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THE SYNTAX OF INDICATOR PARTICLES IN SOMALI
PART TWO: THE CONSTRUCTION OF INTERROGATIVE, NEGATIVE AND NEGATIVE-INTERROGATIVE CLAUSES*

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In Somali there is an obligatory focus marking system. Every main declarative clause must have one (and only one) constituent marked for focus. This marking is carried out by means of a set of particles traditionally called "indicators". The focus system appears to have a pervasive influence on the syntax of the language: all of the major syntactic processes affecting a clause (relativization, subordination, noun modification, question formation, negation, etc.) are dependent on it. This paper attempts to show that significant generalizations regarding the formation of interrogative, negative, and negative-interrogative clauses can be captured only with reference to the focus structure of corresponding main declarative clauses.

1. Introduction

This article is a continuation of a study on the syntactic organization of the Somali language according to a certain perspective which was outlined in its predecessor (see Antinucci and Puglielli [1980], hereafter referred to as "Part One"). There we wrote: "We will try to show that most of the Somali sentence patterns (relative and subordinate clauses, yes-no and focalized questions, negative, co-ordinated and 'presentative', etc.) can be optimally accounted for if we derive them from a basic kernel containing only main declarative sentences. The different types of sentence patterns will naturally correlate with the different types of main declarative clauses, once these are defined in terms of their indicator structure." In Part One we presented evidence for the correctness of this approach by applying it to the description of relative clauses, subordinate clauses and certain types of noun modifiers in Somali. More evidence will be presented in this paper through the analysis of yes/no questions, negative clauses, and negative yes/no questions. Specifically, we will argue that significant

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generalizations concerning the behavior of these types of sentences can be naturally captured when

(a) they are derived from main declarative sentences;
(b) this derivation makes crucial reference to the indicator structure of the sentence.

As will be clarified below, indicators are particles whose function is to mark the constituent focussed upon in a sentence. They are, therefore, focus markers. It is characteristic of Somali that: (a) every main declarative sentence must contain one (and only one) focus marker; (b) focus markers can mark only one of the major constituents of the sentence, i.e. either a NP or the verb. From (a) it follows that a sentence like:

(1) *Axmed yimid
   A. came

is ungrammatical because it doesn't contain any focus marker. From (b) it follows that there are two (and only two) grammatically acceptable ways of expressing the propositional content of (1). Since in (1) there are two major constituents (NP and verb), we can either mark for focus the NP, as in:

(2) Axmed baa yimid
    A. P came
    "Axmed came"

or the verb, as in:

(3) Axmed waa yimid
    A. P came
    "Axmed came"

1The term "indicator" is taken from Andrzejewski [1975], which provides the most extensive treatment of this topic of the Somali grammar. This term is here retained because it is largely traditional in the literature on Somali, though more appropriate terms might be "focus-marker", "focus-particle", or "focus-indicator".

2Except when otherwise indicated, Somali sentences are quoted following the conventions of the national Somali orthography (see Andrzejewski[1974]). Notice that c stands for a voiced pharyngeal fricative, x for an unvoiced pharyngeal fricative. In the English glosses, "P" stands for "indicator".

3 Baa is the NP-focus marker (which has a variant form ayaa) and is
We call the "indicator structure" of a sentence the whole complex of phenomena, both formal (form of the noun, form of the verb, agreement pattern, etc. —see below for details) and semantic, associated with the use of a given indicator. In what follows we will see that both the formal and the semantic properties of the various types of yes/no questions, negative clauses, and negative yes/no questions match those of main declarative sentences that have the same indicator structure. In our exposition we will first illustrate the formal aspects of this correspondence and then the semantic ones.

2. Interrogative Sentences

2.1. The structure of yes/no questions. Yes/no questions (henceforth, Y/N questions) are formed in Somali by marking the sentence with an interrogative particle ma. This particle can occupy a number of different positions in the sentence, depending on the number of sentence constituents which are present. Thus, in a sentence with two constituents (NP and verb) ma can occupy two possible positions:

always placed at the end of the NP to be marked for focus; waa is the verb focus marker and is instead placed in front of the verb complex. When a NP followed by baa ends in a short vowel, a regular contraction takes place by which the short vowel ending and the initial b- of baa undergo elision. Thus, sequences such as Caa baa or hilibka baa are pronounced as Calaa and hilibkaa. For the sake of clarity, we will disregard these contractions and will always spell the NP and the indicator in their full form. Choice of the constituent to be marked for focus depends on which part of the sentence is considered to constitute new information for the hearer. To take the clearest case, (2) would be an appropriate answer to the question 'Who came?', while in this context (1) would be totally inappropriate; on the other hand, (1) would be appropriate (and (2) inappropriate) as an answer to the question 'What did Axmed do?'. A precise statement of the contextual conditions governing focus choice would require a detailed analysis of texts and conversations, a task which is outside the scope of this article concerned more with the structure of the various sentence types than with their use. Some aspects of the use of indicators are dealt with in Andrzejewski [1975], Hetzron [1965], and Zholtkovsky [1971]. Notice that glosses included in double quotes (as those of (2), (3) and following) indicate that the sentences to which the glosses refer have the same "cognitive" or "propositional" meaning, while they differ in focus choice.
In a sentence with three constituents (two NPs and a verb), ma can occupy three different positions:

(5) a. ma Axmed baa hilibka cunay "did Axmed eat the meat?"
   Q A. P the-meat ate
   b. Axmed ma hilibka buu cunay4 ""
   A. Q the-meat P-he ate
   c. Axmed hilibka ma cunay ""

and so on. In general, in a Y/N question ma is placed in front of any one of the sentence major constituents, i.e. NP's or verb. There are, however, many cooccurrence restrictions on the placement of ma. Thus, all of the following sentences are ungrammatical, although ma does precede one of the major constituents (a NP in (6), (8), (9), (10), (11) and the verb in (7), (12), (13)):

(6) *ma Axmed yimid
(7) *Axmed baa ma yimid
(8) *ma Axmed hilibka cunay
(9) *ma Axmed hilibka buu cunay
(10) *Axmed ma hilibka cunay
(11) *Axmed baa ma hilibka cunay
(12) *Axmed baa hilibka ma cunay
(13) *Axmed hilibka buu ma cunay

A comparison between (4-5) on the one hand and (6-13) on the other allows us

4 Buu in this sentence is a combination of the indicator baa plus the short form of the 3p. sing. subject pronoun, uu. The short forms of the subject pronouns are the following:

1p. sing. and pl. aan 3p. sing. fem. and 3p. pl. ay
2p. sing. and pl. aad 3p. sing. masc. uu

Their combinations with baa give rise to baan, baad, bay, buu. The conditions of occurrence of such pronouns are discussed below.
to pick up the relevant properties involved in this grammaticality contrast:

(c) ma can be placed in front of a NP if and only if this NP is marked by the indicator baa;

(d) ma can be placed in front of the verb if and only if no NP is marked by baa (and, in general, no indicator occurs in the sentence).

On the basis of (c) and (d) above, we could formulate a rule that directly generates Y/N questions in Somali. The rule could be stated in the following way:

(e) enclose one of the NPs of the sentence between the particles ma ... baa;

or else

(f) place ma in front of the Verb.

Yet (e) and (f) are still inadequate, in that they will also generate ungrammatical sentences. Let's consider (e) first.

Notice that in (5b) baa occurs combined with a pronominal copy of the subject NP, constituted by the short form of the subject pronoun (uu), while it occurs alone in (4a) and (5a). This feature will have to be specified in rule (e), because if we change it the sentences become ungrammatical:

(14) *Axmed ma hilibka baa cunay (cf. 5b)
(15) *ma Axmed buu hilibka cunay (cf. 5a)
(16) *ma Axmed buu yimid (cf. 4a)

Since in (4a) and (5a) ma ... baa marks a subject NP while in (5b) a non-subject NP, this could be done by adding to (3) the specification that baa must be combined with the subject pronoun when ma ... baa marks a non-subject NP. However, this is not enough. If we invert the order of subject and object in (14), the sentence becomes grammatical:

5We use the term "non-subject NP" rather than "object NP" because NPs other than subjects are not functionally distinguishable in Somali. See "Part one", n.4.
(17) ma hilibka baa Axmed cunay "did Axmed eat the meat?"

Inverting instead the order of subject and object in (5b) does not alter the grammaticality of the sentence:

(18) ma hilibka buu Axmed cunay "did Axmed eat the meat?"

If, however, the subject NP is shifted to postverbal position, then again the ma ... baa marking a non-subject NP must carry the subject pronoun:

(19) ma hilibka buu cunay Axmed "did Axmed eat the meat?"

(20) *ma hilibka baa cunay Axmed

Furthermore, the distribution of the subject pronoun accompanying baa changes if the subject NP happens to be first or second person, rather than third person as in all the examples considered so far. In this case the subject pronoun must always be present, no matter what the order of the NPs is:

(21) adigu ma hilibka baad cuntay "did you eat the meat?"
       you Q the-meat P-you you-ate

(22) *adigu ma hilibka baa cuntay

(23) ma hilibka baad adigu cuntay "

(24) *ma hilibka baa adigu cuntay

(25) ma hilibka baad cuntay adigu "

(26) *ma hilibka baa cuntay adigu

This fairly complex set of restrictions will have to be included in the formulation of (e), if the rule has to generate directly all the correct Y/N questions. Even if we do this, however, the rule will still be inadequate.

In fact, it must be noticed that in the ma NP baa questions the verb shows two different sets of forms, depending on which NP is marked by the particles. In (5a) (and also in (4a)) the final syllable of the verb carries a high-tone, while in (5b) a middle tone (tones are not shown in the standard orthography):

(5') a. ma Axmed baa hilibka cunay
   b. Axmed ma hilibka buu cuntay
This difference emerges even more clearly when the subject NP is plural:

(27) ma wiilasha baa hilibka cunáy "did the boys eat the meat?"
    Q the-boys P the-meat ate-3 sg
(28) wiilashu ma hilibka bay cuneen ""
    the-boys Q the-meat P-3 pl ate-3 pl

Although the subject NP is plural the verb retains its 3 p. singular form in (27), while taking the 3 p. plural form in (28). In the present tense, besides the different agreement pattern, there is a difference in the length of the final vowel of the verb inflection:

(29) ma Axmed baa hilibka cunaya "is Axmed eating the meat?"
    Q A. P the-meat is-eating
(30) Axmed ma hilibka buu cunayaa ""
    A. Q the-meat P-he is-eating

This distinction is carried over, through different formal means, in all classes of verbs and in all tenses. We will not dwell on this anymore, since it has been described by Andrzejewski [1964], who called the two sets of forms "restrictive" and "extensive" paradigms. The important point to notice for our purposes is that when ma ... baa marks the subject NP of the sentence the verb appears in the "restrictive" paradigm, while when ma ... baa marks a non-subject NP the verb appears in the "extensive" paradigm. Rule (e) will also have to include this specification. There is, of course, finally the question of which of the NPs will get ma ... baa by rule (e).

Also rule (f) needs some refinements to generate the correct set of Y/N questions of the ma verb type. First of all, since, as we have just seen, Somali has two different complete sets of verbal forms, we will have to state that a Y/N question of the ma verb type always requires the "extensive" paradigm:

(31) Axmed hilibka ma cunay = (5c)
(32) *Axmed hilibka ma cunáy
(33) wiilashu hilibka ma cuneen "did the boys eat the meat?"
    the-boys the-meat Q ate-3 pl
(34) *wiilashu hilibka ma cunáy
(35) Axmed hilibka ma cunayaa "is Axmed eating the meat?"
   A. the-meat Q is-eating
(36) *Axmed hilibka ma cunayaa

Second, rule (f) does not generate some perfectly grammatical Y/N questions of the ma verb type. In fact, in addition to (4b) and (5c), the following sentences are also possible:

(37) Axmed muu yimid (cf. (4b))
(38) Axmed hilibka muu cunay6 (cf. (5c))

Uu is again the short form of the subject pronoun, which can occur together with ma. Contrary, however, to the cases where the subject pronoun occurs in the ma ... baa questions, this occurrence is not syntactically conditioned. The subject pronoun can freely occur or not, no matter what the order of the NPs in the sentence:

(39) Axmed {muu} cunay hilibka
(40) hilibka {muu} cunay Axmed
(41) hilibka Axmed {muu} cunay

Furthermore, it can be freely present or not even when the subject NP is not 3rd person:

(42) adigu hilibka {maad} cunfay
    you the-meat Q you-ate

Thus, in our rule (f) we will have to state that a pronominal copy of the subject NP can optionally occur together with ma.

A third problem, finally, has to do with the definition of the position which is to be occupied by ma in these sentences. Up to now we simply said that ma is placed in front of the verb. This is not enough, however, because in a Somali sentence the verb can be immediately preceded not only

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6 Muu = maa + uu. Other combinations of the interrogative particle plus the subject pronouns are maa + aad = maad, etc. These combinations can also appear in their full form: maa uu, ma aad, etc.
by a NP, but also by a series of elements of various nature: adverbs, possessive pronouns, prepositional particles, object pronouns, etc. (the full list of these elements and their relative ordering is given in Zholkovsky [1971]).

(43) hilibka ma la cunay "was the meat eaten?" (lit. "did one eat the meat")

(44) Ca li warshaddaas ma ka shaqeeyaa "does Ali work in that factory?"

(45) shineemada maad lgu aragtay "did you see me in the cinema?"

In (43) the verb is preceded by the impersonal pronoun (la), in (44) by a prepositional particle (ka), in (45) by the combination of an object pronoun (i) plus a prepositional particle (ku). As it can be seen, ma has to precede all these elements. Thus, in order to place ma in the right place, rule (f) will have to list all the elements that can precede the verb and state that ma precedes all of them.

To sum up, any attempt to formulate directly the rule to generate Y/N questions in Somali will have to include, in addition to (e) and (f) above, statements correctly describing (at least) the following phenomena:

(g) conditions of occurrence and distribution of the subject pronouns both in the ma NP baa and in the ma verb questions;

(h) conditions of occurrence of the "extensive" and "restrictive" paradigms of the verb both in the ma NP baa and in the ma verb questions;

(i) placement of ma with respect to the preverbal elements in the ma verb questions.

The crucial point we wish to make is that the inclusion of information relative to (g-i) in the rule for generating Y/N questions will constitute unnecessary duplication, since statements correctly accounting for (g-i) are already included in the Somali grammar. In fact, they are independently needed to generate the set of grammatically well-formed main declarative sentences.
2.2. Formal correspondences between declaratives and Y/N questions. Consider first the ma NP baa questions. Statements accounting for (g) are already available, because they are needed to describe the behavior of subject pronouns in simple declarative clauses containing baa. In fact, the behavior of subject pronouns is exactly the same in the ma NP baa questions and in the baa declaratives, as the reader can see by comparing the following declarative sentences with the ma NP baa questions indicated on the left side (sentences (46-53) mean "Axmed ate the meat"; (54-55) mean "you ate the meat"): 7

(46) Axmed { baa}hilibka cunay cf. (5a)
(47) *buu " (15)
(48) Axmed hilibka { buu}cunay " (5b)
(49) *baa " (14)
(50) hilibka { baa}Axmed cunay " (17)
(51) buu " (18)
(52) hilibka { buu}cunay Axmed " (19)
(53) *baa " (20)
(54) hilibka { baad}adigu cuntay " (23)
(55) *baa " (24)

Rules concerning the selection of the restrictive v. the extensive verbal paradigm (point (h)) are already available too. In main declarative clauses the restrictive paradigm appears only (and always) when the indicator baa marks the subject NP, in all other cases the extensive is used; exactly as in Y/N questions where the restrictive appears only when ma ... baa marks

7Definitions of the conditions governing the occurrence of subject pronouns are given in "Part One". We summarize them here:

(a) if baa marks a subject NP, then the subject pronoun can never occur;

(b) if baa marks a non-subject NP and the subject is first or second person, then the subject pronoun must always be present;

(c) if baa marks a non-subject NP and the subject is third person, then the subject pronoun must always be present, except when the non-subject NP precedes the subject NP and they are both preverbal. In the last case the pronoun can be freely present or absent.
the subject NP. Compare again the following declaratives with the questions indicated on the left side:

(56) Axmed baa hilibka cunây "Axmed ate the meat" cf. (5'a)
(57) Axmed hilibka buu cunay " " (5'b)
(58) wiilasha baa hilibka cunây "the boys ate the meat" " (27)
(59) wiilashu hilibka bay cuneen " " (28)
(60) Axmed baa hilibka cunaya "Axmed is eating the meat" " (29)
(61) Axmed hilibka buu cunayaa " " (30)

Therefore, we can avoid the duplication involved in stating (g) and (h) if, instead of generating Y/N questions directly, we are allowed to make reference to the structure of the independently generated declarative sentences. In this case the rule for the ma NP baa questions can be formulated in a very simple way:

(j) a Y/N question is formed by taking a main declarative clause and inserting the particle ma in front of the NP which is marked by baa.

The rule thus stated accounts for Y/N questions in two steps. First a declarative sentence is generated, and then it is transformed into a question through the appropriate insertion of ma. Thus, to generate, for example, (3a), (5b), (17), (18), (19), we will start from (respectively) (46), (48), (50), (51), (52) and apply rule (j) to them. In this way all the peculiarities listed in (g), (h) are automatically taken care of by the rules that generate the declarative sentences and need not be mentioned at all in the rule of Y/N question formation.

The same approach can easily solve the problems of the ma verb questions listed in (g), (h), (i) above, since in this case too there are corresponding declarative clauses whose behavior is identical to that of the ma verb questions. As we said in "Part One", every Somali main declarative clause must contain an indicator particle. There are two types of indicators: baa, marking NP's, and waa, marking the verb. Thus, an alternative way of constructing declarative sentences like (56-57) is by using the indicator waa instead of baa:

(62) Axmed hilibka waa cunay  "Axmed ate the meat"
(63) Axmed waa yimid  "Axmed came"

Declarative sentences of the waa type have, among others, the following properties. A pronominal copy of the subject NP, constituted by the short form of the subject pronoun, may freely appear together with waa:

(64) Axmed hilibka wuu cunay  same meaning as (62)
(65) Axmed wuu yimid  """" (63)

This occurrence is syntactically unconstrained: no matter what the relative order of the NP's and Verb is, both the simple waa and the waa + pro constructions are possible ((66-68) have the "same meaning" as (62)):

(66) Axmed {waa} cunay hilibka
     {wuu}

(67) hilibka {waa} cunay Axmed
     {wuu}

(68) hilibka Axmed {waa} cunay
     {wuu}

In waa sentences the verb always appears in the extensive paradigm:

(69) Axmed hilibka waa cunay  = (62)
(70) *Axmed hilibka waa cunay
(71) wiilashu hilibka waa cuneen  "the boys ate the meat"
(72) *wiilashu hilibka waa cunay
(73) Axmed hilibka waa cunayaa  "Axmed is eating the meat"
(74) *Axmed hilibka waa cunaya

Besides being placed in front of the verb, waa must also precede all the preverbal elements accompanying the verb:

(75) hilibka waa la cunay  "the meat was eaten"  cf. (43)
(76) Cali warshaddaas waa ka shaqeeyaa "Ali works in that factory"  " (44)
(77) shineemada waad igu aragtay  "you saw me in the cinema"  " (45)

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8Combinations of waa + subject pronoun are: waa + aan = waan; waa + aad = waad; waa + ay = way, cf. fn. 4.
Comparing the set of sentences (64-77) with (31-45), it is easy to see how these properties of the *waa* declaratives match exactly those of the *ma* verb questions listed in (g-i) above, once *ma* is substituted for *waa*. Therefore, if we have already in our grammar the rules to generate the correct set of *waa* declarative sentences, stating directly the rules for *ma* verb questions will again involve a good deal of duplication. This can be avoided if we allow *ma* verb questions to be derived from *waa* declaratives by means of a rule of the following type:

(k) a Y/N question is formed by taking a main declarative clause and substituting *ma* for the indicator *waa* in it.

Thus, sentences like, for example, (4b) and (5b) will be generated by transforming the corresponding *waa* declaratives (63) and (62) through application of rule (k). In this way conditions (g-i) will not need to be specified at all in the question formation rule, since they will be automatically taken care of by the independently needed rules that generate main declarative clauses. Notice, furthermore, that the formulation of rule (k) also predicts the non-occurrence of sentences containing both *ma* and *waa* (as opposed to *ma* and *baa*), since it calls for "substitution" of *waa* , and in fact these sentences are ungrammatical:

(78) *Axmed waa ma yimid
(79) *Axmed ma waa yimid

2.3. Semantic correspondences between declaratives and Y/N questions. Up to now we have been arguing in favour of a derivation of Y/N questions from declarative sentences on purely formal grounds. We showed that a number of formal properties of Y/N questions (subject pronoun distribution, verb choice, etc.) are most efficiently accounted for in a grammar of Somali if we generate them as transformations of main declarative clauses, because in this way we can capture significant generalizations regarding the common behaviors of questions and declaratives. The pro-derivational argument can be strengthened even more if we allow semantic considerations to play a role in it. First of all, notice that if we generated Y/N questions directly a very important correlation within Somali grammar would be missed,
namely that the number of ways in which a sentence can be questioned corresponds exactly to the number of ways in which the same sentence can be asserted by varying only its indicator structure. Thus, a sentence meaning "Ali went to Xamar yesterday" can be formulated in Somali in four different ways, by varying its indicator structure:

(80) shaley baa Cali Xamar tegay
    yesterday P  C. X. went
(81) shaley Cali baa Xamar tegay
(82) shaley Cali Xamar buu tegay
(83) shaley Cali Xamar waa tegay

Now there are four (and only four) ways of asking the corresponding question "did Ali go to Xamar yesterday?":

(84) ma shaley baa Cali Xamar tegay
    Q yesterday P  C. X. went
(85) shaley ma Cali baa Xamar tegay
(86) shaley Cali ma Xamar buu tegay
(87) shaley Cali Xamar ma tegay

More than this purely quantitative correspondence, our rule makes the claim that there is a one-to-one correspondence between statements and Y/N questions: each statement has its corresponding Y/N question (the one generated by the application of (j)/(k) to the statement). It turns out that this syntactic correspondence captures a very neat semantic correspondence. As we said in section 1 (see also "Part One"), the semantic function of indicator particles like baa and waa is to mark the focus of assertion. Baa focuses the assertion on the NP marked by it and waa on the verb. Thus, a better approximation for the English translation of sentences (80-83) would be:

(80') 'it was yesterday that Ali went to Xamar'
(81') 'it was Ali that went to Xamar yesterday'
(82') 'it was to Xamar that Ali went yesterday'
(83') 'Ali did go to Xamar yesterday'\(^9\)

\(^9\)These glosses are simply suggestive of the differences in focus im-
Y/N questions show the same property: the constituent marked by ma is always in focus. Obviously, in this case, it is the focus of the question and not of the assertion. Sentences (84–87) are, therefore, more appropriately glossed with the question equivalents of (80–83), i.e. "was it yesterday that Ali went to Xamar?", etc. This is the reason why sentences like (7), (9), (11), (12), (13) are ungrammatical: ma cannot mark for question a constituent which is not in focus. The essential generalization underlying the formation of Y/N questions in Somali10 is that in a sentence only the focused constituent can be questioned. By tying the process of question formation to the focus structure of the corresponding declarative clause, our rule of question formation captures automatically this generalization. Given our framework, the semantic effect of ma can be described as simply changing the illocutionary force of the sentence (from assertion to question): the fact that sets like (80–84), (81–85), (82–86), (83–87) have exactly the same propositional meaning and the same distribution of focused v. non-focused information results automatically from the way in which the rule of question formation is formulated. In fact, the two rules (j–k) can be collapsed into a single unitary statement which is much more revealing:

(1) a Y/N question is formed by marking with ma the focused constituent of a declarative clause.

Rules (j) and (k) can then be seen as "spelling" rules specifying the details of placement of ma (addition to the left of a baa marked constituent and substitution of waa).

Presumably, this generalization holds for every natural language, but in Somali it is remarkably transparent.

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3. **Interrogative Form of Verbless Sentences**

The only exception to our rules (j) and (k) is constituted by Y/N questions of verbless sentences. Somali has a class of main declarative clauses of the general form NP waa NP, where no verb appears:

(88) Cali waa macallin
     C. P teacher
     "Ali is a teacher"

(89) kuwaasi waa geedo timireed
     those P trees of-dates
     "those are date trees"

(90) kani waa ninkii aan shaley la hadlay
     this P the-man I yesterday with talked to yesterday
     "this is the man I talked to yesterday"

As the glosses show, it is a kind of predicate nominal construction, where no copular verb appears and the predicate NP takes the position normally occupied by a verb, i.e. right after the indicator waa. As is frequently the case with these types of sentences, they can be used only if the temporal reference of the sentence is present. For past (or future) reference one has to resort to a normal construction containing the verb 'to be', such as:

(91) kuwaasi geedo timireed bay ahayeen
     those trees of-dates P-they were
     "those were date trees"

(92) kuwaasi geedo timireed waa ahayeen
     ""

The problem for our analysis of Y/N questions is that given the structure of sentences (88-90), rule (k) will automatically apply to them in order to produce the corresponding Y/N questions. Substituting ma for waa, rule (k) will produce:

(93) *Cali ma macallin
     cf. (88)

(94) *kuwaasi ma geedo timireed
     " (89)

(95) *kani ma ninkii aan shaley la hadlay
     " (90)

which are ungrammatical. In fact, the Y/N questions corresponding to sentences (88-90) are:

(96) Cali ma macallin baa
     C. Q teacher P
     "is Ali a teacher?"

(97) kuwaasi ma geedo timireed baa
     those Q trees of-dates P
     "are those trees of dates?"
As can be seen, the resulting form of these sentences is that of an ordinary NP question, i.e. the one generated by rule (j). What seems to be happening here is that the rule of question formation is sensitive to the NP status of the questioned constituent rather than to the presence of waa. The rule treats the predicate nominal as a focused NP and not as a verb, even if this constituent is preceded by waa. This is probably due to the ambiguous status of the predicate nominal in (88-90). This constituent behaves like an ordinary predicate, and in fact it shares all the structural properties of a predicate: (a) presence of waa; (b) position of waa. As with an ordinary verbal predicate, waa must precede and cannot be separated from it:

(99) *Cali macallin waa

(100) *waa Cali macallin

Compare:

(101) Cali waa yimid "Ali came"

(102) *Cali yimid waa

(103) *waa Cali yimid

(c) the NP accompanying it behaves as its subject: it is morphologically marked as a subject NP (see Andrzejewski [1964]); it can be omitted as in verbal sentences such as:

(104) waa macallin

(105) waa yimid

It can be switched in post-"verbal" position in sentences such as:

(106) waa macallin Cali

(107) waa yimid Cali

Yet it also has all the properties of an ordinary NP, as shown by the fact that it can take the definite article and it can be modified by any noun modifier: a genitive noun in (89), a relative clause in (90). In view of this ambiguity, it seems reasonable to consider sentences like (96-98) as
true exceptions to our rule (therefore, to be dealt with separately), rather than counterexamples to our general analysis.

