góonáa 'farm', pl. gòonàkíi ; (b) ùbáa 'father', pl. ùbànníi; (c) dóokìi 'horse',

pl. dáwáakʃi; (d) káayáa 'load', pl. káyàyyákʃi.

Class 7: plurals are characterized by a high-high tone pattern with a terminal -uu. E.g. yáatsàa 'finger', pl. yáatsúu.

Class 8: plurals of this class may be termed 'opposite' or 'polar' plurals. If the singular ends in -a or the plural ends in -i. If the singular ends in -i or -e the plural ends in -a. E.g. kàazáa 'chicken', pl. kàajʃi; mʃjìi 'husband', pl. mázáa.

Class 9: in class 9 are lumped a miscellani of other plurals ending in -a, e.g. cóokàlʃi 'spoon', pl. cóokúlàa; màròokʃi 'beggar', pl. màròokáa.

Class 10: Class 10 plurals are reduplicative, e.g. ʃrìi 'kind', pl. ʃrìi ʃrìi; yáakìi 'war', pl. yàakɛ́ yàakɛ́e.

From the analysis of these plural classes one can derive the following concerning the tone patterns of noun plurals.

3.1. Some nouns have the same tone patterns in the singular and in the plural and differ only by a terminal vowel, e.g. kàazáa 'chicken', pl. kàajʃi. These will not be analyzed further here.

3.2. Some nouns have all tones high in the plural, e.g. (a) ʃáakìi 'house', pl. ʃáakóokʃi; kújèeráa 'chair', pl. kújéeróorʃi; (b) yátsàa 'finger', pl. yáatsúu; màcè 'woman', pl. máatáa.

3.2.1. An interesting occurrence has to be noted at this point. The [+H] tone on the final syllable which appears in plural patterns occurs also in verbs with the same [+high] final vowel (see p. 405). As to the infix /o/, verbs with this [+high, +mid, +rounded] vowel in the final syllable usually have the [+H, +"downstep"] tone on this syllable (see Rule 6). The pattern of a verb terminated by the vowel /o/ does not have a tonal contrast; the tone of the final syllable is spread over other syllables of the verb.

The plural pattern with -CooCii termination has all tones high, its final syllable with [+high] vowel carries [+H] tone. The tonal contrast is absent. Two rules are proposed here for such a pattern: (a) tone-vowel height correlation rule: the final [+high] vowel receives [+H] tone, and (b) regressive tone spreading rule: the tone of -CooCii termination spreads over other syllables. The tonal contrast phenomenon becomes neutralized by the presence of the [+high, +mid, +rounded] vowel in the termination. For noun plurals with this termination the tone spreading rule appears as somewhat different than for the verb:

(12)

$$S \dashrightarrow \begin{bmatrix} S \\ +H \end{bmatrix} / \quad \_\_ \_\_ \quad \begin{bmatrix} S \\ +high \\ +mid \\ +round \\ +H \end{bmatrix} \begin{bmatrix} S \\ +high \\ -mid \\ -round \\ +H \end{bmatrix} \#$$

3.2.2. I cannot offer any explanation why the tonal contrast is absent, for example, in the plural noun yáatsúu (tones: high-high) and for a [+H] tone on [-high] vowel of the plural noun máatáa. These are certainly exceptions.

3.2.3. There are only a few nouns with all tones low in the singular (but none among them is monosyllabic). Many nouns have all tones high. In the plural, however, I have not found a pattern of only low tones. It could be assumed that low tones patterns are restricted only to the imperative (verb) and to the singular (noun).

3.3. Some nouns exhibit in plural the pattern of two tonal contrasts. It is of importance to note that such a pattern usually begins with a high tone, never with a low tone.

3.3.1. In the singular the noun can have such patterns as ¯⌋, ⌋⌊, ⌋⌊⌋, ¯⌋⌊, etc. and we can find nearly all possible combinations of high and low tones with the number of tonal contrasts limited only by the number of syllables. In the plural the tone pattern can have at the most two tonal contrasts. High-low-high pattern sometimes with the first or final tone repeated in two syllables: ¯⌋¯ or ¯⌋⌊ were found only. Thus it confirms again the statement that the usage of the low tone is restricted. A bicontrasted pattern can begin only with a

high tone. In other words, it should have a high tone both at the beginning and at the end of the pattern. E.g. ƙásáa 'earth', pl. ƙásàashée (s --→ sh/___ e); ɋáawáa 'corpse', pl. ɋáawàwwákʼi [⁀\/‾‾]. The final vowels are vowels /e/ and /i/ of [+high] quality.

3.3.2. Some bisyllabic plurals have a falling-high tone pattern with [-high] final vowel. E.g. yáaròo 'boy', pl. yáàráa; dámìi 'bundle of corn', pl. dámmáa. Though I cannot state this with full confidence, it seems that such plurals were originally constituted of three syllables. More research has to be undertaken to explain satisfactorily enough the exceptional case of these nouns.

3.4. Frequently the plural patterns exhibit a one tonal contrast. In such cases, the tonal contrast takes place at the end of the pattern: either between the tone of the suffix and that of the non-stem or within the bisyllabic suffix itself. The contrast is regressive. The patterns with one tonal contrast are: $(-)\text{--}\backslash\_$ or $(-)\text{-}\_/$.

3.4.1. And again, as in the case of the verb, the degree of the final vowel height determines its tone. The rule is:

(13) $\begin{bmatrix} \text{S} \\ \alpha\text{high} \\ \text{-mid} \end{bmatrix} \text{--→} \begin{bmatrix} \text{S} \\ \alpha\text{H} \end{bmatrix} / \text{\_\_\_\_} \#$

Noun plurals with a [-high] final vowel of -naa, -uwaa, -ukaa, -aa suffixes usually have tonal patterns with [high$_0$-low] tonal contrast. Examples: cóokúlàa 'spoons', dáakúnàa 'houses'.

