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THE INTERACTION OF SEGMENTAL AND TONAL LEVELS: THE CASE OF [ɯ] IN TEMNE*

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Temne is a West Atlantic Mel language, spoken in northern Sierra Leone, which has both phonemic and morphological tone. This paper explores the interaction between tonal and segmental levels through the investigation of segmental rules of insertion and deletion and through verbal inflections and derivations. The paper shows that tonal patterns on Temne verbs are not additive, unlike the segmental portions of the verbs, and that the tones on verbs must be viewed as almost totally independent of the component morphemes of the verb. In the process, the paper argues for the analysis of [ɯ] as an underlying vowel and for the analysis of pronouns as noncliticized morphemes, which means that Temne has redundant subject markers in certain types of sentences. Both of these are issues which various authors have taken opposing stances on in the literature.

1. Introduction

Temne is a West Atlantic Mel language spoken in northern Sierra Leone.[1]

*The data on which this paper is based (a corpus of over 1500 lexical items) was collected during research supported by the African Studies Program at Indiana University, 1976-1978. A shortened version was presented at the Ninth Annual Conference on African Linguistics, Michigan State University, East Lansing, Michigan, April 1978. We would like to thank Josh Ard, Charles Barton, Mary Clark, and Russell Schuh for their insightful comments on and criticisms of various drafts of this paper. We would especially like to thank Madina Dumbuya, our principal Temne speaker.

[1]There are five dialects of Temne: Western, the most widely spoken dialect, found in the westernmost part of Sierra Leone; Yoni, spoken to the east of Western Temne; Bombali, spoken to northeast of Yoni; Western Kunike, spoken to the east of Yoni: and Eastern or Deep Kunike, which is spoken to the east of Western Kunike [Dalby 1962]. Schlenker [1861] worked on Western Temne;

Although it has phonemic and morphological tone, only two accounts of the language, Dalby [1966] and Wilson [1968], deal with tone to any extent. Some accounts mention tone but do not mark it (as in Wilson [1961] and Thomas [1916]), and others do not mention tone at all (as in Scott [1956] and Coleman [1967]). While most accounts mention processes which affect consonants and vowels (such as assimilation, deletion, insertion, and coalescence), even those analyses which include tonal phenomena do not deal with the interaction of non-tonal processes with tonal processes.

This paper will explore this interaction between tonal and segmental levels using as an example the processes of insertion and deletion affecting the Temne high back unrounded vowel [ɯ] . This vowel has a controversial status in the phonological literature on Temne. It has been analyzed by various scholars as a semi-vowel, as the syllabic variant of a non-syllabic consonant, and as an anaptyctic vowel in polysyllabic stems while being underlying in monosyllabic ones. The first part of this paper will therefore establish the status of [ɯ] as a normal vowel having the same properties as other Temne vowels and will also establish it as an underlying vowel in at least some instances. Once the status of [ɯ] as a normal Temne vowel has been established we will discuss the interactions of segmental and tonal levels that deletion and insertion of this vowel bring about. Such interaction between vowels and tones raises the question of how tones are to be represented underlyingly. These phenomena present problems especially for an analysis which assumes underlying tone to be the property of syllables or of single segments, i.e. part of the feature matrix of a vowel. As will be shown, to resolve such problems and reach a clearer understanding of what happens to a tone when the segment which bears it is deleted or inserted it will be necessary to assume that tone is the property of larger underlying sequences, i.e. morphemes or words.

Thomas [1916] probably also worked on Western Temne. It is not clear which dialects Sumner [1922] and Scott [1956] were working on. Wilson [1961] was working on Western Temne and Dalby [1966] was working on Yoni. This analysis is based on Western Temne.

2. Review and Discussion of Previous Analyses of [ɯ]

In order to understand the problem of the status of [ɯ] it is necessary to see how this vowel has been analyzed in the past: Schlenker [1861:xvii] describes it as "an imperfect vowel sound", which he contrasts with normal vowel sounds; Scott [1956:8] considers it to be a semi-vowel; Dalby [1966:7] appears to treat it as an allophonic reflex of a non-syllabic consonant in the environments in (1).

(1) CC → CɯC (where C ≠ ŋ, h, w, y)
Cy → Cɯy
Cŋ(C) → Cɯŋ(C)
ŋŋ(C) → ŋɯŋ(C)
VCCV → VCɯCV (usually)

For Dalby, [ɯ] therefore is everywhere derived, and one is left in doubt as to whether it is a vowel at all. Lastly, Wilson [1961:3-4] analyzes [ɯ] as inserted in concord elements, between the final consonant of a word and the initial consonant of the next word, and between the second and third consonants of a polysyllabic stem. Wilson considers all other occurrences of [ɯ] to be underlying.

2.1. The analyses of Schlenker and Scott. The first concern of this analysis will thus be to establish that [ɯ], contrary to the accounts of Schlenker, Scott, and Dalby, is the same as other vowels of Temne. According to most analyses, the phonemic vowels of Temne are those in (2).

(2) i u
e o
ɛ ʌ ɔ
a

If we include [ɯ] as a phonemic vowel, Temne can be characterized as having a nine vowel system with three unrounded front vowels, three rounded back vowels, and three unrounded back vowels.[2]

[2]Only the vowels, /i,e,ɛ/ condition palatalization of /t,s,w/ . There-

(3) i ɯ u
e ʌ o
ɛ a ɔ

[ɯ] , therefore, fits into the symmetrical pattern in (3). While this is not a persuasive argument for the status of this segment as a vowel, the symmetrical pattern does have aesthetic appeal.

[ɯ] is somewhat shorter in duration that other Temne vowels, and this might have been what Schlenker meant when he described it as "imperfect". However, as will be shown below, it has the same phonological and distributional characteristics as non-controversial Temne vowels and therefore the length of [ɯ] cannot be considered a criterion for classifying it as something other than a normal vowel.

Scott analyzes [ɯ] as a semi-vowel. However, the semi-vowels have a defective distribution, appearing underlyingly in stem and word initial position only.[3] [ɯ] has the same distribution as the other vowels. Moreover, the only segments which bear surface tone in Temne are vowels and sonorant consonants, specifically /m, n, ŋ, r, l/ . The semi-vowels never bear tone. High back unrounded [ɯ] carries tone just like the other vowels. [ɯ] therefore acts like a vowel and not like a semi-vowel.

2.1.1. Dalby's analysis and Temne pronouns as independent words. Since Dalby's analysis hinges on a defective distribution for [ɯ] as opposed to other vowels, the environments in which [ɯ] is found are presented below. Temne vowels appear (a) word-initially, (b) between consonants, (c) after a semi-vowel, (d) in the environment of another vowel, and (e) word-finally. We will examine each possible environment in turn.

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fore, /a/, although phonetically rather front, can be said to act like a back vowel.

[3]All other surface occurrences of [w] and [y] can be shown to be derived from the underlying high vowels:

ɔ́ tʊ́		'he is sick'	ùtwɪ́	/tu+i/	'he is sickly'
ɔ́ g͡bʌ́Ts	/g͡bʌl+s/	'he chops wood'	ɔ́ g͡bʌ́y	/g͡bʌi/	'he breaks open'
			ʌ̀g͡bʌ́yʌ́	/g͡bʌl+ʌ/	'it is broken'

For a formalization of this rule, see (27), rule 6.

(a) Vowels appear word-initially in concord elements and pronouns. [ɯ] does not appear in this position as there is no concord element or pronoun which begins with this segment. As can be seen in (4), /ɵ/ and /o/ also do not appear in this position.[4]

(4) Word-initially

ɾ	'I'	-------		ù	'a [+AN]' (ANimate)
-------		ńŋ	'the (sg.)'	-------	
é	'the (pl.)'	ńŋ	'the (pl.)[+AN]'	ó	'the (sg.) [+AN]'

Therefore, the fact that [ɯ] does not appear word-initially is not significant.

(b) All vowels, including [ɯ] , appear between consonants. In our corpus there are no [ŋɯC] sequences, a fact which Dalby considers significant, but there are also no [ŋaC] or [ŋɛC] sequences.

(c) Vowels appear after /y/ and /w/ .

(5)	mùyɾ	'a state, condition'	yùnt	'trees'	kùyókó	'a cassava'
	rùyèm	'a lie'			ùyòlé	'a rich person'
	ùyék	'a monkey'	ùyé	'an old woman'		
	ùwìr	'a goat'			ùwùnɾ	'a person'
	ùwèr	'a rodent'			ʌwól	'a game'
	ó wék	'he squeezes out'	ùwàn	'a child'	mʌ wɔ́n	'it is hot/warm'

As the examples in (5) show, any gaps do not seem to be significant. [ɯ] does not occur after /w/ , but neither does /ʌ/ , a segment whose status as a vowel has never been questioned. And while there are very few cases of [ɯ] appearing after /y/ , there are no occurrences of /u/ or /ʌ/ in this posi-

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[4]Throughout this paper /g͡b/ indicates a voiced co-articulated labio-velar stop, /t̪/ indicates a voiceless unaspirated lamino-alveolar stop, /t/ indicates a voiceless aspirated apico-alveolar stop, and /ɯ/ indicates a high back unrounded vowel. Tone will be indicated as follows: High tone V̂ or H (underlying); Low tone V̌ or L (underlying); Mid tone V̄ or M (underlying) or H (with surface tone derived by downstep); Lowered mid V̄ or M (underlying); High tone falling to mid V̂ or HM (underlying) or HL (with surface tone derived).

tion.

(d) Vowels can appear in the environment of another vowel, usually a high vowel. If the two vowels differ in tone, both vowels appear as vowels on the surface:

(6)	ʌ̀ràfʃà	'a raffia'	ɔ̀ yáʌ̀	'he is lazy'
	mʊ̀sɔ̀ʃ	'some soap'	ùkʃàmdɛ̀r	'a carpenter'

There are very few examples of this type, and the fact that none of them contains [ʊ] does not seem to be significant.

If the two vowels have the same tone, the high vowel appears as the corresponding semi-vowel (cf. (27), Segmental Rule 6). The overwhelming majority of these sequences have the shape CVy . The rest have shapes CwV and CyV .

(7)	ʌ́ bʃyā	'it becomes black'	-------		ʌ̀kwʃ	'an alligator' (/kʊ́ʃ/)
	mʌ̀ fɛ́y	'it is hot'	ʌ̀ gbʌ́yʌ́	'it is broken'	ùsɔ́y	'a horse'
	-------		ùfày	'a butcher'	rʊ̀fɔ̀y	'an evening'
			dʊ́nyʌ́	'the world'		

As can be seen in (7), [ʊ] does not appear adjacent to a semi-vowel derived from a vowel, but then neither does /ɛ/ . Again this gap in the distribution of [ʊ] does not seem to be significant.

(e) All vowels appear in word-final position. This includes [ʊ] , contrary to Dalby's analysis.

(8)	sʊ́	'we'
	nʊ́	'you (pl., subj.)'
	tʊ́	future marker

Granted, pronouns and tense/aspect markers which appear before a verb are not usually considered the strongest evidence for claims about word-final position, since in some languages they are merely particles which are cliticized to the verb. However, this is not the case in Temne. There is ample evidence that the pronouns and tense/aspect markers are independent words, and most analyses of Temne treat them as such (see Coleman [1967], Schlenker [1861], Scott [1956], Sumner [1922]). Thomas [1916], Wilson [1961, 1968], and Dalby

[1966] treat them as clitics (hence Dalby's statement that there are no word-final [ɯ]). To clarify this matter, we present below a review of the evidence indicating that pronouns and tense/aspect markers are independent words.

The basic sentence in Temne is on the model of:

(9) rə́mɛ̀s rʌ́ fūmpɔ̄ 'the egg fell'
def+egg pro fall-past

If the full NP subject does not appear, the sentence is on the model of:

(10) rʌ́ fúmpɔ̄ 'it is falling'
pro fall-pres.

The morpheme labelled "def" in the first sentence marks plurality, definiteness and noun class. Similar agreement particles appear before adjectives, genitives, and demonstratives. The morpheme labelled "pro" in both sentences above agrees with the antecedent or referent noun in class and plurality. Dalby and Wilson label all of these morphemes which agree with the head noun "CE's" (that is, concord elements), and do not discriminate among them, treating the morphemes that appear before nouns, adjectives, genitives, demonstratives, and verbs as all being cliticized to the following word, even extending this treatment to the personal pronouns. However, the morphemes which appear before the verb in a Temne sentence behave significantly differently from similar morphemes which appear before the nominal elements. Note that in sentences like the first one above, according to this analysis, there is a double subject. Both [rə́mɛ̀s] and [rʌ́] are the subject of the verb [fúmpɔ̄] .[5] The second subject does disappear in relative clause structures:

(11) a. rə́mɛ̀s fūmpɔ̄ é rʌ́ g͡bʌ̀y (/é/ marks a subordinate clause (SUB))
def+egg fall-past SUB pro break open-past
'the egg that fell broke open' (cf. (9))

[5]Although the analysis of sentences of any language as routinely containing a double subject may seem bizarre, especially for those linguists who are used to person/number markers as clitics, it seems that this is the correct analysis for Temne. Aside from the syntactic and tonal evidence presented below, Hutchinson [1969, 1979] adopts this analysis for syntactic reasons independent of those presented here.

b. ɔ́làŋ͡mg͡bá tù é ɔ́ nɯ̀ŋk mT
def+man sick-past SUB pro see-past me
'the man who was sick saw me'

The second subject also does not appear in sentences in which the longer forms of the pronoun appear:

(12) mɪ́n mʌ̀ yɔ́ mʌ́+pánt ʌ́+mɪ́
I non-past do-pres def+work CE+my
'*I* am the one doing the work'

(See Appendix I for further examples.)

These "pro" elements are, then, at the very least not a necessary constituent of the verb morphology. There are, additionally, reasons for not considering them to be cliticized to the verb when they do appear. First, several elements routinely appear between the pronoun and the verb. These are most commonly the tense/aspect markers [lá] 'habitual', [tɯ́] 'future', [pɔ́] 'completive', [dé] 'about to', and combinations of them such as [tɯ́ dé] 'about to (near future)', [tɯ́ lá pɔ́] 'will usually have'.

(13) ɔ́tàr ɔ́ lá yàk ɪ́ lá rù
def+slave pro hab wash-past I pro hab weave-past
'the slave used to wash' 'I used to weave'

ɔ́tàr ɔ́ tɯ́ yák ɪ́ tɯ́ rú
def+slave pro fut wash-pres I pro fut weave-pres
'the slave will wash' 'I will weave'

In addition, adverbs can separate the pro from the verb:

(14) ɪ́ Tá dɪ́ɛ̂ 'I haven't eaten yet'
I yet eat+NEG

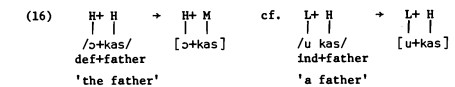
Moreover, adverbs also sometimes appear between the pro-tense/aspect marker series and the verb:

(15) ɔ́ tɯ́ pɔ́ Tɔ̀ŋ kàr or ɔ́ tɯ́ pɔ́ kàr Tɔ̀ŋ
he pro fut compl by now wait-past
'by now, he will have been waiting'

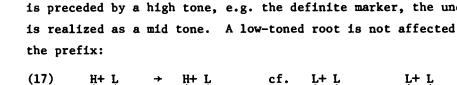
Therefore, free morphemes can be interposed between the pro and the verb and between the tense/aspect markers (which in turn separate the pro from the

verb) and the verb. Since neither the pro nor the tense/aspect markers can be analyzed as being cliticized to the following verb, the [ɯ] in sɯ̰ 'we', nɯ̰ 'you' and tɯ̰ (future marker) must therefore be word-final.

The second block of evidence which supports the analysis of the pro and tense/aspect markers as independent words concerns the tonal process of downstep. Within the nominal paradigm, where the effects of downstep are most evident, a high tone followed by a high tone is downstepped to mid tone:

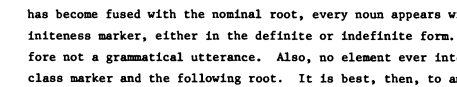


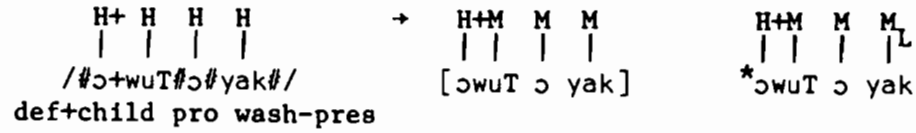
(For a complete description of this phenomenon see Mountford [1979].) The underlying tone of the root for 'father' is a high. This tone appears on the surface when it is preceded by the low-toned indefinite prefix. When /kɑ̰s/ is preceded by a high tone, e.g. the definite marker, the underlying high tone is realized as a mid tone. A low-toned root is not affected by the tone of the prefix:



Note that except for proper names and a few cases in which the class marker has become fused with the nominal root, every noun appears with its class/definiteness marker, either in the definite or indefinite form. [kɑ̰s] is therefore not a grammatical utterance. Also, no element ever intervenes between a class marker and the following root. It is best, then, to analyze the class/definiteness markers as being prefixed onto the verb root.

Contrast this with the tones found on a verb and its preceding pro (which is sometimes homophonous with the definite class marker):





(NB: Once the high tone register is lowered by downstep, it stays lowered throughout the rest of the clause.) If the domain of downstep is the word as is indicated by the way in which it functions in nouns and adjectives, then this appearance of a high tone on the verb is further evidence that the morphemes we have been calling "pro" are independent words.[6]

---

[6]There are certain tonal patterns on pro followed by verb which look like there is some sort of process of downstep in operation. This occurs when the verb is a Class II verb, that is, its past tense is marked with a mid tone.

Class I		Class II	
ɔ́ bʌ́f	ɔ́ bʌ̀f	ɔ́ dér	ɔ́ dēr
he farm-pres	he farm-past	he come-pres	he come-past
'he is farming'	'he farmed'	'he is coming'	'he came'

The mid tones in these cases and in the further examples are due to the verb class, and not to a process of downstep conditioned by the preceding pronoun or tense/aspect marker. How much of the verbal tone patterns should be analyzed as a result of the process of downstep is a difficult question. There is certainly nothing to stop us from assuming the widest possible applicability and analyzing any M tone which follows a H tone in verbs as an underlying H downstepped to mid. In addition, Pattern VII (see Appendix Two) is clearly a pattern best analyzed as being formed by the application of downstep. On the other hand, unconditioned word-initial M tones occur in the past tense forms of Class II verbs, contrasting with the word-initial L tones in the past tense forms of Class I verbs. This and the contrast of present tense H L and past tense M L in Pattern VI verbs suggest that the mid tone is acquiring semiphonemic status in the Temne verb. This is further supported by the existence of close triplets in which H, M, and L contrast on the first syllable of a word:

dí	'eats'				
dīs	'feeds'	dĪs	'fed'	dìs	'yesterday (adv)'
fúmpɔ̄	'falls'	fūmpɔ̄	'fell'	fùmpɔ́	'Fall down!'

(There is no sign of unconditioned mid tones in Temne nouns and adjectives.) There is also a contrast of M and H after L in verbs (but not in nouns and ad-

The non-occurrence of downstep, incidentally, provides evidence that the tense/aspect markers (for the most part, high-toned) are also independent words. As we have seen in the first part of this discussion, even the longest concatenation of tense/aspect markers produces a surface sequence of high tones:

(19) ó tʊ́ dɛ́ tɔ́ŋ 'he is about to cook (in the near future)'
he fut about to cook-pres

ɔ́ŋ tʊ́ pɔ́ bèk 'they will have arrived'
they fut compl arrive-past

ɔ́ŋ tʊ́ lɔ́ pɔ́ yɔ̄kā 'usually they will have gotten up'
they fut hab compl get up-past

mʌ́ tʊ́ lɔ́ pɔ́ tɔ̄sʌ̀ 'usually it will have boiled'
it fut hab compl boil-past
(ref=water)

This and the previous evidence concerning the interposability of other morphemes between the tense/aspect markers or pro and the verb lead us to consider both the pro morphemes and the tense/aspect markers to be independent words. The [ʊ] in sʊ́ , nʊ́ and tʊ́ thus appear word-finally and the distribution of [ʊ] is not as defective as Dalby's [1966] analysis would lead us to believe. Thus, the high back unrounded vowel [ʊ] has a normal distribution; any gaps in its distribution are shared by at least one other vowel.

2.1.2. Phonological processes affecting all vowels, including [ʊ] . In addition to the above evidence, [ʊ] also behaves like other Temne vowels in that it is subject to processes which affect other vowels. For example, there is an allophonic rule in Temne which lengthens vowels, including [ʊ] , before /r/ .

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jectives). Any verb with a L M past tense (Patterns IV, V, VII, VIII, VIIIa) contrasts with the form of that verb in the imperative, which in Temne has the pattern L H, e.g. yànɛ̄ 'washed one's face' vs. yànɛ́ 'wash your face!', tʊ̀lā 'heard something' vs. tʊ̀lʌ́ 'listen!'. There are thus some M tones in verbs which are difficult to derive from H tones. Since the resolution of the problem of the extent of the applicability of downstep in verbs does not affect the issues under consideration in this paper, we will for the moment treat all mid tones in verb patterns as underlying.

(20)	[rʉ̀fɩ̀]	'a death'	[ɔ́ fɩ̀:r]	'he found (something)'
	[ɔ́ bèk]	'he arrived'	[mʉ̀bè:r]	'some liquor'
	[ɔ́ bɛ́nt]	'he prevents'	[mɛ́:r]	'some salt'
	[kʉ̀nt]	'a tree'	[kʉ̀:r]	'a louse'
	[kʉ̀mʌ́ŋk]	'an ear of corn'	[mʉ̀mʌ́:rɔ́]	'some oil/fat'
	[ùkás]	'a father'	[ɔ́ ká:r]	'he waits for'
	[rʉ̀wʉ̀]	'a knee (area)'	[ɔ́ wʉ̀:r]	'he came from'
	[ɔ́ bɔ́t]	'he puts'	[ɔ́ bɔ́:r]	'he peels'
	[ɔ́ bɔ́]	'he gives credit to'	[ɔ́ bɔ́:r]	'he is in debt to'

Furthermore, there is a tendency for central vowels, including [ʉ] , to be slightly rounded after labials, and especially when they are between two labials:

(21)	/ùfàdɛ́ŋ/	'an enemy'	[ùf {à, ɔ} dɛ́ŋ]
	/bàfù/	'April'	[b {à, ɔ} fù]
	/ʌfʌ́sʌ/	'some strength'	[ʌf {ʌ́, o} sʌ]
	/rʉ̀pʌ́mpɔ̀/	'some cotton'	[rʉ̀p {ʌ́, o} mpɔ̀]
	/ùpʉ̀ŋk/	'a fool'	[ùp {ʉ̀, u} ŋk]
	/àfʉ́m/	'people'	[àf {ʉ́, u} m]

The vowel [ʉ] is thus subject to the same processes which affect other vowels.

2.2. Wilson's analysis of the status of [ʉ] as an underlying vowel. One may ask whether [ʉ] is an *underlying* vowel. At this point it is necessary to examine Wilson's generalization that [ʉ] is inserted when it appears between the second and third consonants of a polysyllabic stem. For this generalization to hold, one would expect it to be possible to state a rule of [ʉ]-insertion which would insert this vowel in a definable environment. Such a statement would capture the generalization that Temne does not allow consonant clusters of a certain type in medial position. Although there are se-

quences of the type CVCɯCV in Temne, there are many more sequences of the type CVCCV .[7] Most of the -CɯC- sequences involve stop-r sequences, as in (22a), but as can be seen in (22b), there are also stop-r sequences which never appear with an intervening [ɯ] .