Notice, furthermore, that the really important generalization captured by our analysis and stated in (1), that the questioned constituent is always the focused constituent of the corresponding declarative clause, holds perfectly well also in these sentences. No matter what its structural status is, the predicate nominal in sentences like (88-90) is always the focused constituent of the clause. In fact, if we want a sentence corresponding to (88) where the focus is not on the NP macallin but on the other constituent (Cali), this will appear as:

(108) Cali baa macallin ah
     C. P teacher is

which is an ordinary verbal sentence, containing the verb 'to be' and the indicator baa on the subject NP.11

4. Negative Sentences

In Somali negative sentences are formed by using a negative particle and the negative conjugation of the verb. There are two negative particles, aan and ma. Their use is exemplified in the following sentences:

(109) Cali baan hadiyad keenin \"Ali didn't bring a present\"
     C. P-neg present bring

(110) Cali hadiyad baanu keenin12
     P-neg-he

(111) Cali hadiyad ma keenin

We can immediately notice that when aan occurs, it accompanies the NP marked by baa, when ma occurs instead there are no indicators and ma

11Since in sentence (108) the focus is on the subject NP, the verb 'to be' appears in the restrictive paradigm form ah (see Andrzejewski [1969]).

12When the negative particle aan combines with baa, or with baa + subj. pro., the following contractions take place:

baa + aan = baan
baa + aan + aan = baanan
baa + aan + aad = baanad
baa + aan + uu = baanu
etc.
precedes the verb. Any other distribution of the negative particles will result in an ungrammatical sentence:

(112) *Cali baa hadiyad aan keenin
(113) *Cali aan hadiyad buu keenin
(114) *Cali aan hadiyad keenin
(115) *Cali hadiyad aan keenin
(116) *Cali baa hadiyad ma keenin
(117) *Cali hadiyad buu ma keenin
(118) *Cali hadiyad waa ma keenin
(119) *Cali hadiyad ma waa keenin

The situation is, therefore, exactly parallel to that of Y/N questions, where the interrogative particle (ma) can either accompany the NP marked by baa or precede the verb in absence of any indicator. In fact, we can use essentially the same arguments we used for Y/N questions to show that negative sentences are to be derived from main declarative clauses. The rules involved in such a derivation will be very similar to (j) and (k) above, differing only in the spelling details.

Consider first the cases of aan negations, i.e., the cases where the negative particle marks a NP. The rule involved can be formulated in the following way:

\begin{enumerate}
\item[(m)] a negative sentence is formed by inserting aan after the NP marked by baa into a main declarative clause and changing the form of the verb into the negative form.
\end{enumerate}

The arguments we used to justify the corresponding (j) rule for Y/N questions in 2.2 were of four kinds: (1) distribution of the interrogative particle; (2) distribution of the subject pronouns; (3) form of the verbal

The negative conjugation has two forms: an invariable form ending in -in and a person inflected one ending in -o. The last one is identical to the so-called "dependent" verb form (see Andrzejewski [1968]), which is a kind of subjunctive. The -o form can be used only with the negative particle ma, in which case it has a present tense value, while the -in form has a past tense value. With the negative particle aan only the -in form can be used, and its value can be both present and past.
conjugation; (4) semantic correspondence between pairs of rule related declarative question clauses. The same arguments can be used to justify (m), except for (3) since in Somali there is a special verbal conjugation which is used in all negative sentences (see fn. 12). Let us briefly review such arguments. Obviously, rule (m) will predict the correct distribution of the aan particle. Since aan will be inserted only on a NP marked by baa, sentences like (109-110) will be generated while sentences like (112-115) will be excluded. Subject pronouns in negative clauses behave exactly in the same way as in Y/N questions and main declarative clauses. If the negative particle marks the subject NP, then the pronoun can never be present, no matter what the order of the NP's is:

(120) *Cali baanu hadiyad keenin cf. (47)
     C. P-neg-he present bring
(121) *hadiyad Cali baanu keenin

If aan marks a non-subject NP, then the pronoun must appear except when the non-subject NP precedes the subject NP and they are both in preverbal position:

(122) Cali hadiyad \{baanu\} keenin cf. (48)
     C. present \{P-neg-he\} bring
(123) " \{baan\}
     " \{P-neg\}  " (49)
(124) hadiyad \{baan\} Cali keenin (50)
(125) \{baanu\}  " (51)
(126) hadiyad \{baanu\} keenin Cali " (52)
     \{*baan\}  " (53)

If the subject is first or second person then the subject pronoun must always appear, also in cases like (124-125):

(127) hadiyad baanad (adigu) keenin\(^{13}\) cf. (54)
     present P-neg-you you bring

\(^{13}\)The combinations of baa + aan + pro. given in these sentences (and in fn. 12 above) are those characteristic of the dialect spoken in the northernmost regions. South of these regions (approximately from the Mudug area), the relative order of aan and pro. is inverted, i.e. the negative
(128) *hadiyad baan (adigu) keenin cf. (55)

Since rule (m) derives negative clauses from previously generated declarative clauses, all these restrictions on the occurrence of subject pronouns are already taken care of (by the rules generating, e.g. (47-54)) and need not be specified for negative clauses.

Finally the semantic argument parallel to 2.3. Rule (m) enables us to capture automatically the semantic correlation existing between pairs of main declarative and negative clauses. In a negative clause the constituent marked by aan is always in focus. Thus, more revealing glosses for sentences like (109) and (110) are, respectively:

(109') 'it wasn't Ali that brought a present'
(110') 'it wasn't a present that Ali brought'

Rule (m) derives (109) and (110) from, respectively:

(129) Cali baa hadiyad keenay
     C. P present brought

(130) Cali hadiyad buu keenay
     C. present P-he brought

Now, (129) and (130) have exactly the same focus structure as (109) and (110).

Consider now negative clauses of the ma type. The rule involved in the derivation of these sentences parallels the rule for deriving ma verb questions:

(n) a negative sentence is formed by substituting ma for waa into a main declarative clause, changing the form of the verb into the negative form and, eventually, moving ma after the sequence of object pronoun + preverbal particles inside the verb complex.

The last specification is necessary because the position occupied by nega-

particle is placed after the combination of baa + pro., rather than being inserted between them. Thus, baanad appears as baadan.

14See fn. 9, above.
tive ma with respect to the verb complex is different from that occupied by interrogative ma. Thus, while interrogative ma appears, as waa, at the beginning of the verb complex (see (43-45) and (75-77)), negative ma occurs inside it. Compare the negative equivalents of (43-45):\(^{15}\)

(131) hilibka la ma cunin "the meat was not eaten"

(132) Cali warshaddaas ka ma shaqeeyo "Ali doesn't work in that factory"

(133) shineemada igu maad arkin "you didn't see me in the cinema"

Again, the same arguments in 2.2 used to support the derivation of ma verb questions from waa declaratives can be used to support the derivation of ma negatives from waa declaratives. Let's briefly review them in the form of predictions that can be formulated from rule (n). If ma negatives are derived from waa sentences, we will predict that, contrary to the aan negatives, baa will never cooccur with negative ma, and since rule (n) calls for "substitution" of waa, negative ma will never cooccur with waa either. Thus, rule (n) will correctly predict that sentences like (116-117) and like (118-119) are ungrammatical. Rule (n) will also predict that subject pronouns in ma negatives will behave in the same way as subject pronouns in waa declaratives. We said above that in these sentences the occurrence of subject pronouns is syntactically unconstrained: they can be freely present or absent (see (62-68)). The same applies to ma negatives (ma negation + pronoun is never contracted):

\(^{15}\)This statement applies to the dialects spoken in Northern Somalia, with the exclusion of the coastal and southern regions. In the dialects spoken in these regions, negative ma occupies instead the same position of interrogative ma and waa, i.e. at the beginning of the verbal complex. Thus, sentences like (131-133) would appear in these dialects as:

(131') hilibka ma la cunin

(132') Cali warshaddaas ma ka shaqeeyo

(133') shineemada maad igu arkin

Maad = ma + aad. The combinations of negative ma plus the subject pronouns are identical to those of interrogative ma (see fn. 6) and they can also appear in their full form, as in (134-137).
Finally, rule (n) will predict that the focus of ma negatives will always be on the verb (cf. 2.3), since they derive from waa declaratives, which have focus on the verb. This prediction is confirmed: in sentences like (134-137) the negation bears in every case on the verb, and they contrast with negative sentences like (109-110) where (as shown by (109'-110')) the negation bears on one of the NP constituents.

Though in the case of negative clauses we lack the argument based on the form of the verb, there is an additional piece of evidence in favour of our analysis, deriving from the behavior of negation in subordinate clauses. Subordinate clauses (which, as we showed in "Part One", are in Somali all relative clauses) may be negated only by means of aan, and never ma, as the following sentences show:

(138) **waalki aan af talyaniga ku hadlin waad aragtay**

"you saw the boy who doesn't speak Italian" 

(139) *waalki aan talyaniga ku ma hadlin waad aragtay

(140) inaan Cali imaamin waan doonayaa

"I want Ali not to come"

(141) *in Cali ma imaamin waan doonayaa

In "Part One" we argued that all subordinate clauses are derived from main declarative clauses of the baa type. Assuming this derivation, rule (m) automatically explains why only aan is found in negative subordinates: since they all come from baa sentences only rule (m) can apply to them
(and not rule (n)) resulting, therefore, in the presence of aan.

As with Y/N questions, our analysis allows us to capture the essential generalization underlying the construction of negative clauses in Somali, i.e. that only and always focused constituent are negated. In fact, we can explicitly formulate this generalization in a single more abstract rule of negation covering both (m) and (n), as we did in (1) for question formation:

(o) a negative clause is formed by marking with the negative particle the focused constituent of a main declarative clause.

Then (m) and (n) become (as (j) and (k)) "spelling" rules, specifying how the actual marking is effected. 16

Finally notice that verbless sentences, such as (88-90), cannot be negated. In order to negate them we have to resort to their ordinary verbal equivalents:

16 Before closing this section, we must mention a third type of negative sentence. This is used very rarely and in highly restricted contexts. It is formed by adding aan to the indicator waa, as in the following sentences:

(i) waanu ku arkin "he didn't see you"
   P-neg-he you see
(ii) waanad iI sheegin "you didn't tell it to me"
   P-neg-you me-to tell

Formally, this construction can be accounted for by extending rule (m). Instead of specifying the context of aan insertion as the NP marked by baa, one can simply say that aan is inserted after any indicator:

(m') a negative sentence is formed by inserting aan after any indicator into a main declarative clause and changing the form of the verb into the negative form.

Rule (m') will generate both the baa + aan sentences and the waa + aan sentences like (i-ii). This rule will still correctly predict the syntactic behavior of sentences like (i-ii) and the fact that they have verb focus. There is, however, no way of predicting the additional idiosyncratic meaning that such sentences have. Compared to focus equivalent ma negations, waa + aan negations can only be used when the clause implies some sort of opposition to or unfulfillment of the expectations created by the preceding context. Thus, (i-ii) could never be used in isolation, as opposed to the corresponding ma sentences. Examples of appropriate use are the following:
5. **Interrogative Sentences: miyaa Construction**

In addition to the particle *ma*, there is another particle in Somali which can turn a sentence into a Y/N question. This is the particle *miyaa*. The syntactic behavior of this particle differs from that of *ma*, although for each *ma* sentence there is a semantically identical sentence with *miyaa*. The use of *miyaa* appears in the following sentences:

(144) *Cali miyaa keenáy₁⁷* 'was it Ali who brought it?'
(145) *miyaa Cali keenáy* 'did Ali bring it?'

The two sentences are (as can be seen from the glosses) semantically identical to, respectively:

(146) *ma Cali baa keenáy*
(147) *Cali ma keenáy*

Notice, furthermore, that although no indicator (*baa* or *waa*) occurs in (144-145), sentence (144) has the restrictive verbal paradigm and sentence (145) the extensive, as shown by the tonal features on the verbal endings.¹

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¹In Somali, the third person object pronoun is zero. Thus, when no NP object appears in sentences with transitive verbs, such as (144-149), a definite object is understood.

¹⁷That the restrictive paradigm is involved in sentences such as (144) and the extensive in sentences such as (145) is also proved by the differ-
We are thus in the presence of the same basic facts that justified our derivation of *ma* questions from main declarative clauses, i.e. correspondence of focus and correspondence of verb forms (the third group of facts, those related to the distribution of subject pronouns, will be taken up below). Therefore, it appears natural to postulate also for *miyaa* sentences a derivation from main declarative clauses. In fact, if we derive (144) from a *baa* sentence and (145) from a *waa* sentence, both the semantic value of the resulting question (in terms of focus distribution) and the distribution of verb forms will be automatically accounted for. Sentence (144) will be derived from:

(148) Cali baa keenay "Ali brought it" ('it was Ali who brought it')

where the NP subject (Cali) is in focus, and the verb appears in the restrictive paradigm, since *baa* marks the subject NP. Sentence (145) will be derived from:

(149) Cali waa keenay "Ali brought it"

where focus is on the verb and the verb appears in the extensive paradigm, as in every *waa* sentence. The rules involved can be formulated in the following way:

(p) a Y/N question is formed by substituting *miyaa* for *baa* into a main declarative clause;

(q) a Y/N question is formed by substituting *miyaa* for *waa* into a main declarative clause and moving it to the beginning of the clause.

ent agreement pattern with a 3p. plural subject (the restrictive keeps the 3p. sing. ending):

(i) wiilashaas miyaa keenay "did those boys bring it?" (restrictive)
(ii) miyaa wiilashaasi keeneen " " (extensive)

or by the contrast between the short (restrictive) and long (extensive) vowel ending of the present tense:

(i) Cali miyaa keenaya "is Ali bringing it?"
(ii) miyaa Cali keenayaa ""


Furthermore, since both rule (p) and (q) call for "substitution" of the indicators, they also account for the impossibility of occurrence of either baa or waa inside miyaa sentences:

(150) *Cal i miyaa baa keenay
(151) *Cal i miyaa waa keenay
(152) *miyaa Cal i baa keenay
(153) *miyaa Cal i waa keenay

Up to now, we haven't considered the third major argument we used to justify our claim that both Y/N questions and negative clauses are to be derived from main declarative clauses, namely, the capability of our analysis of accounting, at no extra cost, for the behavior of subject pronouns inside these types of sentences. Evidence parallel to that found in ma questions and negatives is available also for miyaa sentences, but a more careful analysis is required, since some data appear to contradict the predictions made by rule (p) and (q). Since these rules effect only a substitution of the indicators in the original declarative sentences, we would expect subject pronouns in miyaa clauses to show exactly the same distribution they show in main declaratives. Thus, if miyaa marks a non-subject NP, we would expect the subject pronoun to obligatorily accompany the NP + miyaa when this follows the subject NP or the subject NP is post-verbal, and optionally when the NP + miyaa precedes the subject NP and they are both pre-verbal. These predictions turn out to be correct:

(154) Cali hadiyad miyuu keenay
c. present Q-he brought
Cf. (48)
(155) "
(156) hadiyad miyuu keenay Cali
(157) "
(158) hadiyad miyaa Cali keenay
(159) "

19The usual contractions take place: miyaa + aan = miyaan; miyaa + aad = miyaad; miyaa + ay = miyay; miyaa + uu = miyuu.
Second, we would expect that when miyaa comes from waa (and is, therefore, preposed to the whole sentence, as prescribed by rule (q)), the subject pronoun can be freely present or absent, no matter what the order of the NP’s is. Also this prediction turns out to be correct:

(160) \{miyaa\} Cali hadiyad keenay  
\{miyuu\}  
\text{cf. (62)}
(161) \{miyaa\} Cali keenay hadiyad  
\{miyuu\}  
\text{" (66)}
(162) \{miyaa\} hadiyad keenay Cali  
\{miyuu\}  
\text{" (67)}
(163) \{miyaa\} hadiyad Cali keenay  
\{miyuu\}  
\text{" (68)}

Third, when miyaa marks a subject NP, the subject pronoun should never be able to accompany it, since a NP subject marked by baa can never be accompanied by a subject pronoun. The rule, therefore, correctly predicts the ungrammaticality of:

(164) *Cali miyuu keenáy

and of:

(165) *Cali miyuu hadiyad keenáy

There is, however, a problem: if the verb in (164) and (165) is changed from the restrictive to the extensive paradigm, then the two sentences become perfectly grammatical:

(166) Cali miyuu keenay
(167) Cali miyuu hadiyad keenay

The problem is that there is no way of predicting the grammaticality of (166-167) on the basis of our rules. Given the way (p) and (q) are formulated, sentences like (166-167) will not be generated at all. Sentences (166) and (167) could only come from sentences:

(168) *Cali buu keenay
(169) *Cali buu hadiyad keenay
which are ungrammatical. Is this then a counterexample for our analysis of miyaa sentences? It would be a counterexample *if in the two sentences the focus of the question were on the subject NP Cali*. In fact, if this were the case, our most general claim that the focus of the resulting question is always predictable from the focus of the corresponding declarative would be falsified. There is no way in which the presence of the subject pronoun and of the extensive form of the verb in (166-167) can be predicted from a main declarative clause where the subject NP is in focus. Fortunately, however, in both (166) and (167) the focus of the question is *not* on the subject NP Cali. In (166) the focus is on the verb keenay and in (167) on the object NP hadiyad. Thus, in order to preserve the general condition of focus invariance, (166) should be derived from a declarative where the focus is on the verb, and (167) from a declarative where the focus is on the object NP hadiyad. It turns out that such sentences do exist and they show both the presence of the subject pronoun and the extensive form of the verb. They are, respectively:

(170) Cali wuu keenay
(171) Cali hadiyad buu keenay

Therefore, the condition of focus invariance does make the correct predictions concerning both the presence of the subject pronoun and the form of the verb. What is wrong with our analysis is not the general claim that the semantic value and the syntactic behavior of miyaa questions can be predicted from those of main declaratives, but the spelling details concerning the placement of miyaa contained in our rules (p) and (q).

If sentences like (166-167) are to be derived from, respectively, (170-171), this means that when the subject pronouns are present the placement of miyaa is freer than when they are absent. In fact, from (170-171) rules (q) and (p) would only derive:

(172) miyuu Cali keenay
(173) Cali hadiyad miyuu keenay

(which, by the way, have exactly the same meaning as (166-167)). What seems to be happening is that if a subject pronoun accompanies miyaa, i.e. if a
subject pronoun is present in the starting declarative clause, then

\( (p') \) the combination of miyaa + pro, resulting from a baa substitution, can be optionally moved in front of the NP;

\( (q') \) the combination of miyaa + pro, resulting from a waa substitution, can optionally remain in its original place (without having to be moved in front of the sentence).

By adding specifications \((p')\) and \((q')\) to \((p)\) and \((q)\), we are now able to obtain the correct results. The newly stated rules will also make some further predictions. For example, they will predict that sentences such as:

\( (174) \) Cali hadiyad miyuu keenay
\( (175) \) miyuu hadiyad keenay Cali

are ambiguous as far as focus is concerned, since they have two possible sources: \((174)\) can be derived both from

\( (176) \) Cali hadiyad buu keenay
via simple \((p)\) and from
\( (177) \) Cali hadiyad wuu keenay
via \((q-q')\). Sentence \((175)\) can be derived both from

\( (178) \) hadiyad wuu keenay Cali
via simple \((q)\) and from
\( (179) \) hadiyad buu keenay Cali
via \((p-p')\). And in fact \((174-175)\) have each two interpretations: one where the focus of the question is on the verb and one where the focus is on the NP hadiyad. Finally, notice that the qualification in \((p')\), \((q')\) "if a subject pronoun is present in the starting declarative clause" is essential to allow the additional possibilities of miyaa placement. Leaving miyaa in its place when it is derived from waa \((q')\), and preposing it to the NP when it is derived from baa \((p')\), is possible only if a subject pronoun is present, as shown by the ungrammaticality of the following sentences where no subject pronoun is present:
(180) *Cali miyaa keenay
(181) *Cali miyaa hadiyad keenay

To sum up, the effects of the two rules with their possible double output can be schematically represented as follows (where parentheses indicate optionality):

\[
\text{NP} + \text{miyaa} + (\text{pro}) \quad \ldots \quad \text{(p)} \\
\text{NP} + \text{baa} + (\text{pro}) \quad \ldots \quad \text{miyaa} + \text{pro} + \text{NP} \quad \ldots \quad \text{(p')} \\
\text{miyaa} + (\text{pro}) \quad \ldots \quad \text{V} \quad \ldots \quad \text{(q)} \\
\text{waa} + (\text{pro}) + \text{V} \quad \ldots \quad \text{miyaa} + \text{pro} + \text{V} \quad \ldots \quad \text{(q')} \\
\]

As for Y/N questions of the ma type and for negative clauses, also in the case of miyaa questions we can formulate a higher level rule, covering both (p) and (q), explicitly stating the essential generalization common to the three analyses:

(r) a Y/N question is formed by marking with the interrogative particle miyaa the focused constituent of a main declarative clause.

6. Verbless Sentences: miyaa Construction

Verbless sentences of the type NP waa NP can also form miyaa questions. As the ma questions seen above, the miyaa questions derived from these sentences also behave exceptionally with respect to our rules. In fact, given the presence of waa in a sentence like:

(182) Cali waa macallin
    cf. (88)
    C. P teacher

rule (q) would apply, producing

(183) *miyaa Cali macallin

which is ungrammatical. The correct form of this question is instead:

(184) Cali macallin miyaa

Here again, as in the ma question form of these sentences, it seems that the rule inserting miyaa is more sensitive to the NP status of the questioned constituent (macallin) than to the presence of waa. It places
miyaa as if macallin were a NP marked by baa,\(^{20}\) which is what happens also to the ma question form of (182):

(185) Cali ma macallin baa

In view of our analysis of ma questions, however, there is no need to analyze also this case as an exception to rules (p-q). It is obvious that there is only one bit of exceptional behavior: in all cases of Y/N question formation the predicate of sentences like (182) is treated as a NP, and, therefore, it is the rule for NP focus that is applied. Formally, the problem can be easily solved, without having to state the same exception twice, if we reformulate the rules for miyaa questions in such a way that they apply to already formed ma questions, rather than directly to declarative sentences. For example, rule (p) could be formulated in the following way:

(s) .... ma + NP + baa ... \rightarrow ... NP + miyaa ...

Thus, to derive (184) we would start from (182), apply the ma question rule, deriving (185), and then apply to the output of this rule rule (s), which is now the ordinary rule for NP focus. Rule (s) would then cover both the ordinary cases of NP focus and predicate nominals. We can make both miyaa rules ((p) and (q)) dependent on the previous formation of a ma question, since this will have no consequences on any other cases (the two formulations make exactly the same predictions, except for the NP waa NP case).\(^{21}\)

\(^{20}\)Notice that the rule involved in deriving (184) from (182) cannot be conceived as a sort of "mirror image" of rule (q), i.e. substituting miyaa for waa and moving it to the end of the sentence instead of to the beginning of it. The place of miyaa is not at the end of the sentence but right after the predicate nominal. If the subject is switched in post-verbal position as in

(i) waa macallin Cali

the corresponding question appears as

(ii) macallin miyaa Cali

\(^{21}\)In view of this case, one is tempted to analyze miyaa as a combination of the interrogative particle ma plus the indicator ayaa, an al-
7. **Negative-Interrogative Sentences**

One important consequence of our analysis of Y/N questions and negative clauses is that the rules provided to account for these sentence types will automatically generate negative questions. As we shall see, negative questions result from the simple application of both the rule for Y/N questions and that for negation to the usual starting sequences constituted by main declarative clauses. Given our approach, they can be accounted for at no extra cost in the grammar of Somali.

Consider first negative questions with NP focus:

(186) ma Cali baan hadiyad keenin  
Q C. P-neg present bring  
"didn't Ali bring a present?"
(187) Cali ma hadiyad baanu keenin  
P-neg-he  
""
(188) Cali miyaan hadiyad keenin  
Q-neg  

One could then argue that the difference between a ma NP baan question and a NP miyaan question is only that the first comes from a declarative containing baa and the second from a declarative containing ayaa. The two indicators trigger two different rules of ma insertion: when baa is present, ma is inserted in front of the NP, while when ayaa is present, ma is inserted after the NP but in front of the indicator, thus giving origin to a sequence NP ma ayaa. Besides accounting for the "origin" of miyaan and for the fact that the two types of questions are identical in meaning (since there is no difference in declaratives between the use of baa and that of ayaa, and in both types of questions the same interrogative particle, ma, is inserted), this analysis would also explain the non-occurrence of ma NP ayaa constructions, which is the only asymmetry in the otherwise identical distribution of the two indicators. We are, however, unable to offer any kind of phonological and/or historical evidence justifying the analysis of miyaan as ma + ayaa. Furthermore, this derivation could not be claimed to work synchronically, because it would obviously not account for verb-focus miyaan questions.
As it can be seen, negative questions can be freely formed by changing the verb form and adding aan, the negative particle, to any Y/N question, either of the ma type (186-187), or of the miyaa type (188-190). Thus the simple application of both rule (m) and (j) to structures like:

(191) Cali baa hadiyad keenay
(192) Cali hadiyad buu keenay

will produce (186) and (187). Application of rules (m) and (p) to the same starting sequences will produce (188) and (189). Finally, by applying (m) and (p') to (192) we will derive (190). There is nothing more to say on negative questions with NP focus, since their behaviors are completely predicted by the two sets of rules.

Negative questions with verb-focus require instead some additional qualifications, because in this case the only possible constructions are the following:

(193) miyaan Cali hadiyad keenin
(194) miyaanu Cali hadiyad keenin
(195) Cali hadiyad miyaanu keenin

There are two technical problems here. The first is that only miyaa questions can give rise to negative questions (as (193-195) show), while verb focus sentences have two possible forms for Y/N positive questions: the ma type and the miyaa type. In fact, from:

(196) Cali hadiyad waa keenay

one can derive (by means of, respectively, (q) and (k)):

(197) miyaa Cali hadiyad keenay
(198) Cali hadiyad ma keenay

Therefore, (198) has to be excluded as a possible source of negative questions. This can be done by using the reformulation of the miyaa question rules given in the preceding section. According to this reformulation,
miyaa questions are not formed directly from waa sentences but from questions of the ma type. One could render the application of the rule deriving miyaa constructions from ma verb questions obligatory if the sentence is negative.

The second problem is that, as they are formulated now, the rules of negation are not able to insert the negative particle aan into a verb focus clause, since the insertion of aan is dependent on the presence of baa. One way of solving this problem would be to adopt the enlarged formulation of the rule of aan insertion given in fn. 16 (m') in order to account for waa + aan negatives. However, we will not pursue any further the technical problems involved in a more precise formulation of the rules and their interplay, since such problems can be discussed in a meaningful way only on a higher level of formalization than the one we have been adopting throughout this paper.