Noun plurals with a [+high] final vowel or rising diphthong of -kii, -ai, -nii, -uu suffixes have patterns with [low$_0$-high] tonal contrast. Examples: ɋòonàkʼi 'farms', àlbàsúu 'onions'.

3.4.2. As it was shown in 3.4.1 the "extreme" vowels of the final syllable cause the tonal contrast to appear in the monocontrasted pattern as it happened in the case of the verb (see page 412). The rule is:

(14) $\text{S} \text{--→} \begin{bmatrix} \text{S} \\ \text{-}\alpha\text{H} \end{bmatrix} / \text{\_\_} \text{\_\_} \begin{bmatrix} \text{S} \\ \alpha\text{H} \end{bmatrix} \#$

3.4.3. Two important observations have to be pointed out here: (a) the [+high, +mid, +rounded] vowel /o/ does not appear as final in the plural patterns at all. It can be found only as a part of -CooCii plural suffix (see paragraph 3.2.1); (b) the [+high, +mid, +rounded] vowel /e/ does not appear in monocontrasted patterns. It is present in bicontrasted patterns only (see 3.3.1).

3.5. The same rules determine the assignment of tones in the noun plural patterns as well as in the verb patterns in Hausa: tone-vowel height correlation rule, regressive tonal contrast rule of monocontrasted patterns, and tone spreading rule in patterns with the [+high, +mid, +rounded] vowel /o/ in plural termination.

4. Conclusions

4.0. The assignment of tones within the patterns of the verb and noun plurals in Hausa is largely predictable.

4.1. We cannot be sure whether tones in Hausa originated from the vowel height of the termination. We can, however, definitely posit that the tone and the degree of vowel height in the termination of the verb and noun plurals are correlated. To put it otherwise, the suprasegmental feature is correlated with the segmental one.

4.2. The tonal contrast plays a very special role in the patterns in that it organizes them. The presence or absence of tonal contrast in the pattern is determined by the quality of the final vowel; the tonal contrast takes place in the pattern only with the final vowel of "extreme" quality. The final (in verb) or infixed (in noun plurals) vowel of [+high, +mid, +rounded] quality is responsible for the tone spreading in the pattern. While the tonal contrast may be progressive or regressive, tone spreading in Hausa is always regressive.

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A NOTE ON DOWNSTEP IN YALA (IKOM)

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I am very pleased to find that three of your authors have noticed my article, "Yala (Ikom), a terraced-level language with three tones." I would be even more pleased if they had quoted it correctly.[1] The importance of the Yala (Ikom) case is shown by the fact that none of your authors has fully grasped the essential point: both low tone and mid tone produce that lowering of pitch on subsequent tones higher than themselves which we may call "downdrift". When a low or a mid-tone syllable has been elided, either as an optional form of current speech or obligatorily and as an event in the past history of the language, the result is the phenomenon of down-step, between two highs, between two mids, or between high and low. The effect of the last is to cancel the otherwise expectable down-glide. In the example which both Leben and Fromkin cite, ɔ́ kà [ɔ́ káà] versus kɔ́! kà [kɔ́ kà], the downstep is surely produced by the historical elision of the mid-tone /-ō/ of the subjunctive which is heard in at least three other dialects of Idoma-Yala. I am also at pains to argue the case synchronically from

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[1] Robert G. Armstrong, "Yala (Ikom), a terraced-level language with three tones". Journal of West African Languages 5.1: 49-58.

Victoria Fromkin, "Tone features and tone rules". Studies in African Linguistics 3.1: 64. She quotes Leben, saying that kɔ́ kà does not have the expected glide, heard in ɔ́ kà, because of the deletion of an intervening low tone. She writes, "The difference between a contour tone and a sequence of level tones must somehow be represented in the systematic phonetic output of the grammar." Agreed; but I wrote kɔ́! kà. Fromkin omits the down-step marker.

Jerry Larson, "Downstep, downdrift, and diacritics". Studies in African Linguistics, Supplement 2: 177. I symbolize the phonetic and phonological arbitrariness of which Larson speaks by setting up only one category of downstep, which may be triggered by either a latent mid or a latent low tone. The morphological or syntactic reason for the downstep is usually transparent.

William R. Leben, "Suprasegmental and segmental representation of tone". Studies in African Linguistics, Supplement 2: 184-186.

evidence to be found in the present Yala (Ikom) speech. (Paragraphs 5.2, 6.1 ff., and the end of 6.3). There is no evidence for an elided low tone in the kó! + verb utterances.

I call your attention to paragraphs 3.0, 5.0.1, 7.0, and 7.2, where I show that the correlate of the effect of the mid-tone in producing down-drift and downstep is a lengthened normal pitch-interval between high and mid, by comparison with many cognate forms in the other dialects of Idoma-Yala. I point out that tonetically Yala (Ikom) ó múwā sounds like Yoruba ó já'de, where the lengthened interval is indeed produced by an elided low tone that may still be heard in some varieties of Yoruba. Thus ó já'de = ó jáàde, from ó já òde. But there is no evidence that such a thing happened in Yala (Ikom). The hypothesis that elided low tones underlie all those lengthened high-to-mid intervals would be quite lopsided, since it would imply that the low tones in question are spurlos versunken in the other dialects. It seems to me more economical simply to report the fact of the lengthened interval plus its effect in producing downdrift and downstep and to confess that on present evidence we do not know how this happened to happen.