(22) a. CVCɯCV		b. CVCCV	
ùkòmɯ̀rɔ́	'a mother with infant'	ɔ̀ Tàmrɔ́	'he is uncontrollable'
kɯ̀làpɯ̀rɔ́	'a hat'	bàprɔ̀n	'March'
ʌ̀bʃtɯ̃́rʌ	'a bottle'	ʌ̀mɔ́ŋkrɔ̀	'a mango'

Thus between a stop and a following /r/ is not an adequate statement of an environment for insertion. Nor do the tone patterns of these words provide a context for insertion. If [ɯ] were to be inserted in /làpùrɔ́/ the tonal pattern on the words /làpùrɔ́/ and /Tàmrɔ́/ underlyingly would both be low

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[7]For example:

-NC-				
			ùbɔ́lɔ́mbɔ́	' a doctor'
			ùsámpɔ́	'a female dancer'
			TʌmTùrkʃn	'six'
			ʌ̀bɔ́ndɔ́	'a women's secret society'
			ʌ̀lɔ́nTɔ̄	'an okra'
			mʌ́ntɯ̃r	'some tears'
			rɯ̀wʌ́nkɔ̀m	'a symbolic gift'
			mɯ̀làŋkɔ̀	'some palm kernel oil'
			kɯ̀gbɛ̀ŋ͡mgbɛ̀	'a pepper'
- [-nas, -cont]	[-cont]	-	ʌ̀bɯ̀Tkà	'a heel'
			ʌ̀kòndɛ̀dʌ́kdʌ́k	'a lizard'
			ɔ́ bɔ́kTɛ̄	'he churns up'
			ɔ́ rɯ́pnɛ̀	'he turns around'
- [+cont]	[-cont]	-	ùbɔ̀rkɔ́	'a young woman'
			ʌ̀kɔ́ʃTɔ́	'a shoe'
			ʌ̀kúfnà	'a wing'
- [-nas, -cont]	[+cont]	-	ʌ̀bɔ́Trèbɔ́	'familiarity' (and other examples in (11))
- [+cont]	[+cont]	-	ùkɯ́rʃì	'a spirit/devil'
			ɔ́ fɔ́flɔ́	'he whispers'

Dalby [1966:7] also notes the existence of these consonant clusters, although he doesn't consider it an argument against the derived status of [ɯ] .

high and would thus not supply a context for [ɯ]-insertion.[8] Any attempt to write an insertion rule to account for the presence of [ɯ] in cases like these would have to be lexically specific in order to derive the correct output. So, for at least these cases, [ɯ] must be considered to be underlying.[9] This is not to claim, however, that all [ɯ]'s are underlying.

3. Some Theoretical Predictions of Tone-Segment Interactions

Taking the status of [ɯ] as an underlying vowel to be established, what, then, is the status of the tone which [ɯ] bears? What happens to this tone when [ɯ] is deleted? And where does the tone come from when [ɯ] is inserted? Given the currently available frameworks, one could reasonable expect any of the following:

Tone as a segmental feature: If tone is considered to be part of the feature specification of a segment, one would expect that if the segment were deleted the tone on that segment would also be deleted. If, however, a potential tone-bearing segment were inserted one could expect one of two things: either the tone would be inserted with the segment and therefore all segments inserted by the same rule would bear the same tone, or the tone would be derived from surrounding tones, either by copying or assimilation. In either case, the tone on the inserted segment would be predictable.

Tone as a property of the syllable: If tone is considered to be the property of a syllable and the syllabic nucleus merely functions as its carrier in the surface structure, then one would expect that if the syllabic nucleus were deleted the tone would not necessarily delete. If the role of the syllabic

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[8]Nor is there any reason to believe that the tone on [ɯ] in these forms is not underlying. The three tone patterns represented in these examples are also found in other three-syllable noun stems: (H H L) ʌ̀g͡bán̄kà 'an area of the Pɔrɔ bush', (L L H) ʌ̀bɔ̀Trèbá 'familiarity', and (H L H) ʌ̀Támbàlɛ̄ 'a prayer drum'.

[9]Dalby's statement that [ɯ] in one syllable stems is inserted will not be considered here. Given an analysis in which tone is not the property of a segment or syllable (as in an autosegmental framework) there is no way to argue against such an analysis. The same is true of Wilson's analysis of [ɯ] as inserted in indefinite articles /kɯ̀/ , /mɯ̀/ , /tɯ̀/ , /rɯ̀/ , that is, between his underlying indefinite article /k-/ and the noun stem which begins with a consonant. We will merely point out that such analyses buy us nothing. There is no simple generalization about the impermissibility of stem-initial consonant clusters which would be captured here since there are consonant clusters in this position: [krf̄fì] 'spirit/devil' (a variant pronunciation of [kɯ́rfì]), [g͡brán̄] 'clean'. As for his statement that [ɯ] appears between words we have found no evidence for this whatsoever.

nucleus were to be assumed by another segment, the tone could be expected to appear on that segment. If another segment within the syllable did not become the syllabic nucleus, it is uncertain what would happen to the tone (perhaps it would turn up on the syllable nucleus of the readjusted syllable). But, if the syllabic nucleus which carries tone were shown to have been inserted between two non-syllabic consonants then the only way in which the tone could be *underlying* would be if consonant clusters were marked with a tone just in case a syllabic nucleus should become available and a syllable formed. This would be highly suspect. The tone cannot be inserted with the vowel for if the tone were inserted with the vowel that would imply that the tone was a property of the vowel and not the syllable. Rather the tone would have to be inserted or derived by a separate rule.

Tone as an autosegment: If, as in an Autosegmental Framework [Goldsmith 1976], tone is considered to be on a level independent of consonant and vowel features and to be associated with morphemes or words rather than segments, then if a surface tone-bearing segment were to delete, one would not expect the tone to delete, but rather that it would reassociate with another segment capable of carrying tone or be deleted by an independent rule. If the surface tone-bearing segment were shown to have been inserted, then the tone with which it is associated could be an underlying tone. Since tones do not necessarily have to be associated with an underlying vowel this tone could either be one associated with a particular morpheme or could spread from an adjacent morpheme.

The purpose of this paper is not to go into all the details of these frameworks nor to discuss all their advantages and disadvantages, but rather to examine their claims concerning the status of a tone vis à vis the segmental level with respect to deletion and insertion phenomena in Temne.

3.1. Tonal behavior when [ɯ] is deleted. There are several processes affecting [ɯ] in Temne, among them deletion and insertion. A rule of deletion will be examined first. Wilson [1961:4] notes that [ɯ] optionally deletes in rapid speech giving the example: [ɔ́ bɯ̄p] 'he found' becoming [ɔ́ þp] . (The tones are ours, Wilson [1961] does not mark tone.) He does not mention what happens to the tone on the deleted vowel. Our corpus contains no cases of deletion in this environment, but there are cases of deletion of [ɯ] in rapid speech before a sonorant consonant. The tone which was carried by the [ɯ] then appears on the conditioning sonorant. This rule can affect [ɯ] in any syllable, carrying any tone:[10]

[10]An alternative analysis would be to have underlying syllabic consonants, /ç/ which are realized on the surface as [ɯC] with the [C] desyllabified

(23) [ɯ] → Ø / __ [+son] (optional, rapid speech)

TʌmTɯ̀rèŋànlè	'nine'	→	TʌmTi̩èŋànlè	kɯ̀bɯ̀lɑ́y	'a basket'	→	kɯ̀bi̩ɑ́y
TʌmTɯ́dɛ́rɯ́ŋ	'seven'	→	TʌmTɯ́dɛ́rŋ́ (*TʌmTdɛ́rɯ́ŋ)	ʌlɛ́mɯ̀rē	'an orange'	→	ʌlɛ́mi̩ē
pɯ́lɑ́	'some rice'	→	pi̩ɑ́	mɯ̀sɯ̀m	'some taboos'	→	mɯ̀sm̩
ùkɯ́rfì	'a devil'	→	ùkf̩fì				

In order to account for this, a segmental analysis would have to include an ad hoc rule which would copy the tone onto a following sonorant in just those cases in which [ɯ] deletion is going to apply. However, if it is assumed that tone is the property of a string of segments, the analysis is rather straightforward. If tone is considered to be a property of syllables, as in the second framework mentioned above, it would be expected to appear on whatever was acting as the nucleus of the syllable. Since the deletion of the vowel in the above case is associated with the following sonorant becoming syllabic, and thus the nucleus of the syllable, it is no surprise that the tone appears on this sonorant. A derivation within this framework would look like that in (24):

(24) Syllable-Base Framework (brackets indicate the domain of a syllable)

	# $[_{L}ʌ]$ + $[_{H}kɯr]$ $[_{L}fi]$ #
[ɯ]-deletion	# $[_{L}ʌ]$ + $[_{H}kr]$ $[_{L}fi]$ #
Syllabification	# $[_{L}ʌ]$ + $[_{H}kr̩]$ $[_{L}fi]$ #
Output	# ʌ + kf̩fì # 'a devil'

---

and its role as tone-bearer taken over by an inserted [ɯ]. However, there is no convincing evidence that there are any underlying syllabic consonants in Temne. The only syllabic consonants which appear consistently on the surface (that is, appear on the surface without an alternate form of the same word with a vowel and a consonant ever appearing) are in the word [ŋ́] 'you (sg., subj. pro) and various words for 'yes' and 'no': [ŋ́kō] 'yes' from [ǎŋkō], and [ḿ̩], [m̩̀ ḿ̩], and [C̃ C̃] 'no' ('C̃' representing a velar click with nasal release). Most of the words for 'yes' and 'no' are clearly ideophones and can be excluded from consideration. This leaves only [ŋ́] 'you'. It makes more sense to consider this word to have an underlying vowel than to consider it alone as evidence for underlying nasal consonants in Temne.

Similarly, if an Autosegmental framework is adopted, then the deletion of a vowel would again not affect the tonal level. The tone would simply reassociate to the nearest segment capable of bearing tone on the surface. A derivation within this framework would look like (25):

(25) Autosegmental Framework

	# ʌ + kwrfi #	Segmental Level
	L H L	Tonal Level
[w]-deletion	# ʌ + krfi #	
	L H L	
Syllabification	# ʌ + kr̩fi #	
	L H L	
Reassociation	# ʌ + kr̩fi #	
	L H L	
Output	# ʌ + kf̩fi #	'a devil'

While (24) and (25) are very much alike, the analyses are not identical. The Syllable-Base framework offers a ready explanation for the syllabification of the following sonorant after the deletion of [w] because a syllable must have a nucleus; however, this is considered to be a separate phonological process in the Autosegmental analysis.[11]

Thus, in order to account in a principled way for the persistence of a tone after the segment which bears it is deleted, it is necessary to abandon the assumption that tone is part of the feature matrix of any *one* segment and to adopt a framework in which tone may be associated on the underlying level

[11]Note that a Syllable-base framework and an Autosegmental framework are not mutually exclusive [Goldsmith 1976:1-3]. The tonal level is not the only independent level which can be posited for a language. One could also assume a level of syllable structure. Such an analysis would give the following derivation:

L H L		L H L		L H L
σ σ σ	→	σ σ σ	→	σ σ σ
u kwr fi	segmental rules	u k r f i	syllable rules	u k r̩ f i 'a devil'

with a larger unit.

3.2. Insertion analysis of [ɯ] in three suffixes. The case of [ɯ]-insertion in Temne presents a more interesting example of the interaction, or non-interaction, of tonal and non-tonal rules. Consider the forms in (26):

(26) Examples of [ɯ] insertion[12]

/r ∿ ɯr ∿ ɡ/ transitive

1.	stop+[ɯr]	ɔ́ kɔ́t	'he ties'	ɔ́ kɔ́tɯ́r	'he ties on'
2.	fric+[ɯr]	ɔ́ fɔ́f	'he talks'	ɔ́ fɔ́fɯ́r	'he scolds (talks on)'
3.	m+[ɯr]	ɔ́ bɔ̃́m	'he defecates'	ɔ́ bɔ̃́mɯ́r	'he defecates on'
4.	{n, ŋ}+[d]	ɔ́ tã́ŋ	'he locks'	ɔ́ tã́ŋɡ	'he locks out'
5.	V+[r]	ɔ́ yé	'he gives to'	ɔ́ yér	'he shares with'
6.	VV+[r]	ɔ́ wáy	'he buys'	ɔ́ wáyr	'he buys from'

/s ∿ ɯs/ segmentative I

7.	stop+[ɯs]	ɔ́ yák	'he washes'	ɔ́ yákɯ̄s	'he washes repeatedly'
8.	fric+[ɯs]	ɔ́ Túf	'he spits'	ɔ́ Túfɯ̄s	'he spits repeatedly'
9.	r+[ɯs]	ɔ́ mér	'he swallows'	ɔ́ mérɯ̄s	'he swallows repeatedly'
10.	m+[ɯs]	ɔ́ lɯ̃́m	'he throws'	ɔ́ lɯ̃́mɯ̄s	'he throws repeatedly'
11.	{n, ŋ}+[s]	ɔ́ tã́ŋ	'he locks'	ɔ́ tâs	'he locks repeatedly'
12.	V+[s]	ɔ́ bɔ́	'he gives credit'	ɔ́ bɔ̂s	'he gives credit to several people'
13.	VV+[s]	ɔ́ pʌ́y	'he jumps'	ɔ́ pʌ́̂Ts	'he skips'

---

[12]There are in addition to these three suffixes a Causative, a Converse and a Partial Completive.

/s/$_{CAUS}$	ɔ́ dí	'he eats'	ɔ́ dî́s	'he feeds'
	ɔ́ bɔ́l	'it becomes long'	ɔ́ bɔ́lɯ̄s	'he makes long'
/r/$_{CON}$	ɔ́ bɔ́	'he gives credit to'	ɔ́ bɔ́r	'he is in debt to'
	ɔ́ yép	'he lends'	ɔ́ yépɯ́r	'he borrows'
/r/$_{PC}$	ɔ́ yé	'he gives'	ɔ́ yér	'he shares'
	ɔ́ yák	'he washes'	ɔ́ yákɯ́r	'he washes part of something'

Segmentative I (/s/$_{SI}$) and Transitive (/r/$_{T}$) are phonetically indistinguishable from the Causative and the Partial Completive, respectively. The Transitive and the Converse are indistinguishable except in those cases in which the Reciprocal (/ʌnɛ/) is also present on the verb (see examples in Appendix Two, and also Section 4).

/T ∿ ɯT/ segmentative II

14. stop+[ɯT] ɔ́ sʊ́k 'he moves' ɔ́ sʊ́kʊ̄T 'he scoots down'
15. fric+[ɯT] ɔ́ fɔ́f 'he talks' ɔ́ fɔ́fʊ̄T 'he talks continuously'
16. m+[ɯT] ɔ́ sɔ̰́m 'he sends' ɔ́ sɔ̰́mʊ̄T 'he sends continuously'
17. {n, ŋ}+[T] ɔ́ sɔ̰́ŋ 'he gives' ɔ́ sɔ̰̂nT 'he gives continuously'

In these forms [ɯ]C appears after /m/ , /r/ , and obstruents, and C appears after vowels, glides derived from vowels, and the non-labial nasals. Other rules which apply to these forms are listed in (27):

(27) Segmental Rules

1. [+syl] → [+nas] / __ [+nas]

   All vowels before nasals are nasalized. (cf. 3, 4, 10, 11, 16, 17)

2. $\begin{bmatrix}+\text{son}\\+\text{cons}\\-\text{nas}\\-\text{lat}\end{bmatrix} \rightarrow \begin{bmatrix}-\text{son}\\-\text{cont}\end{bmatrix} / \begin{bmatrix}+\text{nas}\\\alpha\text{cor}\\\alpha\text{ant}\end{bmatrix} (\#) \begin{bmatrix}\text{———}\\-\text{stem}\end{bmatrix}$

   Non-stem /r/ , that is /r/ in concord elements, locatives and suffixes, becomes [d] after [n] and [ŋ] (optional across word boundaries). (cf. 4)[13]

3. $\begin{bmatrix}+\text{nas}\\\alpha\text{ant}\\\alpha\text{cor}\end{bmatrix} \rightarrow \emptyset / \_\_ \begin{bmatrix}-\text{syl}\\+\text{cont}\end{bmatrix}$

   /n/ and /ŋ/ delete before non-syllabic continuants. (cf. 11)

4. $\begin{bmatrix}+\text{nas}\\+\text{back}\end{bmatrix} \rightarrow \begin{bmatrix}\alpha\text{ant}\\\beta\text{cor}\\\gamma\text{co-art}\end{bmatrix} / \_\_ (\#) \begin{bmatrix}+\text{cons}\\\alpha\text{ant}\\\beta\text{cor}\\\gamma\text{co-art}\end{bmatrix}$ (co-art = co-articulated labio-velar)

   The velar nasal [ŋ] assimilates to the point of articulation of the following consonant. (cf. 4, 17)

5. [-son] → [-voice] / __ #

   Obstruents are voiceless word-finally. (cf. 4)

---

[13]For more on the alternation of [r] and [d] , and similar stop-formation processes in other languages, see Nemer [1979].

6. $\begin{bmatrix} +syl \\ +high \\ \alpha tone \end{bmatrix} \rightarrow [-syl] \; \% \; \underset{[\alpha tone]}{V}$ (where [αtone] indicates identical tones)

A high vowel becomes a glide when it is in a VV sequence and agrees in tone with the other vowel. (cf. 6, 13)[14]

This analysis will consider the /C/ form of these suffixes to be underlying. The [ɯ] in these cases is, then, inserted. We exemplify these rules in (28), omitting tones for the moment. Non-applicable rules are not included in the derivations; [ɯ]-insertion applies after rule 4.

(28) Sample Derivations

	#bɔT + r#	#bɔT + r + ʌnɛ#
[ɯ]-insertion [Ex. 36]	#bɔT + ɯr#	does not apply
Output	[bɔTɯr]	[bɔTrʌnɛ]
	'to like'	'to like each other'
	#taŋ + s#	#sɔŋ + T#
1.	#tãŋ + s#	#sɔ̃ŋ + T#
3.	#tã + s#	does not apply
4.	does not apply	#sɔ̃n + T#
Output	[tãs]	[sɔ̃nT]
	'to lock repeatedly'	'to give continuously'

3.2.1. The alternative deletion analysis of [ɯ] and other arguments for insertion. The alternative analysis is that the underlying forms of these suffixes are the ones with the high back unrounded vowel. Such an analysis would necessitate a rule like the following:

(29) $[ɯ] \rightarrow \emptyset \; / \; \left\{ \begin{bmatrix} +syl \end{bmatrix} \right\} + \_\_ \; C \; \#$

[14]Underlying /ui/ sequences which agree in tone appear on the surface as [wi] (*[uy]), e.g. /ù+tú+ɾ/ [ùtwɾ] 'he is sickly'. The process could be expressed, however, and possibly with more explanatory value, in metrical formalism.

which would delete [ɯ] after vowels, /n/ , and /ŋ/ , when in a word-final morpheme. Such an analysis would consider it to be accidental that the vowel in these suffixes is always [ɯ] . Moreover, given the following data, the deletion analysis becomes even more complicated:

(30) 1.		2.		3.	
ʌ́ bɔ́T	'it becomes sweet'	ɔ́ bɔ́Tɯ́r	'he likes'	sɯ́ bɔ̂Trʌ̄nɛ̄	'we like each other'
ɔ́ yɛ́p	'he lends'	ɔ́ yɛ́pɯ̄s	'he lends to several people'	sɯ́ yɛ̂psʌ̄nɛ̄	'we lend to each other'
ɔ́ fɔ́f	'he talks'	ɔ́ fɔ́fɯ̄T	'he talks continuously'	sɯ́ fɔ̂fTʌ̄nɛ̄	'we talk to each other continuously'

To account for the non-appearance of [ɯ] in the forms in the third group, a deletion analysis would also have to specify that the vowel deletes whenever another morpheme follows.

(31)

$$[\text{ɯ}] \rightarrow \emptyset \; / \left\{ \begin{array}{l} + \_\_ \; C \; + \\ \left\{ \begin{array}{l} [+\text{syl}] \\ \begin{bmatrix} +\text{nas} \\ \alpha\text{ant} \\ \alpha\text{cor} \end{bmatrix} \end{array} \right\} + \_\_ \; C \; \# \end{array} \right\}$$

The rule required in a deletion analysis is thus highly complex. Moreover, it seems suspiciously linked to these particular VC morphemes (the only suffixes of this type, see footnote 12).

In contrast, an analysis which treats the [ɯ] in these forms as inserted involves an insertion rule which captures a generalization about allowable consonant sequences in Temne, viz. the rule would insert [ɯ]

1. between two consonants word-finally, when the first is non-nasal, and
2. between a nasal and a consonant word-finally when they disagree as to point of articulation.

That is, the only consonant clusters which appear word-finally in Temne are homorganic nasal-stop clusters. This generalization is a simple one, but it is not statable as such within the traditional phonological formalism.

Within a rule formalism referring only to segments, the rule appears as:

(32)
$$\emptyset \rightarrow [\omega] \; / \; \left\{ \begin{bmatrix} -syl \\ -nas \end{bmatrix} \_\_ [-syl] \quad \begin{bmatrix} -syl \\ +nas \\ \alpha cor \end{bmatrix} \_\_ \begin{bmatrix} -syl \\ -\alpha cor \end{bmatrix} \right\} \#$$

or $\emptyset \rightarrow [\omega] \; / \; C \_\_ C \; \#$ except in $/ \begin{bmatrix} +nas \\ \alpha ant \\ \beta cor \end{bmatrix} \_\_ \begin{bmatrix} -syl \\ \alpha ant \\ \beta cor \end{bmatrix} \; \#$,

i.e. [ω] is inserted between two consonants word-finally except between homorganic nasal-stop clusters.

Note that the insertion analysis can account for the forms in column 3 above without further modification. The consonant clusters in these forms are not word-final. Therefore the structural description for [ω]-insertion is not met and no [ω] appears.

A simplification in formalizing [ω]-insertion could be achieved by treating homorganic nasal-stop clusters as one segment. The rule would then simply be:

(33) $\emptyset \rightarrow [\omega] \; / \; C \_\_ C \; \#$

There is independent evidence that [mp], [nt], [nT], [ŋk], [mb], [nd], and [n͡m͡gb] clusters act as one segment. This involves a raising rule which affects /e/ and /o/ in closed syllables.

(34)
$$\begin{bmatrix} +syl \\ -high \\ -low \\ \alpha back \\ \alpha round \end{bmatrix} \rightarrow [+raised] \; / \; \_\_ \; C \left\{ \begin{matrix} C \\ \# \end{matrix} \right\}$$

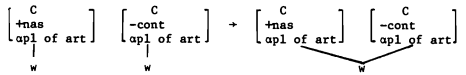
/kʷìòp/	'a fish'	[kʷìòp]	cf.	/àyɔ́ká/	'a cassava'	[àyɔ́ká]
/àlèŋ/	'a song'	[àlìŋ]	cf.	/rʷbéŋà/	'a rope'	[rʷbéŋà]
/àlɔ́nTō/	'an okra'	[àlɔ́nTō]	cf.	/ɔ́ bɔ́kTɛ̄/	'he churns up'	[ɔ́ bɔ́kTɛ̄]
/pɛ́ndɛ́/	'some millet'	[pɛ́ndɛ́]	cf.	/àg͡bɛ́ŋkrá/	'a scream'	[àg͡bɛ́ŋkrá]

The nasal-stop clusters in 'an okra' and 'some millet' do not condition raising and thus do not act like a -CC- cluster, suggesting that these are single segments, rather than a sequence of two consonants.