A possible solution would involve an ordering of the rules along the following lines. The first rule to (optionally) apply would be negative formation. If we adopt the formulation (m') given in fn. 16 above, then (n) and (m') will have three outputs, two for waa sentences and one for baa sentences:

(1) waa V  (2) NP baa
(3) ma V (4) waa aan V (5) NP baa aan

Then the rules for ma question formation apply. Since these rules are dependent on the presence of either waa or baa for their application (see (j) and (k)), they will apply either to (1) and (2) generating simple Y/N questions:

(6) ma V  (7) ma NP baa
or to (4) and (5), generating negative questions but not to (3), since this structure does not contain either baa or waa. Application to (4) and (5) will generate:

(8) ma aan V  (9) ma NP baa aan

Now the rules for miyaa question formation can apply, since in the section on "verbless sentences" we made them dependent on the prior application of the ma question rules (see p. 32). These rules can now apply either to (6) and (7), generating positive miyaa questions:

(10) miyaa .. V  (11) NP miyaa
In any case, once ma verb questions are excluded, the rules for question formation will correctly predict that there will be three possible constructions for negative interrogative verb focus sentences. When the starting declarative is a sentence like (196), where no subject-pronoun is present, the output of rules (q-q') is only one, and therefore only (193) will be generated. When the starting declarative is instead:

(199) Cali hadiyad wuu keenay

where a subject pronoun is present, rules (q-q') provide two possible outputs, and therefore both (194) and (195) will be generated.

Finally notice that, since there is no negative construction for verbless sentences, such sentences will also lack a negative question form.

or to (8) and (9) which also contain the relevant substructures needed to trigger the rules, generating negative miyaa questions:

(12) miyaa aan .. V  (13) NP miyaa aan

All we have to stipulate is that in case (8), i.e. when a ma verb question is accompanied by aan, application of the miyaa rule is obligatory, rather than optional as in all other cases. In fact, contrary to (6), (7), and (9), (8) is an intermediate structure which doesn't correspond to any grammatical surface sentence.
REFERENCES


THD VOWEL SYSTEM OF PERO

Zygmunt Frajzyngier
University of Colorado

The paper is a synchronic description of the vowel system in Pero, a West Chadic language. It has been found that the features high, low, and round are the only distinctive features necessary to describe the underlying vowels. The main characteristic of this vowel system is extensive neutralization of these features, which results in a large number of phonological alternations. The description provides the rules to account for all of the phonological alternations to be found in the verbal system and thus accounts for most of the alternations to be found in the language.

1. Introduction

The purpose of this paper is to describe the vowel system of Pero, a West Chadic language.1 The interest that this vowel system may present to a scholar involved in Chadic, Afroasiatic, or general linguistics are massive processes of neutralization of the distinctive features. The main result of this description is the explanation of phonological alternations. The description is synchronic and consists of postulating underlying vocalic segments, rules which insert segments not present in the underlying form, and rules to account for the phonetic realization of the underlying and inserted segments. The morpheme structure conditions affecting vowels will be introduced when the rules relating to them are discussed. Frequent reference will be made to the consonantal system, described in Frajzyngier

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1The work on this paper was begun when I was on the staff of the Department of Nigerian Languages, Abdullahi Bayero College, Ahmadu Bello University. It was supported by a grant from the Bayero College. I have benefited from comments by Paul Newman and Roxana Ma Newman on the preliminary findings regarding the vowel system. David S. Foad and Jean Charney of the University of Colorado have read an earlier version of this paper and saved me from many errors of form, simultaneously raising a number of helpful questions concerning the content of the paper. For the remaining errors I only am responsible.
[1978], because of the interrelationship between vowels and consonants in Pero, which affects both systems.

2. Underlying and Phonetic Vowels

The following are postulated as underlying vocalic segments for Pero:

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>e</th>
<th>a</th>
<th>o</th>
<th>u</th>
<th>ii</th>
<th>ee</th>
<th>aa</th>
<th>oo</th>
<th>uu</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Low</td>
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<td>+</td>
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<td>-</td>
</tr>
<tr>
<td>Round</td>
<td>-</td>
<td>-</td>
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<td>+</td>
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<tr>
<td>Long</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Postulating the existence of the distinctive feature [round] rather than the features [back] or [front] captures the fact that vowels /i/, /a/, and /e/ constitute in Pero a class opposed in its phonological behaviour to the class /o/ and /u/. The distinctive features [back] or [front] would not capture this fact. In the description of the phonetic realization of some segments it will be necessary, however, to use the redundant feature [back]. The importance of the natural classes determined by the value of the feature [round] will be seen in the discussion of the rules of lowering and raising.

The set of phonetic vowels contains the underlying vowels as listed above plus a high central vowel [+] to be described in the section dealing with the neutralization of the feature [round].

3. Epenthetic Vowels

In addition to the vowels derived from the underlying segments there are vowels in Pero which are inserted by rule. The constraints that require vowel insertion are of two kinds: (a) syllable structure constraints and (b) consonant cluster constraints. Although it is mechanically possible to formulate rules which would include the consonant cluster constraint as a particular type of syllable structure constraint, the conditions of this constraint have nothing to do with syllable structure, but rather with the phonological features present in the consonants involved.

The following syllable structures which are not allowed in Pero are pertinent to the rules of vowel insertion:
1. syllables of the structure (C)V(C)CC;
2. syllables of the structure CCV(C) in which the first consonant
   is not a nasal.

The following consonant clusters, which are not allowed in Pero, require a
vowel insertion:

3. [-back] [+back], i.e. clusters such as -pk-, -bg-, -vγ-, -dg-.

Another type of cluster is the one which has in the first or second position
[j] (= IPA dʒ). The following is the formulation of this constraint in
terms of features:

4. [-nasal] [+palatal]

5. [+palatal] C

Clusters in which the first consonant is a nasal and the second is [j] are
allowed.

Although there are several types of constraints that require insertion
of a vowel, the quality of the epenthetic vowel is determined by the same
conditions regardless of the type of constraint. The only environment
which does not naturally determine the quality of the epenthetic vowel is
described by the following rule:

Rule 1. EPENTHESIS I

\[ \emptyset \rightarrow \begin{bmatrix} V \\ +\text{high} \\ +\text{round} \end{bmatrix} / \ C___C\# \]

The rule states that [u] is inserted in order to break a word final (hence
syllable final) consonant cluster.

- à děn m \rightarrow [ádděnu̯m] (for consonantal changes see Frajzyngier
  neg bitter neg [1978])
- à dǐn m \rightarrow [áddǐnu̯m] (black)
- à tóm m \rightarrow [árőmùm] (blood)
- à ʔm m \rightarrow [áʔamùm] (water)
The claim that there is nothing in the environment that predicts that the epenthetic vowel is [u] is based on the fact that it is inserted regardless of the quality of the preceding vowel. One could conceivably claim that it is the consonantal suffix [m] which determines the quality of the epenthetic vowel, and unfortunately there is no other consonantal suffix added to the stems ending in a consonant by which one might test this hypothesis.

An alternative solution would be to postulate /a...um/ as the underlying form of the negative morpheme, i.e. instead of postulating insertion of [u] one would postulate its existence in the underlying representation. This would in turn require a rule deleting /u/ whenever it is preceded by a vowel, e.g.

\[
\begin{align*}
\text{à gbándì um} & \rightarrow [\text{àgbándìm}] \\
\text{neg baobab neg} & 
\end{align*}
\]

Assuming that the underlying form of the negative contains /u/ one would have to postulate the following rule to account for the deletion as in the example above.

Rule 2. VOWEL ELISION

\[
V \rightarrow \emptyset / V+\_
\]

The rule says that a vowel is deleted when preceded by another vowel in a different morpheme. The rule, however, is not otherwise supported in the language as there are vocalic suffixes which when added to morphemes ending in a vowel do not cause deletion of this vowel. Such is the case with the definite suffix -i.

In the remaining environments the quality of the epenthetic vowel is determined either by the quality of the preceding vowel (when the appropriate vocalic and consonantal environment is met) or by the quality of the following vowel (in all other environments). The following rule is written with the intention that its subparts be applied in order from top to bottom, i.e. first, application to the narrower environment, then to the wider:
Rule 3. **EPENTHESIS II**

\[
\emptyset \rightarrow \left[ \begin{array}{c} V \\ +\text{high} \\ -\text{long} \\ <1\text{-round}_1> \\ <2\text{around}_2> \end{array} \right] \bigg/ \left[ \begin{array}{c} V \\ +\text{high} \\ <1\text{-round}_1> \\ <1\text{+pal}_1> \\ <1\text{+pal}_1> \\ <-2\text{round}_2> \end{array} \right] \\
\left\{ \begin{array}{l} C \text{ } C \\ C \text{ } C \text{ } V \\ C \text{ } C \text{ } V \end{array} \right\}
\]

where $\bar{s}$ in line 2 is a syllable containing a long vowel or ending in a nasal or a consonant identical to the next consonant.

The top line of the rule says that \( i \) is inserted between two palatal consonants which are preceded by the sequence \( iC \), regardless of the vowel in the following syllable:

\[
\text{wícc- } \text{burn } \text{pl} \rightarrow [\text{wícc'jò}] \quad \text{'burn it (pl.)!'}
\]

The second and third lines say that the epenthetic vowel will agree in roundness with the following vowel. In the second line, a vowel is inserted between consonants following a heavy syllable provided that syllable contains a long vowel or ends in a nasal or a consonant identical to the next consonant (i.e. \( NC \) and \( C_1C_1 \) behave as inseparable clusters).

\[
\begin{array}{l}
\text{túul- } \text{scatter Perf} \\
\text{báan- } \text{look Perf} \\
\text{pénj- } \text{see pl} \\
\text{ádd- } \text{eat pl Ven} \\
\text{ádd- } \text{eat pl Háb}
\end{array}
\rightarrow
\begin{array}{l}
[túulúgò] \quad \text{'he scattered'} \\
[báan'yò] \quad \text{'he looked'} \\
[pénjújò] \quad \text{'see many'} \\
[áddúrù] \quad \text{'eat many and come'} \\
[áddíjì] \quad \text{'always eat many'}
\end{array}
\]

The third line says that elsewhere when three or more consonants occur in a row, insert a high vowel agreeing in roundness with the next vowel before the last two consonants (see below, following Rule 8, for some examples).
Postulating the existence of epenthetic vowels in Pero allows us to explain several facts that have remained unexplained so far. The first of them pertains to the formation of plural verbs and the other to the vowel alternations. There is a group of verbs which have the first syllable light and a sonorant as the first consonant of the second syllable. The formation of the plural forms for such verbs can be represented by the following rule:

**Rule 4. PLURAL VERB FORMATION**

\[
C_1V C_2 \rightarrow V \rightarrow C_1 V C_1 C_2^{-}[=son]\ \text{[PLURAL]}
\]

This rule produces a syllable structure unallowed in Pero. By Rule 3, [i] or [u] is inserted to produce syllable structures that are allowed:

- **píñ-wash**
  \[\text{R-4} \rightarrow \text{píppn-} \rightarrow \text{R-3} \rightarrow \text{[píppúñò]} \text{[IMPERATIVE]}\]

- **mén-like**
  \[\rightarrow \text{memmn-} \rightarrow \text{[memmúñò]} \text{[IMPERATIVE]}\]

- **mír-remember**
  \[\rightarrow \text{mímmr-} \rightarrow \text{[mímmúrò]} \text{[IMPERATIVE]}\]

- **jír-steal**
  \[\rightarrow \text{jíccr-} \rightarrow \text{[jíccúrò]} \text{[IMPERATIVE]}\]

The plural forms of the roots or stems that already have a consonant cluster in the middle position is formed by addition of the phonologically conditioned suffixes -j- or -t-. Addition of a consonantal suffix to a consonant cluster once again produces an unallowed syllable structure and therefore requires insertion of a vowel as formulated in Rule 3:

- **yímm-think**
  \[\text{Pl} \rightarrow \text{yímmj-} \rightarrow \text{R-3} \rightarrow \text{[yímmújò]} \text{[IMPERATIVE]}\]

- **yémm-carve**
  \[\text{Pl} \rightarrow \text{yémmj-} \rightarrow \text{[yémmújò]} \text{[IMPERATIVE]}\]

- **wácc-scatter**
  \[\text{Pl} \rightarrow \text{wáccj-} \rightarrow \text{[wáccújò]} \text{[IMPERATIVE]}\]

- **càdd-carry**
  \[\text{Pl} \rightarrow \text{càddt-} \rightarrow \text{[càddúrò]} \text{[IMPERATIVE]}\]

- **dílt-fetch**
  \[\text{Pl} \rightarrow \text{díltt-} \rightarrow \text{[díltúrò]} \text{[IMPERATIVE]}\]

- **water**

**Studies in African Linguistics 11(1), 1980**
Thus the rule accounts for the presence of the same vowel (in the examples above it is [u]) in various forms of the plural verbs. But it also accounts for the vowel alterations. The forms above are quoted in the imperative which in all of these verbs has a back vowel. If however there is a non-back vowel following the epenthetic vowel the epenthetic vowel is non-back:

\[
\begin{align*}
\text{càdd} & -t- \text{-jì} \rightarrow [\text{càddìrjì}] & \text{'always carry many'} \\
\text{carry} & \text{ P}1 \text{ Habit} \\
\text{pénj} & -j- \text{-nà} \rightarrow [\text{pénjìjìnà}] & \text{'saw many and came'} \\
\text{saw} & \text{ P}1 \text{ Perf} \text{ Vent} \\
\text{càmm} & -j- \text{-jì} \rightarrow [\text{càmmìccì}] & \text{'always make many ropes'} \\
\text{make a} & \text{ P}1 \text{ Habit} \\
\text{rope} & \text{cf. [càmmújò]} & \text{'make many ropes'} \\
\text{cf. [càmmújò]} & \text{ [IMPERATIVE]}
\end{align*}
\]

The conditions governing the quality of an epenthetic vowel when it is inserted to break an unallowed consonant cluster are the same as in Rule 3. The rule to account for constraint 3 (p. 41) has the following form:

Rule 5. EPENTHESIS III

\[
\begin{align*}
\emptyset & \rightarrow \left[ \begin{array}{c}
\text{V} \\
\text{+high} \\
\text{+back} \\
\text{[around]}
\end{array} \right] \\
& \text{C} \text{ C} \text{ V} \\
& \text{[-back]} \text{ [+back]} \text{ [around]}
\end{align*}
\]

\[
\begin{align*}
\text{túr} & -\text{kò} - \text{ Perf} \rightarrow \text{CVC} & \text{R-5} \rightarrow \text{CVC} & \text{R-14} \\
\text{climb} & & \text{[túróyò]} & \text{[túróyò]} & \text{'climbed'} \\
\text{kúb} & -\text{kò} - \text{ Perf} & \text{R-5} & [\text{kúbugò}] & \text{'tasted'} \\
\text{taste} & & & & \\
\text{kúd} & -\text{kò} - \text{ Perf} & \text{R-5} & [\text{kúdugò}] & \text{'refused'} \\
\text{refuse} & & & & \\
\text{kúd} & -\text{kò} - \text{ Perf} & \text{ée} & \text{2} & \text{nì} & \text{ICP} & \text{R-5} & [\text{kúdígéenì}] & \text{'he refused'} \\
\text{refuse} & & & & & & & \\
\end{align*}
\]

\[\text{2The insertion of -ee- is required in certain cases when a verb is followed by a pronominal suffix. A description of the phenomenon in Pero and other West Chadic languages is the subject of a publication in preparation.}\]
The derivation of the phonetic form immediately above requires the application of the following ordered rules:

- **Underlying**
  \[ /kúd̩ kò ée nì/ \]

- **R-2 Vowel Elision**
  \[ kúd̩ k ée nì \]

- **R-5 Epenthesis III**
  \[ kúd̩ k ée nì \]

**Stop Voicing**
(See Frajzyngier [1978]) \[ kúd̩géenì \] 'he refused'

Thus the rule of epenthesis allows us to explain and therefore predict the vowels in different inflectional forms.

The rule to account for epenthetic vowels resulting from constraints 4 and 5 (p. 41) have the following form:

**Rule 6. Epenthesis IV**

\[
\emptyset \rightarrow \left[ \begin{array}{c}
V \\
+\text{high} \\
\text{around} \\
-\text{long}
\end{array} \right] \rightarrow \left[ \begin{array}{c}
C \_\_ C \\
-\text{nasal} \\
[+\text{palatal}] \\
[\text{around}] 
\end{array} \right] \\
\left[ C \_\_ C \right] \rightarrow \left[ +\text{palatal} \right] \rightarrow \left[ \text{around} \right] 
\]

(NB: \[ j \] is the only [+palatal] intervocalic consonant)

- \[ ád̩̃\]  
  \[ \text{eat} \rightarrow \text{ád̩̃jì} \]  
  'always eat'

- \[ káp̩̃\]  
  \[ \text{talk} \rightarrow \text{káṽ̩jì} \]  
  'always talk'

- \[ cúg̩̃\]  
  \[ \text{fall down} \rightarrow \text{cúg̩̃jì} \]  
  'always fall down'

- \[ túr̩̃\]  
  \[ \text{climb} \rightarrow \text{túr̩̃jì} \]  
  'always climb'

- \[ káj̩̃\]  
  \[ \text{move} \rightarrow \text{káj̩̃jò} \]  
  'moved'

- \[ máj̩̃\]  
  \[ \text{ask} \rightarrow \text{máj̩̃jò} \]  
  'asked'

In the last two examples, the rule Vowel Lowering IV (see p. 55) applies to the epenthetic \[ u \].

- \[ péj̩̃-tù- \]  
  \[ \text{thatch} \rightarrow \text{píjútù} \rightarrow \text{[píjútù]} \rightarrow \text{[píjúrù]} \]  
  'thatch and come'

\[*STOP \rightarrow \text{CONTINUANT} \] [Frajzyngier 1978]
The Vowel System of Pero

4. Neutralization of the Contrast [+round] vs. [-round]

As in many West Chadic languages (cf. Schuh to appear) the contrast between front and back high vowels is not very stable. In Pero there are instances of free variation between short /i/ and /u/ within the same dialect, e.g. túccò and tîccò 'pound' as well as variation between dialects, e.g. Filiya [pìdi], Gwandum [fúd]\] 'place' ([f] is a realization of /p/ before back short vowels, cf. Frązyngier [1978])

The neutralization of the feature [round] may occur in Pero as a result of two processes. The first process is the assimilation of /i/ → [u], and the second process involves changes in the feature [back], which is a redundant feature for Pero vowels. This process will be labeled "centralization". By this process both /i/ and /u/ become [i] in certain environments.

In both dialects on which the present study is based there following rule accounts for the neutralization of the feature [round] before a round glide or a round vowel preceded by a sonorant. The round glide may or may not be preceded by a sonorant.

Rule 7. ROUNDNESS ASSIMILATION

\[ V ~+~ [+round] \quad /\quad \left( \begin{array}{c} [+high] \\ [-cons] \\ [+son] \\ [+round] \\ [-cons] \\ [+son] \\ [+voc] \\ [+round] \end{array} \right) \]

Examples of /i/ → [u] / ___ ( C ) w :

\[ n\] + wé + kò \quad R-7 \quad [nùwèyò] \quad R-21 \quad [nùèyò] \quad 'I saw'

 İ + we + kò \quad R-7 \quad [šùwèyò] \quad 'you saw'

(ci) + wé + kò \quad [šùwèyò] \quad 'you saw'

([š] is a variant of /c/ occurring before a sequence [-cons][-cons], cf. Frązyngier [1978])

\[ n\] + n + wécc- + nà \quad [nùnùwèccínà] \quad 'I roasted and came'

İ + n + wécc- + nà \quad [nùnùwèccínà] \quad 'I roasted and came'
Example of /i/ → [u] / C V :
[+son][+round]

nì tòdd- kò → [nùròddíoyò] 'I cracked'
I crack Perf

In the derivation of the phonetic form, the rule of assimilation is preceded by the rule STOP → CONTINUANT which creates the necessary sonorant. The complete derivation of this form has to include the following rules:

R-3 EPENTHESIS II nì tòdd- u- kò
R-14 VOWEL LOWERING III nìtòddókò
STOP → CONTINUANT nìròddíoyò [Frajzyngier 1978]
R-7 ROUNDNESS ASSIMILATION nùròddíoyò

The following rule of centralization accounts for the neutralization of the feature [round] by indicating the changes in the articulation of both /i/ and /u/.

Rule 8. CENTRALIZATION

\[ \text{V}^{[+\text{back}]} / \text{C}^\text{C$^0$} \]

The rule states that short /i/ and /u/ will become [i] when following a back consonant in closed syllable.

<table>
<thead>
<tr>
<th>Underlying</th>
<th>/tékk- l + tù/</th>
<th>/tékk- l + nà/</th>
<th>/tékk- l + kò/</th>
</tr>
</thead>
<tbody>
<tr>
<td>C ASSIMILATION</td>
<td>tékk-llù</td>
<td>tékk-llà</td>
<td>—</td>
</tr>
<tr>
<td>[Frajzyngier 1978]</td>
<td>—</td>
<td>—</td>
<td>tékk-lyò</td>
</tr>
<tr>
<td>STOP → CONTINUANT</td>
<td>—</td>
<td>—</td>
<td>tékk-lyò</td>
</tr>
<tr>
<td>[Frajzyngier 1978]</td>
<td>—</td>
<td>—</td>
<td>tékk-lyò</td>
</tr>
<tr>
<td>R-18a VOWEL RAISING</td>
<td>tékk-llù</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>R-3 EPENTHESIS II</td>
<td>tékkúllù</td>
<td>tékkúllà</td>
<td>tékkúlyò</td>
</tr>
<tr>
<td>R-8 CENTRALIZATION</td>
<td>tékkúllù</td>
<td>tékkúllà</td>
<td>tékkúlyò</td>
</tr>
</tbody>
</table>

'rub and come' 'he rubbed' and came'

Compare the above example with the Imperative form tékkúlò 'rub!'. A few more examples in which the same process takes place are:
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\[ \text{yékl-} + \text{tù} \rightarrow [\text{yéfllù}] \quad \text{(following VOWEL RAISING, C VOICING, EPENTHESIS)} \]

\[ \text{yékl-} + \text{nà} \rightarrow [\text{yéyfllà}] \quad \text{(following EPENTHESIS, STOP } \rightarrow \text{ CONTINUANT)} \]

\[ \text{cúgd-} + \text{nà} \rightarrow [\text{cúgfnnà}] \quad \text{(following EPENTHESIS, C ASSIMILATION)} \]

Compare the last example with the following with which it constitutes a near-minimal pair:

\[ \text{cúug-} + \text{nà} \rightarrow [\text{cúugfnà}] \]

The above examples have all involved centralization of epenthetic vowels. Though I have found no examples of centralization of underlying /u/, the following shows centralization of underlying /i/:

\[ /\text{gínnímà}/ \rightarrow [\text{kínnímà}] \quad \text{'deity'} \]

The vowel /i/ also undergoes centralization in another context which does not affect /u/. Therefore the following rule does not contribute to the neutralization of the feature round but rather assigns a redundant feature to the [-round] vowel /i/:

\textbf{Rule 9. i CENTRALIZATION}

\[ \begin{bmatrix} \text{V} \\ +\text{high} \\ -\text{round} \end{bmatrix} \rightarrow \begin{bmatrix} \text{C} \\ -\text{voice} \\ +\text{labial} \end{bmatrix} \]

The rule states that /i/ will become [ɨ] when following a voiceless labial consonant in non-initial position. This last condition is indicated by postulating the left environment for the rule as CC, since this is the only non-initial environment in which a voiceless consonant may occur in Pero: Intervocalic single consonants are always voiced (cf. Frajzyngier [1978]).

\[ \text{nápp-c-} + -\text{jì} \rightarrow [\text{náppfcl}] \quad \text{'they always touch'} \]

\[ \text{ápp-c-} + -\text{ánì} \rightarrow [\text{áppfjáanì}] \]
In both of the above examples the rule of centralization was preceded by
Rule 3, which inserts epenthetic [i] to break up a consonant cluster which
is not allowed by the syllable structure constraints.

5. The Contrast Between Long and Short Vowels

There is no phonological contrast of length in word final position; I
did not perceive any phonetic variations in length in this position either.
In word initial position length is distinctive only for the low vowel /a/:

ádu 'eat' áajò 'stop quarrel'

In word medial position a length contrast was recorded for all vowels:

búrù 'mix (with oil, water, etc.)' búrò 'leak'
cóvò 'put' cóvò 'rinse cloth'
pílù 'buy' bílò 'husk, peel'
télò 'cross' télò 'ask'

This system of length distinctions is unusual in West Chadic. Schuh (to
appear) claims that no contrast of length in mid vowels in word medial
position can be reconstructed for West Chadic, but the examples quoted
above are by no means exceptional, and the distinction is not only phonetic
but phonemic as well. The height of the final vowel of the verbal forms
above is determined by the weight of the first syllable in essentially the
same way as described for Kanakuru in Frajzyngier [1976], i.e. the final
vowel of the verb is [-high] if the first syllable is heavy but it is [+high]
if the first syllable of the verb is light.

In certain contexts, such as formation of the imperative, the short mid
vowels function as long regardless of their phonetic length, and they in-
variably require the final vowel to become [-high] as in the above examples
télò 'ask' and cóvò 'put'. There are, however, other contexts, such as
formation of the plural verb, in which the length distinction in mid vowels
is contrastive and determines the form of the plural stem.

A preliminary internal reconstruction of the vowel system indicates
that long [ee] in medial position may be derived from long [ii] as one of
its sources. In the nominal system of Pero there is no long [ii] save for
borrowed words. Restricting the analysis to nouns would even argue against
the phonemic status of [ee] in Pero. However in the morphology of verbs there is a four way contrast between /i/\~{\i}i/ and /e/\~{\e}e/. The "suspicious" element in this contrast is /ii/ since it occurs much less frequently than the rest of the elements.

A long vowel is shortened when occurring in a closed syllable which has a non-sonorant final consonant. This is captured by the following rule:

Rule 10. VOWEL SHORTENING

\[
V \rightarrow [-\text{long}] / \frac{C}{[-\text{son}]} \]

\[\text{píit-} \quad \text{tù} \rightarrow [\text{píttù}]
\]

make fire Vent

Long vowels do occur, however, when followed by a sequence of consonants, the first of which is a sonorant:

\[\text{píit-} + \text{na} \rightarrow [\text{píinnà}] \quad '\text{made fire and came}'\]

make Vent fire Perf

\[\text{káandÈ} \quad '\text{okra}'\]

\[\text{céerrò} \quad '\text{talk for me!}' \quad (\text{cf. céerò 'talk!'})\]

The syllable boundary in such words is after the vowel and before the first sonorant, i.e. káa$nÈ, píi$nnÈ. This syllabic division was obtained in lento speech.

Although length in Pero is phonemic, not all phonetic long vowels derive from underlying long vowels. Most of these vowels will be discussed later in this paper in Section 8. Here I will only mention one possible source of such vowels, viz. consonant deletion in intervocalic position. The process can be illustrated with the verb máalò 'wander about'. Its plural form is mákkúlò. As other plural forms similar to this, it has been derived through reduplication of the medial consonant. One has therefore to assume that the underlying form of the verb to 'wander about' is not máalò but rather /mákálô/. When a stop occurs in intervocalic position it becomes a voiced continuant, according to a well attested rule in Pero (see Frajzyngier [1978]). We would have therefore a form máyalò. Since this form does not exist one has to assume that the intervocalic
voiced continuant was deleted. Such a rule for deletion is known in other West Chadic languages, e.g. in Kanakuru [Newman 1974:8], but it is not otherwise supported by the data in Pero, i.e. intervocalic continuants are normally not deleted.