It should be noted that from the very beginning, at the Ibadan Seminar in January, 1967, Dr. Elizabeth Dunstan queried the extension of the notion of "downstep" from environments of two equal tones (e.g. high plus high) to two unequal tones (e.g. high plus low). The second sentence of paragraph 6.0 and the decision to write "downstep" between quotation marks when it comes between high and low (paragraph 6.3) reflect this discussion. Not everybody is convinced yet, and I would claim nothing more than the convenience of expediency in what I have done.

When we meet new phenomena, we normally try to comprehend then with the older concepts that we already have, perhaps modifying or extending these in some way. The result may or may not be expedient. My doubts about "downstep" between high and low are expressed in 6.3. In 6.0, I suggest that we might consider the phenomenon from the point of view of its origin, calling it "latent non-high tone", or more briefly "latent tone". (So far as one can tell, high tone is never elided.) We could

then say that between two high and between two mid tones, latent tone produces a downstep; between high and low it blocks the normally expectable glide. We can show both situations with the same mark, e.g. an apostrophe, and call it a "latent tone". Other possible names seem to me less good. "Assimilated tone" seems counter-intuitive. "Elided or lost non-high tone syllable" implies more than we know on present evidence. (Cf. 6.3.1)

The reason for uniting the "blocking of the glide" with "downstep" is, firstly, that we have already had to extend the concept of downstep to include the lowering of successive mid tones, and secondly, that the same things that produce downstep between two hgihs or two mids also block the glide between high and low. E.g. kó' sósí! 'Let him cut the tree!' and kó' kwènyà! 'Let him run!' (6.3 and 6.3.1). For latent low before low, note òsó'wò 'God'. (Parenthetically, it now seems likely that the first morpheme of òsó'wò is not òsé 'king', but rather òsí, plural èsí 'tree, medicine' with vowel harmony. Note the saying in Central Idoma, "òwòìcō ècí" 'God is 'medicine''.)

While I have your attention, I should like to correct an unfortunate typographical mistake in line 22, page 55, of my article: for "propriate" write "propitiate". In the spirit of Nabokov commenting on the text of Eugene Onegin, I should like to report that an etymologically literal translation of my prize sentence is, 'From time to time the penis and the vagina make the dead spirits.' ('Make' in the sense of 'invoke, propitiate'.)

Studies in African Linguistics
Volume 3, Number 3, December 1972

ON COST ACCOUNTING IN LEXICAL STRUCTURE: A REPLY TO FRANK HENY

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In the last issue of SAL a very stimulating article by Frank Heny [1972] appeared, in which a new suggestion for treating lexical categorization in Bantu was offered. Briefly stated, Heny suggested that the class Noun and Adjective in Bantu languages such as Shona should be considered one lexical class. The sole criterion in support of this suggestion involved some facts concerning the concord-agreement prefixes of these lexical categories. The phenomenon is traditionally known to Bantuists as the "Primary vs. Secondary concord" variation. It applies only to noun "classes" whose CV-shaped prefixes commence with a nasal consonant (here excluding class 10 which demands extra considerations). All modifier/predicate categories in Bantu must agree with the "class" (number-gender) of the head/subject noun. That is, they take the same class prefix as that noun. If the head noun has a nasal-commencing prefix, all modifiers/predicates--with the exception of adjectives--take the "secondary", V-shaped prefix. However, adjectives take the same CV-"primary" prefix as the noun itself. Thus, for example (from Swahili):

m(u)-ti u-le	'that tree'
mi-ti i-le	'those trees'
m(u)-ti u-me-vunjika	'the tree broke'
mi-ti i-me-vunjika	'the trees broke'

but, in contrast:

m(u)-ti m(u)-kubwa	'the tree is big', 'the big tree'
mi-ti mi-kubwa	'the trees are big', 'the big trees'

On the basis of this similarity between nouns and adjectives, Heny suggested that they be merged into one lexical category (which will then presumably be subdivided to account for the remaining differences between the two sub-categories).

It seems to me that there exist several strong arguments why a lexical solution of this type should be rejected.

1. Cost accounting in the lexicon

An adjective has no inherent gender features (in Bantu as well as any other language). Rather, it is an agreeing category, taking the gender-number features of the head or subject noun. Further, disregarding the use of modifiers as anaphoric pronouns (which is extensive in Bantu and involves all modifiers), the syntactic distribution of adjectives differs from that of nouns. The former may not appear as heads of NP's (unless under anaphora), while the latter do. The only syntactic position shared by the two is that of Predicate (following "be"), and this is a rather universal feature in language. Finally, in terms of semantic sub-categorization the two categories differ radically. Nouns go by some hierarchy such as concrete/abstract, animate/inanimate, human/non-human, etc. Whatever is the hierarchy for the semantic classification of adjectives, it is different, in part involving selectional restrictions which are defined upon those inherent (hierarchical) semantic features of nouns. Thus, in terms of cost-accounting (i.e. the number of exception features mentioned for a lexical category), Heny's solution would entail the following: set up a unified lexical category for both nouns and adjectives, say Noujective. Then subdivide it immediately into two sub-classes, one of which (i.e. $\text{Nouj.}_{\text{Adj.}}$) differs from "normal" noun members of the category (i.e. Nouj._{N}) in the following exception features: (a) members of this class have no inherent gender, and "agree" with the gender of nouns just like other modifier/predicate categories; (b) members of this class differ from "normal" nouns in their syntactic distribution; (c) members of this class have a semantic sub-categorization which is radically different from that of "normal" nouns, does not branch out from the same hierarchy and is rather reminiscent of that of other stative predicates. All these exceptional features will then characterize the new lexical sub-category Nouj_{Adj} in order to account

for a single, morphological feature which unites the two classes: the fact that both take the same CV- concordial prefix.