A problem with such an analysis for homorganic nasal-stop clusters in

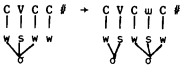
forms which insert [ɯ] is that some of these clusters are created by suffixing, e.g. /ɔ́ wɔ́ŋ + r/ → [ɔ́ wɔ́ŋg] 'he enters upon'. We would have to say that for the morphology these consonants are two segments, but that as far as the phonological rules are concerned, they are one segment. Recent papers dealing with problems of this kind [Leben 1980, McCarthy 1981], although directed towards geminate consonants, provide a formalism for expressing the idea that homorganic nasal+stop sequences can act as a unit. These analyses allow some morphological and phonological rules to be expressed at the metric level (that is, to be defined at the level of syllable composition).

The incorporation of this level into Temne analysis in order to more succinctly express the [ɯ]-insertion process involves the addition of the following readjustment rule after the rule of nasal assimilation (rule 4):

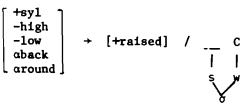
(35) 

Rules of [ɯ]-insertion and vowel raising can then be expressed as syllable-sensitive segmental rules:

(36) [ɯ]-insertion



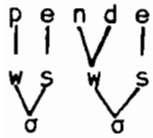
(37) Mid-vowel raising



The [ɯ]-insertion rule (36) will insert [ɯ] between two consonants of the configuration:  , but not  , the configuration of word-final ho-

morganic nasal-stop clusters.

Similarly, since the raising rule only affects mid vowels in heavy syllables, it will not affect a word such as /pɛ́ndɛ́/ which has the structure



One further indication of the correctness of the insertion analysis is that this insertion rule affects forms without verbal extenders. For instance the verb ɔ́ gbʌ́lʉ́p 'he blinks' has the past tense form ɔ́ gbʌ̀lʉ̀p 'he blinked'. This is the only bisyllabic verb in our corpus with this tone pattern in the past tense. There is, however, a large class of monosyllabic verbs with high tone in the present and low tone in the past. Clearly (within any framework) the [ʉ] has been inserted in an underlyingly monosyllabic stem and has copied (or become associated with) the tone on the stem vowel.

3.2.2. Tonal behavior when [ʉ] is inserted. If it is accepted that [ʉ] is inserted in these forms, what is the status of the tone which appears on this vowel? Consider the forms in (38) which show the tone patterns associated with these forms when the verb stem is held constant.

(38)

ɔ́ Tʉ́f	'he spits'	ɔ́ Tʉ́fʉ̄s	'he spits repeatedly'	ɔ́ Tʉ́fʉ̂r	'he spits on'
ɔ́ fɔ́f	'he talks'	ɔ́ fɔ́fʉ̄T	'he talks continuously'	ɔ́ fɔ́fʉ̂r	'he scolds'
ɔ́ pʌ́y	'he jumps'	ɔ́ pʌ́ɪ̄s	'he skips'	ɔ́ pʌ́yr	'he jumps on'
ɔ́ tɛ̃ɛ̃ŋ	'he locks'	ɔ́ tɛ̂s	'he locks repeatedly'	ɔ́ tɛ̃ɛ̃ŋg	'he locks out'
ɔ́ bɔ́	'he gives credit to'	ɔ́ bɔ̂s	'he gives credit to several people'	ɔ́ bɔ́r	'he is in debt to'

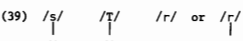
Within a segmental framework one would expect that the tone on an inserted vowel would either be inserted as part of the vowel and thus always be the same if the same rule were involved or that it would be predictable from surrounding tones. The derived forms of 'spit' and 'talk' in (38) show that neither of these possibilities holds.

If, on the other hand, tones are considered to be the property of syllables, the status of the tones on these suffixes is puzzling. While /r/ can

be accounted for by a simple copying rule, the tones on /T/ and /s/ are not predictable and therefore must be underlying (unless they are inserted by some ad hoc tone rule). If tone were the property of an underlying syllable, a single consonant, including an improbable syllabic nucleus like /T/ , would have to be considered a syllable underlyingly. This suggests that any segment could be considered an underlying syllable and be assigned an underlying tone just in case a syllabic nucleus became available, a suspect solution at best.

The only framework in which the above forms can be satisfactorily accounted for is an autosegmental one. Because tone within this framework is not associated with segments or syllables, but with larger units like morphemes or words, any particular segment (provided that it is a morpheme) could be attached to any number of tones underlyingly, including no tone. The only condition on this is that lines of association do not cross. Thus morphemes which happen to consist of single consonants can have the underlying forms shown in (39), where /s/ and /T/ have underlying mid tones, and /r/ has either an underlying high tone or no underlying tone at all.

(39)



The forms in (23), (26) and (38) can then be accounted for by the rules of tone association in (40). Sample derivations are shown in (41).

(40) Association Rules

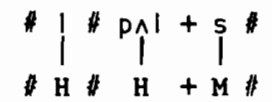
1. Tones which are not associated with a syllabic segment associate with the nearest syllabic segment which is unassociated (if one exists and association lines will not cross).
2. If there is no syllabic segment which meets the description above, the tone will associate with the syllabic segment to its left (within a word). If there is no syllabic segment to the unassociated tone's left, it will associate to the right.
3. Any syllabic segment which is not associated with a tone will associate with the tone to the left.

The derivations in (41) make use of the segmental rules 1-6 in (27). Only applicable rules are mentioned. The order of rule application is as follows: Segmental rules 1-4, [ɯ]-Insertion (36), Segmental rule 5, [ɯ]-Deletion

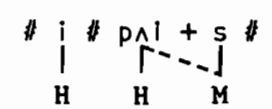
(23), Syllabification, Association rules (40), Downstep, Segmental rule 6.

(41) Autosegmental derivations

a.



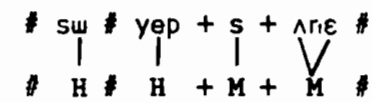
Association R1



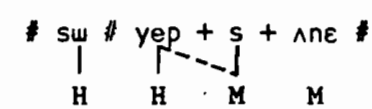
OUTPUT [ʃ pʌ̃ts][15]

'I skip (jump repeatedly) (pres. tense)'

b.



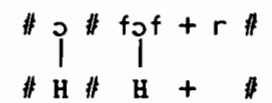
Association R2



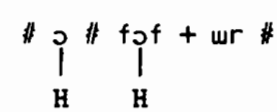
OUTPUT [sɯ́ yêpsʌ̄nɛ̄]

'we lend to each other (pres. tense)'

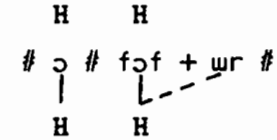
c.



[ɯ]-insertion



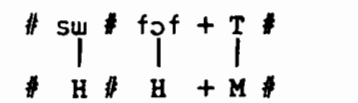
Association R3



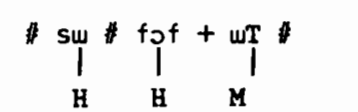
OUTPUT [ɔ́ fɔ́fɯ́r]

'he scolds (pres. tense'

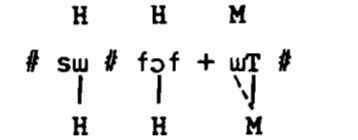
d.



[ɯ]-insertion



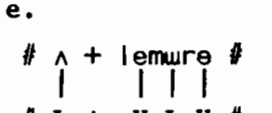
Association R1



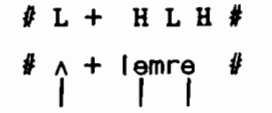
OUTPUT [sɯ́ fɔ́fɯ̄T]

'we talk continuously (pres. tense)'

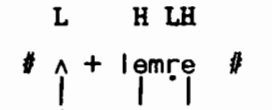
e.



[ɯ]-deletion

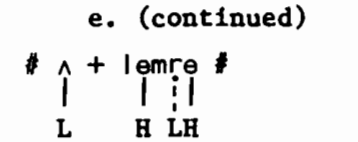


Syllabification

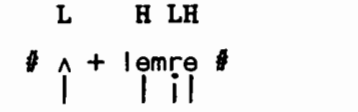


e. (continued)

Association R1



Downstep



OUTPUT [ʌ̀lɛ́mr̀ɛ̄]

'an orange'

[15]Rule 6, which changes high vowels to glides, is one of the few segmental rules which applies after the association of tone. However, the poten-

4. The Non-Additive Nature of Tones in Morphologically Complex Verbs

To retrace the steps in this paper, we have moved from considering an analysis which views tone as a feature of segments to one in which tone appears to be the property of strings (syllables or morphemes) in order to account for the persistence of tones after the deletion of the tone bearing segments. We were forced to discard the syllabic analysis in favor of an analysis in which tone is the property of a morpheme, based on evidence that many morphemes which seem to be associated with a particular tone in Temne are underlyingly non-syllabic consonants which only form separate syllables on the surface under well-defined conditions.[16] We will now consider further evidence which

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tially affected vowel here is associated with the next syllable, bleeding rule 6. Note that such rules which refer to both the tonal and segmental levels are at a very low level in the derivation.

[16]Independent evidence supporting an analysis of tone as the property of a morpheme in Temne, rather than of a syllable, comes from downstep in nouns and adjectives:

/ɔ́+yárṛ/	[ɔ́yārṝ]	'the cat'	/ù+yárṛ/	[ùyárṛ]	'a cat'
def sg+cat			ind sg+cat		
/ɔ́+ká/	[ɔ́kā]	'the creature'	/ù+ká/	[ùká]	'a creature'
def sg+creature			ind sg+creature		

We account for downstep in high-toned noun roots like 'creature' by positing the following rule: # H H # → # H M #. To account for downstep in words like 'a cat' we must only realize that downstep is not a process conditioned by the presence of the definite, but is a phonological process which affects two high tones within a word. Words like 'the cat' show the downstep process applied twice. # H H H # → # H M H # → # H M M_L #. The tone associated with /yari/ can be adequately described either as the property of the syllable or of the noun morpheme: /yárṛ/ /yari/ . However, there is yet another pattern to be
H H

considered:

/kʌ́+yɔ́ká/	[kʌ́yɔ̄kā]	'the cassava leaf'	/kù+yɔ́ká/	[kùyɔ́ká]	'a cassava leaf'
def sg+cassava leaf			ind sg+cassava leaf		

In order to distinguish words like /yari/ from words like /yoka/ (in which the entire noun root downsteps together) tone must be analyzed as a property of the morpheme. A syllable analysis either cannot distinguish these two patterns, or is forced to have one vowel of all roots like /yoka/ as underlyingly toneless, which is equivalent to saying that there is one tone per morpheme: /-yárṛ/ /-yari/ , /-yóká/ /-yoka/ or /-yóka/ .
H H H
Detailed consid-

indicates that even the analysis of tone as a property of the morpheme is an oversimplification.

So far in this discussion, we have examined only a very limited set of Temne verbs, and then only the present tense forms of these verbs. When the past tense of these and other verbs is taken into consideration, it soon becomes necessary to view the tonal level, at least in verbs, as even further removed from the segmental level. Consider the forms in (42):

(42)

1.

ɔ́ fɔ́f	'he talks'	ɔ́ fɔ́fɨ̄T	'he talks continuously'	ɔ́ fɔ́fɨ̂r	'he scolds'
ɔ́ fɔ̀f	'he talked'	ɔ́ fɔ̄fɨ̄T	'he talked continuously'	ɔ́ fɔ̄fɨ̄r	'he scolded'
ɔ́ tã́ŋ	'he locks'	ɔ́ tã̂s	'he locks repeatedly'	ɔ tã́nḡ	'he locks out'
ɔ́ tà̃ŋ	'he locked'	ɔ́ tã̄s	'he locked repeatedly'	ɔ́ tã̄nḡ	'he locked out'
ɔ́ pʌ́y	'he jumps'	ɔ́ pʌ́Ts	'he skips'	ɔ́ pʌ́yr	'he jumps on'
ɔ́ pʌ̀y	'he jumped'	ɔ́ pʌ̄ys	'he skipped'	ɔ́ pʌ̄yr	'he jumped on'

2.

ɔ́ fɛ́T	'he cleans thoroughly'	ɔ́ fɛ́Tɨ̂r	'he cleans part of sth. thoroughly'
ɔ́ fɛ̄T	'he cleaned thoroughly	ɔ́ fɛ̄Tɨ̄r	'he cleaned part of sth. thoroughly'
ɔ́ g͡bɛ́p	'he climbs'	ɔ́ g͡bɛ́pɨ̄s	'he climbs repeatedly'
ɔ́ g͡bɛ̄p	'he climbed'	ɔ́ g͡bɛ̄pɨ̄s	'he climbed repeatedly'

There are two main verb classes in Temne: (1) verbs which have a low tone on the first syllable of the stem in the past tense, and (2) verbs which have a mid tone on the first syllable of the stem in the past tense. (Additional differences define these classes as well—see Appendix Two.) However, as the examples in (42) show, all verbs ending in the three suffixes under discussion fall into the mid-tone class, regardless of the class of the verb stem.

In our discussion thus far, we have been assuming that if tones are the property of morphemes, then the tones are additive, much as semantically we

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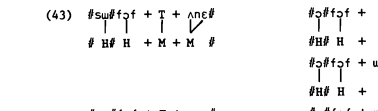
eration of this evidence is found in Mountford [1979].

have considered that the meaning of a word is the sum of its morphemes (other things remaining equal). That is, we have assumed that given

/fɔf/	pres	H	past L
/T/		M	
/ʌnɛ/		M	

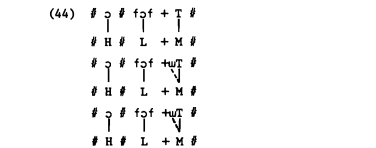
the tone pattern on any verb which contains these morphemes would be these underlying tones strung together.

(43)



However, (44) and the other examples in (42) show that we can no longer maintain this assumption.

(44)



Note that the mid tone in these examples is not the result of any tonal processes changing LM to MM. There is nothing impermissible about a LM tone pattern, a pattern which does occur in bisyllabic verbs on the surface (see Appendix Two, Patterns IV, V, VIII, VIIIa).

There is, however, a second way to view tones as the property of a mor-

pheme. This is to assume that a particular morpheme, say the last one, is responsible for the tone melody found on the entire word. This is similar to certain stress patterns in English which are associated with particular suffixes regardless of the stress pattern of the word from which it is formed:

(45) fábricàte fàbricátion
provóke pròvocátion
frústrate frùstrátion

For Temne, this kind of analysis gives the following (with suitable modifications to our tone association rules):

(46) /fɔf/ + Ø (unsuffixed) pres H past L
/T/ pres H M past M
/r/ pres H past M

#ɔ#fɔf + Ø#	#ɔ#fɔf + T #	#ɔ#fɔf + r#
#H# + H#	#H# +H M#	#H# + M#
	#ɔ#fɔf +ɯT #	#ɔ#fɔf +ɯr#
	#H# +H M#	#H# + M#
#ɔ#fɔf + Ø#	#ɔ#fɔf +ɯT #	#ɔ#fɔf +ɯr#
#H# + H#	#H# +H M#	#H# + M#
ɔ́ fɔ́f	ɔ́ fɔ́fɯ̄T	ɔ́ fɔ̄fɯ̄r
'he talks'	'he talks continuously'	'he scolded'

Of course, we do not want to give up the concept of additivity of tones altogether. It is the principle at work at the sentence level and for nouns. However, in order to account for the past tenses of Temne verbs, it seems that we must give it up in favor of an analysis in which the tone pattern is the property of the word as determined by the morphemic composition of that word.

To take another example, /ʌnɛ/ takes the following tone pattern:

	pres H M		past L M	
(47) ɔ́ fɔ́f	'he talks'	sɯ́ fɔ́fʌ̄nɛ̄		'we talk to each other'
ɔ́ fɔ̀f	'he talked'	sɯ́ fɔ̀fʌ̄nɛ̄		'we talked to each other'

ɔ́ már	'he helps'	nɯ́ márʌ̄nɛ̄	'you (pl.) help each other'
ɔ́ mār	'he helped'	nɯ́ màrʌ̄nɛ̄	'you (pl.) helped each other'
ɔ́ yɛ́pʉ́r	'he borrows'	ɔ́ŋ yɛ́prʌ̄nɛ̄	'they borrow from each other'
ɔ́ yɛ̄pʉ̄r	'he borrowed'	ɔ́ŋ yɛ̀prʌ̄nɛ̄	'they borrowed from each other'[17]

Moreover, it is clear from further examples like those in (48) that the tone pattern on the verb is not determined solely by the final suffix.

(48)

		a.	
ɔ́ fɔ́flá	'he whispers'	nɯ́ fɔ́flʌ́nɛ́	'you whisper to each other'
ɔ́ fɔ̄flā	'he whispered'	nɯ́ fɔ̄flʌ̄nɛ̄	'you whispered to each other'
ɔ́ ʈɔ́ŋklá	'he gathers (pieces)'	ɔ́ŋ ʈɔ́ŋklʌ́nɛ́	'they assemble themselves'
ɔ́ ʈɔ̄ŋklā	'he gathered (pieces)'	ɔ́ŋ ʈɔ̄ŋklʌ̄nɛ̄	'they assembled themselves'

verb + /la/ + /ʌnɛ/ pres H past M

		b.	
ɔ́ fɔ́fɯ̄ʈ	'he talks continuously'	sɯ́ fɔ́fʈʌ̄nɛ̄	'we talk continuously to each other'
ɔ́ fɔ̄fɯ̄ʈ	'he talked continuously'	sɯ́ fɔ̀fʈʌ̄nɛ̄	'we talked continuously to each other'
ɔ́ yɛ́pɯ̄s	'he lends continuously'	sɯ́ yɛ̂psʌ̄nɛ̄	'we lend continuously to each other'
ɔ́ yɛ̄pɯ̄s	'he lent continuously'	sɯ́ yɛ̀psʌ̄nɛ̄	'we lent continuously to each other'
ɔ́ bɔ́ʈɯ̂r	'he likes'	sɯ́ bɔ̂ʈrʌ̄nɛ̄	'we like each other'
ɔ́ bɔ̄ʈɯ̄r	'he liked'	sɯ́ bɔ̀ʈrʌ̄nɛ̄	'we liked each other'

verb + $\left\{\begin{matrix}/\mathrm{T}/\\ /\mathrm{s}/\\ /\mathrm{r}/\end{matrix}\right\}$ + /ʌnɛ/ pres H͡M M past L M

That is, not all verbs which end in /ʌnɛ/ have H M in the present and L M

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[17]The Converse ($/\mathrm{r}/_{\mathrm{CON}}$) is phonetically indistinguishable from the Transitive and the Partial Completive except when /ʌnɛ/ is added:

sɯ́ yɛ́prʌ̄nɛ̄	'we borrow from each other'
sɯ́ bɔ́ʈrʌ̄nɛ̄	'we like/love each other'

We speculate that the converse forms have been relexicalized as monomorphemic Pattern II verbs.

in the past. The tone pattern which appears on these verbs depends not on the last suffix, but on *which* suffixes are present. The more morphemes present in a Temne verb, the more complex the tone patterns become, as will become apparent by a quick scan of Appendix Two. However, there are some tone patterns which are associated with specific meanings:

(49)

Transitive:	pres H	past M			
verb+/r/$_T$	ɔ́ bɔ́Tŵr	'she likes'	cf.	ŋʌ́ bɔ́T	'it becomes sweet'
	ɔ́ bɔ̄Tw̄r	'she liked'		ŋʌ́ bɔ̀T	'it became sweet'
verb+/ʌ/$_T$	ſ Tɔ́rʌ́	'I lower s.th.'		ſ Tɔ́r	'I go lower'
	ſ Tɔ̄rʌ̄	'I lowered s.th.'		ſ Tɔ̀r	'I went lower'
Segmentative:	pres H M	past M			
verb+/T/	ɔ́ yſfw̄T	'he asks continuously'	cf.	ɔ́ yſf	'he asks'
	ɔ́ yTfw̄T	'he asked continuously'		ɔ́ yl̀f	'he asked'
verb+/s/$_{SI}$	ɔ́ bɔ́tw̄s	'he arranges'		ɔ́ bɔ́t	'he puts'
	ɔ́ bɔ̄tw̄s	'he arranged'		ɔ́ bɔ̀t	'he put'
Causative:	pres H M	past M			
Verb+/s/$_{CAUS}$	ɔ́ dſs	'he feeds'	cf.	ɔ́ dſ	'he eats'
	ɔ́ dTs	'he fed'		ɔ́ dT	'he ate'
Reciprocal:	pres H M	past L M			
verb+/ʌnɛ/	ɔ́ŋ fɔ́fʌ̄nɛ̄	'they talk to each other'	cf.	ɔ́ fɔ́f	'he talks'
	ɔ́ŋ fɔ̀fʌ̄nɛ̄	'they talked to each other'		ɔ́ fɔ̀f	'he talked'

Tri-morphemic Reciprocal:		pres H	past M			
(1)	verb+/ia/+/ʌnɛ/	[Examples in (48a)]				
(2)		pres H L M	past L M			
	verb+/ʌ/$_T$+/nɛnɛ/	ɔ́ŋ g͡bɛ́ŋʌ̀nɛ̄nɛ̄	'they hate each other'	cf.	ɔ́ g͡bɛ́ŋʌ́	'he hates'
		ɔ́ŋ g͡bɛ̀ŋʌ̀nɛ̄nɛ̄	'they hated each other'		ɔ́ g͡bɛ̄ŋʌ̄	'he hated'

(Verbs which take /ʌ/$_T$ do not take /ʌnɛ/ , probably to minimize confusion

with reflexive forms; cf. ɔ́ gbɛ́ŋʌ́nɛ́ 'he hates himself' vs. ɔ́ gbɛ̄ŋʌ̄nɛ̄ 'he hated himself'.) The appearance of a H L M tone pattern on the present tense of these complex reciprocal verbs suggests that the high falling to mid found on verbs of the type

$$\text{verb} + \left\{ \begin{matrix} /\text{T}/ \\ /\text{s}/ \\ /\text{r}/_{\text{T}} \end{matrix} \right\} + /\text{ʌnɛ}/$$

e.g. sʊ́ yɬfTʌ̄nɛ̄ 'we ask each other continuously' and other examples in (48b), is underlyingly H L and that such verbs are further examples of this tri-morphemic reciprocal tone melody. There are no four-syllable morphologically complex verbs in our corpus which end in /ʌnɛ/ , so there is no independent evidence for this. Nevertheless, such an analysis has the advantage of accounting for an otherwise unusual tone pattern.