Another possible source of long vowels is the deletion of glides in intervocalic position. This also will be dealt with later in this paper.

6. Vowel Lowering

There are several rules lowering vowels in Pero. Although the output of these rules is often similar, collapsing them together will not serve any purpose because the rule that would emerge would be so complicated that it would require a considerable effort on the part of the reader to break it down into several rules. The order in which the rules are written is arbitrary, with the rules having somewhat similar contexts being grouped together.

Rule 11. VOWEL LOWERING I

\[
V \rightarrow [-\text{high}] / \left\{ \begin{array}{c} V \\ [-\text{long}] \\ [+\text{low}] \end{array} \right\} \]

The rule states that /i/ will become [e] when preceded or followed by /a/ and /u/ will become [o] when followed by /a/. The following examples show various developments of this rule, first when the /a/ precedes the high vowel and then when it follows it.

/\text{i}/ \rightarrow [\text{e}]

\begin{align*}
\text{ta } & \text{'p-ù } \rightarrow [\text{téebù}] \quad \text{'he will catch'} \\
\text{Fut } & \text{catch}
\end{align*}

Derivation of the phonetic form involves the following rules:

<table>
<thead>
<tr>
<th>Rule</th>
<th>Operation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-11</td>
<td>VOWEL LOWERING I</td>
<td>ta épù</td>
</tr>
<tr>
<td>R-27</td>
<td>VOWEL ASSIMILATION</td>
<td>téeepù</td>
</tr>
<tr>
<td>STOP</td>
<td>VOICING</td>
<td>téebù</td>
</tr>
</tbody>
</table>
à ìmmìjè m → [àèmmìjèm] 'it is not that'
Neg it is that Neg

Note that when /a/ precedes the lowering rule applies only to /i/, e.g.
à ùmmò m → [àùmmòm] 'not this'
Neg this Neg

Both /i/ and /u/ are lowered when followed by /a/, e.g.

è ám → è ám
Eq water

nì càiù á → [nìjadiùóò] 'may I walk around?'
I wander around Q

cú + ánlì → [cóánì] 'eating'
eat Nom

It seems that the lowering of /i/ before /r/ followed by /a/ may be considered as part of the same rule. Compare the following examples:

cí + tá + wàrt- + tù → [čèràwàttù] 'you (f) will come'
2f sg Fut come Vent

(/c/ → [ças]/*[+voc][+voc], see Frajzyngier [1978])

cín nì tá wàrt- tù -n- l → [cínèráttùnì]
Rel I Fut come Vent Caus Rel Anaphora

'which shall I bring?'

The following rule is proposed to account for the lowering above:

Rule 12. VOWEL LOWERING II

\[
\begin{array}{llll}
V & [-\text{high}] & /[-\text{cons}] & V \\
,-\text{round} & [-\text{long}] & [+\text{low}] \\
\end{array}
\]

Note that this rule differs from the preceding rule only in the fact that /r/ precedes the low vowel, which must be considered the decisive factor in lowering.

Vowels in medial closed syllables are lowered one degree:³

³One would like a rule which more directly represents that vowels are lowered one degree. In an earlier draft of this paper I present the following form for Rule 13:
Rule 13. VOWEL LOWERING III

\[
V \rightarrow \begin{bmatrix} \text{[-high]} \\ \text{[+low]} \end{bmatrix} /V(C(C))\_CCV
\]

Condition: Does not apply to /o/.

This rule lowers the high vowels to corresponding mid vowels and the mid vowel /e/ to [a]. The rule may be applied only once to a vowel to prevent /i/ → e → [a].

The following examples illustrate first the application to the non-round vowels and then to the round vowel.

/\text{i}/ → [e]

\text{nǐ ìll-} + kò → [nìlélòyò]  
I stand up  Perf

\text{cì mà} + γì + n + nó → [cìmàyènnò]  
if you (r) don't make for me

/\text{e}/ → [a]

\text{àn} + cèngò → [ànjángò]  
Sing stubborn

\text{nì} + cèyy- + ko → [nìjáyyòyò]  
I p drink Perf

It appears that the above rule can also operate across word boundaries. In this case it is dependent on the tempo of speech:

\text{fójè} + n dábà → [fójàn dábà]  
chicken Poss  'Daba's chicken'

\text{tójè} + n táyà → [tójàn táyà]  
horse  'Taya's horse'

To see that the decisive factor here is the presence of the next word, compare the following example in which the lowering does not take place:

\text{à kéekè m} → [àkéekèm]

Neg bicycle Neg

\[V \rightarrow \text{[a]high-1]/V(C(C))\_CCV\]

A convention would then interpret resulting [+high-1] as [-high] and [-high-1] as [+low]. This type of formalism could easily be adapted to languages with more than three degrees of height.
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/u/  + [o]

nì + mún- kò  + [nìmôngò]   'I gave'
I give Perf

Cf. mùnnówè  'give me (something)'

bálù  + n  + kà cákka  + [bálôngà jákà]   'tire him'
get tired Caus Cong 3 p sg m

The form àngóndòl recorded in Kraft (n.d.) must be derived from:

àn  + kúndùl  + [àngóndùl]   'native doctor'
Sing deity

The next two rules are similar in that the consonant following the lowered vowel is [+back]. The differences between these rules are however so numerous that they warrant postulation of two different rules.

Rule 14. VOWEL LOWERING IV

\[
\left[ \begin{array}{c} V \\ +(h) \\ -l \\ (-h) \end{array} \right] \rightarrow \left[ \begin{array}{c} C \\ +b \\ +c \end{array} \right] V
\]

The rule says that a high vowel will be lowered to the next vowel of the same class when preceded by a syllable and followed by the back fricative [y]. The following examples illustrate first the application of the rule to /i/ and then to /u/:

/i/  + [e]

mà cfìyà  + [màjéyà]   'you are a jackal'
you jackal

nì  + yì  + kò  + [nìyéyò]   'I made'
I make Perf

Cf. yì  + kò  + [yìyò]   'he made'
mù  + lì  + kò  + n  + [mùlýéyò̀n]   'those who were appointed'
Rel put Perf Caus

Cf. lì  + kò  + [lìyò]   'he put'

/u/  + [o]

à cfúyà  m  + [àvóyàm]   'not a thigh'
Neg thigh Neg

à  + júk  + m  + [àjjóyùm]   'not a chair'
Neg chair Neg
Derivation of the last form involves not only the lowering rule 14 but also the epenthesis rule 1, which produces ąjjúkùm, and the stop → continuant rule [Frajzyngier 1978] which produces ąjjúyùm. Lowering applies only after the stop → continuant rule.

Ample examples of the application of this rule may be found in the non-ventive perfective forms of the verbs which have the first syllable heavy, i.e. which require a vowel insertion before addition of the suffix -kò:

<table>
<thead>
<tr>
<th>Underlying</th>
<th>āddù + kò</th>
<th>cóovù + kò</th>
<th>fccù + kò</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-3 EPENTHESIS II</td>
<td>āddúkò</td>
<td>cóovúkò</td>
<td>fccúkò</td>
</tr>
<tr>
<td>STOP → CONTINUANT</td>
<td>āddúyò</td>
<td>cóovúyò</td>
<td>fccúyò</td>
</tr>
<tr>
<td>[Frajzyngier 1978]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-14 VOWEL LOWERING</td>
<td>āddúyò</td>
<td>cóovúyò</td>
<td>fccúyò</td>
</tr>
</tbody>
</table>

When the back consonant that follows the "vulnerable" vowel is a voiced stop, then the rule does not apply, e.g. kúbúgò 'he has tasted the liquid', rím búgò 'he has made, produced something'. While the above may be sufficient as an explanation of the constraint on the application of the lowering rule 14, one has to explain why the velar consonant becomes a voiced stop rather than a fricative. The following rule, which is ordered after Rule 3 EPENTHESIS II, accounts for the voicing of the velar stop without fricativization:

Rule 15. VELAR STOP VOICING

\[
C \rightarrow [+\text{voice}] / V \quad (C) \quad C \quad V
\]

\[
[+\text{back}] \quad [+\text{high}][+\text{voice}][+\text{voice}][+\text{high}]
\]

The rule states that a velar consonant is voiced when it follows a high vowel preceded by a sequence consisting of a high vowel and a voiced consonant. The derivation of the examples quoted above and of other words meeting the condition of Rule 15 would have the following form:

<table>
<thead>
<tr>
<th>Underlying</th>
<th>kúb- + kò</th>
<th>rím- + kò</th>
<th>cúgd- + kò</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-5 EPENTHESIS III</td>
<td>kúbúkò</td>
<td>rím bókò</td>
<td>cúgdúkò</td>
</tr>
<tr>
<td>R-15 VELAR STOP VOICING</td>
<td>kúbúgò</td>
<td>rím gò</td>
<td>cúgdúgò</td>
</tr>
</tbody>
</table>

'he combed'
The following are further examples in which lowering predictably does not apply:

\[
\begin{align*}
\text{pínn- wash Pl} & \rightarrow [pínnígò] \quad \text{'they washed'} \\
\text{cÍ- stay Pf} & \rightarrow [cÍdígò] \quad \text{'who stayed'}
\end{align*}
\]

The back consonant is a deciding factor in the next lowering rule, but the scope of the rule is much narrower and the conditions are different.

Rule 16. VOWEL LOWERING V

\[
\begin{align*}
\left[ \begin{array}{c}
V \\
\text{-round}
\end{array} \right] & \rightarrow [-\text{high}] / \\
\left[ \begin{array}{c}
\text{+high} \\
\text{+back} \\
\text{-cont}
\end{array} \right] \quad \text{C}
\end{align*}
\]

The rule states that /i/ will become [e] before /k/ or /g/ followed by another consonant when in word initial position.

The evidence for this rule consists of two observations. First, there are no lexical morphemes in Pero that have a high front vowel followed by a velar consonant in word initial position. The second observation is the behaviour of the morpheme i(C)-, used as a copula in existential sentences. This morpheme is realized as /i/ before the words beginning with a vowel and as /C/ before the words beginning with a consonant. C in this case represents the same consonant as the initial consonant of the word to which the morpheme is prefixed:

\[
\begin{align*}
\text{í ám} & \rightarrow [ëám] \quad \text{'it is water'} \\
\text{í wórí} & \rightarrow [íwwórí] \quad \text{'it is Wori'} \\
\text{í cfnù} & \rightarrow [íccfnù] \quad \text{'it is they'}
\end{align*}
\]

When this prefix is added to morphemes with an initial back consonant the vowel is lowered:
In the last three examples, the initial consonant, if reduplicated, is subse­quently deleted, because three consonant clusters are not allowed in Pero (see Frajzyngier [1978] for derivation of [kp] and [gb]).

The last rule of lowering applies to the non-back high vowel /i/. It cannot be ascertained that it would not apply to the high back vowel if there were in Pero suffixes with initial /u/. Since no such suffixes were recorded the rule will be formalized to apply only to /i/.

Rule 17. VOWEL LOWERING VI

\[
\begin{align*}
V^	ext{high} & \rightarrow [-\text{high}] / V^	ext{-high} \quad \text{[#]}^	ext{+round} \\
\end{align*}
\]

The examples chosen are of the nouns ending in /o/ plus the definite suffix:

- meat + def \rightarrow [léè] 'the meat/animal'
- tree + def \rightarrow [fúròè] 'the tree'
- bird + def \rightarrow [dúòè] 'the bird'

Cf. gruel + def \rightarrow [bwél] 'the gruel'

Notice that the above rule is similar to the upper part of Rule 11, lowering the vowel after /a/. One could collapse these rules together but the new rule would require the introduction of the feature [back]. Differences in the behaviour of the vowels still remain as the high round vowel is not lowered after [o]. Since even the collapsed rule would have two different expansions the two rules may remain separated as proposed in this paper.
7. Raising

The contrast high vs. non-high in Pero is also neutralized by the following raising rules.

Rule 18a. VOWEL RAISING I

\[ V \rightarrow [+\text{high}] / \text{(__C) (C)C + C} \quad V \]
\[ [-\text{low}] \quad [+\text{high}] \]

The rule states that one or more non-low vowels (i.e. non /a/) are raised when a suffix consisting of consonant and a high vowel is added to a form ending in a consonant. The rule is well motivated as the deciding factor here is the height of the vowel in the suffix. The following are examples of the application of this rule:

/e/ \rightarrow [i]

pér- announce -tù \rightarrow [pírrù] 'announce and come'

pén- know -tù \rightarrow [píndù] 'know and come'

pén- know -jì \rightarrow [pínljì] 'always know'

dét- get -tù \rightarrow [dfìttù] 'get and come'

bél- break -tù \rightarrow [blìllù] 'break and come'

bèbúl- break pl -tù \rightarrow [blìbúllù] 'break many and come'

/o/ \rightarrow [u]

wócc- leave -jì \rightarrow [wúccfjì] 'always leave' (R-3 EPENTHESIS II follows R-18a)

tánd- sew -jì \rightarrow [túndfjì] 'always sew'

fód- pray -tù \rightarrow [fúttù] 'pray and come'

cókót- lift -tù \rightarrow [cúgtìttù] 'lift and come' (R-8 CENTRALIZATION follows R-18a)

To the above rule there is only one lexical exception in Pero, viz. the verb kóv- 'to forge', e.g.
kóv- -jì → [kóvìjì]
rather than the expected [kúbìjì]. I do not think that this exception under­
mines the rule since this verb is exceptional in many other respects, e.g.
its imperative form is kóvù rather than the expected kóvò. Its plural
formation also differs from what one expects from the verbs having the
phonological characteristics of kóvù (cf. Frajzyngier [1977]).

Another closely related rule which accounts for raising is much more
limited in scope as it applies to monosyllabic verbs only. Monosyllabic
verbs in Pero retain the final vowel when a suffix is added. This vowel is
raised if the suffix consists of a consonant followed by a high vowel. The
following rule is the formalization of the above statement:

Rule 18b. VOWEL RAISING II

V → [+high] / #C + C V
[-low] [VERB] [+high]

wé -tù → [wírù] 'see and come'
see Vent

jé -jì → [jìjì] 'always drink'
drink Hab

lé -tù → [lìrù] 'give birth and come'
give birth Vent

ké -tù → [kìrù] 'chop and come'
chop Vent

but compare:

cá -tù → [cáarù] 'come down'
descend

(At present I am unable to account for the length of the vowel in the last
two examples.)

Raising sporadically occurs across word boundary when a monosyllabic
verb is followed by another word containing a high vowel, e.g.

có -mín + [cùmín] 'drink beer!'
drink (Imp) beer

Outside of the verb system Rule 19 has been found to operate only with
the noun we 'thing' when it is followed by possessive pronouns:
"yours (f. sg.)" ("your thing")

wímù 'ours' ("our thing")

but

wénò 'mine' ("my thing")

wéyò 'yours (m. sg.)' ("your thing")

The reason why raising occurs in the above construction and not in others is probably because the construction with we has been grammaticalized as a marker of the independent possessive pronoun.

A final raising rule is the following:

Rule 19. /e/ Raising

\[
\begin{array}{c}
\text{V} \\
-\text{high}
\end{array}
\rightarrow [+\text{high}] / C \quad C \rightarrow \quad \quad
\begin{array}{c}
\text{V} \\
-\text{round}
\end{array}
\]

The rule states that /e/ will become [i] when in the verbal root to which a high vowel suffix is added. Note that unlike the raising rules 18a and 18b, this rule does not apply to the mid back vowel /o/. Compare the following examples:

pét- -i \rightarrow [pɛr₁] 'he should go out'

go out Subj

kém -i \rightarrow [kɛm₁] 'he should fill'

fill Subj

cék- -i \rightarrow [cɛg₁] 'he should be lost'

be lost Subj

but

tók- -i \rightarrow [tɔ́ŋ₁] 'he should kill'

kill Subj

8. Contact Between Vowels and Operations on Glides

8.1 Introduction. Unlike the previous sections of this paper which began with a certain rule and then proceeded to the environments in which the rule operates, the present section describes the environment consisting of two adjacent vowels and then proceeds to describe various rules that operate in
this environment. This departure from the model of description used above is justified by the fact that the environment is the same in terms of the major classes involved in it, while the rules that operate here supplement each other. It is also assumed that this manner of description will be more appropriate from the point of view of the reader, who is more likely to ask "what happens when two or more vowels are in contact" rather than to ask about a rule whose existence cannot even be predicted. The description that follows will not repeat the instances of lowering rules described earlier in the paper.

There are two sources from which adjacent vowels may emerge. One is the underlying structure within one morpheme or in two consecutive morphemes. The other source is the glide deletion rules operating across morpheme boundaries. One might even claim that in certain instances there is a glide deletion rule operating within the morpheme. This distinction is necessary because of the rules related to glide insertion; the latter will not apply to the vowels that come into contact as a result of the glide deletion rules. In order to assure that such vowels will not be considered in the glide insertion rules the glide deletion is presented first. This will be followed by glide insertion rules and then by vowel deletion rules.

8.2. Glide Deletion

Rule 20. \(/y/\) Deletion

\[
/\text{G}/ \rightarrow \emptyset / \left[ \begin{array}{c} \text{V} \\ \text{-round} \\ \text{[-back]} \end{array} \right] + \left[ \begin{array}{c} \text{V} \\ \text{-round} \\ \text{[-high]} \end{array} \right]
\]

The rule states that \([y]\) will be deleted when preceded and followed by non-round vowels. Note that the rule applies only to the underlying glides and not to the phonetic glides, to be described later in the paper.

\[
\begin{array}{c}
\text{ká} + \text{yèbí} & \rightarrow [\text{káèbí}] & 'after' \\
\text{at} & \text{back} & \\
\text{à} \text{yí} \text{-jí} & \rightarrow [\text{éejí}] & 'he is not working' \\
\text{Neg} & \text{work} & \text{Frog}
\end{array}
\]

Derivation of the phonetic form \([\text{éejí}]\) involves the following ordered rules:
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Underlying
R-20 GLIDE DELETION
R-11 VOWEL LOWERING
R-27 VOWEL ASSIMILATION

In addition to the above rules there is a tone change linked with the vowel assimilation.

\[
\begin{align*}
\text{Temp} & \quad \text{call} & \text{Perf} \\
\text{Rel} & \quad \text{call} & \text{Perf} & \text{Pre-} & \text{l sg} & \text{Caus} & \text{Pro} \\
\end{align*}
\]

Note that the tone of the perfective suffix \( \text{nà} \) has been shifted onto the verb root.

If the initial vowel is high, i.e. /i/ the rule doesn't apply.

\[
\begin{align*}
\text{l sg} & \quad \text{call} & \text{Perf} & \text{Vent} \\
\text{l sg} & \quad \text{do} & \text{Hab} \\
\end{align*}
\]

I have recorded a few instances when the rule does not apply despite the fact that the environment is met. It is likely that the main reason for non-application of the rule is a slower than normal tempo of speech. The instances of non-application of the rule occur in elicited sentences rather than in the collected texts. One such example is the following:

\[
\begin{align*}
\text{Fut} & \quad \text{know} & \text{Stat} \\
\end{align*}
\]

The back glide /w/ is deleted only between low vowels. The following rule accounts for this deletion, but just as was the case with the deletion of the palatal glide, there are instances when the rule was found not to apply. Again, the only explanation that I can offer for this is speech
tempo.

Rule 21. /w/ DELETION

\[ \begin{align*}
  G &\rightarrow \emptyset \\
  V &\rightarrow V \\
  [+\text{back}] &\rightarrow [+\text{low}] \\
  [+\text{low}] &\rightarrow [+\text{low}]
\end{align*} \]

\[ \text{tà wát- tò } + \acute{\text{a}} \rightarrow [\text{tátòá}] \quad \text{'will he come?'} \]

Fut come Vent Q

(Note lowering of the high vowel of the ventive suffix before /a/ by Rule 11.) Vowel shortening follows the glide deletion.

The instances of back glide deletion are equaled in number by instances in which it is not deleted; therefore, the status of the rule governing it remains questionable. The following is one of the counter-examples to this rule:

\[ \text{nì } + \acute{\text{a}} + \text{wá } + \text{m } + [\text{náawám}] \quad \text{'I don't see'} \]

1 sg Neg see Neg

8.3. Glide Insertion and Glide Formation Rules. There are two processes by which a glide that is not part of underlying structure may appear in the phonetic structure of Pero. One is the process in which a glide is inserted between two vowels without any changes in the syllabic structure of the utterance; the other is the process in which a high vowel becomes a glide and the syllabic structure of the utterance is changed.

These processes are similar in both their outputs and the environments. The differences however are numerous enough to require the postulation of two different rules to account for the phenomena.

Rule 22. GLIDE INSERTION

\[ \begin{align*}
  \emptyset &\rightarrow G \\
  + (C) &\rightarrow +V \\
  [\text{around}] &\rightarrow [\text{around}] [\text{LEXICAL}]
\end{align*} \]

The rule states that a glide is inserted between a monosyllabic lexical morpheme ending in a vowel and the next morpheme beginning with a vowel. The value of the feature [round] of the glide depends on the preceding vowel.

\[ \text{tà wà ëë mà } \rightarrow [\text{tàwàyéemà}] \quad \text{'he/she will see you'} \]

Fut see Pre- 2 pl Pro
Postulating the above rule of glide insertion may help in explaining the formation of the plural form for monosyllabic verbs. There are several processes by which the plural form of the verb is derived in Pero, and all of them depend on the phonological structure of the verb (cf. Frązyngier [1977]). Monosyllabic verbs differ from all other verbs by the absence of syllable reduplication or consonant gemination. Instead, in monosyllabic verbs another syllable is created by addition of a vowel. One can formalize this process by the following rule:

Rule 23. MONOSYLLABIC PLURAL STEM PREPARATION

\[
CV \rightarrow CV \ V \\
\text{[VERB]} \quad \text{[PLURAL]}
\]

Addition of another syllable consisting of a vowel creates an environment for a non-round glide insertion as all the verbs have a final non-round vowel in the base from which plural stems are formed, viz. pre-perfective forms.

After the palatal glide is inserted it is reduplicated, i.e. it is treated as if it were an underlying consonant. Reduplication in turn creates a heavy first syllable which determines the height of the final vowel of the verb (cf. Frązyngier [1976]). The examples illustrating formation of the plural form will derive the imperative form of the verb, which requires a round vowel:

Following are some of the examples of the insertion of the round glide inserted by Rule 22:
The other rule that accounts for the presence of glides in the surface structure is the rule of glide formation.

Rule 24. GLIDE FORMATION

\[
\begin{aligned}
&V + \text{high} \quad \text{around} \\
&\text{C} + V
\end{aligned}
\]

This rule states that a high vowel will become a glide when followed by another vowel across a morpheme boundary.

\[
\begin{aligned}
cú + áaní &\rightarrow [cwáaní] 'eaten' \\
et &\rightarrow Stat \\
pàenáttù + I &\rightarrow [pàenátwì] 'the monster' \\
monster &\rightarrow \text{Def} \quad \text{(one /t/ is deleted)} \\
à + lì + ée + nò + pídà + m &\rightarrow [àlyéenò bìdàm] 'it doesn't hurt me' \\
Neg &\rightarrow \text{put Pre-} \\
à &\rightarrow \text{ls wound Neg} \\
pron &\rightarrow \text{Ben}
\end{aligned}
\]

The above rule operates across word boundaries as well, e.g.

\[
\begin{aligned}
mù + n + tê + wé + iù &\rightarrow [mùndìwérwìl] 'let them see the land'
\end{aligned}
\]

There are a number of phonological rules operating on the above representation. The vowel which becomes a glide is underlined.

\[
\begin{aligned}
màttò + mù + á + rànà + m &\rightarrow [màttò mwàránàm] 'this car is not fast' \\
car &\rightarrow \text{this} \\
Neg &\rightarrow \text{fast} \\
Neg
\end{aligned}
\]

There is evidence that this rule operates or used to operate in morpheme internal position as well, at least for the high round vowel.

There is a group of words (described in Frajzyngier [1978]) that have an

\[4\text{Factors governing the choice of Rule 24 here rather than Rule 23, as in the case of cúwì 'to eat' above, are unknown.}\]
initial labiovelar stop, \([kp]\) or \([gb]\). When this stop occurs in intervocalic position, e.g. in the negative frame, instead of the stops we have a cluster consisting of stop and a glide, i.e. \([kw]\) or \([gw]\). Since there are no morpheme internal sequences of \([u]\) plus another vowel it is postulated that in Pero the following process takes place:

\[
C_1 \quad V \quad V \rightarrow C_1 w \quad V \rightarrow C_1 \quad C_2 \quad V
\]

\[ [+\text{back}] [+\text{round}] \quad [+\text{stop}] \]

Very often the output of the above process is phonetically realized as \(C_2 V\), as the result of the deletion of \(C_1\), e.g.

\[
/k\u00f3\u0111\u00e1t\u015bl/ \rightarrow kw\u00e1tt\u015bl \rightarrow [kp\u00e1tt\u015bl] \rightarrow [p\u00e1tt\u015bl] \quad '\text{man}'
\]

The last two forms were both recorded. The evidence for the second form is provided by such forms as \([m\u0103yw\u00e1tt\u015bl]\) 'you men'. Also there are no initial consonant clusters consisting of a velar consonant and a glide in Pero.

8.4. Vowel Deletion.

8.4.1. Morpheme Internal Position. A vowel may be optionally deleted in normal or fast speech when preceded or followed by a sonorant, i.e. by \(r\), \(l\), and nasal consonants. The following is the rule proposed to account for the deletion:

Rule 25. VOWEL DELETION I (optional)

\[
V \rightarrow \emptyset / C
\]

\[ [-\text{long}] [+\text{son}] \]

\[
p\text{fit}- \quad + \quad k\text{o} \rightarrow [p\text{ir}\text{g}\text{o}] \quad \text{make fire Perf}
\]

The following is the derivation of this form:

Underlying

\[
p\text{fit}- \quad k\text{o}
\]

R-5 EPENTHESIS III \(p\text{fitúk}\text{o}\)
R-25 VOWEL DELETION I \(p\text{ir}\text{g}\text{o}\)
R-10 VOWEL SHORTENING \([p\text{ir}\text{g}\text{o}]\)
Further application of this rule is blocked by syllable structure constraints. The ordering of the second and third rules is arbitrary and may be reversed.

The following verbs, although disyllabic in their quotation form, may be analyzed as deriving from the underlying trisyllabic forms by the following process:

Underlying  | úgútò      | úgúnò    
STOP → CONT | úgúrò      | -------  
R-25 VOWEL DELETION I | [úgrò]      | [úgnò]   

For the verb 'to answer' a form with undeleted vowel úgúnò has been recorded as well. The vowel which has been deleted from the imperative form is retained in other forms where its deletion would violate a syllable structure constraint, e.g.