2. Variability in Bantu, synchronic and diachronic

While most Bantu languages conform to the double-concord system described above, in several this system has undergone a diachronic change, to the effect that adjectives, both modifying and predicating, have adopted the secondary (V-) concord type, and have been thus brought into line with all other modifiers/predicates. Thus in ChiBemba, for example (for further detail see Givón [1972]), this is indeed the case:

umu-ti uu-kalamba	'the tree is big', 'the big tree'
imi-ti ii-kalamba	'the trees are big', 'the big trees'

There is strong evidence that ChiBemba adjectives used to have the primary (CV-) concord but have changed it some time in the recent past. Now, here is the rub: the semantic class of adjectives in ChiBemba, Swahili, and Shona is virtually the same class. Its syntactic distribution is the same. But according to Heny's proposal there is a great difference at a rather deep level between Shona and Swahili on one hand and ChiBemba on the other: in the first two there is a class Noujective, while in ChiBemba no grounds for establishing this class exist. Further, taking Heny's suggestion, ChiBemba must have undergone a deep lexical reorganization fairly recently, moving from a one-class lexical categorization (as Shona and Swahili) to a two-class categorization, all this without changing syntactic distribution, semantic classification or the facts of the gender-features of nouns. Finally, in the ChiBemba concordial system there is one residue of the primary concord for adjectives--in Class 1 (human gender singular). For adjectives modifying this noun-class only, the concord is CV- rather than the now-normal V-:

umu-ana muu-kalamba	'the child is big'
*umu-ana uu-kalamba	

This last fact drives home the rather superficial nature of the phenomenon upon which Heny has based, entirely, his suggestion for the class Noujective.

3. Morphology in linguistic diachrony

In a number of papers (most explicitly in Givón [1971]) I have argued that the morphology of languages represents a petrified situation which reflects earlier stages in the syntax/semantics. That is, the morphology, because of its bound nature, is conservative, lagging behind the constant syntactic/semantic change in language. Now, there are good grounds for believing that the primary (CV-) concord of Bantu adjectives represents precisely this type of petrification (for more details of the data supporting this argument, see Givón [1972]). The class of non-derived adjectives in Bantu is extremely small. When you weed out stems obviously derived from synchronic nouns or verbs, the list reduces to less than ten. Most evidence suggests that even this small group was a relatively recent innovation in Proto-Bantu, and the most intelligent guess is that it originated from the gradual shift to using some noun stems (such as those for 'child', 'female', 'male') as modifiers. Some of these stems still exist as both nouns and adjectives (i.e. Bemba -kota 'female' (n.) and -kote 'female' (adj.)). Others may be only reconstructed (e.g. -pya 'new', 'young' (adj.), cf. -bi 'child' in Proto-Niger-Congo). Many Bantu languages still attest some NOUN-NOUN compounds in which the second member is a predicative modifier (on the paradigm of 'female-lion'). Now, if it is indeed true, as I have suggested here, that the class Adjective in Bantu arose from noun stems, then a most natural diachronic explanation exists for the primary concord of Bantu adjectives, namely that the erstwhile noun stems brought their noun-type prefixes with them when they changed their syntactic/semantic behavior. In other words, they behaved in full accord with what is known about linguistic change in general, so that a new syntactic/semantic class was established in the lexicon, while the bound morphology continued to reflect the pre-change situation.

Heny's solution simply raises the question: should our synchronic syntactic/semantic description seek to account for the (more conservative)

morphology, or should we admit the facts of life, that the morphology will always lag behind? To me the answer to this is rather serious.

To sum up, then, in terms of Cost-Accounting, in terms of language-variability within the Bantu group (and along a temporal axis within the same language), and in terms of what is known to us about the relations between morphology and syntax, Heny's solution must be rejected.

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Studies in African Linguistics
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COST ACCOUNTING VS. EXPLANATION:
A REPLY TO A REPLY

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Talmy Givón's reply to my paper (Heny [1972]) raises several important questions. His objections amount to the claim that my explanation of the relationship between Shona nouns and adjectives was far too costly--and was in any case quite unnecessary. There seems to be a fundamental difference between Givón and myself over what it is that constitutes a sound linguistic argument, and in my reply I shall simply try to show why I do not believe that Givón's observations diminish in any way the force of my original arguments. In this way, the basic disagreement may be resolved.

I take it as axiomatic that the goal of a theory of language is to provide explanations of linguistic phenomena. An explanation may be effected in a number of ways, but it involves, essentially, the setting up of a hypothesis from which the observed and otherwise aberrant phenomena can be deduced or predicted. An explanation may be simple or complex depending upon the circumstances. In judging between rival explanations relative complexity may be an issue, but it is totally pointless to object, in a vacuum, that an explanation is complex. Likewise, it would be quite wrong to compare an explanatory but complex account of a set of phenomena with a simple description of those phenomena.

In the present case, I know of no systematic theory other than the one set out in Heny [1972] from which it is possible to deduce (fairly precisely) that "nouns" and "adjectives" in Shona will exhibit the relationships discussed in that paper. Although admittedly somewhat programmatic, it is the only existing explanation of those facts, and hence there is no point in remarking that simpler ways exist of describing the facts. Of course there are. I explicitly formulated and rejected one such mere description in my paper: phonological

rules can be used to delete that nasals (and so on--Givón is wrong in thinking that it is only the nasals that are relevant--see Heny [1972]), and these rules must work everywhere except before nouns and adjectives. In any such solution the fact that nouns and adjectives are alike in a number of ways, including concord, has to be regarded (from the point of view of a synchronic grammar) as purely a matter of chance.