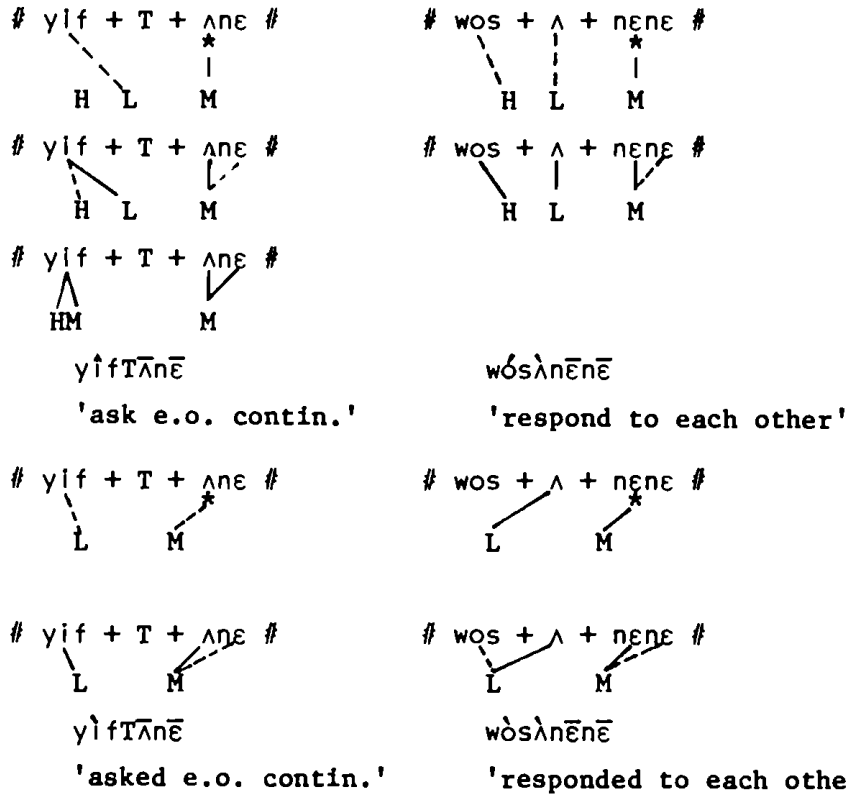
Tone patterns, then, seem to be the property of the entire word, in the sense that the particular pattern which appears is dependent on the morphological composition without being the result of particular tones being part of particular segmental morphemes. In this sense, tone melodies for Temne words are more synthetic than agglutinative. The tone patterns on Temne verbs, in fact, strongly resemble the prosodic templates proposed in McCarthy [1979] for Semitic. The templates consist of empty consonant and vowel patterns which are associated with a particular semantic verb class. For example, the template for the intensive (pIʕʕeI) in Hebrew is CVCCVC. The template for the causative (hitpaʕʕeI) is CVCCVC plus the prefix template CVC. Given the root /ktb/ 'write' and the vowel melodies /I e/ , /a e/ , the verb is derived as follows:

(50)

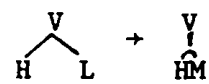
Vowel melody	e		a e
Prosodic template	CVCCVC	CVC +	CVCCVC
Root melody	k t b	hit	k t b
	[klttəb]	[hitkattəb]	
	'scribble'	'cause to write'	

In much the same way, we can say that we have a Reciprocal tone pattern H L M in the present and L M in the past and derive our verbs as follows:

(51)



This new perspective will require certain modifications in our tone rules and conventions. First, we will need a rule which changes a HL associated with the same vowel to a HM:



Second, we must include in the underlying form for the reciprocal morphemes an asterisk on the first vowel. This is a convention, as in Goldsmith [1976], which ensures that this is the vowel which gets associated first.

Third, we must add to our Association Rules (40) a preliminary rule which states that tones in Temne associate from right to left within the word. That is, the last tone always associates first, then the tone on its left associates with the next possible syllabic segment and so on. This last rule along with the asterisk convention does the work of the morpheme boundaries in our previous derivations.

These three changes and the analysis of verbal tone patterns as tem-

plates allow us to account for all tone patterns of Temne verbs. Our derivations of nouns, it should be noted, need not be modified. The tone patterns in the nouns considered in this paper are all clearly additive.

5. Summary

In this paper we have explored the interaction of tonal and non-tonal levels in Temne using as an example rules of deletion and insertion affecting the high back unrounded vowel [ɯ] . First the distribution of [ɯ] in Temne was presented and its status as an underlying vowel was established. We then went on to examine segmental rules of deletion and insertion which affect [ɯ] in conjunction with a consideration of the status of tone vis à vis the segmental level. We considered three possibilities: that tone is the property of the segment, that tone is the property of the syllable, and that tone is the property of larger units such as the morpheme or the word. An analysis in which tone is considered to be the property of segments was quickly shown to be inadequate to account for the retention of the tone on [ɯ] when this vowel is deleted. An analysis in which tone is considered to be the property of syllables was later shown to be unable to account for the tone which appears when [ɯ] is inserted. Only an account which considers tones to be the property of morphemes could account for the interaction of tone and segment which resulted from the application of these deletion and insertion rules. We then presented a detailed analysis of these processes within an autosegmental framework. However, additional evidence suggested that even this analysis of tone as independent of segmental units such as the segment and the syllable had not gone far enough. Instead of being the property of individual morphemes, verbal tone patterns in Temne seem to be determined by the morphological composition of the entire word, without any part of the pattern being attributable to any particular morpheme. We argued that these verbal tone patterns are best considered as fused templates. The alternative to this approach, it should be pointed out, is to simply list each verb in the lexicon indexed for tone pattern.

The fact that we are forced to adopt such a framework in order to account for these data implies that there are two distinct levels within the phonology of Temne and languages like it: a segmental level (corresponding

to vowel and consonant features) and a tonal level (which operates independently of the segmental level during most of the derivation). The tonal level is independent of such segmental units as the segment and the syllable. In verbs it appears to be independent of individual morphemes, at least in the additive sense. As we have seen, there is some interaction between the segmental and tonal levels: there is a segmental rule of gliding which refers to tone in its structural description; the rule which changes a H L series to a HM falling tone requires both tones to be associated to the same segment. But for the most past, except for the relatively automatic reassociation of tones when vowels are deleted or inserted, the segmental and tonal levels in Temne have a very low degree of interaction.

APPENDIX I: Pronouns

For a more complete listing of pronominal forms, see Wilson [1961].

Subject:		Singular		Plural
	1.	ſ		sʌ́
	2.	ŋ́		nʌ́
	3. I	ɔ́	II	ə́ŋ
	III	kʌ́	IV	tʌ́
	V	ʌ́ŋ	VI	ɛ́
	VII	rʌ́	VIII	mʌ́
			IX	pʌ́
			X	nʌ́
			XI	tʌ́

Subject (long forms):		Singular		Plural
	1.	mſn		sə́
	2.	mún		nə́
	3. I	kɔ́n	II	ŋə́
	III	kʌ́	IV	tʌ́
	V	ŋʌ́	VI	yʌ́
	VII	rʌ́	VIII	mʌ́
			IX	pʌ́
			X	nʌ́
			XI	tʌ́

short: ſ yɔ́ mʌ́pān'ſ 'I am working'

long: /mſn mʌ́ yɔ́ mʌ+pʌ́n ʌ+mi/ 'I am the one doing the work'
I non- do- def+work CE+my
past pres

Object:

		Singular		Plural
1.		mʃ́		sú
2.		mú		nú
3.	I	kɔ̀	II	ŋà
	III	kʃ́	IV	tʃ́
	V	ŋʃ́	VI	yʃ́
	VII	rʌ́	VIII	mà/mʃ́
			IX	pʃ́
			X	nʃ́
			XI	tʃ́

Possessive (animate only; prefixed by an element which agrees with the head noun):

	Singular	Plural
1.	-mʃ́	-sú
2.	-mú	-nú
3.	-ɔ́ŋ	-ʌ́ŋ

Emphatic (animate only; inanimate forms are the same as the long form pronouns):

	Singular	Plural
1.	mʃ́nɛ́	sʌ́
2.	múnɔ́	nʌ́
3.	kɔ́nɔ́	ŋʌ́

/ɔ́+wʃ́r kɔ́nɔ́ ɔ́+wúT ɔ́ wàI dɪ̀s/
def+goat he-emph def+child pro buy-past yesterday

'as for the goat, the child bought him yesterday'

APPENDIX II: Verb Classes

As we have noted in the text of this paper, there are two main classes of verbs in Temne: (1) those which take a low tone on the first syllable of the stem in the past tense and (2) those which take a mid tone on the first syllable in the past tense. The eight tone patterns found in Temne verbs fit into the classes shown in the table on the following page.

Several of these patterns are associated with particular meanings. Pattern I appears on verbs marked with transitive suffixes /r/$_{T}$ and /ʌ/$_{T}$. Pattern II appears on verbs marked with the Segmentative suffixes /s/$_{ST}$ and /T/ and with the Causative. Patterns IV, II, VIII and VIIIa are associated with reciprocals. The most common Reflexive patterns are V and II. VII is the pattern which marks intensive. Many of these patterns and their associated meanings are discussed in the final section of the paper.

Beginning on page 147 is a list of a representative number of verbs from each tone pattern, showing a modification of the tonal melody as verbal suffixes are added. The melodies are shown for the present and past tenses, other tenses are marked in Temne by means of pre-verbal tense/aspect markers, as in the examples in section 2.1.1 of this paper, which do not affect the tonal melody of the verb.

Pattern I verbs are by far the most numerous in our sample of Temne. Because of this, the examples of the other verb patterns are not as complete. Gaps in the following paradigms represent gaps in the present corpus and not necessarily the non-existence of a particular form in Temne. We have found, however, that the more suffixes are added to the verb, the less likely it is to be judged acceptable by speakers.

For an explanation of the subscripts which appear on the suffixes heading each column, please see footnote 12.

Tone Patterns in Temne Verbs

	(1) Low tone in past				(2) Mid tone in past		
	Pres	Past			Pres	Past	
I	H	L		II	H	M	
	bʌ́f	bʌ̀f	'farm'		bá	bā	'lay an egg'
	g͡bʌ́lɯ́p	g͡bʌ̀lɯ̀p	'blink'		bɛ́mpá	bɛ̄mpā	'make'
					fɔ́flʌ́nɛ́	fɔ̄flʌ̄nɛ̄	'whisper to e.o.'
IV	HM	LM		III	HM	M	
	tɯ́lʌ̄	tɯ̀lʌ̄	'hear s.t.'		tɯ̂l	tɯ̄l	'hear'
	tɯ́lʌ̄nɛ̄	tɯ̀lʌ̄nɛ̄	'hear e.o.'		fúmpɔ̄	fūmpɔ̄	'fall'
	kɯ́lĺʌ̄nɛ̄	kɯ̀ll̀ʌ̄nɛ̄	'watch e.o.'		sɔ́kānɛ̄	sɔ̄kānɛ̄	'confuse someone'
V	HL	LM		VI	HL	ML	
	mʌ́ŋknɛ̀	mʌ̀ŋknɛ̄	'hide oneself'		tɔ́sʌ̀	tɔ̄sʌ̀	'boil (INT)'
					lʌ́Tɯ́rʌ̀	lʌ̄Tɯ̄rʌ̀	'be soaked by the rain'
VII	HM	LM					
	rɯ́prɯ̄p	rɯ̀prɯ̄p	'spin'				
	pʌ́Tspʌ̿T̿s	pʌ̀Tspʌ̿T̿s	'skip (intensive)'				
VIII	HLM	LM					
	pĺàrʌ̄	pl̀àrʌ̄	'spend the day'				
	wósʌ̀nɛ̄nɛ̄	wòsʌ̀nɛ̄nɛ̄	'answer each other'				
VIIIa	HM M	LM					
	sâysāy	sàysāy	'make a fuss'				
	yêpsʌ̄nɛ̄	yèpsʌ̄nɛ̄	'exchange repeatedly'				

(In reduplicated forms, all subsequent tones are lowered by equal increments.)

Pattern I Verbs: Pres H Past L

		+/r/$_{T}$	+/r/$_{CON}$	+/r/$_{PC}$	+/s/$_{SI}$
pres	fɔ́f	fɔ́fŵr			
past	fɔ̀f	fɔ̄fw̄r			
	'talk'	'scold'			
pres	sóm	sómŵr			
past	sòm	sōmw̄r			
	'send'	'send s.o.'			
pres	bɔ́		bɔ́r		bɔ̂s
past	bɔ̀		bɔ̄r		bɔ̄s
	'give credit to'		'owe'		'give credit repeatedly'
pres	yép		yépŵr		yépw̄s
past	yèp		yēpw̄r		yēpw̄s
	'lend'		'borrow'		'lend repeatedly'
pres	táŋ	táŋg			tâs
past	tàŋ	tāŋg			tās
	'lock'	'lock out'			'lock repeatedly'
pres	yé			yér	yês
past	yè			yēr	yēs
	'give'			'share'	'give repeatedly'
pres	báŋ				
past	bàŋ				
	'hurt (imp)'				
pres	bɔ́ɪ	bɔ́ɪŵr			
past	bɔ̀ɪ	bɔ̄ɪw̄r			
	'become sweet'	'like'			
pres	mʌ́ŋk	mʌŋkŵr			mʌŋkw̄s
past	mʌ̀ŋk	mʌ̄ŋkw̄r			mʌ̄ŋkw̄s
	'hide'	'hide sth.'			'hide repeatedly'
pres	kɔ́				
past	kɔ̀				
	'go'				
pres	gbʌ́lʊ́p				gbʌ́lpw̄s
past	gbʌ̀lʊ̀p				gbʌ̄lpw̄s
	'blink'				'blink repeatedly'

Pattern I (cont.)

		+/s/$_{CAUS}$	+/T/	+/l/	+/s/$_{CAUS}$+/r/$_{T}$
pres	fɔ́f		fɔ́fw̄T	fɔ́flā́	
past	fɔ̀f		fɔ̄fw̄T	fɔ̄flā	
	'talk'		'talk cont.'	'whisper'	
pres	sṓm		sṓmw̄T		
past	sòm		sōmw̄T		
	'send'		'send cont.'		
pres	bɔ́				
past	bɔ̀				
	'give credit to'				
pres	yép				
past	yèp				
	'lend'				
pres	táŋ				
past	tàŋ				
	'lock'				
pres	yé				
past	yè				
	'give'				
pres	báŋ	bâ̄s			bā́sẃr
past	bàŋ	bā̄s			bā̄sw̄r
	'hurt (imp)'	'make hurt'			'make s.o. hurt'
pres	bɔ́T	bɔ́Tw̄s			
past	bɔ̀T	bɔ̄Tw̄s			
	'become sweet'	'make sweet'			
pres	mʌ́ŋk				
past	mʌ̀ŋk				
	'hide'				
pres	kɔ́		kɔ̂T		
past	kɔ̀		kɔ̄T		
	'go'		'walk'		
pres	g͡bʌ́lẃp				
past	g͡bʌ̀lẁp				
	'blink'				

Pattern I (cont.)

		+/s/$_{CAUS}$+/s/$_{SI}$	+/T/+/r/$_{T}$	+/T/+/s/$_{SI}$	+/r/$_{T}$+/s/$_{SI}$
pres	fɔ́f				
past	fɔ̀f				
	'talk'				
pres	sǫ́m				
past	sǫ̀m				
	'send'				
pres	bɔ́				
past	bɔ̀				
	'give credit to'				
pres	yέ́p				
past	yὲp				
	'lend'				
pres	tə́ŋ				tə́ndɨ̄s
past	tə̀ŋ				tə̄ndɨ̄s
	'lock'				'lock out repeatedly'
pres	yέ́				
past	yὲ				
	'give'				
pres	bə́ŋ	bə́sɨ̄s			
past	bə̀ŋ	bə̄sɨ̄s			
	'hurt (imp)'	'make hurt repeatedly'			
pres	bɔ́ɪ				bɔ́ɪrɨ̄s
past	bɔ̀ɪ				bɔ̄ɪrɨ̄s
	'become sweet'				'make s.o. like'
pres	mʌ́ŋk				mʌ́ŋkrɨ̄s
past	mʌ̀ŋk				mʌ̄ŋkrɨ̄s
	'hide'				'hide s.o. repeatedly'
pres	kɔ́		kɔ́ɪ̀ɨr	kɔ́ɪ̀ɨs	
past	kɔ̀		kɔ̄ɪ̀ɨr	kɔ̄ɪ̀ɨs	
	'go'		'walk to'	'walk repeatedly'	
pres	g͡bʌ́lɨ́p				
past	g͡bʌ̀lɨ̀p				
	'blink'				

Pattern I (cont.)

		+/r/$_{CON}$+/s/$_{SI}$	+/r/$_{FC}$+/s/$_{SI}$	+/r/$_{T}$+/T/	+/ʌnɛ/
pres	fɔ́f			fɔ́frw̄T	fɔ́fʌ̄nɛ̄
past	fɔ̀f			fɔ̄frw̄T	fɔ̀fʌ̄nɛ̄
	'talk'			'scold cont.'	'talk to each other'
pres	sɔ́m			sɔ́mrw̄T	sɔ́mʌ̄nɛ̄
past	sɔ̀m			sɔ̄mrw̄T	sɔ̀mʌ̄nɛ̄
	'send'			'send s.o. cont.'	'send each other'
pres	bɔ́	bɔ́rw̄s			bɔ̂:nɛ̄
past	bɔ̀	bɔ̄rw̄s			bɔ̀:nɛ̄
	'give credit to'	'owe repeatedly'			'give credit to each other'
pres	yɛ́p	yɛ́prw̄s			yɛ́pʌ̄nɛ̄
past	yɛ̀p	yɛ̄prw̄s			yɛ̀pʌ̄nɛ̄
	'lend'	'borrow repeatedly'			'lend each other'
pres	táŋ				
past	tàŋ				
	'lock'				
pres	yɛ́		yɛ́rw̄s		yɛ̂:nɛ̄
past	yɛ̀		yɛ̄rw̄s		yɛ̀:nɛ̄
	'give'		'share repeatedly'		'give each other'
pres	báŋ				
past	bàŋ				
	'hurt (imp)'				
pres	bɔ́T				
past	bɔ̀T				
	'become sweet'				
pres	mʌ́ŋk				
past	mʌ̀ŋk				
	'hide'				
pres	kɔ́				
past	kɔ̀				
	'go'				
pres	g͡bʌ́lẃp				
past	g͡bʌ̀lẁp				
	'blink'				

Pattern I (cont.)

		+/r/$_{T}$+/ʌnɛ/	+/r/$_{CON}$+/ʌnɛ/	+/r/$_{PC}$+/ʌnɛ/	+/s/$_{SI}$+/ʌnɛ/
pres	fɔ́f	fɔ́frʌ̄nɛ̄			
past	fɔ̀f	fɔ̀frʌ̄nɛ̄			
	'talk'	'scold e.o.'			
pres	sɔ́m				
past	sɔ̀m				
	'send'				
pres	bɔ́		bɔ́rʌ̄nɛ̄		bɔ́sʌ̄nɛ̄
past	bɔ̀		bɔ̀rʌ̄nɛ̄		bɔ̀sʌ̄nɛ̄
	'give credit to'		'owe e.o.'		'give credit to e.o. repeat.'
pres	yɛ́p		yɛ́prʌ̄nɛ̄		yɛ̂psʌ̄nɛ̄
past	yɛ̀p		yɛ̀prʌ̄nɛ̄		yɛ̀psʌ̄nɛ̄
	'lend'		'borrow from e.o.'		'exchange repeatedly'
pres	tʌ́ŋ				
past	tʌ̀ŋ				
	'lock'				
pres	yɛ́			yɛ̂rʌ̄nɛ̄	yɛ̂sʌ̄nɛ̄
past	yɛ̀			yɛ̀rʌ̄nɛ̄	yɛ̀sʌ̄nɛ̄
	'give'			'share w/e.o.'	'give e.o. repeatedly'
pres	bʌ́ŋ				
past	bʌ̀ŋ				
	'hurt (imp)'				
pres	bɔ́T	bɔ̂Trʌ̄nɛ̄			
past	bɔ̀T	bɔ̀Trʌ̄nɛ̄			
	'become sweet'	'like e.o.'			
pres	mʌ́ŋk	mʌ̂ŋkrʌ̄nɛ̄			
past	mʌ̀ŋk	mʌ̀ŋkrʌ̄nɛ̄			
	'hide'	'hide e.o.'			
pres	kɔ́				
past	kɔ̀				
	'go'				
pres	g͡bʌ́lʊ̀p				
past	g͡bʌ̀lʊ̀p				
	'blink'				

Pattern I (cont.)

		+/s/$_{CAUS}$+/ʌnɛ/	+/T/+/ʌnɛ/	+/l/+/ʌnɛ/
pres	fɔ́f		fɔ̂fTʌ̄nɛ̄	fɔ́flʌ́nɛ́
past	fɔ̀f		fɔ̀fTʌ̄nɛ̄	fɔ̄flʌ̄nɛ̄
	'talk'		'talk to e.o. cont.'	'whisper to e.o.'
pres	sɔ́m		sɔ̂mTʌ̄nɛ̄	
past	sɔ̀m		sɔ̀mTʌ̄nɛ̄	
	'send'		'send e.o. cont.'	
pres	bɔ́			
past	bɔ̀			
	'give credit to'			
pres	yɛ́p			
past	yɛ̀p			
	'lend'			
pres	táŋ			
past	tàŋ			
	'lock'			
pres	yɛ́			
past	yɛ̀			
	'give'			
pres	báŋ	bâ̰sʌ̄nɛ̄		
past	bàŋ	bà̰sʌ̄nɛ̄		
	'hurt (imp)'	'hurt e.o.'		
pres	bɔ́T			
past	bɔ̀T			
	'become sweet'			
pres	mʌ́ŋk			
past	mʌ̀ŋk			
	'hide'			
pres	kɔ́			
past	kɔ̀			
	'go'			
pres	g͡bʌ́lʉ́p			
past	g͡bʌ̀lʉ̀p			
	'blink'			

Pattern II Verbs: Pres H Past M

		+/r/$_{T}$	+/r/$_{CON}$	+/r/$_{PC}$
pres	gb̂ép			
past	gb̄ēp			
	'climb up'			
pres	bṵ́p			bṵ́pṵ́r
past	bṵ̄p			-----
	'meet s.o., reach s.wh.'			'be present, be in attendance'
pres	ŋém	ŋémṵ́r		
past	ŋēm	ŋēmṵ̄r		
	'yawn'	'yawn at'		
pres	yókā			
past	yōkā			
	'get s.o. up'			
pres	fúŋʌ́	fúŋʌ́r		
past	fūŋʌ̄	fūŋʌ̄r		
	'fan s.o.'	'fan at s.o.'		
pres	tʃsṵ́m			
past	tʃsṵ̄m			
	'sneeze'			
pres	Tʃlá	Tʃlár		
past	Tʃlā	Tʃlār		
	'sell'	'sell to s.o.'		
pres	gb̂étʌ́	gbétʌ́r		
past	gb̄ētʌ̄	gbētʌ̄r		
	'shriek'	'shriek at s.o.'		
pres	tɔ́ká	tɔ́kár		
past	tɔ̄kā	tɔ̄kār		
	'scoop up with one's hand'	'grab'		

NB: Most of the verb forms which follow the pattern II tone pattern are transparently: Pattern I verb $\left\{\begin{matrix}+/r/\\+/la/\end{matrix}\right\}$. See Pattern I paradigm for the effects of adding further suffixes.

Pattern II (cont.)