Úgún- + tì + [ígúndù] + [ígñndù] 'he answered and came'

(See Frajzyngier [1978] for voicing of stop.)

Additional evidence for the correctness of the above analysis is provided by the following discussion. Let us assume that the underlying structure of the verb [úgrò] is /úgt-/ , i.e. let us assume that it does not have a medial vowel. A morpheme structure constraint which does not allow a sequence of consonants with different values for the feature [voice] will force one of the two phonetic realizations for the above underlying form: [úkt-] or [úgd-]. Were such forms not allowed in the phonetic structure of Pero, the vowel insertion rule would require insertion of a high vowel between the consonants forming the cluster. But such clusters do exist in the phonetic structure of Pero (cf. [cúgdò] 'comb', [cuktu] 'lift it (Vent)')

The following derivation provides additional evidence for the underlying medial vowel:

Úgút + kò + [úgúrgò]5 'he uprooted'

The derivation of this form involves the following rules:

5Rule 25 could also produce the incorrect *[ugrugo]. I do not have an explanation now for the prediction of which vowel will be reduced.
The following is an example of vowel deletion before [y]:

\[
\text{fúyī} + \text{kò} \rightarrow [\text{fúyīyò}]
\]

'he ate it up'

Note the deletion of [u] must occur before the suffix is attached because disyllabic verbs with the first syllable light delete the final vowel before suffixation. Were the suffixation in this verb to occur before the vowel deletion we would get the form *[fúyīyò].

8.4.2. Morpheme final position. When a morpheme with a final vowel with a low tone is followed by another morpheme beginning with a vowel, the final vowel is deleted along with its tone. This rule has a constraint, viz. it does not apply to monosyllabic lexical morphemes, which always preserve their final vowel. The following is proposed as a formalization for the rule:

Rule 26. VOWEL DELETION II

\[
V \rightarrow \emptyset / \begin{array}{l}
\text{[-long]} \\
\text{[Low tone]}
\end{array} +V
\]

Condition: The rule does not apply to monosyllabic lexical morphems.

Examples (the underlined vowels are deleted):

\[
\text{péémùn wòrí á} \rightarrow [\text{péémùn wòríá}] \quad \text{'is the woman of marriageable age}
\]

Wori?’

cf. wòrí péémùn + á \rightarrow [wòrí péémùné] 'is Wori of marriageable age?'

\[
\text{nī} + \text{úgùt} + \text{kò} \rightarrow [\text{nùgùrgò}]
\]

'I uprooted'

\[
\text{nī} + á + \text{wá} + \text{m} \rightarrow [\text{nàwám}]
\]

'I don't see'
Note that in the last example the deletion rule applies twice, to the subject pronoun cl and to the perfective suffix kò, in both cases deleting the morpheme final vowel.

\[
\text{pét- + tù + -éé- + kò + [pítteégò] 'he left and came'}
\]

\[
\text{leave Vent Pre-pron 2m ICP}
\]

\[
\text{péngr- + tù + -éé- + kò + [píngíréégò] 'he retreated here'}
\]

\[
\text{retreat Vent Pre-pron 2m ICP}
\]

The above phonetic forms are derived through the application of the following ordered rules:

- **Underlying**: pét- tù + kò  péngr- tù + kò
- **R-18a RAISING**: píttúkò  píngr tù kò
- **CONS ASSIM**: -------  píngrru kò
  [Frajzyngier 1978]
- **R-15 STOP VOICING**: píttúgò  píngrrúgò
- **SON DELETION**: -------  píngrrúgò
  [Frajzyngier 1978]
- **-éé- INSERTION**: píttúééégò  píngríééégò
- **R-26 VOWEL DELETION II**: píttéégò  píngréégò
- **R-3 EPENTHESIS II**: -------  píngíréégò

The above deletion rule may be alternatively stated as involving a stem preparation rule, which would delete the final vowel before a morpheme beginning with a vowel is added. There is, however, good evidence that the vowel is deleted after another vowel is added. This evidence is provided by the following forms, all of which involve the definite suffix, realized /í/ after vowels:

- **bwé**: + ̀ + [bwéí] 'the gruel'
- **júrà**: + ̀ + [júrè] 'the peanuts'
- **róccò**: + ̀ + [róccè] 'the liver'
The only way in which one can explain the final /e/ in the last two examples is by postulating that a lowering rule has applied to /i/. Such rules, in fact, have been postulated earlier in this paper for other contexts. The derivation of the last two examples would involve the following ordered rules:

```
Underlying      júrà + i       róccò + i
R-11 LOWERING   júrà̀       róccò̀
R-26 VOWEL DELETION júrè       rócce
```

The best explanation that I can offer for the non-application of this rule to the monosyllabic lexical morphemes is that if the rule were to apply and the vowel were deleted the identification of the morpheme would become very difficult. When deletion would be expected for these roots, glide insertion (Rule 22) occurs instead.

8.4.3. Vowel deletion in sandhi. The primary factor affecting the deletion of vowels in sandhi is the tempo of speech. In normal and fast speech the final vowel may be deleted when followed by a word beginning with a vowel. At the same time, other phonological rules, such as lowering, may apply:

- cékò + ám → [céyàm] 'drink water!'
- díkò + n + mù + ám → [díyò́nmwà́m] 'fetch us some water'
- mù cíñù wát- tù → [mùjíñáttù] 'they should come, let them come'

Note that in the last example the glide deletion rule applies before the vowel deletion rule.

8.4.4. Three vowel sequence reduction. There is in Pero a constraint, similar to the constraint in Kanakuru (cf. Newman [1974]) which does not allow for the sequence of three adjacent vowels in the phonetic structure. When such a structure would emerge as a result of a morphological process one vowel is deleted:

- dúò + i → [dúè] 'the bird'
There are not enough examples to categorically state that it will be always the penultimate vowel that is deleted.

8.5. Vowel assimilation. While many of the rules described previously could be considered as instances of assimilation, in the present section only complete assimilation will be described. Morphologically instances of complete assimilation are restricted to the vowels of prefixes, e.g. subject pronouns, tense markers and relative markers. Phonologically only the vowels which are [±round] undergo complete assimilation. Moreover, in the examples that follow there will be no instances of /e/ assimilating to the following vowel because there are no prefixes with underlying /e/. Because of this fact I believe there is no need to specify in the rule that it applies to /i/ and /a/ but not /e/. The rule has to be specified as optional since in deliberate speech the assimilation does not take place.

Rule 27. VOWEL ASSIMILATION (optional)

\[
\begin{align*}
  [V] & \rightarrow [\text{round}] \quad / \quad [\text{V}] \\
  [-\text{round}] & \rightarrow [\text{ghigh}] \\
  [-\text{long}] & \rightarrow [\text{ghigh}] 
\end{align*}
\]

Examples:

\[
\begin{align*}
  nì + à + wà + m & \rightarrow [náawàm] \quad \text{'}I don't see' \\
  I \quad \text{Neg} \quad \text{see} \quad \text{Neg} \\
  clì + ámb- + kò + á & \rightarrow [šáambúyà] \quad \text{'}did you climb?\text{'} \\
  2 f \quad \text{climb} \quad \text{Perf} \quad Q \\
  nì + úgút- + nà & \rightarrow [núugúnnà] \quad \text{'}I uprooted' \\
  I \quad \text{uproot} \quad \text{Perf} \quad \text{Vent} \\
  nì + ópp- + nà & \rightarrow [nòoffúnnà] \quad \text{'}I dug [it] there' \\
  I \quad \text{dig} \quad \text{Perf} \quad \text{Vent} \\
  tà + ívù & \rightarrow [tëebù] \quad \text{'}will catch' \\
  \text{Fut} \quad \text{catch} \\
  \text{(Vowel Lowering applies before Assimilation)} \\
  nì + tà + ópp- + tù + ée + tò & \rightarrow [nòoppíréérò] \quad \text{'}I will dig [it] for her' \\
  I \quad \text{Fut} \quad \text{dig} \quad \text{Vent} \quad \text{Pre- 3 f} \\
  \text{pron} \\
\end{align*}
\]

Compare, however, the following example in which the rule does not apply:
9. **Conclusions**

The vowel system in Pero may be described in terms of the features [long], [high], [low], and [round]. Each of the features divides the system into two natural classes which behave similarly in their relationship with other vowels and with consonants. Thus, the vowels which are [+high, +long] affect the rule of voicing of stops; the choice between [p] and [f] as the realization of /p/ depends on the feature [round] of the following vowel.

The main characteristic of this system is the extensive neutralization which affects all of the distinctive features and all the vowels. The feature [long] is neutralized in closed syllables. The neutralization of the remaining features can be represented by the following diagram in which the arrows indicate the direction of change which produces the neutralization.

![Diagram of vowel system]

An interesting fact about the neutralization processes in the vowel system is the different resistance to change of the distinctive features or of the clusters of features. Thus /i/ becomes /u/ in certain environments but /u/ does not become [i]; at most it is centralized. Both mid vowels are subject to raising rules but only /e/ is subject to a lowering rule. The most stable vowel in Pero is /a/, i.e. the only underlying vowel with the feature [+low], which is not subject to any change other than that in 8.5 leading to the neutralization of distinctive features.
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VOWEL COALESCEANCE AND TONAL MERGER
IN CHAGGA (OLD MOSHI):
A NATURAL GENERATIVE APPROACH

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The first section of this paper is a discussion of the vowel coalescence process of Chagga (Old Moshi dialect). Vowel coalescence processes interact with tone rules in an interesting way. I discuss the analysis of Chagga tone which was done by Nurse and Philippson [1977]. In section 2 I discuss some problems with their analysis and suggest revisions within the Transformational Generative framework. In section 3 I offer an alternative analysis which follows the constraints on grammars imposed by Natural Generative Phonology, showing that by treating the problem morphotonemically, problems inherent to the more abstract analysis can be avoided.

1. Vowel Sandhi

An understanding of the system of vowel sandhi in Chagga is critical to an understanding of its tense system. Vowel initial tense markers merge so completely with preceding vowel final subject markers that one must reconstruct the entire paradigm before the tense markers become discernible. We will see, for example, that the verbs in several tense paradigms are rendered segmentally ambiguous as a result of vowel coalescence, as the following examples show:

The data used in this paper are representative of Old Moshi, one of the Central Kilimanjaro groups of Chagga dialects. I would like to express many thanks to Mrs. Helen Mariki for her invaluable assistance and cooperation. Thanks also goes to Prof. Larry Hyman, whose seminar on Bantu Tonology served as impetus for this work. A special note of thanks and appreciation to Prof. Paul Schachter for having worked patiently with me while preparing an earlier draft of the paper. Thanks also to Prof. Thomas Hinnebusch who made comments on an earlier draft, and finally thanks to Prof. Russell Schuh whose comments contributed to the final version of this paper.
Most of the data which are relevant to this study are found in the Bantu verbal, which consists of a subject pronominal concord, a tense marker and a verb stem. Coalescence in this environment results from the juxtaposition of a pronoun agreement morpheme and a vowel initial tense marker.

Coalescence also takes place between the stems of the associative morpheme and their pronominal agreement forms, as shown in Appendix I, no. 7. As the vowels which actually occur in these environments are exhaustive, there are sequences which are possible but which do not occur. Therefore the rules which have been formulated here to account for such sequences are actually predictions about them. The vowel sequences which actually occur are listed below:

\[a + a = a \quad e + i = e \quad u + a = o \]
\[a + e = e \quad u + e = o \]
\[i + a = ya \quad u + u = u \]
\[i + e = e \]

Many of the sandhi rules in Chagga are not unlike vowel coalescence.

---

2Chagga has two tones at the underlying level, H and L. The conventions I will use for marking tones are as follows:

' = H

' = L

' = D (downstepped H)

^ = falling

v = rising
rules which are commonly found in languages. The first process to be discussed, palatal glide formation, involves two separate rules. **Palatal Glide Formation** forms \( y \) from the high front vowel, /i/, before a vowel which is [+back, +low], /a/.

**Rule (1) Palatal Glide Formation**

\[ i \rightarrow y / \{ C \} \_ a \]

Examples of **Palatal Glide Formation** are found when subject agreement markers for classes 4 and 9 (i), 7 (ki), and 8 (\( \xi \)) combine with the associative morpheme /-a/:

- Class 9: \( i + a \rightarrow ya \)
- Class 7: \( ki + a \rightarrow kya \)
- Class 8: \( \xi i + a \rightarrow \xi a \)

Closely related to **Palatal Glide Formation** is **Palatal Glide Insertion**, a morpho-phonemic rule which inserts a palatal glide between /i/ and any non-high vowel in infinitives:

**Rule (2) Palatal Glide Insertion**

\[ \emptyset \rightarrow y / X V \_ V \]  
\[ [+\text{high}] [-\text{high}] \]  
\[ [-\text{back}] \]

\[ [+\text{infinitive marker}] \]

Examples:

- \( i + \text{adanya} \rightarrow [iyadanya] \) 'to listen'
- \( i + \text{oloka} \rightarrow [iyoloka] \) 'to fall'
- \( i + \text{ende} \rightarrow [iyende] \) 'to bring'

By this analysis no rule ordering is required, if the general principle that morphophonemic rules precede phonological rules is assumed (Hooper [1976]).

1.1. **Fusion.** The fusion process represents the heart of the sandhi process in Chagga. Two adjacent vowels will merge to become a single vowel

---

3The palatal glide \( y \) is deleted when it is preceded by a palatal or velar consonant.
segment. The simplest rule of this type involves identical underlying vowels:

Rule (3) \( V + V \rightarrow V \)

\[
\text{[af]} \quad \text{[af]} \quad \text{[af]}
\]

Examples of this process are found in the recent past paradigm and among nominals:

\[
\text{nà-à-dèdà} \rightarrow \text{[nàdèdà]} \quad \text{'he spoke'}
\]

he-rec pst-speak

\[
\text{wù-úkì} \rightarrow \text{[wúkì]} \quad \text{'honey'}
\]

Cl 11 pro-noun root

The second part of this process involves the coalescence of unlike vowels. The following are examples of the types of sequences that are coalesced.

\[
\text{lù-é-dèdà} \rightarrow \text{[lùdédà]} \quad \text{'we will speak'}
\]

we-fut-speak

\[
\text{lù-à-dèdà} \rightarrow \text{[lùdèdà]} \quad \text{'we spoke'}
\]

we-rec pst-speak

\[
\text{nà-é-dèdà} \rightarrow \text{[nàdèdà]} \quad \text{'he will speak'}
\]

he-fut-speak

\[
\text{nòl-é-dèdà} \rightarrow \text{[nòldèdà]} \quad \text{'I will speak'}
\]

I-fut-speak

The feature of roundness is significant in these rules. When one or both of the underlying vowels are round, the coalesced vowel is round. Otherwise the vowel is non-round. A possible formalization is given below (the two vowels in each rule must not be identical; this could be handled by conditions on the rules or by ordering these rules after rule 3):

Rule (4) \( V + V \rightarrow V \)

\[
[-\text{rd}] \quad [-\text{rd}] \quad [-\text{high}]
\]

\[
[-\text{low}] \quad [-\text{rd}]
\]

Rule (5) \( V + V \rightarrow V \)

\[
[\text{ard}] \quad [\text{brd}] \quad [-\text{high}]
\]

\[
[-\text{low}] \quad [+\text{rd}]
\]

Condition: alpha or beta must be [+ round].
These rules can be further collapsed as follows:

Rule (4, 5') \( V + V \to V \)

\( \text{Condition:}^4 \ (a) \text{ if } a \text{ and } B = - \), \( \gamma = - \)

\( (b) \text{ elsewhere } \gamma = + \)

In summary, there are two basic strategies for coalescing vowels in Chagga. The first strategy, **palatal glide formation**, is used when the high front vowel \([i]\) is found before \([a]\). Its morphophonemic correlate inserts a palatal glide between \([i]\) and any non-high vowel in infinitives. The second strategy, **fusion**, is used to coalesce vowels to which the palatal glide formation rules are not applicable. The coalescence of unlike vowels depends on the feature \([\text{round}]\). If at least one of the input vowels is \([\text{round}]\), then the resultant vowel is the mid-round vowel \([o]\). Otherwise, the coalesced vowel is the mid-non-round vowel \([e]\).

After having taken a brief look at the vowel coalescence process in Chagga (Old Moshi), I would be the first to admit that the problem of vowel

\(^4\)An interesting sideline note is the problem that such a rule poses for the formalism. Intuitively, the process seems simple enough, and can be summarized as follows (remembering that these are only non-identical vowels, identical vowels being treated under Rule 3, sec. 1.1):

(a) any two non-round vowels will coalesce to \([e]\).

(b) two vowels will coalesce to \([o]\) if at least one vowel is \([+\text{round}]\)

Part (b) poses the challenge, where either of the underlying vowels may be \([+\text{round}]\) in order for the coalesced vowel to be \([+\text{round}]\). The problem is to have the rule express the optional presence of \([+\text{round}]\) on either vowel. One might suggest that this be handled by a neighborhood rule, as shown below:

\[ V \to \begin{cases} [-\text{high}] & [+\text{round}] \\ [-\text{low}] & [+\text{round}] \end{cases} \]

This rule would not be satisfying as it is not reflective of the coalescing process which takes place here. What I did was essentially to avoid handling the optionality of placement of \([+\text{round}]\) by generating the \([o]\) segment elsewhere.
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coalessence exceeds the boundary of a paper of this nature. One very in­teresting problem, for example, which was not resolved in this paper has to do with the environments in which vowel coalescence processes are appar­ently blocked. Vowel coalescence rules do not operate in several environ­ments:

- between tense marker and verb
- between agreement marker and adjective

I would speculate that this restriction has to do with the fact that verbs in Proto-Bantu were consonant initial. Since adjectives in Bantu generally derive from verbs, the same would apply to adjectives. Whatever the reason for these restrictions, it should be known that the rules discussed above would have to be restricted from applying in these environments.

2. **Tonal Sandhi**

Chagga is a tonal language which exhibits both grammatical and lexical tone. Lexically there are two tones, H and L. When adjacent vowels are in a syntactic environment which allows coalescence, there are four tonal sequences possible:

- \( H + H \)
- \( L + L \)
- \( H + L \)
- \( L + H \)

When vowels whose tones are identical coalesce, the resultant vowel bears that tone:

- \( H + H \rightarrow H \)
- \( L + L \rightarrow L \)

Underlying vowels with non-identical tones might be expected to give rise to complex tones, as shown below:

- \( H + L \rightarrow \hat{V} \)
- \( L + H \rightarrow \check{V} \)

There are, however, no falling and rising tones resulting from vowel coa-
2.1. The analysis of Nurse and Philippson. Before proceeding further to discuss the analysis that I am proposing of the tonal sandhi process, I will present relevant portions of Nurse and Philippson [1977]. Nurse and Philippson claim the existence of falling and rising tones at an intermediary point in the derivation, as the following derivations from their paper show:

(5) /tsiː:no/ → tsínà → [tsíːnà] 'four (cl 10)'
   /áː-á-mè-í-à wù-úkì/ → àmélyá wúkì → [àmélyá wúkì...] 'he has eaten honey'

They argue that these abstract tones are responsible for the surface tonal phenomena. I quote from their paper (p. 53):

"L + H gives a H on the following syllable, which will then be downstepped if immediately preceded by another H. ... H + L gives a H which does not shift and remains on the syllable itself, the following syllable will then bear a low tone."

Two tone rules are basic to their analysis, Tone Shift and Tone Polarity. Tone Shift moves all deep structure tones rightward by one syllable. Nurse and Philippson explain the rule as follows:

"OM[Old Moshi], like other Bantu languages in East Africa, has a tone shift, which means that PB[Proto-Bantu] tones are realized on the syllable immediately following that for which they are posited in PB. In other words, the phonetic tone on any syllable will always to some extent depend on the underlying tone of the previous syllable." [1977:52]

As Tone Shift moves all deep structure tones rightward, Nurse and Philippson must provide rules to account for the tones on initial syllables. In

---

5In this section, I rely heavily on the analysis of tones in Chagga put forth in Nurse and Philippson [1977]. I realize that objections could be raised about the validity of the postulated underlying tones in their paper. The scope of this paper is not such that it is possible to undertake a complete reanalysis of the tonal system; however, in section 3 I discuss an alternative approach using a limited amount of data. There I discuss the feasibility of treating the tonal system of Chagga within the framework of Natural Generative Phonology. In the remainder of this section, however, I assume the validity of the underlying tones and tone rules that were postulated by Nurse and Philippson.
addition, they need rules to account for the complex tones which obtain sentence finally. With regard to sentence initial tones, they claim that in some instances, the stabilizer \( n' \) can account for sentence initial high tones:

\[
(6) \quad /n' \, lù-îlè-hùRà \, màRùhnù/ \rightarrow [lîlîlèhùRà \, màRùhù] \quad \text{'we bought bananas'}
\]

The stabilizer \( n' \) that they posit in sentence initial position never surfaces in the speech of my consultant. For all practical purposes, this is like claiming that a floating \( H \) tone exists in the deep structure of some verb paradigms. When the effects of a floating \( H \) are not found on an initial syllable, a floating \( L \) must be posited to account for the sentence initial \( L \) which results after Tone Shift has applied.

The second tone rule which is needed in the Nurse/Philippsen analysis is Tonal Polarity. This rule changes a verb stem-initial \( H \) to \( L \) if a \( H \) tense marker or object marker precedes it.

---

6 In the Nurse/Philippsen analysis, the tone being shifted merges with the underlying sentence-final tone, as follows:

\[
/\prime + c\hat{v}#/ \rightarrow [c\hat{v}#]
\]

\[
/\prime + c\hat{v}#/ \rightarrow [c\hat{v}#]
\]

\[
/\prime + c\hat{v}#/ \rightarrow [c\hat{v}#]
\]

\[
/\prime + c\hat{v}#/ \rightarrow [c\hat{v}#]
\]

7 The \( R \) here represents a slightly retroflexed tap.

8 They state the Tonal Polarity Rule as follows: "If the class prefix preceding the stem carries an underlying \( L \) (i.e. classes 1, 4, 9), then the stem itself will be \( H \). If the underlying tone of the prefix is \( H \) (as in the other classes), then the stem will be low" (p.62). Referring specifically to verbs, they say: "It may be seen in 3.3.4 that several of the pre-stem tense markers end in a \( H \). Similarly, most of the object markers listed in 3.4.5 are \( H \). When \( H \)'s from either of these two series immediately precede a \( H \) in the first syllable of the verb stem, then the latter is realized as \( L \)" (p.67).
Earlier it was mentioned that the coalescence of vowels with differing tones produces altered tones. These phenomena are treated as a part of Tone Shift in the analysis of Nurse and Philipps, which gives the impression that tone shifting causes tonal simplification. They claim that L + H effects a H on the following syllable, which is then downstepped if it follows a H. Their having written the rule in this manner is a consequence of having claimed that the tonal simplification process is a part of Tone Shift. We will see subsequently that it is possible, in fact desirable, to separate this process from Tone Shift. In the case of a H + L sequence, N/P claim that it also yields a H but that this H does not shift. It remains on the syllable itself, and the following syllable then bears a low tone. We have numerous examples to show that this formulation is not correct. The future paradigm provides one such example:

(8) /'lù-è-sànjà mərûhù/ 'we will wash bananas'

The structure which would be generated by the Nurse/Philipps analysis follows:

9The data being analyzed here have expressed objects (see Appendix II). Disyllabic transitive verbs with unexpressed objects have almost identical variants to those of transitive verbs with expressed objects. They differ in one respect. In the recent past paradigm, transitive verbs with unexpressed objects take a H tone on the final syllable:

lósánjá  'we washed (something)'
lómárisá  'we finished'
lóhádímá  'we forgot'
lóséká   'we laughed'

Notice that intransitive verbs do not take such a tone:

lódedá  'we spoke'
lólócà   'we came'
The correct surface structure corresponding to (8) is \[I\text{s\'anja maR\'uh}\].

Looking at Appendix II, we find that a similar situation obtains in the future paradigm of the verbs -iwa, -ambuya, -kudika, and -deda. Among transitive verbs in very fast speech sometimes the initial \(H\) of the verb stem cannot be heard. However, in deliberate speech this \(H\) is always heard (see -ambuya). Notice that given the Nurse/Philippson analysis of \(H + L\) sequences, Tone Shift must be prevented from operating on a \(H\) just in case that \(H\) resulted from the coalescence of \(H + L\).

In summary, I have three major objections to the Nurse/Philippson treatment of these data. Firstly, it requires that abstract underlying tone assignments be posited for all surface tones of Chagga. Secondly, I find it difficult to believe that Tone Shift is part of the grammar of contemporary speakers of this language. The third objection is simply that in some cases the application of their rules produces the wrong output.

2.2. An alternative to the Nurse/Philippson analysis. In this section, I will discuss further the vowels which result from coalescence rules and their interaction with the tone rules of Nurse and Philippson. I suggest changes within the Transformational Generative model which might be made to correct their analysis.

The first tone rule that will be considered is Tonal Polarity, which changes a verb stem-initial \(H\) to \(L\) if a \(H\) tense marker or object marker precedes it. In example (9) below, the \(H\) tense marker which serves as input to Tonal Polarity is also one of the vowels that is affected by Vowel Sandhi:

\[(9) /'lu\text{-á}-\text{déda}/ \quad 'we spoke (recent past)'\]

I have given the variant in the paradigm which would be used with transitive verbs with expressed objects (\(D\ L\ (L)\)). In a more complete account of the verbal variants, it would be necessary to incorporate this \(H\) as a part of the morphotonemic pattern of these verbs:

\[
\begin{align*}
D (L) L [+\text{trans},+\text{object}] \\
[-\text{trans}] \\
D (L) H [+\text{trans},-\text{object}] 
\end{align*}
\]
Vowel Sandhi, if applied first, would change the tone immediately preceding the verb stem to rising:

\[ 'lə-dədə \text{ vowel sandhi} \]

Tonal Polarity would apply, changing the verb stem-initial H to L :

\[ 'lədədə \]

Tone Shift would apply to produce:

\[ [lədədə] \]

The analysis of Nurse and Philippson assumes the existence of rising and falling tones (from vowel coalescence) at an intermediary level in the derivation. I would like to suggest another analysis which does not require the positing of abstract tonemes. This analysis would not combine Tonal Simplification with the tone shifting process, as did Nurse and Philippson. Rather, Tonal Simplification will be considered part of the vowel coalescence process. I have thus rewritten the rules for tonal simplification as sandhi rules, which would need to be included among the vowel coalescence rules given earlier. One way in which this analysis differs from that of Nurse and Philippson is that it derives the surface forms directly from the underlying ones:

\[
\begin{align*}
H + H & \text{ simplifies to } H \\
L + L & \text{ " } L \\
L + H & \text{ " } \{D/H\_, \ H/L\_, \}
\end{align*}
\]

Tonal Polarity may now be altered so that it changes an initial H on a verb stem to L after a tense marker or pronoun which is either H or D (downstepped H). This does not affect the generalization that I made initially, except insofar as it expresses the relationship between L + H and H tones in a more direct way. The generalization can now be expressed in more surface terms than was possible under the alternative analysis. Another advantage of this formulation is that it groups together two tones which seem to make up a class in this language, H and D. In feature termin-
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ology, both could be represented as [+H]. Tonal simplification rules also reflect this class, i.e. all sequences with at least one H simplify to [+H].