It is obviously inappropriate to compare an explanation (such as mine) with any mere description, except under very unusual circumstances: when a synchronic explanation of the facts is in principle to be rejected. We can, however, reject an explanation out of hand only if it is possible to demonstrate:

> (a) that no plausible explanation can be provided, or
> (b) that there is independent evidence showing that the regularity in question must necessarily be regarded as a chance regularity, or
> (c) that there are other (e.g. diachronic) explanations of the phenomena which operate in such a way as to render a synchronic explanation inappropriate.

I believe that Givón's three objections are really addressed directly to these three points (although he does not say so) and that his first objection, under this interpretation is not that my explanation is more complex than certain mere descriptions, but amounts rather to the claim that my account is simply too complex (or costly) to be plausible at all. But when that objection is examined in a little more detail it amounts to very little. The main problem was that I found it necessary to articulate a very unusual little sub-class of nouns which exhibits a number of peculiar semantic and syntactic characteristics. (As a matter of fact I called attention to these facts myself, in considerable detail.) However, any serious account of Shona grammar will have to make provision for a peculiar little class of adjectives--whether they are nouns, or just noun-like. I do not, therefore, believe that Givón has shown any reason for rejecting my explanation on the grounds that it is in principle untenable.

His second objection addressed itself to the possibility that the observed relationship between nouns and adjectives was to be regarded as purely a matter of chance. In particular, Givón observed that other closely related languages failed to display the same regularities, and in Bemba, for example, there was a slight trace of the phenomena, which was clearly to be regarded as superficial and purely accidental in the synchronic grammar. Hence, there was no reason to suppose that the Shona facts deserved more serious explanation. At this point, the implausibility of my theory was again suggested: an account which set up a systematic and deep difference between Shona and Bemba in this one rather minor area, was to be rejected even if it were the only available one. For closely related languages simply do not differ in such a way.

This objection, too, carries little weight. It may--and then again may not--be the case that related languages can differ at a rather deep level. My argument was specifically limited to Shona. Whether or not it applies in some form to Bemba I do not know, but that is irrelevant. In the languages of the world, the behavior, membership and very existence of the class of adjectives seems particularly susceptible to variation. Any theory of language will eventually have to cope with that fact. And we do not at present possess enough data to decide whether it is only at a very superficial level that the variation occurs. In particular, it should be noted that if my explanation of the Shona facts is correct, then it follows that languages (quite closely related languages) do indeed differ in this area at a rather deep level. It is obviously quite wrong to <u>assume</u> that they cannot differ in that way in order to demolish my argument! But in any case, there is strong prima facie evidence that some kind of explanation of the facts is called for.

Givón himself provides some: it seems unlikely that a purely superficial, chance regularity in Shona would at the same time have been maintained in Swahili (see Givón [1972])--and in most of the other southern Bantu languages, and in dozens of others in other Bantu areas (see Guthrie [1967]).

It must therefore be in his last argument, if at all, that Givón succeeds in establishing the fact that a synchronic explanation is not required. He argues that the observed relationships derive solely from the historical origin of the adjective class in Bantu. Since, he claims, morphology "lags behind syntax" there is a "diachronic explanation" of the phenomena and the synchronic grammar of Shona need (should?) not attempt to account for what, again, appears to be no more than an accident when viewed synchronically. In essence the explanation is that the adjective class arose in the first place as a result of certain noun stems being used as modifiers and, presumable, bequeathed a noun-like character to the class as a whole. However, this "explanation" is not part of a systematic theory or hypothesis from which the Shona facts will automatically follow. Givón's ideas about the relationship between syntax and morphology are extremely interesting, and may well throw light on the original word order of Bantu languages (Givón [1971]), but he has not related them to this set of phenomena. Nor is it easy to imagine how that could be done. For one thing, as Givón himself [1972] observed, there are adjective stems which are related to verb stems, while a few others seem to have arisen quite independently. A theory of "morphological lag" seems to be in principle unable to account for the fact that stems which were never noun stems adopted a noun-like morphology. This is an unexplained innovation. There is, likewise, no way in which a lag theory can account for the fact that after the original noun stems began to be used solely as modifiers they acquired the ability to co-occur with prefixes of any class--but still only of the shape associated with nouns. Again there is crucial innovation. Past syntax is quite irrelevant.

In any case, Givón's theory is unable to account for the fact that the class of adjectives arose at all, and having arisen persisted as a peculiar aberration (a superficial accident) in a large number of languages. Why this particular accident, why this lag? No matter how good a diachronic explanation of certain aspects of the change, that persistence, which is the persistence of a syntactic class, and not merely of a morphological aberration, calls for an explanation. I conclude,

therefore, that none of Givón's objections have thrown serious doubt on the explanation provided in Heny [1972], and hence that that explanation, however complex it may be, must stand until a better is available. Adjectives in Shona are a special class of noun, and languages, even closely related ones, can differ at a rather deep level.

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Studies in African Linguistics
Volume 3, Number 3, December 1972

10TH WEST AFRICAN LANGUAGES CONGRESS

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The 10th West African Languages Congress, organized by the West African Linguistic Society, was held at the University of Ghana, Legon, from March 21-26, 1972. Members of the University entertained us with typical West African hospitality throughout the week.

The main theme of the conference was "Language Problems in West Africa". This keynote was struck in the papers of the initial plenary session and continued in later sessions.

The use of parallel sessions (for the first time) made it possible to accommodate a large number of papers each morning. One of the sessions was always devoted to sociolinguistic questions, others to descriptive and occasional historical topics.

As usual, Working Groups were formed which met each afternoon to discuss areas of interest more informally. Prominent among these were groups dealing with oral literature and the generative treatment of tone.