		+/s/$_{SI}$	+/s/$_{CAUS}$	+/T/	+/l/	+/r/$_{T}$+/s/$_{SI}$
pres	gb̂ép	gb̂épw̄s				
past	gb̂ēp	gb̂ēpw̄s				
	'climb up'	'climb up repeat.'				
pres	bẃp					
past	bw̄p					
	'meet s.o., reach s.wh.'					
pres	ŋ́ém	ŋ́émw̄s				
past	ŋēm	ŋēmw̄s				
	'yawn'	'yawn repeat.'				
pres	yóká		yókās			
past	yōkā		yōkās			
	'get s.o. up'		'make s.o. get up'			
pres	fúŋʌ́	fúŋʌ́s				fúŋʌ́rw̄s
past	fūŋʌ̄	fūŋʌ̄s				fūŋʌ̄rw̄s
	'fan s.o.'	'fan s.o. repeat.'				'fan at s.o. repeat.'
pres	tʃsẃm	tʃsmw̄s				
past	tTsw̄m	tTsmw̄s				
	'sneeze'	'sneeze repeat.'				
pres	Tʃlá					
past	TTlā					
	'sell'					
pres	gb̂étʌ́	gb̂étʌ̄s				gb̂étʌ́rw̄s
past	gb̂ētʌ̄	gb̂ētʌ̄s				gb̂ētʌ̄rw̄s
	'shriek'	'shriek repeat.'				'shriek at repeat.'
pres	tɔ́ká	tɔ́kās				tɔ́kárw̄s
past	tɔ̄kā	tɔ̄kās				tɔ̄kārw̄s
	'scoop up with one's hand'	'scoop up repeat.'				'grab repeat.'

Pattern II (cont.)

		+/ʌnɛ/	+/r/$_T$+/ʌnɛ/	+/s/$_{SI}$+/ʌnɛ/
pres	gb͡ɛ́p			
past	gb͡ɛ̄p			
	'climb up'			
pres	bɯ́p			
past	bɯ̄p			
	'meet s.o., reach s.wh.'			
pres	ŋɛ́m			
past	ŋɛ̄m			
	'yawn'			
pres	yɔ́kā	yɔ́kānē		
past	yɔ̄kā	yɔ̀kānē		
	'get s.o. up'	'get each other up'		
pres	fúŋʌ́	fúŋʌ̄nɛ̄		fúŋʌ̄sʌ̄nɛ̄
past	fūŋʌ̄	fùŋʌ̄nɛ̄		fùŋʌ̀sʌ̄nɛ̄
	'fan s.o.'	'fan each other'		'fan each other repeat.'
pres	tʃsúm			
past	tʃsūm			
	'sneeze'			
pres	rɪ́lá			
past	rɪ̄lā			
	'sell'			
pres	gb͡étʌ́		gb͡étʌ̄rʌ̄nɛ̄	
past	gb͡ɛ̄tʌ̄		gb͡ɛ̀tʌ̀rʌ̄nɛ̄	
	'shriek'		'shriek at each other'	
pres	tɔ́kā		tɔ́kārʌ̄nɛ̄	
past	tɔ̄kā		tɔ̀kàrʌ̄nɛ̄	
	'scoop up with one's hand'		'grab each other'	

Pattern III Verbs: Pres HM Past M

		+/r/$_{T}$	+/r/$_{CON}$	+/r/$_{PC}$	+/s/$_{SI}$
pres	ʃə̂T				ʃə́Tm̄s
past	ʃə̄T				ʃə̄Tw̄s
	'build'				'build repeat.'
pres	bɔ́yā				
past	bɔ̄yā				
	'swell'				
pres	kʊ́ɪT				
past	kʊ̄ɪT				
	'look at'				
pres	g͡bɔ́sʌ̄			g͡bɔ́sʌ́r	
past	g͡bɔ̄sʌ̄			g͡bɔ̄sʌ̄r	
	'scrub'			'scrub part of something'	

NB: Most verb forms with a Pattern III tone pattern are transparently: $\left\{\begin{matrix}\text{Pattern I verb}\\ \text{Pattern II verb}\end{matrix}\right\}$ + $\left\{\begin{matrix}/s/\\ /T/\end{matrix}\right\}$. See Pattern I paradigm for the effects of adding further suffixes.

Pattern III (cont.)

		+/s/$_{CAUS}$	+/T/	+/ʌnɛ/
pres	ʃə̂T			
past	ʃə̄T			
	'build'			
pres	bɔ́yā	bɔ́yās		
past	bɔ̄yā	bɔ̄yās		
	'swell'	'cause to swell'		
pres	kʊ́ɪT			kʊ́ɪʃʌ̄nɛ̄
past	kʊ̄ɪT			kʊ̀ɪʃʌ̄nɛ̄
	'look at'			'watch each other'
pres	g͡bɔ́sʌ̄			
past	g͡bɔ̄sʌ̄			
	'scrub'			

Pattern IV Verbs: Pres HM Past LM

		+/r/$_T$	+/r/$_{CON}$	+/r/$_{PC}$	+/ʌnɛ/
pres	ʃɛ́lɔ̄				
past	ʃɛ̀lɔ̄				
	'be willing'				
pres	tɔ́mɔ̄	tɔ́mɔ̄r			
past	tɔ̀mɔ̄	tɔ̀mɔ̄r			
	'dance'	'dance on s.o./s.th.'			
pres	ŋɔ́mT	ŋɔ́mTr			
past	ŋɔ̀mT	ŋɔ̀mTr			
	'make faces'	'make faces at s.o.'			
pres	tɔ́rT				tɔ́rʃʌ́nɛ̄
past	tɔ̀rT				tɔ̀rʃʌ̀nɛ̄
	'show'				'show each other'

NB: Verbs which follow Pattern IV are morphologically complex:

ʃɛlɔ		'be willing'	(Pattern IV)	from	ʃɛl	'smile' (Pattern I)
fʌlɪr	*fʌlwr	'fly over'	(Pattern IV)	from	fʌl	'fly' (Pattern III)
Tɔfswl		'cool s.th.'	(Pattern IV)	from	Tɔ́fɯ̄l	'cool, quiet (Adj.)'
					Tɔ́f	'soil (N)'

The complex tones on /Tɔmɔr/ and /ŋɔmir/ then indicate that these forms are more complex than is immediately apparent.

Pattern V Verbs: Pres H L Past L M

All verbs of this pattern are reflexives. Many are transparently derived from Pattern I verbs. They do not appear with additional suffixes.

pres	gbɑ́nɛ̀	pres	rɑ́nnɛ̀	
past	gbɑ̀nɛ̄	past	rɑ̀nnɛ̄	
	'carry on one's shoulders'		'sweat'	
pres	sɔ́tnɛ̀			
past	sɔ̀tnɛ̄			
	'lean oneself against'	Cf.	sɔt	'lean something against' (Pattern I)

Polymorphemic verbs ending in /nɛ/ have the following tone patterns:

kwlɪ	(III)	'look at'	kwlɪnɛ	(III)	'watch oneself'
gbɛŋʌ	(II)	'hate'	gbɛŋʌnɛ	(II)	'hate oneself'
rwprwp	(VII)	'spin'	rwprwpnɛ	(IV)	'spin (oneself)'

Pattern VI Verbs: Pres H L Past M L

pres fẃntλ
past fw̄ntλ
'lie down' cf. fẃnt 'bed (N)'

pres tér̀λ
past tēr̀λ
'drown (INT)' cf. ter 'let go' (Pattern II)

pres rɛ́̄sλ
past rɛ̄̄sλ
'be on top of' cf. reŋ 'put on top of' (Pattern I)

pres lʌ́Tẃrλ
past lʌ̄Tw̄rλ
'be soaked by the rain' cf. lʌTwr 'drench (subj=rain)' (Pattern II)

Verbs which have this pattern do not usually take further suffixes. The only such example in our corpus is (pres.) fẃntw̄r , (past) fẁntw̄r 'lie on' with the final vowel missing (i.e. [ɯ] instead of [ʌ] before the suffix /r/$_T$) and Pattern IV tones. Such forms require further study.

Pattern VII Verbs: Pres H M (M_L M_{LL}) Past L M (M_L M_{LL})

pres bɔ́tw̄sbɔ̄̄tw̄̄̄s cf. botws 'arrange' (Pattern III)
past bɔ̀tw̄sbɔ̄̄tw̄̄̄s bot 'put' (Pattern I)
'arrange everything'

pres fʌ̂lfʌ̂̂l ($\hat{\hat{}}$ = a lowered fall fʌl 'fly' (Pattern III)
past fʌ̀lfʌ̂̂l as in bɔ́tw̄sbɔ̄̄tw̄̄̄s)
'fly around'

pres rẃprw̄p cf. rwp 'go around' (Pattern I)
past rẁprw̄p
'spin'

This is the most productive pattern for reduplicated verbs. The only suffix that can be added to verbs of this pattern is the reflexive /nɛ/:

rẃprw̄pnɛ̄
rẁprw̄pnɛ̄
'spin oneself around'

Pattern VIII Verbs: Pres H L M Past L M

pres	gbúràŋʌ̀			
past	gbùràŋʌ̀			
	'become clear'	cf.	gbráŋ	'clean (Adj.)'
pres	sómùrʌ́			
past	sòmùrʌ̀			
	'send for'	cf.	somur	'send to' (Pattern II)
pres	gbántànɛ̄nɛ̄			
past	gbàntànɛ̄nɛ̄			
	'slap each other'	cf.	gbanta	'slap' (Pattern II)
pres	tʃìànɛ̄nɛ̄			
past	tʃìànɛ̄nɛ̄			
	'sell for each other'	cf.	tʃìa	'sell' (Pattern II)

Verbs with this pattern are all morphologically complex and do not appear with any further suffixes.

Pattern VIIIa Verbs: Pres HM M Past L M

pres	gbêngbɛŋ			
past	gbèngbɛŋ			
	'check something out'			
pres	sâysāy			
past	sàysāy			
	'be fussy'			
pres	tʃ̂mtʃm			
past	tʃ̀mtʃm			
	'struggle'	cf.	tʃm	'fight' (Pattern I)
pres	bɔ̂tʃʌ̄nɛ̄			
past	bɔ̀tʃʌ̄nɛ̄			
	'love each other'	cf.	bɔT	'become sweet' (Pattern I)
pres	gbɛ̂tʃʌ̄nɛ̄			
past	gbɛ̀tʃʌ̄nɛ̄			
	'fasten together (pl. subj.)'	cf.	gbetur	'fasten' (Pattern II)

All verbs of this pattern are morphologically complex. The reduplicated verbs can take the reflexive /nɛ/ as an additional suffix, e.g. (pres.) tʃ̂mtʃmnɛ̄ , (past) tʃ̀mtʃmnɛ̄ 'struggle with oneself'.

REFERENCES

Bell, A. E. 1970. "A state-process approach to syllabicity and syllable structure." PhD dissertation, Stanford University.

Coleman, William L. 1967. *Temne Short Basic Course*. Revised edition. Bloomington, IN: African Studies Program, Indiana University.

Dalby, David. 1966. "Lexical analysis in Temne with an illustrative word list." *Journal of West African Languages* 3(2):5-26.

Dalby, T. D. P. 1962. "Language distribution in Sierra Leone." *Sierra Leone Language Review* 1:62-67.

Goldsmith, J. 1966. "Autosegmental phonology." PhD dissertation, MIT. [Distributed by the Indiana University Linguistics Club.]

Hutchinson, Larry. 1969. "Pronouns and agreement in Temne." PhD dissertation, Indiana University.

Hutchinson, Larry. 1979. "Cross-reference and agreement." Paper presented at the Tenth Annual Conference on African Linguistics, April 1979.

Innes, Gordon. 1967. *Practical Introduction to Mende*. Oxford: Truex Press.

Leben, William R. 1980. "A metrical analysis of length." *Linguistic Inquiry* 11:497-509.

McCarthy, John J. 1979. "Formal problems in Semitic phonology and morphology." PhD dissertation, MIT. [Distributed by the Indiana University Linguistics Club.]

McCarthy, John J. 1981. "The representation of consonant length in Hebrew." *Linguistic Inquiry* 12:322-327.

Mountford, K. W. 1979. "Allophonic downstep in Temne." Paper presented at the Tenth Annual Conference on African Linguistics, April 1979.

Nemer, Julie F. 1979. "Stop-formation in two African languages." Paper presented at the LSA Winter Meeting, December 1979.

Schlenker, C. F. 1861. *A Collection of Temne Traditions, Fables and Proverbs* London: Church Missionary Society. [Reprinted 1970. Nendeln: Kraus Reprint.]

Scott, J. P. L. 1956. *An Introduction to Temne Grammar*. Kent: Eyre & Spottiswoode Ltd. Sierra Leone Government Publication.

Sumner, A. T. 1922. *A Hand-book of the Temne Language*. Freetown: Government Printing Office.

Thomas, Northcote W. 1916. *Anthropological Report on Sierra Leone, Part II Temne-English Dictionary*. London: Harrison and Sons.

Wang, W. S-Y. 1967. "Phonological features of tone." *International Journal of American Linguistics* 33(2):93-105.

Williamson, Kay. 1967. "The definition of a tone language." *Proceedings of the Tenth International Congress of Linguistics*, Vol. 4:861-864.

Wilson, W. A. A. 1961. *An Outline of the Temne Language*. Oxford: Truex Press.

Wilson, W. A. A. 1968. "An interpretation of the Temne tone system." *Journal of West African Languages* 5(1):5-11.

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THE RELATION BETWEEN THE MIDDLE TONE AND "EMPTY CATEGORY PRINCIPLE" VIOLATIONS IN KRIO*

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An examination of monosyllabic words in Krio reveals the existence of three distinct tones: high, mid and low. In words of more than one syllable, however, only two tones are attested: high and low. The mid tone is, in fact, found only in monosyllabic forms in two very specific contexts: citation forms and sentence final forms. In other contexts, the mid tone is replaced by the high tone. This suggests that the mid tone is merely a phonetic variant of the high tone. The interaction of tones and syntax is considered, in a very specific context.

0. Introduction

Only a few "European-based"[1] pidgin and creole languages have been identified as tone languages. Among these are Jamaican Creole [Lawton 1968],[2] Sara-

*I wish to thank R. Schuh and an anonymous reviewer for comments on an earlier version of this paper. The latter was a revised and extended version of Nylander [1981b], the manuscript version of Nylander [1979]. The latter was presented at a colloquium in Buffalo, New York. I wish to thank Professor N. Domingue of McGill University who encouraged me to do the research for Nylander [1979]. I would also like to thank the department of Linguistics of McGill University for financing my trip to and from Buffalo. In this article, tones are noted as follows: ´ (high tone), ¯ (mid tone), ` (low tone). The following abbreviations will be used: A = accusative case form; O = oblique Case form; OBL = obligative mood; PERF = perfective aspect; PL = plural marker; PROG = progressive aspect; PROS = prospective mood.

[1]"European-based" is to be taken as meaning that the pidgin or creole derives the bulk of its lexical items from some European language (or languages, in the case of Saramaccan, which derives one third of its lexicon from English and another third from Portuguese—cf. Taylor [1971:293]).

[2]The most striking feature in Lawton's data is that sequences of the same tone are not attested in individual words, although they are attested in sentences.

maccan [Taylor 1963:800, 813n] and Nigerian Pidgin [Mafeni 1971]. Some creole languages have been categorically identified as non-tonal languages.[3]

This paper deals with a creole language that has been positively identified as a tone language, Krio, the "English-based" creole language of Sierra Leone and other parts of West Africa [Berry 1971; Jones 1971]. The rest of the paper is divided into three parts. Part 1 sketches the history of the study of Krio tones. Part 2 considers the status of the middle tone in Krio, a topic which has, indirectly, been the subject of some controversy. Part 3 examines the relationship between the middle tone and ECP violations in Krio. The fact that a complementizer can take on a middle tone argues in favour of the lexical status of the complementizer.

1. Studies on Krio Tones

In 1959, Jack Berry identified Krio as a tone language.[4] There must have been a lot of skeptics around, for it took no less than nine years before it was generally agreed that krio *is* a tone language. In the mid-sixties, Strevens [1965:116] described Krio as having "a system of stress and intonation of the same nature as that of Received Pronunciation." Later, Bradshaw [1966: 62n] remarked:

> One of the most fascinating problems presented by Krio is that of tone. There seems to be little agreement as to how far, if at all, tone is significant in the language.

It was only in 1968, at the Mona Conference on Pidgins and Creoles, that it was generally agreed that Krio *is* a tone language. The consensus followed the presentation of another paper by Berry.[5] Commenting on the paper, Hymes

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[3]One such language is Guyanese French Creole: "Le guyanais ne connaît ... ni accent ni tons distinctifs propres" [Saint Jacques Fauquenoy 1972:52]. Another language in this category is Dominican Creole: "...bien que ce créole ait souvent recours à des intonations de grande étendue, inusitées en français, il n'est pas une langue à tons" [Taylor 1968:1023].

[4]Berry's paper was presented at the First International Conference on Creole Languages, held in Jamaica in 1959. It was subsequently published as Berry [1961].

[5]Berry's presentation was eventually published as Berry [1970a]. See also Berry [1970b]. The tonal nature of Krio has since been confirmed in a number of studies, including Coker [1977], Coomber [1969], Fyle & Jones [1980], Johnson [1974], and Nylander [1979, 1981b, 1983b].

[1971:285] observes:

> The generally accepted view (most recently stated by Strevens) that an original tonal system has been replaced in Krio by a sentence-stress and intonation system is now clearly seen to be untenable.

In the light of the number of minimal (tonal) pairs in Krio, it seems strange that almost a decade had to elapse before a consensus on the tonal nature of Krio was reached. Among the tonal pairs are the following (see also Fyle & Jones [1980]):

bàbɔ́	'small boy, junior'	bɔ́bà	'barber'
jɪ̀njɛ́	'red-haired person'	jɪ́njà	'ginger'
kòkɔ́	'coco yam'	kɔ́kɔ́	'bump on the head'
wɔ̀wɔ́	'ugly'	wɔ́wɔ̀	'pandemonium'
sòsɔ́	'Susu (language or people)'	sósɔ́	'nothing but' (cf. sósɔ́ sànsán 'nothing but sand')

2. The Middle Tone

The manner of representing tone, i.e. as an autosegment, a feature on vowels, etc., is not at issue here (cf. Hyman [1975:214-216]). Suffice it to say that each vowel in Krio bears a tone. Most works on Krio, e.g. Coomber [1969], Jones [1971], and Williams [1976], identify Krio as a language with two tones: high and low. However, Krio is identified as having three tones (high, low and mid) by Ladefoged [1968:66].

Is there a middle tone in Krio, and if so, what is its exact status? Part of the answer lies in the very data presented by Ladefoged. A close scrutiny of Ladefoged's data shows that all the forms with mid tones have two features in common: (1) they are monosyllabic, and (2) they are lexical morphemes.

Careful study of monosyllabic forms in Krio reveals the existence of three distinct tones: high (1), mid (2), and low (3).

(1) a. tɛ́ 'until'
    b. dɔ́n perfective aspect marker
    c. dɛ́n plural definite article ("the")

(2) a. bʊ̄k 'book'
    b. gō 'go'

c. ōs 'house'

(3) a. dè progressive aspect marker
b. kìn habitual aspect marker
c. gò prospective mood marker

However, in forms with two (4) or three (5) syllables, only two tones (high and low) are attested (see Fyle and Jones [1980] for further examples):

(4) a. lágbá '(be) big'
b. ébì '(be) heavy'
c. lèkè 'like, as'
d. pàpá 'father'

(5) a. wàálà 'misfortune'
b. àgbádá 'gown'
c. šékpéndé 'hawk'
d. àwòjó '(a) feast'

The middle tone is therefore restricted to monosyllabic lexical morphemes. Furthermore, a close study shows that the middle tone is found only in monosyllabic lexical morphemes in either of two positions, namely (a) in citation form (which explains the presence of the mid tones in the forms cited by Ladefoged), and (b) in sentence final position. In fact, (a) is a subcategory of (b), i.e. words in citation form are one word sentences.

I shall now consider the case of (b), since (a) is amply illustrated in Ladefoged's book. An underlying representation (UR) like that of (6a) has (6b) for phonetic representation (PR).

(6) a. /ì bìn dé/[6] (UR) 'he was present'
he-PAST-be

[6]Contrary to what might be thought, dé is a verb, not an adverb or any other form. The proof of this is that dé can combine with auxiliary (verbal) particles, such as the past tense marker (cf. (6)), the prospective mood marker (cf. (i)) and the obligative mood marker (cf. (ii)).

(i) ì gò dé 'he will be present
he-PROS-be

b. [ì bìn dē] (PR)

However, if dé is followed by any element, i.e. if dé is no longer in sentence final position, its tone is no longer subject to variation. Consider the examples in (7):

(7) a. /ì bìn dé yá/ (UR) 'he was here'
he-PAST-be-here

b. [ì bìn dé yā] (PR)

As can be seen in (7b), although dé is no longer subject to variation, the form yá is now subject to such variation, since it is a lexical morpheme in sentence final position. The same point is illustrated in (8) and (9):

(8) a. /ùnà fáyn/ (UR) 'you(pl) are beautiful'
you-be beautiful

b. [ùnà fāyn] (PR)

(9) a. /ùnà fáyn bɛ́d/ (UR) 'you are very beautiful'
you-be beautiful-very

b. [ùnà fáyn bɛ̄d] (PR)

However, in the case of elements of two (10) or three (11) or four (12) syllables, being in sentence final position is of no consequence:

(10) a. /ì bìn wɔ̀wɔ́/ (UR) 'he was ugly'
he-PAST-be ugly

b. [ì bìn wɔ̀wɔ́] (PR)

(11) a. /ì dɔ́n bàràntá/ (UR) 'he has revolted'
he-PERF-revolt

b. [ì dɔ́n bàràntá] (PR)

(12) a. /à bìn sí ìn tòlɔ́ŋtòlɔ́ŋ/ (UR) 'I saw his turkey'
I-PAST-see-his-turkey

b. [à bìn sí ìn tòlɔ́ŋtòlɔ́ŋ] (PR)

How can we account for the behaviour of monosyllabic lexical items? One possible way is to assume that Krio grammar has the following phonological

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(ii) ì fɔ̀ dé 'he should (= ought to) be present'
he-OBL-be

rule:

(13) [-L] → [-H] / ## C_0^3 ___ C_0^2 // ,

where (a) L = low tone, H = high tone

(b) ## stands for a word boundary

(c) // stands for a sentence boundary

The notation C_0^3 refers to the possible monosyllabic structures.[7] What (13) states is that a high tone ([+H-L]) is lowered to a middle tone ([-H-L]) if it is a monosyllable in sentence final position. This rule also states that the syllable must coincide with a word.[8] Fyle & Jones [1980:xxii] claim that rule (13) does not apply to personal names, e.g. Jɔ́n 'John', and abbreviations, e.g. bɔ́s 'bus'. This, as far as I can see, is incorrect.

Rule (13) applies to lexical morphemes in a unified way. The problem to consider now is how to block (13) from applying to grammatical morphemes. To answer this question, the grammatical morphemes that can appear in sentence final position must be listed. They fall into two categories:

(a) the plural marker dɛ̀n ;

(b) the pronouns mí 'me' (A/O), yú 'you' (A/O), àm 'him, her, it' (A), ín 'him, her, it' (O), wí 'us' (A/O), and dɛ̀n 'them' (A/O).[9]

Rule (13) cannot apply to the plural marker dɛ̀n , nor to the pronouns àm and dɛ̀n , since they bear low tones. In the following examples, each sentence is at once the phonetic and the phonemic realisation of the utterance:

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[7]The maximal structure (CCCVCCC) is not attested in any word. Furthermore, the number of words with an initial or final three consonant cluster is very low. Historically, English initial /s/ was dropped in the integration of English loanwords into Krio (cf. krɛ́p 'scrape', trít 'street', etc. — see Jones [1971:70]). More recent loanwords tend to keep the initial /s/ (cf. stráp 'strap'). Final CCC is attested in words like línks 'cuff links' and wɔ́nks , an ideophone meaning 'hit hard and heavily, as with a stick' [Fyle & Jones 1980].