The second tone rule which interacts with vowel coalescence rules is Tone Shift, which moves underlying tones rightward. Our interest in Tone Shift stems from its operation over coalesced or "derived" vowels. According to the analysis of Nurse and Philippson, coalesced segments provide exceptions to the tone shifting process. I show below that by separating tonal simplification from Tone Shift, and by including it as a part of vowel coalescence, a more correct analysis of the data can be given. Furthermore, it will be shown that this analysis makes certain generalizations about the language which would be otherwise obscured.

Nurse and Philippson [1977:53] make the following statements about the effects of Tone Shift on complex tones:

"H + H and L + L behave exactly like single H and L respectively."
"L + H gives a H on the following syllable, which will be downstepped if immediately preceded by another H."
"H + L gives a H which does not shift, remaining on the syllable itself, the following syllable will then bear a low tone."

These rules are interesting in that they claim that both L + H and H + L simplify to H. In order to make this generalization hold, they must add a condition to the tone shift rule so that the [H] which results from H + L sequences is exempt from shifting. Let's consider data with H + L sequences, deriving them using the Nurse/Philippson rules:

(10) /'Iú-è-dédà/
    we-fut-speak

    lò coalescence
    lò simplification
    *lòdèdà tone shift cf. correct [lòdèdà]

(11) /'ngè-è-sànjà/
    I-fut-wash

    ngè coalescence
    ngè simplification
    *ngèsànjà tone shift cf. correct [ngèsànjà]

Notice that the surface structures that would be derived given the rules of Nurse and Philippson are wrong. The H which results from H + L does not render the following tone L. Even if the following tone were low, as the Nurse/Philippson rule would predict, this formulation would be inherently problematic, since tone shift would have to be prevented from operating in just this case, necessitating the use of a diacritic feature. One possible formulation would be to mark the H which results from H + L as [+HL] and then Tone Shift would be made sensitive to [+HL], being rendered inoperable just in those cases where [+HL] is present in the string.

Given that the data support a generalization which is somewhat different from that made by Nurse and Philippson, I would like to suggest another formulation of the rule governing the coalescence of H + L:

H + L simplify to H, without exception; Tone Shift then applies to effect the correct surface structures.

Derivations given the new formulation are shown below:

(10') /'lú-è-déda/
   ló      coalescence
   '/lódèda' tonal polarity
   [lódèda] tone shift

(11') /'ngí-è-sànja/
   'ngé      coalescence
   simplification
   [ngésànjà] tone shift

One wonders what prompted the complicated statement made by Nurse and Philippson. I would venture to guess that they felt that H + L and L + H should not both simplify to an identical H. They must have wanted to show that the two complex tones contrast in some way. It will be shown that this is the case, without such a complicated statement of the facts.

Turning to L + H sequences and the Nurse/Philippson statement about them, they can be summarized as follows: L-H sequences are also an exception to Tone Shift, shifting as H rather than the expected L-H. This H is claimed to become downstepped if immediately preceded by another H. Again, the justification for including this process as a part of Tone Shift
is unclear. In the analysis that I am proposing, the simplification of L + H (like that of H + L) is a part of Vowel Coalescence. In this way the rules which merge segments would simultaneously merge the suprasegments. With this reformulation, a generalization is possible. The tonal simplification of sequences with opposing values is always [+H]. That this is the case is interesting in that it suggests that [+H] is stronger than [+L] in Chagga. This is reminiscent of the suggestion of Stevick [1969] about Bantu tone systems, that H's are marked in contrast to unmarked L's.

Below, I show derivations to compare the two analyses. Example (12) shows the derivation of a string in the recent past.

(12) /'Iù-á-dédà/  
we-pst-speak  
dédà  polarization  
'Iòdédà  coalescence  
[1ódédà]  tone shift

Revised analysis:

(12') /'Iù-á-dédà/  
dédà  polarization  
'Iòdédà  coalescence  
[1ódédà]  tone shift

Comparing (12) with (12'), we find that the major respect in which the analysis being proposed is different is that it produces the simplified toneme directly from the underlying vowel sequences rather than via the abstract intermediary rising and falling tones. Another way in which this analysis is different is that the tones which result from vowel coalescence are no longer exceptions to Tone Shift. They are simplified by the vowel coalescence rules and are subsequently shifted by Tone Shift.

Given the revised formulation of the tonal simplification process, we can see a general tendency of tones to merge under sandhi in the direction of the marked H tone. It is interesting to contrast this with the tendency of vowel segments to merge becoming intermediate vowels (e and o).

At this point, I would like to say a few words about the interaction between tone rules and vowel coalescence rules with respect to whether or
not ordering is required. Assuming that morphophonemic rules operate before phonological rules, this principle will dictate the order of application of both Tonal Polarity and Vowel Coalescence with respect to Tone Shift. Both Tonal Polarity and Vowel Coalescence, being morphophonemic, will apply before Tone Shift. The principle makes the correct predictions, as the following derivations show:

\[(\text{13}) \quad /'\text{lù-è-sànjà}/
\]
\[\quad \text{we-fut-wash}
\]
\[\quad '\text{lósànjà} \quad \text{coalescence}
\]
\[\quad [\text{lósànjà}] \quad \text{shift}
\]
\[\quad *\text{lósànjà} \quad \text{polarization}
\]

\[(\text{14}) \quad /'\text{lù-á-dèdà}/
\]
\[\quad \text{(recent past)}
\]
\[\quad '\text{lù-á-dèdà} \quad \text{polarization}
\]
\[\quad '\text{lù-á-dèdà} \quad \text{shift}
\]
\[\quad *\text{lódèdà} \quad \text{coalescence}
\]
\[\quad '\text{lù-á-dèdà} \quad \text{polarization}
\]
\[\quad *\text{lódèdà} \quad \text{coalescence}
\]
\[\quad [\text{lódèdà}] \quad \text{shift}
\]

Since Vowel Coalescence is ordered before Tone Shift, the generalization can be made that Tone Shift shifts underlying as well as derived tones. This generalization would not have been possible by the analysis of Nurse and Philipppson, in which the tonal simplification process was formulated as a part of Tone Shift.

3. A Morphotonemic Approach to Verb Variation

The analysis proposed by Nurse and Philipppson to account for the tonal system of Chagga is a possible analysis under the theory of Transformational Generative Grammar, which allows totally abstract underlying segments. It is generally agreed that the set of possible grammars for a given language must be constrained so that those grammars which represent the tacit knowledge of speakers would be the preferred ones. It has been shown that the generative power of the TG model is too strong. That is, grammars constructed within the model may not represent the kind of competence that
speakers use in producing utterances in their language. Such grammars imply that totally abstract deep structure constructs and corresponding "abstract" rules, as well as rule ordering statements, are within the realm of human linguistic competence. In many cases, these theoretical entities are not disconfirmable.

Because of the problems which ensue, a body of literature has come about in which linguists have made various attempts at constraining the set of possible grammars for a given corpus of data. Arguments have been given within the TG model against fully abstract morphophonemics, extrinsic rule ordering and the unconstrained use of diacritic features. Venneman [1971, 1973] argues that even stronger constraints should be placed on grammars. Thus, the Strong Naturalness Condition, which puts restrictions on abstract segments, and the True Generalization Condition and the No-Ordering Principle, which constrain abstract rules, are basic tenets of the alternative approach to phonology which Vennemann and, following him, Joan (Hooper) Bybee advocate.

It is within the context of arguments like these that I would like to suggest that an analysis that does not make use of rule ordering and which constrains abstractness is preferred. Natural Generative Phonology is such a theory. By following the constraints of NGP, the analysis which I propose below eliminates some of the problems which are inherent to the Nurse/Philipsson analysis. I show that relevant generalizations are brought to light which would not have been possible otherwise. Given the scope of this paper, it is not possible to give a total reformulation of the tonal system of Chagga. Thus, I would like to offer this paper as a sample of what this type of analysis has to offer.

The stimulus for this discussion comes from the tone shifting process. The most basic question which can be raised about this rule is whether it can justifiably be said to represent a synchronic process of the language. The relation between the tones of Chagga and those of Proto-Bantu is clear enough and should not be overlooked, especially in view of the historical relationship which exists between them. Nurse/Philipsson must pay the cost however, of claiming that this historical process represents a productive synchronic rule of Chagga grammar. In order to maintain such a claim, they
must set up unconstrained underlying tone assignments on morphemes. Since Tone Shift moves the underlying tones on all morphemes rightward by one syllable, it follows that no morpheme at the level of surface structure will possess the tone which was assigned to it at the underlying level. Thus, the first problem posed by Tone Shift is that it requires that all morphemes of Chagga be assigned abstract tones at the level of deep structure.

A second place where abstractness is created in their analysis is in sentence initial position. Since Tone Shift moves underlying tones rightward, it becomes necessary to account for sentence and word initial tones. Nurse and Philippson account for sentence initial H tones by attributing the tone to the copular form ní, which, according to them, is deleted at the level of surface structure, as the following example shows (p.54):

(15) /ní lù-lé-ñùRà màRùhù/  
    we-pst-buy bananas  
    ìlùìèñùRà màRùhù     'we bought bananas'

The initial syllable of the surface sentence might just as well have been transcribed by [I] because, in fact, there is no contrast between [I] and [III]. What they want to say, however, is that whenever the initial syllable of a sentence in surface structure is H, that H can be accounted for by the presence of ní in the deep structure. In all other cases, sentence initial syllables will be L. This is tantamount to claiming that floating H and L tones are found in pre-sentential positions throughout the language. Since these tones are never produced, it is difficult, if not impossible, to confirm such a hypothesis directly.

A final problem is that which results from the vowel coalescence process. Nurse and Philippson treat the tonal simplification which accompanies vowel coalescence as a part of the tone shifting process, to which these tones are exceptions. If, as they define it, Tone Shift is designed to shift underlying tones rightward, it follows that "derived" vowels would be problematic.

In summary, there are three areas which are problematic for the abstract analysis put forth by Nurse and Philippson: Tone Shift, with its inherent problems; the abstract floating tones that must be posited at the deep
structure level in pre-sentential position; and the problems which coalesced vowels pose for *Tone Shift*.

One of the aims of the Natural Generative Grammar model adopted here is to place constraints on grammars so that it will be possible to choose between the possible grammars of a language. NGG constrains grammars by minimizing abstractness. Since in Chagga the tonal variants of verbs seem not to be phonologically conditioned, this is a natural place to look in trying to find an alternative to the Nurse Philippson analysis. I will show in what follows that by handling the variation of verbs as a morphophonemic problem, many relevant generalizations about the language are revealed which were not possible under the more abstract analysis.

The most striking difference between the abstract analysis and that which I am proposing here is that the tonal variation on verbs is handled morphotonemically. Below, I would like to discuss the variation found on disyllabic and trisyllabic transitive verbs in order to show the feasibility of an NGG type analysis for these data. For example, the verbs -sanja 'wash' and -ambuya 'look at', which were assigned underlying L tones in the analysis of Nurse and Philippson, have the following variants:

- **L L (L)** present
- **D L (L)** recent past
- **H L (L)** past habitual future

In the analysis being proposed here, these verbs may also be assigned L tones underlingly, as this tonal variant is found in surface structures in the present and perfect paradigms. The Strong Naturalness Condition of Vennemann [1971] constrains against positing underlying allomorphs which are totally abstract (from Hooper [1976]):

1. The underlying forms of nonalternating morphemes are identical to their phonetic representations.
2. For alternating forms (a morpheme with one or more allomorphs), one of the allomorphs is listed in the lexicon in its phonetic representation and the others are derived from it.
A pattern much like that found for /L/ is found for verbs which have a H tone in the underlying structure (in the Nurse/Philippson analysis, the initial syllables of this group are H and therefore the verbs are classified as H—see below). This is the pattern of verbs such as -iwa 'steal', -kudika 'carry', -deda 'speak', and -dumbuo 'cut':

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>H</td>
<td>(L)</td>
<td>present</td>
</tr>
<tr>
<td>D</td>
<td>L</td>
<td>(L)</td>
<td>recent past</td>
</tr>
<tr>
<td>H</td>
<td>L</td>
<td>(L)</td>
<td>past</td>
</tr>
</tbody>
</table>

As the morphotonemic patterns of the two groups differ only in present and perfect tense, I will assign to each verb the underlying pattern that is found in the present and perfect tenses. The underlying tones of these verbs would then be as follows:

- sànjà 'wash'
- -lùwà 'steal'
- -àmbùyà 'look at'
- -dèdà 'talk'
- -kùdíkà 'carry'
- -dùmbùò 'cut'

Given this approach to the surface variation among verbs, the underlying representations of verbs are in some cases different from those postulated by Nurse and Philippson. In those cases where they differ, there is a direct relationship between them (the Nurse/Philippson deep structure assignments are leftward by one), as is shown below:

<table>
<thead>
<tr>
<th>THE ABSTRACT ANALYSIS</th>
<th>THE PRESENT ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-sànjà</td>
<td>-lùwà</td>
</tr>
<tr>
<td>-àmbùyà</td>
<td>-dèdà</td>
</tr>
<tr>
<td>-kùdíkà</td>
<td>-dùmbùò</td>
</tr>
</tbody>
</table>

10 Notice that the variants of the latter two groups are identical to those found for /L/ verbs.
By both analyses these verbs are grouped alike. In the abstract analysis, H verbs are assigned the H L (L) variant underlyingly. It is interesting to note that the variant which is considered underlying by the Nurse/Philippson analysis is that variant which is found in the past, habitual, and future tenses. Among L verbs however, the underlying variants correspond to those of the present and perfect tenses. Given the hypothesis proposed here, the deep structure variants always correspond to those found in the present and perfect tenses. As it is common to find that the present variant represents the basic or unmarked verb form, the generalization could be made that the deep structure of verb stems is represented in surface structure by the present tense pattern.

The underlying representations of pronoun agreement morphemes and tense markers are also different from those that were postulated by Nurse and Philippson. In surface structures, pronouns seem to exhibit morphotonemic variation:

\[
\text{PRO} \rightarrow \begin{cases} 
[+H] & \text{(in all tenses except perfect)} \\
[+L] & \text{(in perfect)} 
\end{cases}
\]

By the Nurse/Philippson analysis, pronouns could not be assigned an underlying tone. Under Tone Shift, pronouns, being sentence initial, received the floating tones that they posited in pre-sentential position. The underlying tones of tense markers in the present analysis are as follows:

- present: \(\emptyset\)  
- past: \(\text{è}\)  
- recent past: \(\text{à}\)  
- future: \(\text{é}\)  
- habitual: \(\text{kè}\)  
- perfect: \(\text{amè}\)

Returning now to the discussion of the morphotonemic variants of the verbs themselves, several interesting generalizations are possible:

1) The underlying tonal patterns on H and L disyllabic verb stems always correspond to those of the surface variant which is found in present tense.

2) There are only two morphotonemic variants of H and L verbs:

- \(\text{D L (L)}\) recent past
- \(\text{H L L}\) elsewhere
These two statements can account for the variants only of disyllabic H and L verbs. One might question the relevance of these generalizations as they represent only two tonal verb types, H and L. If, however, we take into account the tonal restrictions on verb stems, we find that these data are indeed representative. Nurse and Philipppson say the following about these restrictions (p.67):

"Verb stems may of course be mono- or poly-syllabic. Monosyllabic stems are either L or H phonologically.... Polysyllables behave in a similar way—however many syllables a stem has, it is only the first which is distinctive in that it may be H or L, the following syllables being all L." [These generalizations all apply to underlying stems.]

By the present analysis, the generalizations they make would have to be restated in terms of surface structure. Thus, it would be the second syllable which is distinctive. Given this generalization, the following tone sequences are not found:

*HH   *LLH   *HHL
*HL   *HLL
*HHH   *HLH

The tonal sequences which are found are as follows:

H   L
LH   LL
LHL   LLL

We can see that the sample of data that was presented here omits only monosyllabic verbs.

Given the above analysis, the complex morphotonemic variation in Chagga verbs has been reduced to one underlying form and two variants. The morphotonemic approach can account for the tonal variation within the Chagga verbal in a rather straightforward way.

It can easily be seen why this problem cannot be handled as a straight phonological one. We can see that given an approach which first of all admits of morphotonemic variation in this environment, certain generalizations are possible. Apparently, the variation which is found on verbs in Chagga obtains as a result of the interaction between the morphotonemic rules of the language and the tones which are lexically assigned. This phenomenon compares with what has been found in other Bantu languages, in which verbs
Chagga Vowels and Tones

and nouns have been shown to exhibit morphophonemic and/or morphotonemic variation (cf. Bennett [1976] and Asongwed and Hyman [1976]).

I am claiming that this analysis is preferable because it does not require abstract underlying tones on morphemes. Neither does it require the abstract floating tones which were needed in the Nurse/Philippson analysis. In fact, this is a significant respect in which the two analyses differ. The analysis of Nurse and Philippson had a three-pronged strategy as an approach to the tonal phenomena within the verb phrase:

1) Abstract deep structure tone assignments and abstract floating tones;
2) abstract phonological rules to alter the abstract deep structure tones;
3) tone melody statements in the lexicon to account for what could not be accounted for by abstract deep structures and phonological rules.

All of these strategies were eliminated by the analysis being proposed here. The abstract underlying tones assigned to verb stems were replaced by setting up morphotonemic tonal variants in the lexicon. The abstract floating tones were eliminated by assigning tone directly to the pronominal agreement morphemes. Tone Shift and Tonal Polarity were unnecessary as there were no longer totally abstract deep structure tones on which they were operable. Finally, a combination of all of these strategies made it unnecessary to include tonal melodies in the grammar.

Often the NGP analysis is found to be more complex, but in this case this is not so. The morphotonemic analysis seems in fact more straightforward, requiring only morphotonemic variants in the lexicon and morphotonemic rules to derive the correct surface structures. In the sense that less apparatus is needed, the proposed analysis is simpler. One might ask whether simplicity is an adequate criterion in choosing between possible grammars, if it means, for example, counting features. Simplicity does seem important insofar as it expresses the extent to which the proposed grammar can adequately express the competence of native speakers. The existence of a rule like Tone Shift, while it may be considered simple by some criteria, would have to be questioned from the standpoint of its being able to represent the kind of knowledge that speakers use in generating structures of
their language. Since morphotonemic and morphophonemic variation is quite commonly found in language, it seems not unreasonable to consider it plausible from a psychological standpoint. *Tone Shift*, on the other hand, has been attested to as a diachronic process in Bantu, but it is questionable as representing a synchronic process of Chagga or any other Bantu language. I would like to suggest that the type of analysis being argued for here is more simple and moreover more feasible as a process which speakers have internalized and use in the generation of their language.

APPENDIX I — Underlying Tones and Morphotonemic Patterns

<table>
<thead>
<tr>
<th>Subject Pronouns</th>
<th>Tense Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>angi 'I'</td>
<td>future</td>
</tr>
<tr>
<td>nu 'you'</td>
<td>-è-</td>
</tr>
<tr>
<td>na 'he, she'</td>
<td>past</td>
</tr>
<tr>
<td>lu 'we'</td>
<td>-lè-</td>
</tr>
<tr>
<td>mu 'you pl.'</td>
<td>present</td>
</tr>
<tr>
<td>wa 'they'</td>
<td>rec. past</td>
</tr>
</tbody>
</table>

I. Future

<table>
<thead>
<tr>
<th>Subject Pronouns</th>
<th>Tense Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ngédédà</td>
<td>-é-</td>
</tr>
<tr>
<td>nódédà</td>
<td>-lè-</td>
</tr>
<tr>
<td>néédédà</td>
<td>-è-</td>
</tr>
<tr>
<td>lódédà</td>
<td>-ke-</td>
</tr>
<tr>
<td>módédà</td>
<td>-ame-</td>
</tr>
</tbody>
</table>

II. Present

<table>
<thead>
<tr>
<th>Subject Pronouns</th>
<th>Tense Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ngfídédà</td>
<td>-è-</td>
</tr>
<tr>
<td>núdédà</td>
<td>-lè-</td>
</tr>
<tr>
<td>nádédà</td>
<td>-è-</td>
</tr>
<tr>
<td>lúdédà</td>
<td>-ke-</td>
</tr>
<tr>
<td>múdédà</td>
<td>-ame-</td>
</tr>
<tr>
<td>wádédà</td>
<td>-è-</td>
</tr>
</tbody>
</table>
Chagga Vowels and Tones

III. Past
ng’ilèdèdà
núlèdèdà
nálèdèdà
lúlèdèdà
mülèdèdà
wálèdèdà

IV. Rec. Past
ngádèdà
nódèdà
nádèdà
lódèdà
módèdà
wádèdà

V. Habitual
ngíkèdèdà
núkèdèdà
nákèdèdà
lúkèdèdà
mükèdèdà
wákèdèdà

VI. Perfective
ngàmèdèdà
ómèdèdà
ámèdèdà
lömèdèdà
mömèdèdà
wömèdèdà

VII. Associative Morphemes

Cl. 1 (u) + a = ɔ
Cl. 2 (wa) + a = wa
Cl. 3 (fa) + a = fo
Cl. 4 (i) + a = ya
Cl. 5 (ii) + a = lya
Cl. 6 (ha) + a = ha
Cl. 7 (ki) + a = kya
Cl. 8 (ši) + a = ša
Cl. 9 (i) + a = ya
Cl. 10 (tsi) + a = tsə
Cl. 11 (u) + a = wo
APPENDIX II — Sample Paradigms of Mono-, Di- and Tri-syllabic Verbs

1. -sànjà 'wash'
   pres. lúsànjà*
   past lúlèsànjà
   rec. past lòsànjà**
   fut. lósànjà
   hab. lúkèsànjà
   perf. lòmèsànjà

2. -twa 'steal'
   pres. lútwa màRùhù*
   past lúlètwa màRùhù
   rec. past lòtwa màRùhù
   fut. lòtwa màRùhù /lòtwa
   hab. lúkètwa màRùhù
   perf. lòmètwa màRùhù

3. -ambuya 'look at'
   pres. lúambuya màRùhù
   past lúlèambuya màRùhù
   rec. past lòambuya màRùhù
   fut. lòambuya màRùhù /lòambuya
   hab. lúkèambuya màRùhù
   perf. lòmèambuya màRùhù

4. -kudíka 'carry'
   pres. lúkudíka šídl*
   past lúlèkudíka šídl
   rec. past lòkudíka šídl
   fut. lòkudíka šídl
   hab. lúkèkudíka šídl
   perf. lòmèkudíka šídl

5. -lyà 'eat'
   pres. lúlyà***
   past lúlèlyà
   rec. past lòlyà
   fut. lòlyà
   hab. lúkèlyà
   perf. lòmèlyà

6. -ca 'come'
   pres. lúcà
   past lúlècà
   rec. past lòcà
   fut. lòcà
   hab. lúkècà
   perf. lòmècà

7. -dèda 'speak'
   pres. lúdèda
   past lúlèdèda
   rec. past lòdèda
   fut. lòdèda
   hab. lúkèdèda
   perf. lòmèdèda

*Iu 'we' maRuhu 'bananas' šídl 'chairs'
** see footnote 9
*** compensatory lengthening on monosyllabic verbs
REFERENCES


ON THE TREATMENT OF SYNTACTICALLY-DISTRIBUTED DOWNSTEP

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University of New Hampshire

It is argued in this paper that the downsteps which mark the associative construction in Igbo and the set of "Class I" words in Kikuyu are best analyzed as morphemes of the form [\( \downarrow \downarrow \downarrow \)\], where the symbol "\( \downarrow \)" represents a drop in pitch. If lexical tone contours are represented dynamically, as sequences of pitch rises (\( \uparrow \)'s) and pitch drops (\( \downarrow \)'s), then the interaction of the downstep with the surrounding tone contour can be accounted for in a coherent way by means of rules which move or delete pitch changes which would otherwise lie too close to another pitch change. In the final section of the paper, this approach is extended to alienable possessive phrases in Asante Twi, whose special tonal properties are shown to result from the presence of an associative morpheme of the form [\( \uparrow \downarrow \)\].

0. Introduction

Many African languages exhibit a tonal phenomenon called "downstep", which is a drop in pitch between two tone-bearing units with the same phonological tone.\(^1\) A downstep may appear in the lexical tone contour of a word, as in the Igbo personal name:

\[
(1) \quad \text{\textvert} \quad \text{\textvert} \quad \text{\textvert} \quad \text{\textvert} \quad \text{\textvert}
\]

Igwe
\[
\text{\textvert} \quad \text{\textvert}
\]

(where the downstep site is marked with a "\( \downarrow \)") or it may serve as the marker of a syntactic construction or lexical class. Igbo, for example,

\(^1\)This definition does not include the phenomenon of a lowered high tone after low which Hyman [1979] includes in the category "downstep". The treatment which I will propose here is probably extendable to these sorts of cases, but I will not be discussing them here.

\(^2\)Unless otherwise specified, the Igbo data in this paper is taken from Green and Igwe [1963].
uses a downstep to mark the second constituent of the associative construction, as in the example:

(2) __________
   isi eyu 'the head of a goat'  ( isi 'head' + eyu 'goat')
   H H H H

Another language which uses a downstep as a grammatical marker is Kikuyu; here the downstep appears after any member of a certain lexical class (called Class I words). For example, in the following sentences taken from Clements and Ford [1977a], there is a (circled) downstep after the Class I words moayahina (a) and moaneki (b):

(3) a. __________
   aheire moayahina njata 'he gave the weakling a star'
   H L H L H L H H
   he-gave weakling star

b. __________
   moaneki :nire 'Mwaniki saw'
   L L L L H H

Notice that the size of the downstep pitch drop is different in these two languages; in Kikuyu it is equal to a drop from high tone to low tone, while in Igbo it is much smaller. The size of the pitch drop is irrelevant to its status as a downstep—what is important is the fact that it appears between two identical tones; in other words, it is a lowering of the overall pitch register rather than a movement from one tone level to another.3

In this paper, I will be concerned primarily with the downstep which is used as a grammatical marker, though an analysis of the lexical downstep of Igbo (illustrated in (1)) will be given incidentally in the course of the discussion. The question I will be addressing is how such a downstep should be represented in the synchronic grammar of a language; the answer I propose will have profound consequences for the representation of tone contours in general. The first two sections of the paper will be concerned with the grammatically-induced downsteps of Igbo and Kikuyu, illustrated in (2) and

3I will be revising this definition during the course of the paper.
(3) above. In the third section of the paper, I will discuss a syntactically-distributed upstep in Twi which lends itself to the same theoretical treatment which is proposed here for downstep.