At the final business meeting, it was announced that the new Secretary-Treasurer of the Society is Dr. Lawrence Boadi (Department of Linguistics, University of Ghana, Legon, Ghana); the Secretariat automatically moves to the same address.

A list of the papers given follows. Please note that the Secretariat does not have any spare sets of papers and any enquiries should therefore be directed to individual authors.

PROGRAM

Wednesday, March 22

Formal opening.

Plenary session:

Gilbert Ansre and E.O. Koranteng (University of Ghana, Legon): Parliamentarians and language policy issues.

Anwar S. Dil (Stanford University) and Ayọ Bamgbọse (University of Ibadan): Public participation in language policy

planning: how and how much?

Maurice Houis (Institut National des Langues et Civilisations Orientales, Paris): Les situations de bilinguisme en Afrique Noire.

Thursday, March 23

Session A:

L. Ayọ Banjọ (University of Ibadan): Towards a national language policy for Nigeria.

Ronald Stanford (Institute of Linguistics, Nigeria): Vernacular reading materials in primary schools: a report and some observations.

Adebisi Afọlayan (University of Ifẹ): The use of an indigenous West African language as the medium of primary education: the six-year (Yoruba-medium) primary project at Ifẹ, Ile-Ifẹ, Nigeria.

Ṣegun Odunuga (University of Ibadan): Choosing a lingua franca; the Soviet experience.

C.L. Brann (University of Ibadan): Techniques in oral language examining.

Jean Ure (University of Ghana, Legon): An investigation of language use in Ghana: the "language diaries" of primary school teachers.

Lindsay Criper Friedman (Abdullahi Bayero College, Ahmadu Bello University, Kano): A sociolinguistic look at English in Nigeria.

Ian Maddieson (University of Ibadan, Jos Campus): Linguistic prejudice.

Session B:

J. le Saout (Université d'Abidjan): Faits de dérivation nominale en gban.

Alan S. Duthie (University of Ghana, Legon): Lexical analysis of an Ewe text.

E.K. Donkor (University of Ghana, Legon): Free variation in Gã phonology.

Edward J. Allan (S.O.A.S., London, and St. Francis' Training College, Hohoe, Ghana): "Verbing things" in Buem.

L. Duponchel (Université d'Abidjan): La structure syllabique en alladian.

H.M.J. Trutenau (University of Ghana, Legon): To spread or not to spread--a hard look at a "tonespreading" proposal, and limitations on requirements of pitch-specification in tone languages.

H-C. Grégoire (Université d'Abidjan): Apports et limites de l'analyse instrumentale des réalisations tonales.

Victoria A. Fromkin (U.C.L.A.): Universals of tone.

R.G.S. Sprigge and K.C. Ford (University of Ghana, Legon): General tone rules for nouns and verbs in Ewe.

Friday, March 24

Session A:

Kay Williamson (University of Ibadan): The Rivers Readers Project.

Jean Ure (University of Ghana, Legon): "Mixed language", bilingualism and language development: a sociolinguistic study.

Afọlabi Ọlabimtan (University of Lagos): Problems of teaching Yoruba as a first language in the cosmopolitan city of Lagos.

Ọlabiyi Babalọla Yai (Université du Dahomey): Linguistique africaine, linguistes et société: plaidoyer pour une étude critique de l'attitude des linguistes en Afrique occidentale.

Antoinette d'Assomption et Ọlabiyi B. Yai (Université du Dahomey): Langues nationales au Dahomey: être ou ne pas être.

Adeboye Babalọla (University of Lagos): The growth of the Yoruba language (1770-1970): problems encountered and solutions essayed.

Ọlasope Oyelaran (University of Ifẹ): The characterization of Standard Yoruba.

Session B:

J.R. Birnie (University of Ghana, Legon): Cloze procedure--an experimental tool for the identification of local variety markers.

Akin. Ịṣọla (University of Lagos): The problem of presentation in teaching Yoruba to non-speakers of the language.

Alan S. Duthie (University of Ghana, Legon): Ewe language publications.

Oludare Ọlajubu (University of Lagos): The primer in Yoruba.

Ɔinma Ogieiriaixi (University of Lagos): Spoken art: literature or non-literature?

M.E. Kropp-Dakubu (University of Ghana, Legon): Some linguistic aspects of style in Gã songs.

Ọlatunde Ọlatunji (University of Ibadan): Ìyẹ̀rẹ̀ Ifá: Yorùbá oracle chant.

Geoffrey M. Ridden (University of Ghana, Legon): English and status in Ama Ata Aidoo and John Steinbeck.

Session C:

E.O. Apronti (University of Ghana, Legon): Why postpositions?

Ian Maddieson (University of Ibadan, Jos Campus): The noun class system of Eggon.

R.G.S. Sprigge (University of Ghana, Legon): An enquiry into the tonemic approach to tone in Ewe.

Dauda Bagari (Abdullahi Bayero College, Ahmadu Bello University, Kano): NP complementation in Hausa.

François Lumwamu (Université de Brazzaville): L'héritage linguistique de K.E. Laman: l'unité du Kikongo.

Ayọ Bamgbọṣe (University of Ibadan): On serial verbs and verbal status.

K.C. Ford (University of Ghana, Legon): An aspect of discourse structure with illustrations from three Ghanian languages: Avatime, Lolobi and Tafi.

John Stewart (University of Ghana, Legon): "Implosives" in Proto-Bantu? A question arising from comparison with Western Kwa languages.

John Bendor-Samuel and Inge Meier (Institute of Linguistics): Basic and derived sentence-types in Izi.

Saturday, March 25

Session A:

R.G. Armstrong (University of Ibadan): The multi-dimensional publication of oral literature.