[8]Most of the words in question are lexical morphemes. On the problem of pronouns, see below.

[9]Note that Krio (unlike English) makes a formal distinction between the accusative case form and the oblique case form in the third person singular. On the other hand, there is no gender distinction in Krio.

(14) l bln sí mì plkín-dèn 'he saw my children'
he-PAST-see-my-child-PL

(15) à bln sí àm 'I saw her'
I-PAST-see-her

However, it can (and does) apply to mí , yú , ín , and wí . This is problematic, but there seems to be no way of formulating (13) without reference to grammatical category.

3. On the Relationship between the Middle Tone and ECP Violations in Krio

3.1. The Empty Category Principle. One of the principles of grammar proposed by Chomsky [1981] is the Empty Category Principle:

(16) Empty Category Principle (ECP)
[α e] must be properly governed.[10]

[α e] refers to non-pronominal empty categories, e.g. ($_{NP}$e), ($_{PP}$e), etc., but not to PRO. Proper government, as defined by Chomsky, is of two types (see footnote 10). Firstly, there is proper government by a lexical category. In (17a), for example, the empty category (e_i) is properly governed by the verb 'see', which is a lexical item. Secondly, there is proper government by coindexation. In (17b), for example, the empty category in subject position (e_i) is properly governed by the coindexed trace in COMP, i.e. by the trace in S', with which it is coindexed.

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[10]Proper government is defined as follows by Chomsky [1981:250]:

Consider the structure of (i):

(i) (β ..... γ ..... α ..... γ .....), where
(a) α = X^0 or is coindexed with γ
(b) where ∅ is a maximal projection, if ∅ dominates γ then ∅ dominates α
(c) α c-commands γ .

In this case, α governs γ .

α *properly governs* β if and only if α governs β (and α ≠ AGR).

(AGR(EEMENT) is part of INFL(EXION).)

C-command is defined as follows by Reinhart [1976:32]:

(i) A c-commands B if neither A nor B dominates the other, and the first branching node which dominates A dominates B.

(17) a. Who$_i$ did you see e$_i$?

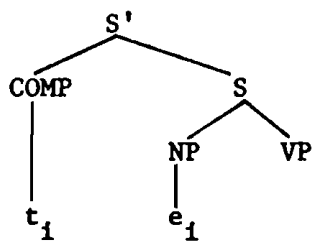
b. Who$_i$ do you think [$_{S'}$ t$_i$ [$_S$ e$_i$ came?]]

Consider, now, the contrast between (17b) and (18):

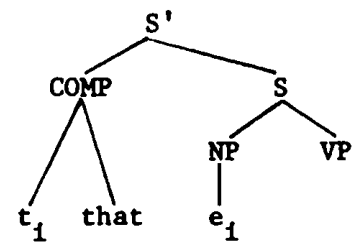
(18) *Who$_i$ do you think [$_{S'}$ t$_i$ that [$_S$ e$_i$ came?]]

The contrast between (17b) and (18) is explained as follows. In (17b), the trace in S' governs the trace in subject position. In (18), on the other hand, the presence of *that* in S' creates a branching COMP, which prevents t$_i$ from properly governing e$_i$. In short, (17b) and (18) have the structures in (19a) and (19b), respectively (omitting irrelevant details, ECP subsumes the *that*—trace filter of Chomsky and Lasnik [1977]).

(19) a.



b.



Consider now (20), which is the Krio equivalent of (18):

(20) údá$_i$ ùnà mémbà [$_{S'}$ t$_i$ sé [$_S$ e$_i$ dè kám?]]
who-you-think- that- PROG-come
'who$_i$ do you think (that) e$_i$ is coming?'

How can the grammaticality of (20) be accounted for? As a first step, consider the following sentences:

(21) a. wétín ì bìn sé? 'what did he say?'
what-he-PAST-say

b. à bìn mémbà [$_{S'}$ sé [$_S$ ì gò gó]] 'I thought that he would go'
I-PAST-think-that-he-PROS-go

The examples in (19) show that sé is ambiguous between a verb ('say') and a *that*-complementizer. There is therefore one fundamental difference between sé and English 'that', namely that sé (unlike 'that') is a *lexical* [-N+V] element.

3.2. Serial verbs and ECP violations.[11] The serial verb construction (SVC) is a construction found in many African and creole languages. SVC has the following structure:

(22) NP_1 Aux V_1 (NP_2) V_2 .....

Consider the following example of a dative SVC

(23) ì bìn lɛ́y gí mí 'he lied to me' (lit. 'he lied gave me')
he-PAST-lie-give-me

In (23), NP_1 (ì) is the syntactic and semantic subject of both verbs, as can be seen in the following examples:

(24) a. ì bìn lɛ́y 'he lied'
he-PAST-lie

b. ì bìn gí mí X 'he gave me X'
he-PAST-give-me-X

However, NP_1 can not be the semantic subject of V_2. Consider the following sentence:

(25) ùnà dɔ́n tɔ́k dú 'you have said enough'
you-PERF-talk-be enough

If this sentence is broken down into its constituent parts, only one of the sentences so obtained is grammatical:

(26) a. ùnà dɔ́n tɔ́k 'you have talked'
you-PERF-talk

b. *ùnà dɔ́n dú 'you have been enough'
you-PERF-be enough

Sentence (26b) shows that ùnà is not the semantic subject of dú . In short, selectional restrictions can be violated in SVC's.[12]

Consider, now, the following analysis. Since NP_1 does not have to be the semantic subject of V_2 and sɛ́ has verbal properties, (20) can be assimilated

[11]This section is a summary of Nylander [1982b]. For detailed bibliographical references for SVC's in African and creole languages, see Nylander [1982a, 1983b]. For studies on SVC's in Krio, see Nylander [1981a, 1982a, 1982b, 1983a, 1983b] and Williams [1971, 1976].

[12]Bamgbose [1974] notes a similar phenomenon in Yoruba.

to an SVC and be reanalysed as (20'):

(20') údá$_i$ ùnà [$_V$ mémbà] [$_V$ sé] e$_i$ dè kám?
NP$_1$ V$_1$ V$_2$

In (20'), e$_i$ is properly governed by the adjacent lexical item sé . Under this analysis, there is no longer any ECP violation.

3.3. Independent evidence for the verbal complementizer status of sé . In this section, independent evidence for the verbal complementizer status of sé will be given. One feature of SVC's is verb stranding,[13] which isolates the final verb at the end of the sentence. Applying verb stranding to (27) (=(23)) yields (28):

(27) ì bìn lấy gí mí — 'he lied to me'
he-PAST-lie-give-me

(28) údá$_i$ ì bìn lấy gí e$_i$? — 'who did he lie to?' (lit. 'who did he lie give?')
who-he-PAST-lie-give

Verb stranding can also apply to (29a) to yield (29b):[14]

(29) a. ùnà mémbà [$_S$, sé [$_S$ John dè kám]] — 'you think that John is coming?'
you-think- that- John-PROG-come

b. wétín$_i$ ùnà mémbà [$_S$, sé [$_S$ e$_i$?]] — 'what do you think? (lit. 'what$_i$ do you think that e$_i$?')
what-you-think- that

Now the *phonetic* realisation of (29b) is (30):

(30) [wétín ùnà mémbà sē]

Thus /sé/ takes on a middle tone in sentence final position. But we have seen that apart from four pronouns, only lexical items are subject to variation in sentence final position. A complementizer is, by definition, a grammatical morpheme. So the fact that sé manifests tonal variation means that

[13]The term *verb stranding* is used to reflect the similarity between preposition stranding and verb isolation.

[14]Note that in (29b) it is the whole subordinate clause that is replaced by the WH-form in sentence initial position.

it is also a lexical item. In short, sé is a verbal complementizer.

Note, furthermore, that there is a trace after sé in (29b)/(30). Recall the debate over the contexts in which 'want to' becomes 'wanna'. It was pointed out during the debate that 'want to' can only contract, i.e. become 'wanna', if there is no trace between 'want' and 'to'. Since there is a trace after sé in (29b)/(30), i.e. sé is not, in an absolute sense, in final position, it must be concluded that the trace does not affect the phonological operation, i.e. high tone → middle tone. The exact reasons for this remains to be determined.

REFERENCES

Bamgbose, A. 1974. "On serial verbs and verbal status." *Journal of West African Languages* 9:17-48.

Berry, J. 1961. "English loanwords and adaptations in Sierra Leone Krio." *Creole Language Studies* 2:1-16.

Berry, J. 1970a. "A note on Krio tones." *African Language Studies* 11:48-59.

Berry, J. 1970b. "A note on the prosodic structure of Krio." *IJAL* 36:266-267.

Berry, J. 1971. "Pidgins and Creoles in Africa." In T.A. Sebeok (ed.), *Current Trends in Linguistics*, 510-536. The Hague/Paris: Mouton.

Bradshaw, A.T. von S. 1966. "A list of Yoruba words in Krio." *Sierra Leone Language Review* 5:61-71.

Chomsky, N. 1981. *Lectures on Government and Binding*. Dordrecht: Foris.

Chomsky, N. & H. Lasnik. 1977. "Filters and control." *Linguistic Inquiry* 8:425-504.

Coker, E. 1977. "Etudes linguistiques sur le créole de la Sierra-Leone." Unpublished doctorat de troisième cycle thesis, Université de Montpellier-III.

Coomber, M.E.A. 1969. "A descriptive study of Krio phonology." Unpublished M.Sc thesis, Georgetown University.

Fyle, C. & E.D. Jones. 1980. *A Krio-English Dictionary*. Oxford/Freetown: OUP/Sierra Leone University Press.

Hyman, L.M. 1975. *Phonology: Theory and Analysis*. New York: Holt, Rinehart

& Winston.

Hymes, D. 1971. "Comments on J. Berry's paper." in D. Hymes (ed.), *Pidginization and Creolization of Languages*, p. 285. Cambridge: Cambridge University Press.

Johnson, A.C. 1974. "A linguistic study of Krio tones." Unpublished M.Phil thesis, University of Leeds.

Jones, E. 1971. "Krio: an English-based creole language of West Africa." In J. Spencer (ed.), *The English Language in West Africa*, pp. 66-94. London: Longman.

Ladefoged, P. 1968. *A Phonetic Study of West African Languages*. Cambridge: Cambridge University Press.

Lawton, D.L. 1968. "The implications of tone for Jamaican Creole." *Anthropological Linguistics* 10/6:22-26.

Mafeni, B. 1971. "Nigerian Pidgin." In J. Spencer (ed.), *The English Language in West African*, pp. 95-112. London: Longman.

Nylander, D.K. 1979. "Aspects of Krio tonology and their implications for lexicography." Paper read at the annual meeting of the New York State Council on Linguistics, SUNY, Buffalo, Novermber, 1979.

Nylander, D.K. 1981a. "Serial and pseudoserial verb constructions in Krio." *Montreal Working Papers in Linguistics* 17:101-118.

Nylander, D.K. 1981b. "Aspects of Krio tonology and their implications for lexicography." Unpublished paper, McGill University/Université de Grenoble-III.

Nylander, D.K. 1982a. "Serial verbs, the *that*-trace filter and the Empty Category Principle." Unpublished paper, McGill University/Université de Grenoble-III.

Nylander, D.K. 1982b. "Serial verbs and ECP violations in Krio." Paper read at the 13th Annual Conference on African Linguistics, Université du Québec à Montréal, April 30-May 2, 1982.

Nylander, D.K. 1983a. "Serial verbs, the θ-Criterion and the Projection Principle: a case study (Krio)." Paper read at the 14th Annual Conference on African Linguistics, University of Wisconsin-Madison, April 7-10, 1983.

Nylander, D.K. 1983b. "Etude descriptive du krio (langue créole de la Sierra-Léone): phonologie et syntaxe." Unpublished thèse de doctorat de troisième cycle, Université de Grenoble-III.

Reinhart, T. 1976. "The syntactic domain of anaphora." Unpublished doctoral thesis, MIT.

Saint Jacques Fauquenoy, M. 1972. *Analyse structurale du créole guyanais*. Paris: Klincksieck.

Strevens, S.D. 1965. *Papers in Language and Language Teaching*. Oxford: Oxford University Press.

Taylor, D. 1963. "The origin of West Indian Creole languages: evidence from grammatical categories." *American Anthropologist* 65:800-814.

Taylor, D. 1968. "Le Créole de la Dominique." In A. Martinet (ed.), *Le Langage*, pp. 1022-1049. Paris: Gallimard.

Taylor, D. 1971. "Grammatical and lexical affinities of creole languages." In D. Hymes (ed.), *Pidginization and Creolization of Languages*, pp. 293-296. Cambridge: Cambridge University Press.

Williams, W.R. 1971. "Serial verb constructions in Krio." *Studies in African Linguistics*, Supplement 2, pp. 47-65.

Williams, W.R. 1976. Linguistic change in the syntax and semantics of Sierra Leone Krio." Unpublished doctoral thesis, Indiana University.

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THE FORTIS FEATURE IN JJU (KAJE): AN INITIAL STUDY[1]

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The fortis feature in JJu (more widely known as Kaje) divides the consonants of the language (except the simultaneous labio-velar plosives kp and gb) into a set of fortis ones and a set of their lenis counterparts. Minimal pairs and other words contrasting in the presence or absence of the fortis feature were studied with the aid of spectrograms, oscillo-grams, and a tape repeater-segmenter system for isolating time portions and measuring their durations. A variety of acoustic cues to the fortis feature was observed. The time span of a consonant is partitioned here into complete occlu-sion, partial occlusion and final transition. The principal experimental result reported here is that the partial occlu-sion portion of the fortis plosives and affricates was found to be consistently longer than that of the lenis ones.

1. Introduction

Jju[2] has a contrast occurring in the prevocalic consonants of noun roots and verb stems that I have chosen to call a fortis-lenis contrast. This choice is based on the auditory impression that fortis consonants are more prominent in various ways, not just longer, which accords with experimental results out-lined below. No claim is made here that this contrast in Jju can "be correlat-

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[1]Jju /ju/ , more widely known as Kaje, is spoken by a people known as the Bajju /bəju/ . According to Greenberg [1966] Kaje is a Benue-Congo Plateau 2a language. The home area of the Bajju is in Kaduna State, Nigeria, extend-ing roughly from Kafanchan at the southeast edge of the area to Kachia at the northwest tip. The 1963 Nigeria census counted 148,459 adult Kaje people in Kaduna State; many live elsewhere.

[2]A full-length paper on this study was presented at the 12th Congress of the West African Linguistic Society, 14-20th March, 1976, University of Ifé, Ile-Ifé, Nigeria. The manuscript of that paper and the data tape for speaker KTM were lost in a subsequent move from Nigeria. The present summary is writ-ten from a record of the measurements made on spectrograms and oscillograms and from memory.

ed with greater, as opposed to less, force being exerted by the respiratory system..., which would seem to be the proper domain of the fortis/lenis labels" according to Ladefoged [1964]. Williamson [1977], in discussing a multivalued feature of length for consonants, summarized reports on the nature and function of fortis-lenis contrasts in three Upper Cross languages and some Ẹdo languages of Nigeria. Debrock [1980] described experiments in which he confirmed that shortened rise time of the intensity of the postconsonantal vowel is a correlate of increased force of consonant articulation in Korean, French and Dutch.

Gerhardt [1980] discussed the role of the fortis-lenis contrast in the development of Plateau languages. In concluding his discussion of "the Central group of the Plateau 2-languages" he says: "In this group the fortis consonants are the marked members of the lenis-fortis congeners. They are marked by length and other articulatory characteristics, e.g. affriction [sic] in case of plosives."

A feature specification of Jju consonants is given in Table 1. Modification of consonants by the features [+ palatalized], [+ labialized] and [+ fortis] is illustrated by the following words. (The feature [+ fortis] is symbolized by a dot under the consonant letter.)

kam	'to scold'	nḳaŋ	'stories'
kʸaŋ	'thing'	ḳʸay	'to mix'
kʷak	'to drag (pl.)'	ḳʷat	'to drag (sg.)'

Labialized consonants are phonetically labio-velarized. Unvoiced plosives are phonetically either aspirated or else followed by a fricative that is not necessarily homorganic. There are many fortis voiced consonants and many lenis unvoiced consonants; the fortis and voicing features are independent, except for some relatively minor restrictions on formation rules.

Voiced plosives modified by the feature [+ palatalized] usually are followed phonetically by a voiced alveolar fricative [z] . The voiced labial consonant /b/ modified by the feature [+ labialized] usually is followed phonetically by the voiced labial fricative [v] . These fricatives account for the non-zero duration of the partial occlusion of tokens of /b/ in Figure 3.

Patterns of absence in our lexical data indicate some formation rules. For example, in the surface structure a fortis labial consonant is always modi-

	Plosives								Nasals			Sibilants						Glides				
	Labial		Alveo.		Velar		Labio-velar					Alveolar			Palatal							
	p	b	t	d	k	g	kp	gb	m	n	ɲ	s	ts	dz	ʃ	tʃ	dʒ	r	w	ɯ	ɥ	y
Anterior	+	+	+	+	-	-	+	+	+	+	-	+	+	+	-	-	-	+	-	-	-	-
Coronal	-	-	+	+	-	-	-	-	-	+	-	+	+	+	+	+	+	+	-	-	-	-
High	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-
Back	-	-	-	-	+	+	+	+	-	-	+	-	-	-	-	-	-	-	+	+	-	-
Round	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-
Continuant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
Nasal	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-
Strident	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	-	-	-	-	-
Delayed Release	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+	-	-	-	-	-
Voiced	-	+	-	+	-	+	-	+	+	+	+	-	-	+	-	-	+	+	+	-	+	-
Vocalic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-
Orthog. Symbol	p	b	t	d	k	g	kp	gb	m	n	ng	s	ts	z	sh	c	j	r	w	hw	yw	hyw	y
Co-occurrences																							
Fortis Unglided					x	x				x		x	x	x				x					
Labialized	x	x	x		x	x	x		x		x	x	x	x	x	x	x	xx	+	+	+	+	ɥ
Fortis + Lab.	x	x			x	x						x	x	x	x	x	x		+	+	+	+	ɥ
Palatalized	x	x	x	x	x	x	x	x	x	x								xx			+	+	+
Fortis + Pal.	x	x	x		x				x	x					x	x	x				+	+	+

x = occurrence of the form
+ = intrinsically of the form

Table 1. Jju consonants. Some transcriptions in this paper use the orthographic symbols z , c and j in place of dz , tʃ and dʒ , respectively. The feature [+ fortis] is transcribed with a dot under the consonant letter(s) (e.g. t̤s , z̤). The features [+ labialized] and [+ palatalized] are transcribed with superscripts (e.g. tʷ , tʸ).

fied by a secondary articulation. This could be the result either of a formation rule or else of an obligatory rule that rewrites unmodified fortis labial consonants as [+ labialized].

ban	'to climb (contin.)'	*b̥a(C)	
bʷan	'to turn (contin.)'	b̥ʷa	'to dip (aor.)'

This study began with the fairly safe hypothesis, based on casual listening, that in most cases fortis consonants are longer than their lenis counterparts. Questions which the study tried to resolve are: What specific aspects of the consonant articulation are lengthened? And what are the other cues to the fortis feature in the speech wave?

2. Definitions

The time span of a consonant is partitioned here into complete occlusion, partial occlusion, and final transition, defined as follows: *Complete occlusion* refers to complete closure of both the oral and nasal passages to air flow through them. *Partial occlusion* refers to a period starting at the end of the complete occlusion, or at the beginning of the consonant if there is no complete occlusion. It continues as long as there is significant aspiration, frication, or impedance to air flow through the oral passageway. *Final transition* refers to a period of continued formant transition to the following vowel. It begins at the end of the partial occlusion.

The partial occlusion of a fully developed plosive or affricate is composed of the transient, fricative, and aspirative segments of Fant's analysis [1973]. For any other consonants the partial occlusion starts at the beginning of the consonant itself. Thus for a nasal most of the duration belongs to the partial occlusion.

Partial occlusion, as defined above, is a relatively simple construct that can be applied to a wide range of consonant articulations. For the unvoiced consonants it is not the same as voice onset time (VOT), and for some of the fortis consonants the quantitative difference between the two is large. The definition of partial occlusion was based on the author's intuition of the phonetic correlates of the systemic feature [+ fortis]. The duration of partial occlusion was found in this study to be consistently longer for fortis Jju consonants than for lenis ones.

3. Methods and Results

Data illustrating several phenomena were recorded from two adult male speakers. Sets of words illustrating the fortis-lenis contrast, some of which were used in this study, are listed in Table 2.

bo	'again'
b̥ò	'refuse, chase away'
b̥ó	'to know, understand'
kaat	'to disregard'
kat	'to go about'
k̥at	'to cut (grass)'
yl	'you (subj. pron., pl.)'
y̥l	'to steal'
nʸak	'cow'
n̥ʸak	'to hide (something), pl.'
nʸat	'to hide (something), sg.'
rak	'to refuse'
r̥ak	'to lick'
rʸa	'heart, liver'
r̥ʸa	'to have contempt'
fʷl	'to become furious'
b̥ʷl	'to rest'
jl	a noun class marker
j̥l	'to repair, correct'
tʸak	'to finish'
t̥ʸak	'to cut'
zuk	'millet'
z̥u	'to hit (sg.)'
zam	'young men'
z̥ak	'to dream'
cet	'strength'
c̥et	'a trip'
ku	3 sg. obj. pronoun
k̥u	'root, tuber'
ga	'may' (particle in VP)
g̥a	'to try hard'
ya	'to eat'
y̥a	'to do, make'
ʃek	'to move oneself, sg.'
ʃ̥ek	'to move oneself, pl.'
cot	'to carry on the head, sg.'
c̥ok	'to carry on the head, pl.'
run	'to carry on the back, sg.'
r̥uŋ	'to carry on the back, pl.'
ʍa	'to think'
m̥a	'lump (as in food)'
cam	'to watch (guard)'
c̥aŋ	'to look at'
bʸi	'bedbug'
b̥ʸi	'to have, own, possess'
bʸey	'to greet, pl.'
b̥ʸek	'to greet, sg.'

Table 2. Examples of the fortis-lenis contrast in Jju.

Data were recorded from one speaker (KMC) in a single session in 1971 and from the second speaker (KTM) in a single session in 1976. The test words were embedded in the frame / ə y̥a ___ brak/ 'He said ___ again', except for six tokens from KMC. A total of 50 utterances by KMC and 72 by KTM were studied to investigate the phonetic nature of the fortis-lenis contrast.

Phonetic correlates of the specification [+ fortis] in Jju were studied with the aid of spectrograms, oscillograms, and a tape repeater-segmenter system for listening to and measuring the duration of precisely selected time-spans of the speech wave. The results are summarized in Table 3.

Vocalic Environment:		e,i,y		o,u,w		a	
		Partial Occlusion	Final Transition	Partial Occlusion	Final Transition	Partial Occlusion	Final Transition
Sibilants							
Plain alveolar	s	L	L	L	L	-------	
Affric. alv.	ts,dz(z)	L	L	L	L	L	L
Plain palatal	ʃ	L	L	L	L	L	L
Affric. pal.	tʃ(c),dʒ(j)	L	L	L	L	L	L
Plosives							
Labial	p,b	L,!	L	L,!	L	-------	
Alveolar	t	h → s/L,!	L	-------		-------	
Velar	k,	h → x	L	h → x	L	h → x	
	g			L	L	L	
r	r	r → r̃/ɹ	L	r → r̃/ɹ	L	r → r̃/ɹ	
Semivowels							
Unvoiced	ʍ,ɥ	L,!	L	L,!	L	L,!	L
Voiced	w,ɥ,y	!	L	!	L	!	L
Nasals	m,n,ŋ	L	L	L	L	L	

Key: L Phonetic feature of fortis sound is longer than that of lenis counterpart.
! Closer articulation and/or intensified or lengthened post-release frication.