1. Downstep in the Igbo Associative Construction

1.1 Previous analyses of this construction. Several syntactic constructions of Igbo, including the associative construction, are characterized by the appearance of a downstep. The downstep is accompanied by two other tonal alternations, so that in fact what we find in these constructions is a "package" of tonal alternations, described below:

(4) a. If the first CV-syllable of the second constituent is high-toned, then a downstep is introduced before it, as in the following examples:

\[
\text{isi eye} \quad '\text{the head of a goat}' \quad | \quad \text{(isi 'head' + eyu 'goat')}
\]
\[
\text{H H H H} \quad | \quad \text{H H H H}
\]

\[
\text{isi ji} \quad '\text{the top of the yam}' \quad | \quad \text{(ji 'yam')}
\]
\[
\text{H H 'H} \quad | \quad \text{H}
\]

b. If the second constituent carries a low prefix tone, that tone is deleted, and the stem tone spreads back onto the prefix. For example:

\[
\text{isi oke} \quad '\text{the head of a rat}' \quad | \quad \text{(oke 'rat')}
\]
\[
\text{H H 'H H} \quad | \quad \text{L H}
\]

c. If the second constituent now begins with L or 'H tone, a low tone

---

4This set of tonal alternations is also found (with slight variations) at the boundary between the subject and predicate of a relative clause and at the boundary between a verb in one of certain grammatical forms and a following NP. The fact that these alternations co-occur in several different constructions is important to our argument, since it shows that their convergence in the associative construction cannot be simply an historical accident.

5This alternation is also often described as follows: if the second constituent has a low prefix tone followed by a high stem tone, the prefix tone is raised to 'H.

6The downstep in this phrase is introduced by rule (4a).
at the end of the first constituent is raised to \( 'H \). For example:

\[
\begin{array}{c}
\text{ōdhù oke} & \text{the tail of a rat} & \text{(ōdhù 'tail')} \\
\text{H 'H 'H H} & \text{H L} \\
\text{abha enwe} & \text{the jaw of a monkey} & \text{(abha 'jaw' + enwe 'monkey')} \\
\text{L 'H L L} & \text{L L L L L L}
\end{array}
\]

Why should the three apparently unrelated tonal alternations of (4) recur as a "package" in several distinct syntactic constructions in Igbo? What ties these three alternations together? Linguists working on Igbo have uniformly tried to answer this question by positing some tonally-active element in these constructions which acts as a sort of "trigger" for each of these changes individually. Ideas as to the nature of the triggering element vary from one analysis to another. Carrell [1970] analyzed it as a special boundary symbol (\( \# \)), Welmers [1970], Voorhoeve, Meeussen, and deBlois [1969], Hyman [1974], Williams [1976], and Goldsmith [1976] analyze it as a floating high tone, and Williamson [1970] argues that it is floating low tone.

Before considering these analyses in detail, we should first be clear as to what it would mean to say that an analysis along these lines had explained the co-occurrence of these three tonal alternations. I suggest that this will be the case if and only if the analysis satisfies the following criteria:

(5) a. The "triggering element" is taken from some specifiable set of elements which may serve this function in human languages.

b. The alternations which the triggering element is said to induce in the surrounding string are (allowing for some variation) predictable in advance by general phonological principles. For example, if the triggering element is a floating high tone, then the set of tonal alternations which is associated with it should be predictable from what we know about the general behavior of high tones and of floating tones.

Unless these criteria are met, our theory will not distinguish sets of tonal alternations like (4), which may function as "packages", from other imaginable sets of tonal alternations which apparently never function in this
way.

With these criteria in mind, let us now consider some of the analyses which have been proposed for the facts of (4). Consider first the analysis proposed by Carrell [1970]. Carrell attributes this package of alternations to the presence of a special boundary symbol (≠). For example, in Carrell's analysis, the first phrase of (4c) is given the underlying representation:

(6) ọdụ ≠ ọke 'the tail of a rat'
    <H L L H>

The boundary symbol ≠ then serves as a context for the tone rules which give this phrase its surface contour (shown in (4c)).

While Carrell's analysis was important as a first attempt to give an explicit formal statement of the tonal alternations of (4), it is easy to see that an analysis along these lines will not meet the criteria we established above in (5). Because the boundary symbol ≠ is chosen arbitrarily, it is impossible to list in advance the set of such symbols which might be available to human languages and impossible to predict what package of tonal alternations might be associated with each such symbol. Consequently, the analysis does not explain why the tonal alternations of (4) should be able to function as a recurring "package" while other arbitrarily chosen sets of alternations may not.

Analyses in which the triggering element is a floating tone fare better by our criteria, in two ways: first, if the "triggering element" is always a floating tone, then we have satisfied criterion (5a), for this is, at least in principle, a specifiable set of entities: furthermore, since floating tones have phonological content, it should be possible to predict in advance what tonal alternations they might trigger in the surrounding string.

To see how this works out in reality, consider the analysis of Igbo which is proposed by Goldsmith [1976]. In Goldsmith's analysis, the triggering element is a floating high tone; for example, the phrase of (6) is assumed to have the underlying representation shown in (7):

(7) ọdụ   ọke
    <H L H L H>
where the circled $H$ is the floating high tone. In this analysis the raising of the low tone at the end of the head noun is accounted for by means of a rule which "docks" the floating tone onto the syllable which precedes it,\(^7\) creating the intermediate form:

\[(8) \quad \odh\h u \quad \text{oke} \]

A subsequent countour simplification rule then gives $\odh\h u$ its output form:

\[(9) \quad \odh\h u \]

By analyzing the triggering element as a floating high tone, we obtain an entirely principled account of this alternation, for the "docking" which is illustrated in (8) is expected behavior for a floating tone, and it is also not surprising that a high tone should merge with a low tone to create a lower-than-normal high, as in (9). Unfortunately, the alternations in the righthand constituent, that is, the downstepping of a high stem tone (alternation (4a)) and the deletion of a low prefix tone (alternation (4b)), do not follow so naturally from the assumption that the triggering element is a floating high tone. Goldsmith's rules for these alternations are as follows:\(^8\)

\[
\text{(10) Introducing the downstep} \\
H \rightarrow \h H / [H]_{\text{affix}}^9 \# (\text{tone})\]

\(^7\)I believe the idea of attributing this alternation to the docking of a floating high tone was first proposed by Welmers.

\(^8\)I have made small adjustments in the statement of these rules so as to avoid going into Goldsmith's feature system for Igbo tones. Both in their original version and in the adjusted version given here, these rules produce incorrect outputs in some cases. (See Clark [1978], Chapter II, for a discussion of these cases with a suggested reformulation of the rules so as to accommodate them.) The argument which will be made here holds for the reformulated versions of the rules as well as for the versions given here.

\(^9\)Goldsmith follows Welmers in analyzing the floating high tone as an independent morpheme—an affix. By referring to the affixal status of the $H$
(11) Deleting a low prefix tone
\[ L \rightarrow \emptyset / [H] \text{affix}## \]

The application of these rules to the phrase of (7) is shown below:

(12) \begin{align*}
\text{odo} & \quad \text{oke} \\
\text{\(H\)} & \quad \text{\(L\)} & \quad \text{\(L\)} & \quad \text{\(H\)}
\end{align*}
\begin{align*}
\text{\(H\)} & \quad \text{\(L\)} & \quad \text{\(L\)} & \quad \text{\(H\)}
\end{align*}
\begin{align*}
\text{\(H\)} & \quad - & \quad \text{\(H\)} \quad \text{\(H\)} \\
\text{\(H\)} & \quad - & \quad \text{\(H\)} \\
\text{\(H\)} & \quad - & \quad \text{\(H\)} \\
\text{\(H\)} & \quad - & \quad \text{\(H\)}
\end{align*}
\begin{align*}
\text{\(H\)} & \quad - & \quad \text{\(H\)} \\
\text{\(H\)} & \quad - & \quad \text{\(H\)} \\
\text{\(H\)} & \quad - & \quad \text{\(H\)} \\
\text{\(H\)} & \quad - & \quad \text{\(H\)}
\end{align*}

While Goldsmith's rules derive the correct surface contour for this phrase, the analysis lacks the principled basis which we had hoped for. Rule (11), which deletes the low prefix tone of the righthand constituent, might be said to be a natural consequence of the presence of a floating tone, though to my knowledge no one has explicitly argued that this is the case. However, rule (10), which introduces the downstep, is completely ad hoc, for there is no reason to expect a floating high tone to have this effect. Thus the analysis fails to satisfy our criterion that the effects of the triggering element should be predictable by general phonological principles.

Other analyses which have used a floating high tone as a trigger for the tonal alternations of (4) fail at this same point. I know of only one
exception to this statement, and that is the analysis proposed by Hyman [1974]. Hyman's analysis is based on the assumption (for which he gives historical motivation) that every Igbo noun has a floating low-tone prefix. For example, in Hyman's analysis, the phrase isi eyulu 'the head of a goat' (4a) has the underlying representation shown in (13). (For the sake of consistency, I continue to use Goldsmith's autosegmental notation, without, I hope, doing violence to the spirit of the analysis.)

\[(13) \begin{array}{c}
\text{isi} \\
\text{eyulu}
\end{array}\]

In Hyman's analysis, the associative tone docks to the left only when the segmental prefix tone of the righthand constituent is non-high. When the segmental prefix is high-toned, as in (13), the docking the right, displacing the original prefix tone, as illustrated in (14):

\[(14) \begin{array}{c}
\text{isi} \\
\text{eyulu}
\end{array}\]

It is the floating low tone which ultimately creates the downstep between the two high tones of eyulu, either by means of the downdrift rule, which regularly lowers a high tone after low in Igbo, or, alternatively, by means of a special rule of the form:

\[(15) L \Rightarrow \text{H} / \text{H} \text{ H} \]

which Hyman proposes and suggests independent motivation for. On either account, this analysis gives us a plausible source for the downstep, since HLH sequences are known to simplify to H^1H in a variety of languages and contexts.

In spite of this very satisfactory result, Hyman's analysis fails in the end, for the following reason: there is no independent synchronic evidence for (and a great deal against) the floating low prefix tone upon which

---

\[\text{The head noun isi will also, presumably, have a low prefix tone. I omit this tone here, for the sake of simplicity, but will return to it later in the discussion.}\]
his analysis depends. For example, consider the following phrases:

(16) a. ... zu yi anu 'and didn't buy meat'

b. ma o ci yi ji 'if he doesn't carry away yams'

c. o nye fi Adha ji 'he gave Adha yams'

If there is really a floating low-tone prefix at the beginning of nouns like eyu, anu, and ji, then why doesn't this prefix have the same downsteping effect in the examples of (16) as it is said to have in (14)? Unless this question can be answered, the analysis has simply substituted one question for another, and the presence of the downstep (alternation (4a)) in the tonal package of (4) is still unexplained.

Williamson [1970] takes a different approach from those we have considered so far in that she identifies the triggering element in the Igbo associative phrase as a floating low tone. This allows her to account for the appearance of the downstep in the following way: let an associative phrase like isi eyu 'the head of a goat' have the underlying representation shown in (17):

(17) isi eyu

where the L is the floating low tone (again, for the sake of consistency. I have translated Williamson's notation into that of Goldsmith's autosegmental framework). Now the appearance of the downstep between the two H's of eyu can be accounted for in a fairly simple way, by means of a rule which transposes a floating low tone with the high tone to its right, creating the intermediate structure:

(18) isi eyu (ultimately, isi eyu)
The downstep itself is introduced by the downdrift rule, which regularly lowers H after L in Igbo.

While an analysis along these lines allows a principled account of the downstep in the second constituent of the associative construction, it does not do so well with the alternation in the lefthand constituent, namely the raising of a low tone at the end of the head noun (tone change (4c)), illustrated below:

\[(19) \quad \text{odhu} \quad \text{enwe} \quad \Rightarrow \quad \text{odhu} \quad \text{enwe} \]
\[
\begin{array}{c|c|c|c|c|c|c|c|c|c}
\text{H} & \text{L} & \text{L} & \text{L} & \text{L} & \text{H} & \text{L} & \text{L} & \text{L} & \text{L} \\
\end{array}
\]

Williamson proposes to account for this change by means of a rule which raises the floating low tone to H when it is followed by a low tone, as in (19). The application of this rule converts the underlying form in (19) to (20):

\[(20) \quad \text{odhu} \quad \text{enwe} \]
\[
\begin{array}{c|c|c|c|c|c|c|c|c|c}
\text{H} & \text{L} & \text{H} & \text{L} & \text{L} & \text{L} & \text{H} & \text{L} & \text{L} & \text{L} \\
\end{array}
\]

and the raising of the final L of odhu is then accomplished in the usual way, by the docking of the H, with simplification of the resulting LH contour to 'H.

I have three criticisms to make of this analysis. The first is that it does not produce the correct output for phrases like the following:

\[(21) \quad \text{odhu} \quad \text{ji} \quad \text{or} \quad \text{odhu} \quad \text{ji} \]
\[
\begin{array}{c|c|c|c|c|c|c|c|c|c}
\text{H} & \text{L} & \text{H} & \text{L} & \text{H} & \text{L} & \text{H} & \text{L} & \text{L} & \text{L} \\
\end{array}
\]

Since ji begins on a high tone level, Williamson's rule which raises L to H should not apply in this case; thus there is no way to account for the raising of the final L of odhu. If, on the other hand, the rule were restated in such a way that it did apply in this case, producing the intermediate form:
then the output would still be incorrect, since there would now be no way to account for the downstep before ji. We could salvage the analysis by postulating a floating low prefix before ji (as is done by Hyman [1974]); however, as was pointed out above, this assumption is untenable because it incorrectly predicts H tone on ji in other contexts as well, e.g. in (16b).

My second criticism of Williamson's analysis is that the rule which raises the L to H in phrases like (19) is ad hoc, since there is no general principle which would lead one to expect a floating low tone to undergo this alternation. Williamson is aware of this weakness in her analysis, and tries to mend it by arguing that the raising of a low tone before low is a widespread phenomenon in Igbo—that, in fact, there is a general rule of the form:

(23) L → H / _+ L (where _ = "morpheme boundary")

As evidence for this rule, Williamson cites the fact that a compound verb which is made up of two low-toned verb radicals receives a HL tone contour, as in the example:

(24) we 'pick up' + fu 'go out' → wefu 'take away'

However, although rule (23) would account for the facts of (24), as Carrell claims, there is a great deal of evidence to show that this is not a general rule of Igbo. To give just a few examples, such a rule would incorrectly predict high tone on fe in the verb stem:

(25) gafemi ( ga 'go' + fe 'pass by' + mi 'be deep')

'go out of one's depth' [Igwe and Green 1970:141]
(26) aci ū ha any (aci 'were carrying' + ū ha 'they' + any 'meat')
     H L L H H H L L H H
     'they were carrying (bits of) meat' [Green and Igwe 1963:75]

and on the low-toned agentive prefix  üy in:11

(27) öz a 'sweeper' (ö + za 'sweep') [Green and Igwe 1963:75]
     L L

Examples like these suggest that the rule which gives we its high tone in
(24) is a lexical rule which applies specifically to the first verb radical
of a compound verb. In Clark [1978], Chapter VII, I argue that the envir­
onment of this rule is correctly stated as follows:

(28) L → H / verb [or — L
           verb stem

If this argument is correct, then clearly this rule will not account for the
raising of L to H in (19), (20) as Williamson's analysis requires. Thus
there is no independent motivation for the rule which does create this
change, and the analysis fails to satisfy our criterion (5b) which requires
that the behavior of the triggering element should be predictable on the
basis of more general rules or principles.

A third, somewhat more theoretical argument which might be made against
Williamson's analysis has to do with the rule which transposes L with H
in (17), (18). Such rules, while statable in an autosegmental framework,
have not generally been employed, and I believe it is hoped that they will
not be needed. The multiplication of rule types is, in general, to be
avoided, because it tends to create indeterminacy in the analysis of parti-

11 The forms below show that the postposed subject pronoun ū ha and the
agentive prefix üy are indeed low-toned:

(i) aci ū ha akhū 'they were not carrying palm nuts'
     H' H L H H

(ii) öz a 'carrier'
     L H

Thus it is not possible to account for the non-application of rule (23) in
(26) and (27) by claiming that üz and ū ha are underlyingly toneless, and
simply share the adjacent low tone segment. Similar evidence can be given
for the underlying low tone of the verb radical mi in (25).
cular phenomena by providing multiple alternative ways of deriving the same output (see Clark [1979] for a more careful development of this argument).

2.2. A new proposal. We began the previous section by listing three tone changes which occur as a "package" in several distinct syntactic constructions in Igbo. We then considered several possible analyses of these facts, all based on the notion of a "triggering element", variously analyzed as a special boundary symbol, a floating high tone, and a floating low tone.

While most of these analyses provided a principled account of some of these tonal alternations, each analysis had to resort to an ad hoc statement of at least one of them. Thus in each of these analyses, the composition of this package of tonal alternations appears to be at least partly accidental, a conclusion that is hard to accept in view of its repeated occurrence in the grammar of Igbo.

I would now like to propose a radically different, and I believe more principled, account of these facts. This account is based on the notion that the central tonal alternation in this package is the insertion of the downstep; in other words, the downstep itself is the "triggering element" for the other two alternations. To make this idea work, we must begin by making a fundamental revision in our thinking about the nature of tone contours.

Consider a tone contour as in the Igbo noun ƙu ƙo 'chicken'. This contour is usually defined as an ordered sequence of tone levels, LHL, mapped onto the phonological string as shown in (29):

(29) ƙu ƙo

However, there is another logically possible way of defining this contour, viz. by means of the pitch changes rather than the pitch levels within it.12

---

12This way of looking at tone contours is not original with me. Dynamic-tone analyses have been given of Japanese (by the Japanese linguist Hattori) and of English (by British linguists such as Crystal), though not, to my knowledge, of tone languages like Igbo. Winston [1960] and Stewart
In this view, which I will call the "dynamic-tone" view, we could represent the tone contour of (29) as shown in (30):

(30) \( \varphi \uparrow k\_u \downarrow k\_o \)

What this representation means is that there is a rise in pitch \( \uparrow \) between the first two syllables of \( \varphi \underline{k\_u} \underline{k\_o} \) and a drop in pitch \( \downarrow \) between the second and third syllables. Both representations (29) and (30) define the same physical contour; the difference between them lies simply in whether the pitch levels or the pitch changes within the contour are taken to be significant. Which view is correct is an empirical question which may be investigated in a variety of ways, for example, by studies of the perception of tone contours, as in the work of Hombert [1976] and Gandour and Harshman [1978], or, as in the present paper, by studying the tonological systems of human languages to see which view leads to a better overall theory of tonal processes.

Let us now give a more formal interpretation of the tonal representation of (30). To begin with, let us assume that the pitch-change markers \( \uparrow \) and \( \downarrow \) (henceforth "pcm's") are independent phonological units, on a par with the phonological segments, though, of course, very different from them in phonetic content, since they represent articulatory gestures rather than articulatory configurations. In addition to the two "basic" pcm's \( \uparrow \) and \( \downarrow \), some languages also make use of an "abbreviated" rise and fall which I [1971] make use of a "mixed" system in which the downstep is represented by a dynamic-tone unit "!", which designates a drop in pitch, but in which the lexical tone contours of words are represented as sequences of tone levels such as "low" and "high".

In the remainder of this paper, I will, for the sake of clarity, use a more graphic representation, shown below, in which the pitch levels are filled in with dotted lines:

(iii) \( \varphi \uparrow \underline{k\_u} \downarrow \underline{k\_o} \)

The dotted lines have no theoretical status, but are there simply to make the contour more readable. They can be filled in by means of the following algorithm: draw a line from the head of each pcm to the tail of the pcm which follows it. Draw a line extending backwards from the tail of the first pcm to the beginning of the phrase. Draw a line extending forwards from the head of the last pcm to the end of the phrase.
will represent as * and *. We can, if we wish, establish a feature system for the set of pitch-change markers; the feature [± pcm] may be used to distinguish pcm's from other phonological units, the feature [± fall] to distinguish ↓ and * from + and *, and the feature [± full size] to distinguish ↓ and + from * and *.

A pcm represents a change in the tension, length, and thickness of the vocal cords which produces a change of pitch. Although it is possible to execute such a gesture quite independently of any phonological segment, e.g. it is possible to 'hum' the tone contour of a word or phrase, pcm's normally occur in conjunction with a phonological string. In the theory which I propose here and in Clark [1978], pcm's are associated with a phonological string through the prosodic structure; in particular, pcm's occupy the boundaries of prosodic units such as the syllable or mora. The pitch levels of the prosodic units themselves are predictable from the configuration of pcm's; thus these pitch levels need not be marked in any way in the phonological representation, nor should they be expected to play any role in tonological processes. One important property of the system is that there can be no more than one pcm at a given boundary in the surface form; representations such as σ+↓σ (where σ = "syllable") are ill-formed, since it is impossible to go up and down in pitch at the same time.

Now consider how the lexical tone contours of Igbo are to be represented in this system. In the dynamic-tone representation given above for [ku] [ko] 'chicken', only those pitch changes which are internal to the word are marked. In the end, however, it will also be necessary to indicate the tonal relationship of one word to another, as well as the difference in the isolation tone levels of such words as eyu 'goat' and enwe 'monkey'. For this purpose, I propose to use the device of a "word-level" pcm which, in Igbo, will be placed at the end of each word, as in the two syllable words below:

(31) a. eȳu↓ b. 0̄ ke↓ c. m̄ be↓ d. en̄we↓

When a word is pronounced in isolation, its word level pcm indicates whether its final syllable is to be pronounced on a higher-than-neutral or lower-than-neutral pitch level, and the pitch levels of preceding syllables
are adjusted accordingly. When words are combined into phrases, the word level pcm's serve to indicate the relative pitch levels of adjacent words. For example, in the phrase:

(32) o → _nyere_ + Ekwe + eewe +  'he gave Ekwe the monkey'

it is the word level + of o +_nyere_ + 'he gave' which gives us the rise in pitch between o +_nyere_ + and Ekwe +. Similarly, it is the word level + of Ekwe + which gives us the drop in pitch between Ekwe + and eewe +.

In some cases, the word level pcm does not appear as a change of pitch in the surface form. For example, in the following sentence there is no + at the end of o +_gu_ +:

(33) o → _nyere_ + o +_gu_ + eewe +  ( o +_nyere_ + + o +_gu_ + + eewe + )

'he gave Ogu the monkey'

Similarly, in the following sentence, there is no drop in pitch at the end of Ekwe +:

(34) o → _nyere_ + Ekwe +_eyu_ +  ( o +_nyere_ + + Ekwe + + eyu + )

'he gave Ekwe the goat'

The general rule is this: the word final pcm fails to show up as a change of pitch in the surface form just in case the next succeeding pcm in the underlying string points in the same direction. Thus we can account for these cases by means of a rule of the following form:

(35) **Identical PCM Deletion**

    pcm ... pcm

    S.D.  1  2  3  where 1 = 3 and where "...") contains no pcm

    S.C.  Delete 1.

This rule accounts for all cases in which the word level pcm fails to show up as a change of pitch at the end of the word in the surface form. Rules of this sort are the typical means by which lexical tone contours are blended together to form phrasal contours.

A rule like (35) also appears to be involved in the formation of lexical
contours in compound words such as the verb $\text{ga} \text{femi}$ 'go out of one's depth' (25). This verb consists of a toneless verb radical $\text{ga} $ 'go' plus two "low-toned" verb radicals $\text{fet} $ 'go across' and $\text{mi} $ 'be deep'. If we assume that low-toned verb radicals (like low-toned words) are marked with a final $+$, then this verb has the "underlying" representation $\text{ga} + \text{fet} + \text{mi} + $. If we allow rule (35) to apply within a single word, then this rule will, correctly, delete the $+$ of $\text{fet} $ in $\text{ga} + $. So that the rule will apply in cases like this, let us add the following condition on its application:

(36) **Identical PCM Deletion**

\[
\begin{array}{c|c|c}
\text{pcm} & \ldots & \text{pcm} \\
\text{S.D.} & 1 & 2 & 3 \\
\text{S.C.} & \text{Delete } l.
\end{array}
\]

Condition: This rule applies at the phrasal level and, if the target pcm is a $+$ also within words.

As the condition suggests, rule (36) does not apply within words if the target pcm is a $+$ . Thus it is possible to find verbs like the following, which have two pitch drops in a row:

(37) $a^{*}u^{*}\_h\_b\_h_{a}^{*} $  ( $\text{atubha} $ ) 'not to throw in'

In such cases, all but the last $+$ will be a "small-sized" $+$ , i.e. a fall from "high" to "downstepped high" rather than a fall from "high" to "low". The small size of the pitch drop in these cases can be accounted for by means of a rule of the form:

\[\text{iv) } \phi \rightarrow + / \left[ \sigma \ldots + \text{verb stem} \right] \]

This is the dynamic-tone version of rule (28) above.
(38) + Before + Reduction

+ → [-full size] / ___... +  

where "..." contains no pcm

As will be shown below, this rule applies at the phrasal level as well as within words.

With these preliminaries behind us, let us now return to the downstep which marks the constituent boundary of the associative construction. What I wish to propose is that this downstep is simply an instance of +; that is, it is a pitch-drop marker exactly like the pitch-drop markers which appear in the lexical representations of words. What distinguishes this + from other +'s is the fact that it is the sole phonological realization of a grammatical formative whose non-tonal segments have dropped out.

The grammatical formative [+] is inserted at the constituent boundary of an associative phrase by means of a rule of the form shown in (39):

(39)  [ [X] [Y] ]

\[^{+N}_{-V}\]

S.D.  1  2

S.C.  Insert the morpheme [+] between 1 and 2, cliticizing it to 2.\(^{15}\)

The feature complex \[^{+N}_{-V}\] in this rule indicates that the constituent to which the rule applies must be a member of the set of nominal categories NP, N, N, etc. There are other conditions which must be placed on this rule if it is to apply correctly in every case. I will not discuss these here but refer the reader to Clark [1978], Chapter VI, for a carefully motivated, detailed statement of the rule. Rules of a similar form will be used to insert the downstep + in the other syntactic constructions in which it appears.