G. Dumestre et G. Retord (Université d'Abidjan): Présentation d'une méthode audio-orale de dioula.

David Arnott (S.O.A.S., London): Some questions concerning the teaching of African languages in schools and universities.

Ọlabiyi B. Yai (Université du Dahomey): Deviation and intertextuality in Yoruba poetry/Écarts et intertextualités dans la poésie orale yoruba.

Session B:

Charles S. Bird (Indiana University): The syntax and semantics of possession in Bambara.

Margrit Bolli, Eva Flik, and John Bendor-Samuel (Institute of Linguistics): Testing the mutual intelligibility of dialects.

Frances Ingemann (Institute for Liberian Languages and University of Liberia), John Duitsman (Institute for Liberian Languages), and William Doe (University of Liberia): A survey of the Krahn dialects in Liberia.

Edward J. Allan (S.O.A.S., London, and St. Francis' Training College, Hohoe): The vowel system of Lelemi.

Papers circulated but not read

J.R. Birnie (University of Ghana, Legon): A further study of markers of local varieties of written English in West Africa.

André Prost (Mission Catholique, Haute Volta): Nõtre et Mõore.

Papers read at the Working Party on Tone

M. Abbott and J.C. Callow (Institute of Linguistics, Ghana): A "deduced" tone in Konkomba.

K.C. Ford (University of Ghana, Legon): Remarks on distinctive features of tone in the light of data from a Ghanaian language with five distinctive phonetic pitch levels (Avatime).

K.C. Ford (University of Ghana, Legon): The non-terracing tone system of Lolobi.

Ian Maddieson (University of Ibadan, Jos Campus): Tone system typology and distinctive features.

THIRD ANNUAL CONFERENCE ON AFRICAN LINGUISTICS

Indiana University
Bloomington, Indiana

The following program, with minor modifications, was distributed just before the meeting to all participants. The proceedings of this conference will soon appear in the African Series of the Research Center for the Language Sciences, Bloomington, Indiana (editor: Erhard Voeltz).

PROGRAM

April 6, 1972

8:00 PM Ballantine Hall 240

Peter Ladefoged (University of California, Los Angeles): Current contributions of phonetic research to linguistics.

April 7, 1972

8:00-9:00 AM, Solarium, Indiana Memorial Union: Registration.

9:00-12:00 Plenary Session, Solarium, IMU (Carleton T. Hodge, Chairman).

Pierre H. Alexandre (Paris): Some observations on modern usage and trends in Brazzaville Lingala.

Lawrence Boadi (University of Ghana, Legon): Topicalization in Akan.

Edgar A. Gregersen (Queens College, City University of New York): Nilotic consonant ablaut.

Larry M. Hyman (University of Southern California): The great Igbo tone shift.

William R. Leben (Brandeis): A constraint on the interpretation of indefinites.

2:00-5:00 Second Session, Section I, Solarium East, IMU, (Paul Newman, Chairman).

Ernest F. Dunn (Rutgers University): Hausa plurals: a stratificational restatement.

John Bryson Eulenberg (Stanford University): How morphological alternations in Hausa conspire to make it a more efficient channel of communication.

Claude Hagège (Université de Poitiers): About system constraint in the presentation of phonemes in Mundang (Léré, Chad).

Charles Kraft (University of California, Los Angeles): Reconstruction of Chadic pronouns.

Judith Maxwell (Michigan State University): On the suprasegmental representation of tone in Hausa.

2:00-5:00 Second Session, Section II, Solarium West, IMU (Georges D. Bokamba, Chairman).

Cheryl L. Austen (Indiana University): A re-evaluation of the Proto-Bantu tonal system.

Patrick R. Bennett (University of Wisconsin): The Bantu absolutive: what kind of phrase?

Irvine Richardson (Michigan State University): Morphotonology and Sukuma verbal forms.

Patricia Buchanan and Jeannine Wadlegger (University of Massachusetts, Amherst): Concord in Tswana locatives.

Robin Cooper (University of Massachusetts, Amherst): The causative and applied construction in Tswana.

Talmy Givón (University of California, Los Angeles): The white linguist in Africa.

8:00 PM Hans Wolff Memorial Lecture, Solarium, IMU.

W. H. Whiteley (School of Oriental and African Studies, University of London and Indiana University): To plan is to choose: the rationale and consequences of language choice in Eastern Africa.

April 8, 1972

9:00-12:00 Third Session, Section I, Ballantine Hall 005 (Wayne R. Williams, Chairman).

Laura Meyers (University of California, Los Angeles): The particle har and sai: even, only and until in Hausa.

Paul Newman (Yale University): Syllabic structure in Chadic vs. universal typology.

Russell Schuh (University of California, Los Angeles): Sound change as rule generalization: a study of consonant lenition in Hausa and Dera.

Neil Skinner (University of Wisconsin): Hausa wani/wata/wadansu and its semantic behavior.

Edwin S. Williams (Massachusetts Institute of Technology): The underlying representation of tone in Margi and Igbo.

9:00-12:00 Third Session, Section II, Ballantine Hall 006 (Richard Spears, Chairman).

Olúṣolá Ajolore (University of Illinois): When vowel clusters occur in Yorùbá.

Ọladele Awobuluyi (Lehmann College, City University of New York): On the nature of relativization.

Kenneth L. Baucon (University of Georgia and Bureau of Literacy, Windhoek, South West Africa): Proto-Central Khoisan.

M. Lionel Bender (Southern Illinois University): The role of phonological innovations in lexicostatistic subgrouping of Ethiopian languages.

Sahnny Johnson (Indiana University): Bambara postpositions: a study of inherent and contextual meaning.

12:00-2:00 Luncheon, Cafeteria ABC, IMU.