Table 3. Acoustic phonetic cues to the feature specification "fortis" in Jju.

The phonetic correlates of the fortis feature were found to be in some ways fairly diverse, as may be seen in the illustrations below. Several of the correlates in Jju are similar to those described for Cajonos Zapotec by Nellis and Hollenbach [1980].

The frequency of the first formant was found to be lower at the onset of fortis /y̰/ than it was for lenis /y/ , as in

[ya] 'to eat' [y̰·a] 'to do'

Similarly, the second formant frequency at the onset of /y̰/ was higher. And the time duration of fortis semi-vowels, measured from the onset of the semi-vowel to the point of formant transition to the next vowel, was greater than that of lenis ones. These physical observations correlate with the auditory impression from listening casually and with the repeater-segmenter that the articulation of fortis semi-vowels is closer and longer than that of corresponding lenis ones.

Affrication or a heterorganic fricative may be added, intensified or lengthened, or it may be substituted for aspiration, as in

[kʰʷak] 'to drag (pl.)' [kxʷat] 'to drag (sg.)'
[bʏ̰ey] 'to greet (pl.)' [bzʏ̰·ək] 'to greet (sg.)'

Either a trilled articulation or else a retroflexed articulation may be substituted for a flap articulation, as in

[ɾak] 'to refuse' [ɾak] or [ɹak] 'to lick'

And a nasal becomes lengthened, as in

[nʏ̰ak] 'cow' [nʏ̰·ak] 'to hide'

Although there is a variety of phonetic correlates of the fortis feature, that portion of the articulation which we have defined here as the partial occlusion was found in these data to be consistently longer for the fortis consonants than for the lenis ones. The durations measured for the complete occlusion and partial occlusion portions of the plosives and affricates in these data are plotted in graphs in Figures 1, 2 and 3. Data for a few cases where the boundaries of the complete occlusion and/or partial occlusion portions of the consonant were especially indistinct and the measurements therefore of more doubtful accuracy are plotted with symbols in parentheses.

For most of these consonants the period of complete occlusion was taken to be the whole of the silent interval from the [a] in / y̰a / in the sentence frame to the beginning of the partial occlusion. The exception to this was for those tokens in which there was obviously a long pause between frame and substitution item, in which the speaker hesitated due to uncertainty about the

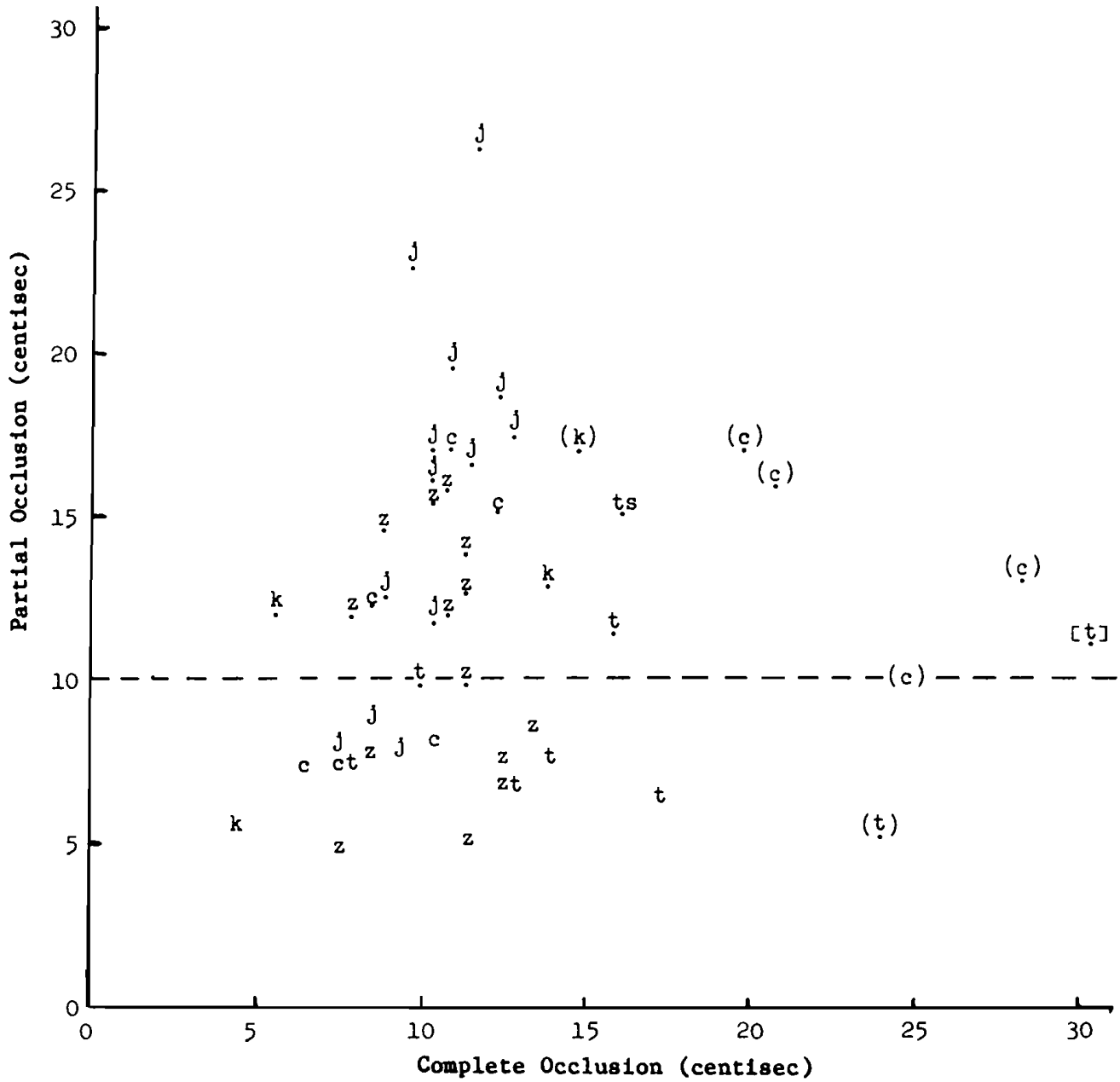

Figure 1. Durations of partial and complete occlusion for lenis and fortis obstruents in Jju: Speaker KMC.

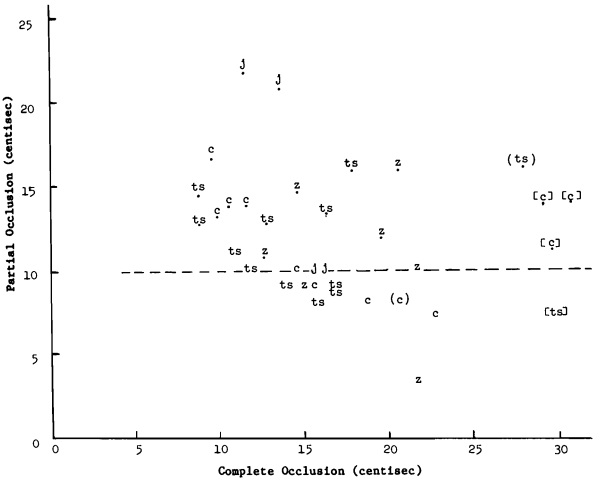

Figure 2. Durations of partial and complete occlusion for lenis and fortis affricates in Jju: Speaker KTM.

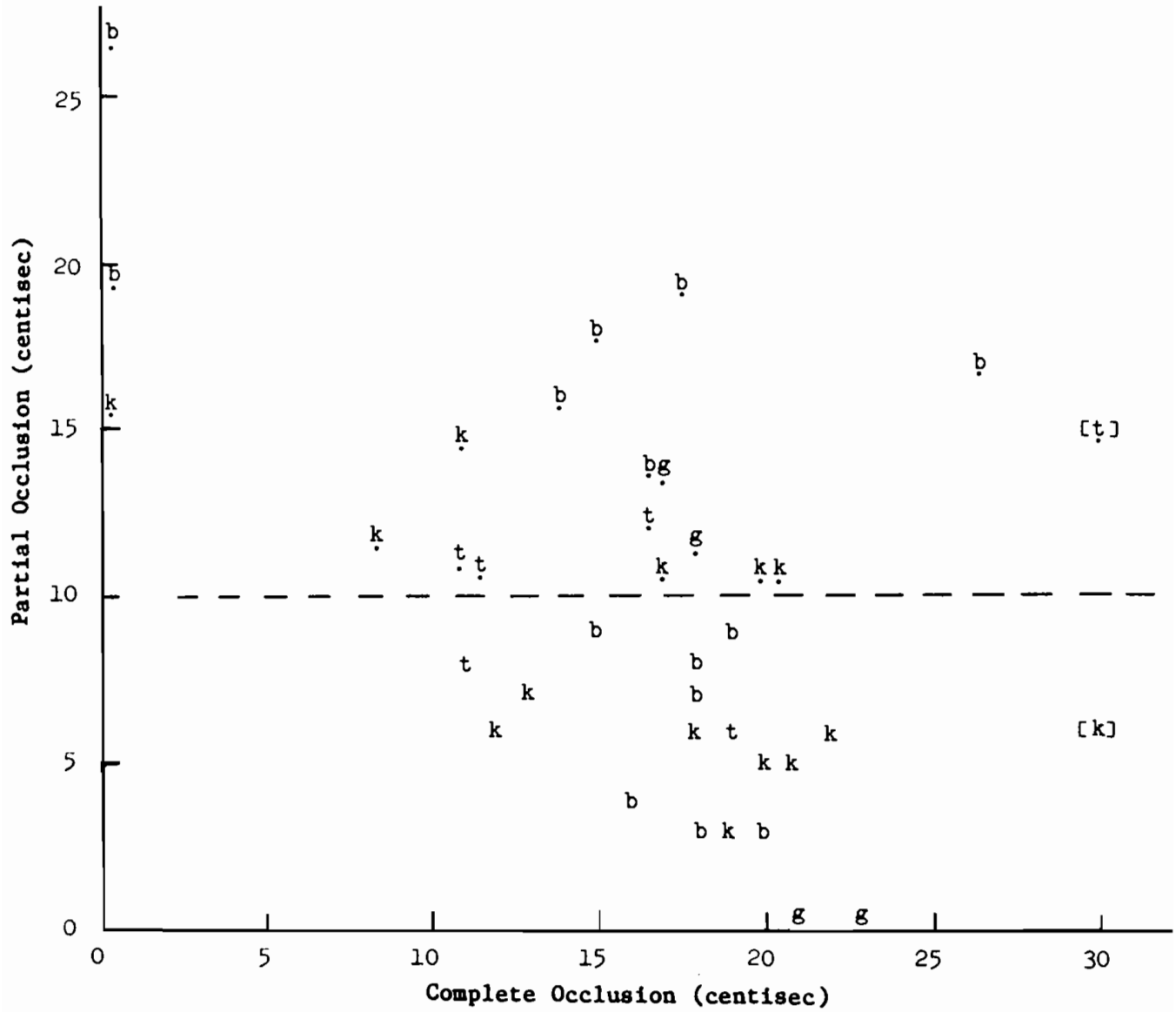

Figure 3. Durations of partial and complete occlusion for lenis and fortis plosives in Jju: Speaker KTM.

word he was to pronounce. The partial occlusion durations for these tokens are plotted at the right (30 cs abscissa) with symbols in square brackets.

Duration of the partial occlusion was plotted versus duration of the complete occlusion in these graphs. This was done in the expectation that although durations might vary with speaking rate, the variations would be correlated in such a way that the fortis consonants and lenis consonants would occupy regions of the graph roughly partitioned by a diagonal line. It was found that the separation of fortis consonants from lenis consonants in these data according to durations was simpler and more nearly complete than had been expected. For most of the data from both speakers, the duration of partial occlusion for fortis consonants is greater than or equal to 10 cs, and that for lenis ones is less than 10 cs.

4. Summary

The fortis feature in Jju is manifested by a variety of phonetic features, including in most cases a lengthened period of partial occlusion. For fortis obstruents this period was found to be consistently greater than or equal to 10 cs, and for lenis ones it was less than 10 cs. The fortis feature applies to all the consonants of Jju except kp and gb .

REFERENCES

Debrock, M. 1980. "An acoustic correlate of the force of articulation." *Journal of Phonetics* 5:61-80.

Fant, G. 1973. *Speech Sounds and Features*. Cambridge, Massachusetts: MIT Press.

Gerhardt, L. 1980. "The fortis-lenis contrast in West African languages." *Africa und Übersee* 63:207-217.

Greenberg, J.H. 1966. *The Languages of Africa*. Bloomington: Indiana University.

Ladefoged, P. 1964. *A Phonetic Study of West African Languages*. West African Language Monographs, 1. London: Cambridge University Press.

Nellis, D.G., and B.E. Hollenbach. 1980. "Fortis versus lenis in Cajonos Zapotec phonology." *International Journal of American Linguistics* 92-46:92-105.

Williamson, K. 1977. "Multivalued features for consonants." *Language* 53: 843-871.

suffixes:

(1) AUXILIARY (Godié)

ɔ yí mɔ́ mɯ 'he will go there'
he FUT[2] there go

(2) PERIPHRASTIC CONSTRUCTION (Wobé)

ɔ mu gbŭ̀ po-à 'he's going to build a house'
he:IMP go house build-NOM

(3) TENSE SUFFIX (Lakota Dida)

ɔ ble-wa saka 'she was pounding rice'
she pound:IMP-PAST rice

While all Kru languages appear to use auxiliaries and periphrastic constructions to express tense, the use of tense suffixes varies considerably from language to language. Wobé, a Western Kru language, apparently has no tense suffixes whatsoever, while other related languages have complex suffix systems with up to six overtly marked tense distinctions. In this paper, I will attempt to explain this variation by claiming that most tense suffixes are innovative, having been derived from temporal adverbs.

2. The Data

As noted above, some Kru languages like Wobé have no tense suffixes. More commonly, however, there are two markers, one indicating recent and one

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Coast. They belong to the Niger-Congo family and are divided into two main groups: Eastern and Western Kru. The Western group is itself divided into two main subgroups: Grebo and Guéré. There are also three isolates: Kuwaa, Aizi, and Sɛmɛ [Marchese 1979b].

[2]Abbreviations used in this paper include the following:

ADV	adverb	HORT	hortative	REC	recent
AF	assertive focus	IMP	imperfective	REM	remote
AUX	auxiliary	NEG	negative	S	subject
DBY	day before yesterday	NOM	nominalizer	SF	shortened form
DEF	definite	O	object	T	tense
ET	earlier today	PER	perfective	V	verb
FUT	future	PERF	perfect	YES	yesterday

Kru languages have three or four tones. In three-tone languages, ´ represents high. Mid tone is unmarked or ¯, and low tone is indicated by ` . In four-tone systems, a mid-high tone is represented by ˊ .

GREBO COMPLEX

Language	Gloss	Time Adverb	Tense Suffix
Nyabo	'today'	kɛ̀ɛ̄tí	kɛ̀ɛ̄
	'yesterday'	pàmā	mā
	'tomorrow'	?[3]	a
	'a long time ago'	sēkɛ̀ɛ̄(ké)	ɛ̄
Borobo	'yesterday'	trótō	tó
	'tomorrow'	g̃ã̀	a
Dyabo	'yesterday'	pama	ma
	'tomorrow'	?	kã
Cedepo	'yesterday'	tómɔ́tè	tɛ́
	'day before yesterday'	ceneya	ya/ɗa/a/ã/nã
	'tomorrow'	kà	kà
	'later today'	?	á
Tepo	'today'	kɛ́kɛ́gbò	kɛ
	'yesterday'	tɷtɔ́tɔ́	tɔ́
	'tomorrow'	ŋàŋà	ŋà
	'earlier today'	?	wɛ̃
		?	lɛ́ (far past)
		?	ɔ́ (past)
Grebo (glebo)	'yesterday'	tɛ́dɔ́dɔ́	dɔ́
	'today'	tɛtɪnɛ́ɛ́	ɛ
	'day before yesterday'	?	dɛ́
	'tomorrow'	?	á
	'day after tomorrow'	?	dɔ̀

[3]In some cases the source of the tense suffix is unknown.

Nyabo	pàmā	mā	'yesterday'
	sēkèē	ē	'a long time ago'
Borobo	trótō	tó	'yesterday'
Cedepo	tómótɛ́	tɛ́	'yesterday'
Grand Bassa	ɓózɛ̌ɛ̃̌ɛ̃	zɛ̌ɛ̃̌	'today'

Despite the lack of a general rule predicting how the short forms are derived from the longer ones, there can be no doubt as to the obvious connection between these suffixes and temporal adverbs.

4. Analysis of the Shortened Forms

The close relationship between the full and reduced forms leaves us with two important questions. First, are the reduced forms really temporal adverbs themselves or do they belong to a separate category TENSE? Secondly, if they are tense markers, how did they develop? To begin with the first question, there is phonological as well as distributional evidence that shortened forms no longer function as adverbs and that they do, in fact, constitute a separate grammatical category TENSE. What is being claimed, then, is that temporal adverbs in Kru have been reanalyzed as tense markers.

4.1. Phonological evidence. There are several phonological facts which suggest that time adverbs and the reduced time particles do not belong to the same grammatical category. The major difference is that full time adverbs and the reduced forms differ in their degree of phonological dependence on the verb. In most languages, reduced forms are phonologically bound to the verb stem, and thus do not have the independent status of a time word. For example, many of the particles have the shape V:

Nyabo	ɵ	'a long time ago'
Borobo	a	'tomorrow'
Grebo	ɛ	'today'

While this syllable structure V is certainly possible in Kru, it is generally restricted to two classes of morphemes: pronouns and suffixes of various types (for example, plural, definite, associative, nominalizers, and aspectual markers). Thus the reduced forms seem to be occurring as suffixes on the verb rather than appearing as full independent words like regular time ad-

tween the verb stem and the object pronoun:

(11) River Cess Bassa

smí	kpɔ̃	wɛ̀ã̀	ɔ̀	nì	'a fish caught it'
fish	catch	T	it	AF	or 'a fish caught him'

(12) Talo Klao

ɔ̄	ɟē	āká	T	'he saw them yesterday'
he	see	T	them	

It is likely, therefore, that the tense marker is a clitic. In fact, the whole sequence <verb-tense-object pronoun> seems to constitute one phonological word. All these facts indicate that from a phonological point of view, there really is a distinction between reduced forms and full time adverbs. Time adverbs are independent, while reduced forms are phonologically dependent.

4.2. Distributional evidence. From a distributional point of view, there are several reasons for considering time adverbs and their corresponding reduced forms as belonging to separate grammatical categories. First of all, reduced adverbs occur in exactly the same position as "traditional" tense markers, i.e. those tenses indicating recent and remote tense, as seen in (4). "Traditional" tense markers generally occur following the main verb. If an auxiliary is present, however, these markers are suffixed onto it, as seen in the following examples from Godié and Dewoin:

(13) Godié

ɔ	lɨ	a	sʉkʌ́	'he was eating rice'
he	eat:IMP	REC	rice	
ɔ	yì	a	sʉkʌ́	lɨ 'he will eat rice'
he	FUT	REC	rice	eat
S	AUX	T	O	V

(14) Dewoin

ɔ	pì	{ɾ / ɗ}	sayɛ̀	'he cooked meat {recently / a long time ago}'
he	cook	{REC / REM}	meat	

However, reduced forms cannot occur in pattern (iii). They may only occur in the traditional tense position:

(17) Borobo

ɔ ye tɔ́ kùà nu 'he didn't work yesterday'
he NEG yesterday work do
S AUX short-form O V

*ɔ ye kùà nu tɔ́
*S AUX O V short-form

In some languages, temporal adverbs and reduced forms sometimes occur in mutually exclusive environments. In Nyabo, for example, pattern (iii) is found for temporal adverbs, but pattern (iv) is excluded. Conversely, reduced forms are found in pattern (iv), but not in pattern (iii):

(18) Nyabo

TEMPORAL ADVERB

ɔ hé kúà nu pàma 'he didn't work yesterday'
he NEG work do yesterday
S AUX O V ADV

*ɔ hé pàma kúà nu
*S AUX ADV O V

SHORTENED FORM

ɔ hé ma kúà nu 'he didn't work yesterday'
he NEG yesterday work do
S AUX short-form O V

*ɔ hé kúà nu ma
*S AUX O V short-form

Temporal adverbs may also occur in sentence-initial position when they are contrastively focussed, i.e. in answer to a question or when correcting a false impression. Reduced particles may never occur in this position, however:

5. Reanalysis

It has been shown, then, that there are major phonological and distributional differences between time adverbs and their reduced counterparts—enough to assume that they belong to separate grammatical categories. In fact, the correlation between time adverbs and what can now rightly be called tense markers suggests that there has been a reanalysis of time adverbs as tense markers. How did this development take place?

5.1. A parallel case of tense innovation. It is well known [Givón 1976a] that the most common source for tense markers is verbs. Givón [1971, 1973] has shown, for example, how verbs like 'want' in Swahili and 'begin' in SiLuyana have turned into future markers. The verb 'finish' in Swahili has apparently given rise to three different past tense markers. In Bamileke [Anderson 1980; Hyman 1980], most, if not all, tense markers are derived from verbs. In the Kru language family itself, verbs such as 'have', 'go', and 'come' often turn into auxiliaries indicating various types of futures [Marchese, 1978b, 1979a]. It is also known that tense systems develop out of aspectual ones [Binnick 1976]. Such changes are attested in Luiseno [Jacobs 1975], Hebrew [Givón 1976b; Gordon, n.d.], and French [Comrie 1976]. But there are few documented cases in the literature of an adverb → tense marker shift.

Kiparsky [1968], following Müller in 1860, claimed that tense in proto Indo-European should be considered an adverbial constituent. This proposal met with considerable opposition, however, because there was no real etymological evidence for linking tense markers with time adverbs [Comrie, p.c.]. However, such a link has been established in certain pidgins and creoles. In Papiamentu, a Portuguese-based creole, the adverb logo 'next, soon' gave rise to a future-marker lo [Bickerton 1981]. In Neo-Melanesian, an English-based pidgin, the adverbial phrase by and by was reanalyzed as a future marker bai . Evidence in favor of this reanalysis includes the following [Sankoff and Laberge 1974:77]:

(i) the future marker bai is a phonological reduction of an adverbial expression baimbai (by and by);

(ii) the particle has lost obligatory stress [suggesting it has changed from an independent word to a clitic—L.M.];

(iii) it co-occurs with adverbs having a future reading, e.g.

klostu bai i dai 'soon he will die'
soon FUT he die

Occasionally, the adverb may occur in sentence-final position, but this is rare. Vogler [1976] calls it a stylistic variation:

(24) Vata

ɓɪáɓɪɛ́ɛ́ ɪɛ dù kú zèkà 'the sheep is in the village today'
sheep:DEF is village at today
S V O[7] ADV

(25) Vata

ń ká sɪ ɓètɛ́ 'I will laugh right away'
I VOL laugh right away
S AUX V ADV

In Godié, another Eastern language, a sample of 135 pages of typed text revealed that out of a total of approximately 100 occurrences of the time adverbs 'today', 'tomorrow', and 'again', only one instance was found with the adverb 'today' in sentence-final position: S AUX O V ADV. For all three adverbs, there were no examples of the word order S V O ADV except when O was a pronoun.