Discussion of an African Linguistics Association (Charles S. Bird, Chairman).

2:00-5:00 Fourth Session, Section I, Ballantine Hall 005 (Mamadou Konaré, Chairman).

Alan S. Kaye (California State College, Fullerton): Historical remarks on Chadian Arabic.

Mona Lindau (University of California, Los Angeles): Features for vowels: advanced tongue root and vowel height.

J. O. Robinson, Jr. (University of California, Los Angeles): Focus-presupposition in Igbo.

Herbert F. Stahlke (University of Illinois): The development of the three-way tonal contrast in Yoruba.

F. Vandamme and A. Diallo (Ghent): Some features of Fulani seen from a functional point of view.

Katherine Watson (Indiana University): Identity deletion phenomena in Lango.

2:00-5:00 Fourth Session, Section II, Ballantine Hall 006 (W. H. Whiteley, Chairman).

Georges D. Bokamba (Indiana University): Immediate dominance, topicalization, and relativization.

Frank Heny (University of Massachusetts, Amherst): An untitled paper on non-phonological rules (in Tswana).

Amy Meyers (Queens College, City University of New York): A curious result of Dahl's law in Kikuyu.

Martin Mould (University of California, Los Angeles): The syntax and semantics of the initial vowel in Luganda.

Linda Roberts and Marjorie Wolontis (University of Massachusetts, Amherst): Conjunction and concord in Bantu.

Don R. Vesper (University of Missouri): Predication and possession in Tumbuka.

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COLLOQUIUM ON PROSODIC SYSTEMS

Leiden, September 9-11th, 1972

Thilo C. Schadeberg
Sektie Afrikaanse Taalkunde
Rijksuniversiteit te Leiden

After a similar meeting had been held at Leiden the year before, the Department of African Languages at Leiden University (Netherlands) organized a colloquium on prosodic systems from September 9th to 11th, 1972. Participation was organized on the basis of personal invitations. The following persons took part in the colloquium:

1. Kees F. de Blois, United Bible Societies
2. Mevrouw L. Bynon-Polak, Museum Tervuren
3. T. L. Cook, RU Leiden
4. André Coupez, Museum Tervuren and Université Libre de Bruxelles
5. Jan Daeleman, UNAZA Campus de Lubumbashi Zaïre
6. Ph. Elias, RU Leiden
7. Claire Grégoire, Museum Tervuren
8. Larry M. Hyman, Linguistics Program, U.S.C.
9. A. E. Meeussen, Museum Tervuren
10. Klaus Piper, RU Leiden
11. Piet van Reenen, VU Amsterdam
12. Thilo C. Schadeberg, RU Leiden
13. Mevrouw Berthe Siertsema, VU Amsterdam
14. Leo Stappers, UNAZA Campus de Lubumbashi, Zaïre
15. Chris Sturtewagen, RU Ghent
16. J. Voorhoeve, RU Leiden
17. M. Voorhoeve, RU Leiden

First, a number of general or theoretical issues were raised in papers and discussed subsequently: naturalness of tone rules (L. Hyman), Bangubangu tone without global rules (A. E. Meeussen), and a downdrift rule meeting certain constraints to be imposed on post-binary rules (Th. C. Schadeberg).

Next, three cases of restricted tone systems were presented: Japanese (A. E. Meeussen), Safwa (J. Voorhoeve), and Kinga (Th. C.

Schadeberg). The defining feature of a restricted tone system is the neutralization of tonal distinctiveness in certain positions of the formative and/or formative string.

Finally, two research reports were brought forward, both of them to become dissertations: the tonal system of Bukusu (K. F. de Blois) and some remarks on the tonal analysis of Suku (K. Piper).

PROGRAM

September 9:

1. Larry M. Hyman, Prolegomena to a theory of natural tone.
2. Thilo C. Schadeberg, [αFn]?
3. A. E. Meeussen, Bangubangu tone.

September 10:

4. Thilo C. Schadeberg, Kinga: a restricted tone system.
5. Jan Voorhoeve, Prominence in Safwa.
6. A. E. Meeussen, Japanese accentuation as a restricted tone system.

September 11:

7. Kees F. de Blois, Some notes on the Bukusu tone system.
8. Klaus Piper, Quelques remarques sur l'analyse tonale du Suku.

Editors' Note: The papers presented by Meeussen (Bangubangu), Schadeberg (Kinga) and Voorhoeve (Safwa) will appear in Studies in African Linguistics, Volume 4, No. 1 (March 1973). The paper by Hyman is available, co-authored by Russell G. Schuh (U.C.L.A.), in Working Papers on Language Universals No. 10, Stanford University, under the title "Universals of tone Rules: evidence from West Africa".

CORRIGENDA

Alexis Takizala has pointed out that in his article "Focus and Relativization: the Case of Kihung'an", S.A.L. 3.2:259-287, the following examples should be corrected to read as follows:

(58, p. 272): kwe kɪ́t Kipes ka-swiim-in zoono instead of
kwe kɪ́t Kipes a-swiim-in zoon

(73, p. 276): Kɪ̀pés a-swiim-in kit zoono instead of
Kɪ̀pés a-swiim-in kit zoon

(84, p. 278): na wu a-mween Kipes instead of
na wu ka-mweene Kipes

(92-95, p. 281): these sentences should be translated as 'the man who...' and not as 'this man'; that is, wu in these examples is a relative pronoun, not a demonstrative.

Larry Hyman has pointed out that in his article "Nasals and Nasalization in Kwa", S.A.L. 3.2: 167-205, the following misprint should be corrected:

Example (48), p.192: stages (c) and (d) should have been written with nasalized vowels, i.e. CNṼ and CṼ, respectively.