In Western languages, however, the situation is not the same. In some languages like Dewoin, time adverbs occur commonly either directly following the verb or in sentence-final position:

(26) Dewoin

ɔ́ nu kùà ɓawáa 'he worked yesterday'
he do work yesterday
S V O ADV

ɔ́ nu ɓawáa kùà " " "
S V ADV O

In other Western languages, while both orders are attested, sentence-final position is preferred:

[7]In many Kru languages, locative verbs like 'be at' can be analyzed as transitive, where the following NP acts as an object.

proposed provides a reason for the unusual innovation of tense markers in Kru. Not only was there a semantic link between time adverbs and the category TENSE, there was also a favorable distribution of elements (time adverbs directly following verbs) for the reanalysis. Furthermore, as has been suggested, there may have been a pattern for such a reanalysis. If recent and remote markers as seen in Godié, Dewoin, Tepo, and Kuwaa are actually reconstructable[9] for Proto-Kru, they could have served as a pattern on which reduced time adverbs became reanalyzed as tense markers. Finally, the proposed adverb shift may explain why some languages do not have any tense suffixes (this latter point will be discussed in section 5.3).

5.2. Proposed scenario for tense innovation. Given the phonological and distributional evidence for reanalysis and facts from a parallel case of tense development in Neo-Melanesian, the following scenario is proposed:

I. Time adverbs occur directly in post-verbal or post-auxiliary position

As was seen above, this stage is presently attested in many Eastern languages and some Western languages. The following example comes from Bassa:

(29) Bassa

ɔ se pàniwɑ̃́ kùà nyu 'he didn't work yesterday'
he NEG yesterday work do

II. Time adverbs are reduced

At this stage, time adverbs occur either in their reduced form or in their full form. The factors governing the occurrence of the form have not been studied in detail, but it is very likely that they are discourse-related.[10] At this point, reduced particles are in complementary distribution with

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has been called "exbraciation" since it normally involves movement of items out of the verb brace: S AUX X V → S AUX V X .

[9]There is considerable evidence supporting a proto *o as a remote past tense marker. In Western Kru, Talo Klao has the form o , Kru as described by Rickard, ó , ò , and wo , and Dewoin, the form ó . The isolate Kuwaa has a remote ó , while Eastern Kru seems to have a fusion of o and some other element: Godie wʌ , Neyo wa or wɛ , and Vata βá .

[10]It is known that in some Kru languages, discourse affects the distribution of tense markers. In Godié, for example, the presence of a tense marker is not particularly prevalent. Often, the tense will appear in sentences at

mantic shift, is attested in only a few languages, but it seems a potential area of change in any of the languages where tense has been innovated. At this stage, the specific tense marker gets generalized to cover a larger semantic range. In two dialects of Bassa and in Neyo, the 'yesterday' tense has been generalized to cover all past actions. In River Cess Bassa, for example, the past tense marker wã̀ is apparently related to the time adverb pànìwã́ 'yesterday', but the marker may now refer to any actions in the past—it is not restricted to actions which happened yesterday. As a general past marker, it may co-occur with other time adverbs:

(34) River Cess Bassa

ɔ kpɔ̃ wã̀ smi-ɔ̀ seèedɛ̀ 'he caught the fish a long time
he catch PAST fish-DEF a long time ago ago'

The same phenomenon occurs in Grand Bassa, where the past tense marker maa derived from pamaa 'yesterday' co-occurs with adverbs having other time references, such as 'day before yesterday':

(35) Grand Bassa

ɔ dɔ maá mɔ̀ɔ kɔfɔ́ 'he bought rice the day before
he buy PAST rice day before yesterday yesterday'

Similarly, in Talo Klao, the tense marker oma 'day before yesterday' has apparently been generalized to cover both past and future actions as long as they are two days removed—this despite the fact that there is another tense suffix lama referring uniquely to 'day after tomorrow' [Singler 1979:26]:

(36) Talo Klao

nɪ̄' tɪ̃-oma-ɔ nɪ̄' nɪ̄'-a plo-lama-ɔ 'I bought it the day before yesterday and I will sell it the day after tomorrow'

or

nɪ̄' tɪ̃-oma-ɔ nɪ̄' nɪ̄'-a plo-oma-ɔ
I buy-DBY-it and I-IMP sell-lama
-oma

In Neyo, both the yesterday-related tense marker and the tomorrow-related one have been generalized to cover unspecified times in the past and future. The marker la , coming from káalaá 'yesterday' gives a general past reading, while the marker lɛ , derived from kɛɛlɛ 'tomorrow' has a general future reading:

"jump" from one stage to the next. In fact, what appears to be happening is that one by one individual time adverbs go through the stages. This means that in a given language all adverb-related markers will not be at the same stage. This is the case, for example, in Talo Klao. As noted above, the reduced form of susumá , omá 'the day before yesterday' has not been completely reanalyzed as a tense marker, since it may not co-occur with the full form:

(40) Talo Klao

*susumá	ɔ	se-omá-ná	ɟi	'he didn't come here the day before
DBY	he	NEG-DBY-here	come	yesterday'

But another adverb-derived marker apparently has been reanalyzed, since it can occur in this manner:

(41) Talo Klao

pɛ́plàaka	ɔ	se-aka-lá	ɟi	'he didn't come here yesterday'
yesterday	he	NEG-YES-here	come	

Furthermore, Singler [p.c.] also notes that some tense markers in Talo Klao show more phonological dependence than others. For example, the marker lamá 'day after tomorrow' assimilates completely to the verb stem, while other suffixes show fewer signs of dependence. A basic principle of syntactic change is seen here. Lexical items undergo change one-by-one, until eventually so many items are affected that we can speak of a new grammatical category ([Lightfoot 1979]; see also Marchese [1979a, forthcoming] for other cases of syntactic change affecting individual members of a class).

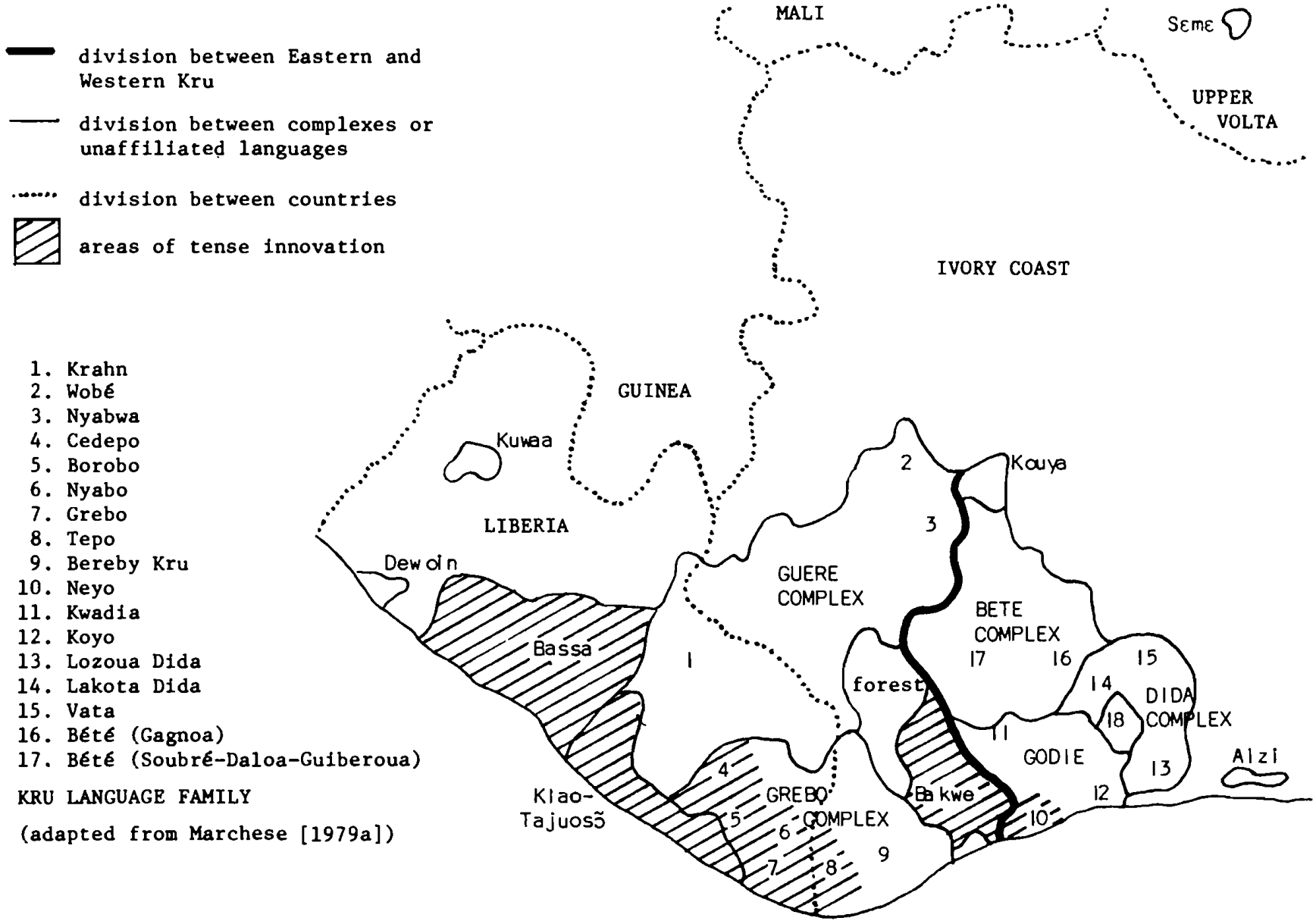
Thus, the stages I-IV as outlined above actually reflect two realities: they can be used to pinpoint a language in its development of adverb-derived tense markers or they can be used to show how far individual adverbs have been reanalyzed within a single language.

5.3. The interaction between tense innovation and adverb shift. It has been claimed that two historical developments have taken place in Kru:

(i) the reanalysis of time adverbs into tense markers

(ii) the shifting of the position of time adverbs (away from post-verbal or post-auxiliary position)

These two processes are independent, but they do interact with each other. It



KRU LANGUAGE FAMILY

(adapted from Marchese [1979a])

REFERENCES

Anderson, Stephen. 1980. "Tense/Aspect in Ngyembɔɔn-Bamileke." Paper presented at the 14th WALS conference in Benin.

Bickerton, D. 1981. *Roots of Language*. Ann Arbor: Karoma Press.

Binnick, R. 1976. "How aspect languages get tense." In S. Steever et al. (eds.), *Papers from the Parassession on Diachronic Syntax*, pp. 40-49. Chicago Linguistic Society.

Clubvine, Rev. Percy E. n.d. *Bassa Grammar*. Ms.

Comrie, Bernard. 1976. *Aspect*. Cambridge: University Press.

Dawson, Keith. 1975. "L'accord vocalique en tepo." *Annales de l'Université d'Abidjan*. Série H., Vol. 8, pp. 15-26.

Givón, Talmy. 1971. "On the verbal origin of Bantu verbal suffixes." *Studies in African Linguistics* 2:145-163.

Givón, Talmy. 1973. "The time-axis phenomenon." *Language* 49:890-925.

Givón, Talmy. 1976a. "On the SOV reconstruction of Southern Nilotic: internal evidence from Toposa. In L.M. Hyman et al. (eds.), *Papers in African Linguistics in Honor of Wm. E. Welmers*, pp. 73-91. *Studies in African Linguistics*. Supplement 6.

Givón, Talmy. 1976b. "On VS word order in Israel Hebrew: pragmatics and typological change." In p. Cole (ed.), *Papers in Hebrew Syntax*, pp. 153-181. Amsterdam: North Holland.

Gordon, Amnon. n.d. "Aspect in Hebrew." Ms.

Gratrix, C. and C. Grah. n.d. -A Zɛ 'Newɔle [Neyo primer]. Abidjan: SIL.

Hyman, Larry. 1980. "Relative time reference in the Bamileke tense system." *Studies in African Linguistics* 11:227-237.

Jacobs, R.A. 1975. *Syntactic Change: a Cupan (Uto-Aztecan) Case Study*. Berkeley: University of California Press.

Kiparsky, Paul. 1968. "Tense and mood in Indo-European." *Foundations of Language* 4:30-57.

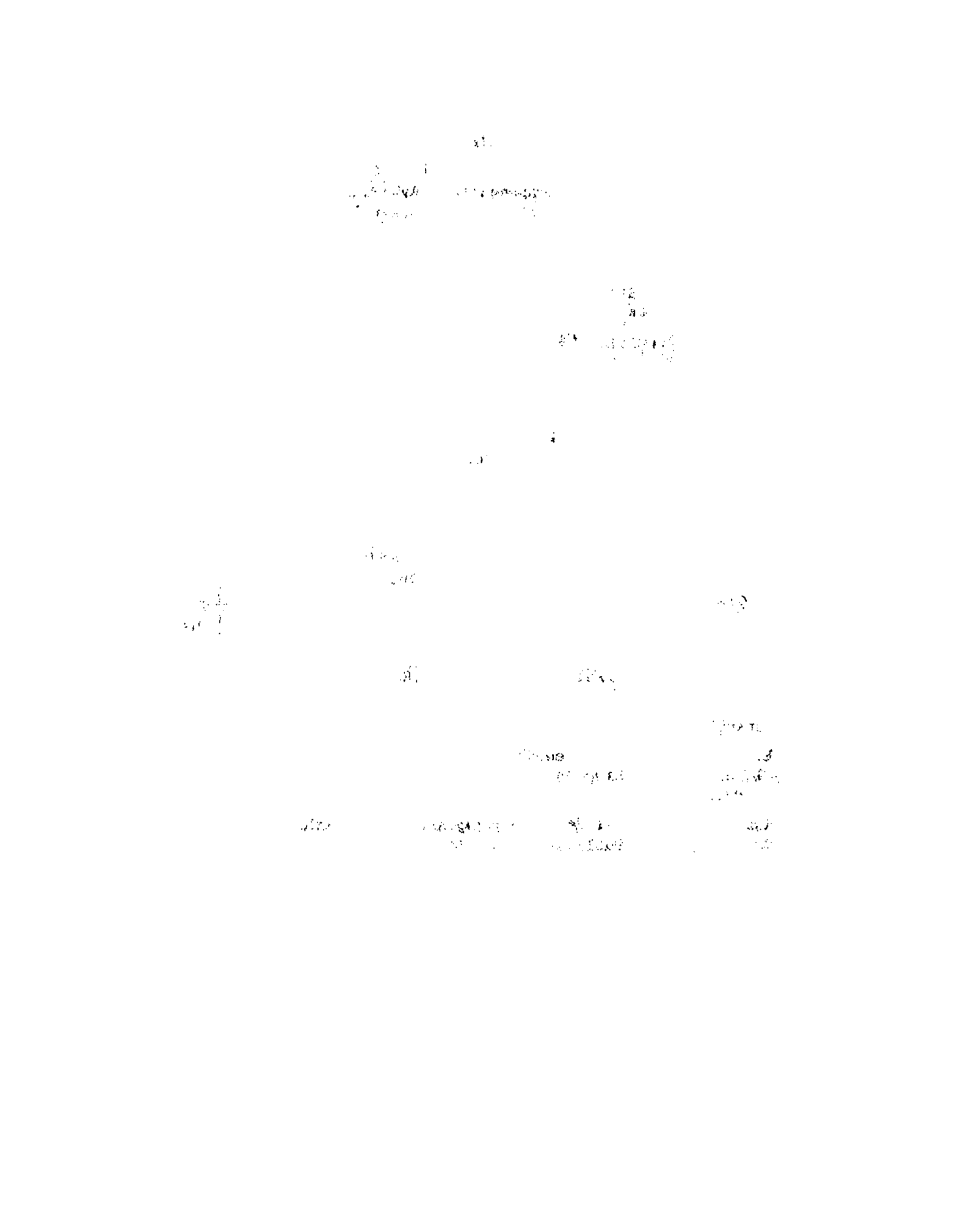
Labov, William. n.d. "On the adequacy of natural languages: the development of tense." University of Pennsylvania, ms.

Lightfoot, David. 1979. *Principles of Diachronic Syntax*. Cambridge: University Press.

Luckau, S. 1975. "A tonal analysis of Grebo and Jabo." Ph.D. dissertation, Stanford University.

Marchese, Lynell. 1975. "Morphonologie du verbe godié." *Annales de l'Université d'Abidjan*. Série H, Vol. 8, pp. 214-239.

Marchese, Lynell. 1978a. "Time reference in Godie." In J.E. Grimes (ed.),



the same feature in the same segment clearly violates the true generalization condition. Furthermore, only an implicit restriction tantamount to rule ordering can suspend pronunciation according to lexical αF.

This understanding of how the non-transformational principles apply in relation to phonological features of lexical entries is not held simply because it is strictly proper, but because the resulting treatment of alternations is supported by several arguments, including its compatibility with the evidence of the gradual leveling of alternations [Hudson 1980:115-20]. Here we will see that the theory also provides an appropriate understanding of extensions.

With the understanding that the true generalization and/or no rule order conditions apply to the rules which are the lexical phonological features, only two possibilities become available for describing cases of alternation of +F/-F. These correlate with the traditional notions of "automatic" and "non-automatic alternation". For non-automatic alternations the lexicon provides the representation +/-F for the affected feature. That is, both values for the feature appear lexically in the alternating segment, and the job of the grammar is to state by rule the environment(s) of occurrence of only one of the two values of such suppletions, with the other necessarily occurring in all other environments (the "otherwise case"). This is approximately, though I would argue not exactly, a notational variant of a transformational "minor rule" analysis employing lexical [αF,X,+$\underline{x}$] (where +$\underline{x}$ is a diacritic or rule feature) and a rule [X] → -αF / +$\underline{x}$, ...

For non-transformational automatic alternations the lexicon provides the representation (αF) (α = + or -), equivalent to αF ∿ ∅. In other words αF is neutralized in some environment(s). Here the job of the grammar is to state by rule the environment(s) of neutralization, in which the zero-alternate of αF must appear; αF necessarily appears otherwise, in the contrastive environment(s). The neutralization rule requires some value for F, and the effect of this requirement is not only selection of the zero-alternate of (αF), but completion of the resulting archisegment with the necessary value for F.

In section 2, I briefly illustrate this with some of the Kanakuru facts from Churma [1982] (after Schuh [1972, 1974], Leben [1974], and Frajzyngier [1976], all derived from Newman [1970, 1974]), and in section 3, having shown

b. $\begin{bmatrix} C \\ -nas \\ -lat \end{bmatrix} \rightarrow \begin{bmatrix} -son \\ -vcd \end{bmatrix} \quad / \_\_\#$

Rule (2b) requires word-finally the zero-alternate of lexical (+son), yielding the archiphoneme of t/r (there is no s or z in Kanakuru), and completes the archiphoneme as [-sonorant, -voiced] t . Otherwise [+sonorant] r appears (which is redundantly [+voiced]). For this illustration I formalize only the word-final strengthening rule; the facts are more complex (cf. Newman [1974:5-6]).

The other possibility for p/t/k ∿ w/r/h as automatic alternations without feature-changing is that (-son) is lexical, as in (3a), in which case we would require the intervocalic "weakening" rule (3b).

(3) a. mo $\begin{bmatrix} C \\ (-son) \\ +ant \\ +cor \\ -nas \\ -lat \\ (-vcd) \end{bmatrix}$ 'oil'

b. C → [+son] / V __ V (and [-son] → [+vcd])

Rule (3b) (cf. Newman's [1974] rule P-1.2, part 2, and Churma's rule (2a)) requires the zero-alternate of lexical (-son), and, since sonorants are necessarily voiced in Kanakuru, also the zero-alternate of (-vcd) of the same segment, yielding from (3a) the archiphoneme of t/d/r , which it then completes as [+sonorant] r , which is redundantly [+voiced]. Otherwise, [-son, -vcd] t appears.

Rule (3b), however, unlike (2b) is not an accurate statement about Kanakuru, since both of the sets p/t/k and w/r/h appear intervocalically [Newman 1970:46, 1974:3]. The true generalization condition therefore disallows an analysis including (3b).

The third possibility, non-automatic alternation, involves lexical representations with the two-valued feature [+/-sonorant]. For 'oil', again, this is (4a), and the necessary rule is (4b):

is a virtue of his system, it can only be concluded that the failure to give such a treatment in cases like this one constitutes a serious problem for the theory" [Churma 1982:24-5].

But here Churma (cf. also Odden [1979:452] and Dresher [1981:100]) has neglected to distinguish between the non-transformational representations for automatic and non-automatic alternations. The alternation appropriately represented by the suppletion $\left\{ \begin{matrix} t \\ r \end{matrix} \right\}$ is *non*-automatic. Rule extension, however, takes place only when an alternation is treated as automatic. Automatic alternations, as we have seen, are described in the non-transformational system as alternations of some feature(s) with zero. An alternation of t and r when extended would have to be, in segment notation where r is basic, $\left\{ \begin{matrix} T \\ r \end{matrix} \right\}$, where T is the archisegment of t and r (or some set including t and r as appropriate, t/d/r in the present case). In feature notation, this is an alternation of the feature +sonorant with zero. To stay with our example of $mo\left\{ \begin{matrix} t \\ r \end{matrix} \right\}$, extension of the alternation to this item was formally, in segment notation, the change of the lexical representation (5a) mor to (5b) $mo\left\{ \begin{matrix} T \\ r \end{matrix} \right\}$, that is, the introduction of parentheses on [+son]:

(5) a. mo $\begin{bmatrix} C \\ +son \\ +ant \\ +cor \\ -nas \\ -lat \end{bmatrix}$ > b. mo $\begin{bmatrix} C \\ (+son) \\ +ant \\ +cor \\ -nas \\ -lat \end{bmatrix}$ (=(2a))

Neither transformational phonology with feature-changing rules nor non-transformational phonology without such rules can entirely predict rule extension to a new morpheme, because this depends on both the form of the rule, *and* the lexical representation assigned the new morpheme. Synchronic phonological theory in general lacks a mechanism for abstracting new morphemes from the stream of speech, and so assigning new forms to the lexicon. But, given a lexical form mor, in transformational analysis this would be subject to the feature-changing rule (6):

(6) $\begin{bmatrix} C \\ -nas \\ -lat \end{bmatrix} \rightarrow \begin{bmatrix} -son \\ -vcd \end{bmatrix} / \_\_\#$ (=(2b))

To summarize, in non-transformational phonology leveling of an alternation is represented as loss, as in (7a), of one of the values of a two-valued feature, according to which the item was previously subject to a non-automatic rule of the form (7b).

(7) a. $\begin{bmatrix} +/-F \\ \dots \end{bmatrix} > \begin{bmatrix} \alpha F \\ \dots \end{bmatrix}$

b. $[+/-F] \rightarrow [-\alpha F] / \dots$

Extension of an alternation is represented as the introduction into morphemes of parentheses, as in (8a), on features which are considered neutralized by an automatic rule of the form (8b).

(8) a. $\begin{bmatrix} X \\ \alpha F \end{bmatrix} > \begin{bmatrix} X \\ (\alpha F) \end{bmatrix}$

b. $[X] \rightarrow [-\alpha F] / \dots$

The diachronic developments formalized in (7a) and (8a) are properly simplifications of grammars. The change (7a) is a notational simplification, and the change (8a) may be understood as a simplification as well.