When a "bare" pitch-change marker is inserted into a string by a rule such as (39), a tension is created, for there will now be two pcm's at the

\(^{15}\)This cliticization does not always take place. For example, in Clark [1978], Chapter VI, I argue that the special tonal properties of the construction which Green and Igwe call the "Genitive of Personification" arise from the fact that the associative [+] does not undergo cliticization in this construction.
same syllable boundary, as is shown below for some typical cases (where the circled \( \dagger \) is the associative marker):

\[
\begin{align*}
(40) & \quad \text{a. } \text{abha} \dagger \text{enwe} \dagger & \quad \text{'the jaw of a monkey'} \\
& \quad \text{b. } \text{O} \dagger \text{ndhu} \dagger \text{j} \dagger & \quad \text{'the bottom of the yam'} \\
& \quad \text{c. } \text{isi} \dagger \text{enwe} \dagger & \quad \text{'the head of a monkey'}
\end{align*}
\]

There are just three logically possible ways to resolve the ill-formedness which is created by the insertion of the associative \( \dagger \) in these examples. (1) Two pcm's at the same syllable boundary might be added together, so that a \( \dagger \dagger \) sequence counts as \( \emptyset \), a \( \dagger \dagger \) sequence as an extra large pitch drop, and so forth. (2) One of the competing pcm's might be deleted, e.g. a \( \dagger \dagger \) sequence might be simplified to \( \dagger \). (3) One of the two competing pcm's might be moved to another boundary, e.g. the \( \dagger \) of a \( \dagger \dagger \) sequence might be retracted to the preceding syllable boundary. If we consider a variety of languages, we can find examples of all these strategies in use. Which strategy is chosen to resolve a particular conflict depends partly on the language and partly on the configuration of pcm's which is being resolved, e.g. a \( \dagger \dagger \) sequence is particularly likely to be resolved by strategy (3). Igbo uses only strategies (2) and (3), and in the following way:

A \( \dagger \dagger \) sequence is resolved by retracting the \( \dagger \) to the preceding syllable boundary. The rule for this retraction is stated in (41), and its application is illustrated in (42):

\[
(41) \quad \dagger \text{ Retraction}^{16} \\
\begin{array}{c}
\sigma & \dagger & \dagger \\
\text{S.D.} & 1 & 2 & 3 \\
\text{S.C.} & \text{Move 2 to the left of 1.}
\end{array}
\]

\( ^{16} \)In the O\( \ddot{u}\n\ddot{u} \) dialect described by Green and Igwe [1963], rule (41) retracts the \( \dagger \) just one mora to the left, as can be seen from cases like the following, where this rule acts to create a rising glide, rather than a level high tone, on the final syllable of the head noun:

\[
(\nu) \quad \text{mkp} \ddot{a} \text{ j} \ddot{i} & \quad \text{'a stick of yams'} \\
\text{m} \text{kp} \ddot{a} & \quad \text{'stick'} & \text{j} \ddot{i} & \quad \text{'yams'}
\]

Since the rule has this effect only when the second constituent begins with
Syntactically-Distributed Downstep

When the preceding syllable boundary is already occupied, as in (40b), the application of rule (41) creates a new pcm-conflict at that boundary, as shown in (43):

\[(43) \varphi \uparrow \text{dhu} \uparrow \varphi \uparrow \text{ji} \uparrow \overset{\text{rule (41)}}{\longrightarrow} \varphi \uparrow \text{dhu} \uparrow \text{ji} \uparrow\]

This new conflict is resolved by the deletion of the \(\uparrow\). The rule for this deletion is stated in (44), and its application to (43) is illustrated in (45):

\[(44) \uparrow \text{Deletion} \]

\[\uparrow \rightarrow \emptyset \quad / \quad \uparrow \]

\[(45) \varphi \uparrow \text{dhu} \uparrow \varphi \uparrow \text{ji} \uparrow \overset{\text{rule (41)}}{\longrightarrow} \varphi \uparrow \text{dhu} \uparrow \text{ji} \uparrow \overset{\text{rule (44)}}{\longrightarrow} \varphi \overset{\text{dhu} \uparrow \text{ji} \uparrow}{\longrightarrow}\]

The reduction of the first two \(\uparrow\)'s in this form is accomplished by the rule of \(\uparrow\) Reduction (38).

Now consider the change which takes place on the other side of the downstep, namely, the raising of the low prefix tone of a noun with the lexical tone contour of \(\varphi_{\uparrow} \text{ke} \uparrow \text{rat}' (4b). This change is easily accounted for by means of an extension of rule (44), so that this rule deletes a \(\uparrow\) after a \(\uparrow\) even when there is an intervening vowel. The revised statement of the rule is given below in (46), followed by an illustration of its application in the derivation of the phrase \(\text{fsi} \ '\text{öke} \ '\text{the head of a rat}'.\)

\[(46) \uparrow \text{Deletion (revised from (44))} \]

\[\uparrow \rightarrow \emptyset \quad / \quad \uparrow (v)\]

\[\]

a consonant, we can account for such cases in the following way: first, assume that Igbo syllables normally contain one mora \(\varphi\), but that they lengthen to two moras in word-final position before a consonant; then assume that rule (44) shifts a \(\uparrow\) back just one mora, rather than a whole syllable. Rule (44) will then apply correctly to (v), as shown below:

\[(vi) \varphi_{\uparrow} \text{kpa} \uparrow \text{a} \uparrow \text{ji} \uparrow \rightarrow \varphi_{\uparrow} \text{kpa} \uparrow \text{a} \uparrow \text{ji} \uparrow\]
The extension of the rule of + Deletion to cover cases like (47) is plausible, I believe, since the + which is deleted in these cases, while not at the same syllable boundary as the controlling +, is at least very close to it—in fact, only one mora away, since there is a general rule of vowel coalescence which merges vowel sequences like io in (47) into a single syllable. If this argument is correct, then we have succeeded in giving a principled account of the whole package of tonal alternations which was described in (4). In particular, we have shown that if the insertion of the downstep (4a) is taken to be the central tone change in this construction, then the other alternations ((4b) and (4c)) can be derived from it in a principled way by means of rules which resolve pcm "conflicts" by deleting or moving away one of the conflicting pcm's.

There is one fact about this construction which still remains to be accounted for, and that is the fact that when the prefix vowel of the second constituent is high-toned (as in isi e'lyu 'the head of a goat'), the associative + does not appear at the constituent boundary in the surface form, but comes after the prefix vowel. We can account for the surface position of the downstep in phrases like this by means of a rule of the following form:

(48) + Shift

\[ \begin{array}{cccc}
\text{S.D.} & 1 & 2 & 3 \\
\text{S.C.} & \text{Move} & 1 & \text{to the right of} 2
\end{array} \]

where 3 contains no pcm

17Notice that rule (48) is not subject to the criticism which we made above of Williamson's rule of low tone transposition ((17), (18)). The difference is that this rule does not transpose one tone unit with another,
Notice that the condition that the prefix vowel must be high-toned has been replaced here by the (equivalent) condition that the pcm which most immediately follows it in the string must be a +. I do not regard this as a particularly natural condition, and it is perhaps significant that it has been dropped in some dialects (including the Aboh dialect described by Hyman [1974]). In these dialects, the downstep + always shifts to the right of the prefix vowel.

2. **Downstep in Kikuyu**

According to Clements and Ford [1977a], Kikuyu has two lexical classes of words, which they call "Class I words" and "Class II words". As is shown in the following examples, Class I words are marked by a downstep (') which normally takes the form of a drop in pitch at the end of the word:

\[(49)\]

\[\begin{array}{c}
\text{ahèirè} & \text{moayahiña} & \text{njata} \\
H & L & H & L & H & H \\
\text{he gave} & \text{weakling} & \text{star} \\
(C1 I)
\end{array}\]

\[\begin{array}{c}
\text{Moanekì} & \text{c:nirè} \\
L & L & L & L & H & H \\
\text{Mwaniki (C1 I) saw}
\end{array}\]

but rather changes the position of a tonal unit with respect to the phonological string. Such rules are common in a dynamic-tone framework, where they take the place of what Hyman and Schuh [1974] call "tone-spreading" rules. I do not believe it is ever necessary to postulate a rule which moves one pcm over another; the sphere of operation of tone rules is always limited to the string which includes the target pcm and the pcm's which most immediately precede and follow it (hence the conditions on rules (36), (38), and (48) that the variable "..." may not subsume a pcm.)

\[18^{18}\] It should perhaps be noted here that when the nominal constituent to which rule (48) applies contains three syllables or more, the downstep is deleted by a subsequent rule. Thus, for example, the phrase ɪsì àkwúkwọ 'chapter of a book' lacks the expected downstep after the prefix vowel of àkwúkwọ 'book' (see Clark [1978], Chapter VI, for a discussion and analysis of this fact).
The examples of (49) show the downstep as it appears when it comes between two high or two low tones. When the downstep lies between a high tone and a following low tone,\(^{19}\) as in the example below, it undergoes a process called "Downstep Displacement", which shifts it over the string of low tones to its right to create the output tone contour shown on the right below:

\[(50)\]

```
<table>
<thead>
<tr>
<th>L</th>
<th>H</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>ndinarora kejanji =&gt; ndinarora kejanji</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

'I didn't watch (Cl.I) crocodile'  
'I didn't watch the crocodile'

Clements and Ford [1979] propose the following analysis of these facts: first of all, the downstep is created by a floating extra low tone, \(\bar{L}\), which acts as the triggering element for a register lowering rule which lowers both the high and low tone registers.\(^{20}\) Since this floating low tone never "docks", it is not actually pronounced but receives its sole phonetic realization through the register lowering which it triggers. The process of Downstep Displacement is then accounted for by means of a rule of the following form:

\[(51) \text{Downstep Displacement}\]

\[
H \bar{L} L \Rightarrow H H Q \bar{L}
\]

The \(\bar{L}\) in this rule is the floating extra low tone, and \(L_Q\) is the maximal sequence of low tones to its right. The application of this rule to (50) is shown below:

\[(52) \text{underlying form: ndinarora kejanji}\]

```
<table>
<thead>
<tr>
<th>L</th>
<th>H</th>
<th>H</th>
<th>H</th>
<th>L</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>ndinarora kejanji</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
Rule (51):
```
```
<table>
<thead>
<tr>
<th>L</th>
<th>H</th>
<th>H</th>
<th>H</th>
<th>H</th>
<th>\bar{L}</th>
<th>L</th>
</tr>
</thead>
</table>
```

\(^{19}\)There is a fourth possibility, \(L^1H\). This sequence is realized as a level low tone; that is, the downstep wipes out the expected rise between \(L\) and \(H\).

\(^{20}\)See Clements and Ford [1977a] for very strong arguments that the downstep is triggered by a phonological unit and not by a diacritic feature on Class I words.
Although this analysis produces the correct phonetic output, it is nevertheless unsatisfactory for two reasons: first, since Kikuyu does not exhibit downdrift, the rule which creates the downstep by lowering the high and low tone registers after \( \underline{L} \) has no independent motivation in the language. This makes the analysis extremely abstract. I find it difficult to believe that a child learning Kikuyu, hearing an unexpected drop in pitch at a certain point, somehow attributes this drop to the presence of a floating low tone, even though no such tone is audible, and even though there is no evidence in his language that a floating low tone would have such an effect. To make the analysis plausible, one would have to argue that the link between downstep and floating low tone is built into the Language Acquisition Device. But this would imply a universality which has not been and cannot be demonstrated; for example, as we have seen, there is no satisfactory way to attribute the downstep of Igbo to a floating low tone.

A second serious objection to the analysis is the complexity and apparent arbitrariness of the rule of Downstep Displacement (51). Unless some way can be found to predict that a floating low tone should interact with the surrounding tone contour in just this way in the synchronic grammar of a language, this analysis serves only to describe the facts and not to explain them.

In a paper given at the Winter 1978 LSA Meeting, Will Leben proposed the following more principled account of Downstep Displacement, based on his Obligatory Contour Principle, which requires that a string of low-toned or high-toned syllables be analyzed as sharing a single tone segment. In Leben's analysis, the phrase of (52) is assigned the following underlying representation:

\[
\text{(53) ndina\text{ra} \text{ } \text{ } \text{ken\text{a}ni}}
\]

\[
\begin{array}{ccc}
\text{L} & \text{H} & \underline{L} \\
L & L & H
\end{array}
\]

where \( \underline{L} \) represents the floating low (or extra low) tone. But this representation includes a sequence of low tones (\( L \underline{L} \)) which, by the Obligatory Contour Principle, should simplify to a single tone segment. That is exactly what happens, through rule (54) below, whose application to (53) is shown in (55):
Now, by a general tone spreading convention for Kikuyu, the final H of ndinarora spreads onto the toneless initial syllables of keŋaŋi to produce the (correct) output contour shown in (56):

(56) ndinarora keŋaŋi
L H I L H I H

This revised version of the analysis does not answer our first objection above, viz. that the child learning Kikuyu has no evidence on which to base his postulation of a floating low tone as the source of the downstep. However, it does seem to answer the second, since rule (54), which corresponds to Clements and Ford's rule of Downstep Displacement, has a principled basis in the Obligatory Contour Principle. This result is illusory, however, for there is another dialect of Kikuyu which cannot be accounted for in this way. The dialect I have in mind is that spoken by one of Ford's informants, Mr. Thairu from the Nyeri district. Mr. Thairu differed from Ford's other informants in that he consistently placed two downsteps in "Downstep Displacement" environments when the righthand word was a member of Class I. An example showing this characteristic of Mr. Thairu's speech is given below (where I continue to assume that the downstep is triggered by a floating low tone):

(57) ti karioki => ti karioki 'it isn't Kariuki
H L H L H H L L

Notice that Leben's proposal cannot be extended to this dialect; in

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21This information is taken from an earlier, unpublished paper by Clements and Ford, entitled "Tone in Kikuyu" [1977b]. I would like to thank Professor Clements for making this paper available to me.
particular, since there is a downstep between $t_i$ and $karioki$ in the surface form, the high tone of the first two syllables of $karioki$ cannot be obtained by spreading the high tone segment of $t_i$. We can, of course, account for these facts by means of a rule like that below, which changes $L$ to $H \hat{\gamma}$ in the environment following $H \hat{\gamma}$:

$$L \rightarrow H \hat{\gamma} \; / \; H \hat{\gamma}$$

But this rule shares the complexity and arbitrariness which we objected to above in Clements and Ford's original statement of Downstep Displacement (51). Once rules like this have been admitted, it becomes difficult or impossible to place limits on the "package" of tonal alternations which may be associated with a floating low tone in the synchronic grammar of a language.

I believe it is possible to give a more principled account of the Kikuyu downstep within the dynamic-tone framework which we have developed in the preceding section for Igbo. Let us begin by assuming that lexical tone is represented in the same way in Kikuyu as in Igbo, except that the word level pcm appears at the beginning of the word instead of at the end. For example, the words $k'\eta\eta\eta\prime$ 'crocodile' and $\acute{a}h\acute{e}\acute{r}e$ 'he gave' will be represented as shown in (59):

$$(59) \; ^{\prime}k\eta\eta\eta\prime \; ^{\prime} \eta \; ^{\prime} \acute{a} \; ^{\prime}h\acute{e}\acute{r} \; ^{\prime}r\acute{e}$$

The blending of lexical tone contours into phrasal contours will be accomplished by means of a rule of the form:

$$(60) \text{Identical PCM Deletion}$$

$$\begin{align*}
\text{pcm} & \ldots \text{pcm} \\
\text{S.D.} & \; 1 \; 2 \; 3 \\
\text{S.C.} & \text{Delete 3.}
\end{align*}$$

Conditions: (i) $1 = 3$

(ii) If $1$ and $3$ are $+$'s, the rule does not apply within a single word.

---

22The position of the word level pcm—whether it comes at the beginning or the end of the word (or in both places)—has widespread consequences for the tonal system of a language. See Clark [1978] Chapter II, for a discus-
Notice that this rule has the same form as the rule of Identical PCM Deletion (36) which was proposed for Igbo in the previous section.\textsuperscript{23} The application of the rule is illustrated below (where the circled pcm is the pcm which is deleted by the rule):

\[(61)\]
\[
\begin{align*}
\text{a. } \text{I-saw } & \text{childish-person} \Rightarrow \text{I-saw a childish person} \\
\text{b. } \text{I-watched } & \text{crocodile} \Rightarrow \text{I watched the crocodile}
\end{align*}
\]

Now consider how we are to account for the downstep which follows a Class I word in phrases like (49a) and (29b). I suggest that this downstep is a morpheme consisting of a only,\textsuperscript{25} like the associative of Igbo, and that it is introduced into the string by means of a rule which inserts the morpheme \([+\)] in the environment immediately following a Class I word.\textsuperscript{24}

\textsuperscript{23}The fact that this rule applies in the opposite direction from the Igbo rule, i.e. it deletes all but the first of a sequence of identical pcm's rather than all but the last as in Igbo, is a consequence of the fact that the word-level pcm of Kikuyu comes at the beginning of the word rather than at the end.

\textsuperscript{24}Since prefixes are all underlyingly low-toned, nouns which begin on a high tone level, as \(+\text{kye}+\text{na}+\text{na}\) does, are somewhat exceptional. I have not been able to find any examples in Clements and Ford's work in which a word which ends on a high tone level is followed by a word which begins (at the underlying level) on a high tone level. Thus I constructed this example myself from parts found in Clements and Ford [1977a]. Since I have not been able to check the example with a native speaker, it should be taken as an example of how, in principle, rule (60) is meant to work, and not as an example of a grammatical sentence of Kikuyu. In both these examples I have ignored the occurrence of underlying downsteps which do not, for one reason or another, affect the surface contour.

\textsuperscript{25}Clements and Ford [1978] give evidence to show that the downstep was historically part of the lexical tone contour of Class I words; it achieved its "independent" status when lexical tone contours shifted to the right in Kikuyu, leaving a final low tone (in our terms, a final \(\downarrow\)) unassociated. However, the distribution of the downstep in modern Kikuyu is governed by a set of rules which are entirely syntactic in form (see Clements and Ford [1977a] for a complete statement of these rules). Thus I assume here that the downstep has been re-analyzed as a grammatical formative in its own right.
Suppose, furthermore, that like the morpheme \([\downarrow]\) of Igbo, the \([\downarrow]\) of Kikuyu undergoes cliticization to the word which follows it. If these suggestions are correct, then after the insertion and cliticization of the \([\downarrow]\), the phrases of (49) will have the underlying representations shown below (where the circled \(\downarrow\) is the downstep):

\[
(62) \begin{align*}
\text{a. } & \uparrow \text{a} \uparrow \text{he} \uparrow \text{rel} \uparrow \text{moa} \uparrow \text{ya} \uparrow \text{hi} \uparrow \text{na} \uparrow \text{pjata} \\
& \text{he gave the weakling (Cl I) a star'} \\
\text{b. } & \uparrow \text{moaneki} \uparrow \text{c} \uparrow \text{ni} \uparrow \text{rel} \\
& \text{'Mwaniki (Cl I) saw'}
\end{align*}
\]

The rule of Identical PCM Deletion (60) will apply to (62b), deleting the \(\uparrow\), and producing the surface contour shown in (63), which is correct:

\[
(63) \uparrow \text{moaneki} \uparrow \text{c} \uparrow \text{ni} \uparrow \text{rel} \quad \text{(cf. (49b))}
\]

For (62a), we will have to introduce a rule of \(\uparrow\) Deletion, the same rule which was proposed in the preceding section for Igbo:

\[
(64) \uparrow \text{Deletion} \\
\quad \uparrow \rightarrow \emptyset / \uparrow _{
}\]

Rule (64) applies to the underlying form (62a) to produce the (correct) surface contour:

\[
(65) \uparrow \text{a} \uparrow \text{he} \uparrow \text{rel} \uparrow \text{moa} \uparrow \text{ya} \uparrow \text{hi} \uparrow \text{na} \uparrow \text{pjata} \quad \text{(cf. (49a))}
\]

So far, then, we are able to account for the facts of Kikuyu using rules of exactly the same form as those we proposed for Igbo in the preceding section.

Now consider the phrase of (50), which undergoes the process which Clements and Ford call "Downstep Displacement". In the present framework, this phrase will have the underlying representation shown below, where the circled \(\downarrow\) is the downstep:

\[
(66) \uparrow \text{ndi} \uparrow \text{narora} \uparrow \text{kega} \uparrow \text{ni}
\]

As usual, the insertion of the downstep has created an ill-formed string containing two pcm's (in this case two \(\uparrow\)'s) at the same syllable boundary; thus a rule must be introduced to resolve the conflict. Of the three logic-
ally-possible strategies for the resolution of such conflicts, Kikuyu chooses the third, i.e. it moves one of the conflicting 's away. The rule which effects this movement may be stated as follows:

(67) **Downstep Displacement**

\[
\downarrow \quad \downarrow \quad \\
S.D. \quad 1 \quad 2 \quad \\
S.C. \quad \text{Move} \quad 2 \quad \text{maximally far to the right.}
\]

The term "maximally far" in the structural change of this rule means to the end of the phrase or to the next pcm whichever comes first. If there is a following pcm within the phrase, rule (67) cannot move the \( \uparrow \) past that point, because of a general condition on tone rules which prevents the movement of one pcm over another (see footnote 17 above). Thus when it applies to the phrase of (66), rule (67) moves the \( \uparrow \) up to the following \( \uparrow \) and no further; the rule of \( \uparrow \) Deletion (64) then deletes the \( \uparrow \), as shown below:

(68) \( \uparrow \) ndi \( \uparrow \) narora \( \uparrow \) ke\( \text{a} \) \( \uparrow \) ñi \quad \text{underlying form, after insertion and cliticization of the}[\[\downarrow \uparrow]]

\( \emptyset \Rightarrow \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \emptyset \quad \text{Downstep Displacement (67)} \)

\( \uparrow \) Deletion (64)

\( \uparrow \) ndi \( \uparrow \) narora \( \downarrow \) ke\( \text{a} \) \( \uparrow \) ñi \quad \text{output so far}

The application of these two rules does not complete the derivation, for there are two downsteps in our output tone contour where there should be only one. The first downstep, which is the "extra" one can be eliminated by means of a rule of \( \uparrow \) Before \( \uparrow \) Deletion, stated formally below:

(69) **\( \uparrow \) Before \( \uparrow \) Deletion**\(^{26}\)

\( \downarrow \rightarrow \emptyset / \quad \ldots \quad \downarrow \quad \text{where } \ldots \text{contains no pcm} \)

Domain: This rule applies at either the word or phrase level.

\(^{26}\)According to Clements and Ford [1977a], there is a downstep after the first word in each of these phrases at the underlying level. However, since the downstep is removed by subsequent rule (Clements and Ford's KU-4 and KU-1, respectively), I have ignored it in these representations.
Rule (69) applies to the output form (68)\(^\text{27}\) to produce the (correct) surface contour:

(70) \(\_ndi\_\overline{\text{nà}}\overline{\text{bà}}\_\text{kena}\_\text{qi}\) 'I watched the crocodile'

Notice that the need for an additional rule (rule (69)) is not a disadvantage of the analysis—quite the opposite, in fact, since the "double downstep" dialect of (57) is easily accounted for by means of a condition on this rule blocking its application to Class I words. Thus, in this dialect, rule (69) will not apply in (57), and the correct output contour is obtained.

The derivation of (68), (70) shows what happens when the rightward movement of a \(\_\) by Downstep Displacement is stopped by a \(\_\) later on in the phrase. Clements and Ford [1977a] also give an example in which the downstep has shifted all the way to the end of the phrase. A derivation of this example in the present framework is given below:

(71) 'he gave' 'weakling' 'banana' 'heavy'

\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) underlying form
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) after insertion
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) plus certain re-
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) adjustment rules
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) Identical-PCM
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) Deletion (60)
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) Downstep Dis-
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) placement (67)
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) + Before + De-
\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) deletion (69)

\(+_\text{ne}_+\_a+_\text{hei}_+\_\text{rê}+_\text{moa}_+\_\text{yà}+_\text{hi}_+\_\text{na}\ _+_\text{iriyo}\ _+_\text{irito}\) output form

'he gave the weakling a heavy banana'

---

\(\text{27}\) As it is stated here, rule (69) predicts the deletion of the initial \(+\) of a phrase like (63); that is, in level-tone terms, it predicts that this phrase should begin on a high tone level when preceded by a high tone. I do not know whether or not this prediction is correct. If it is not, then this result could be avoided by including the deletion of the "extra" downstep in the structural change of the rule of Downstep Displacement (67). I would prefer not to have to resort to a solution of this sort, because there seems to be no principled connection between the two changes the rule would have to effect, namely, the movement of \(+_2\) and the deletion of \(+_1\). Actually, so that the internal \(+\) of ke\(\bar{a}\)\(\bar{a}\) (68) will not itself be delet-
ed before a following \(+\), rule (69) should be ordered before the rule of \(+\) Deletion (64).
While the dynamic-tone analysis of Kikuyu which has been proposed here is still tentative at certain points, I believe it is sufficiently well worked out to illustrate the potential advantages of an analysis along these lines. First, as we have seen here, the dynamic-tone framework allows a very concrete representation of the downstep as a pitch drop (which is just what it is phonetically). Thus we avoid the acquisition puzzle which is posed by analyses which treat the downstep as the reflex of an otherwise inaudible triggering element such as a floating low tone. In addition, as has been shown here, the dynamic-tone framework permits a principled account of the process of Downstep Displacement, for the rule which effects this change is one of a small set of possible strategies for the resolution of an ill-formedness created by the insertion of a "bare" pcm into the string. Finally, the analysis proposed here includes a plausible account not only of the standard dialect, but also of the "double-downstep" dialect which was illustrated in (57).

3. The Associative Marker of Twi: An Instance of Syntactically-Distributed Upstep

In the preceding sections of this paper, I argued that the syntactically-governed downsteps of Igbo and Kikuyu should be analyzed as morphemes whose only phonological realization is a pitch drop (\(+\) ). Since the theory of tone which is proposed here also provides a second basic tone marker, \(+\), we naturally expect that there should also be morphemes consisting of a \(+\) only, and that the introduction of one of these morphemes into a phonological string should give rise to tonal alternations of the same sort as those we have found in connection with downstep. In this section, I will take up some data from Twi which seem to fulfill this prediction. The analysis proposed here is based on data presented in Nyaggah [1976].

Nyaggah begins her discussion by presenting six examples of possessive constructions involving inalienable possession. Here, as she points out, the tone of the possessive pronoun is determined by a sort of polarity rule which gives the pronoun opposite tone from the first syllable of the head noun:
Two further examples illustrate the application of a vowel elision rule which deletes the second vowel of a sequence:

(73) a. ne ti 'her head' ( ne 'her' + è-ti 'head')
    b. nason 'his ear' ( ne 'his' + à-son 'ear')

(73b) shows that Vowel Elision must be preceded by a rule which changes [e] to [a] before [a].

Nyaggah then goes on to present a series of examples involving alienable possession. In contrast to the examples of (72) and (73), these phrases show characteristic tonal mutations in the head noun which Nyaggah attributes to the presence of a floating high tone associative marker. The examples are divided into two groups: first those whose stems have initial low tone underlyingly and then those with high-toned stems:

(74) a. nàkównà 'her chair' ( à-kównà 'chair')
    b. nè pònà 'her walking stick' ( pònà 'walking stick')
    c. nè dúà 'his tree' ( è-dúà 'tree')
    d. nè sàpo 'her sponge' ( sàpo 'sponge')

(75) a. né tâ 'his ladle' ( è-tâ 'ladle')
    b. nàfuò 'her farm' ( à-fuò 'farm')
    c. né pônò 'his table' ( è-pônò 'table')
    d. né dàn 'his house' ( è-dàn 'house')

The generalization to be drawn from this data is as follows: stems with the lexical contour LH (74) acquire H'H tone in this construction, with low tone on the possessive pronoun, while stems with the lexical contour H or HH (75) become 'H(H), with high tone on the possessive pronoun.

I will not present Nyaggah's own account of these facts but will proceed directly to a dynamic-tone analysis. Let us begin by assuming that

28The "'" indicates a downstepped high tone. "'" and "", as usual, indicate high and low tone respectively.
lexical tone contours in Asante are represented as in Kikuyu, with the "word level" pcm at the beginning of the word. Then the phrases of (72) will be derived as follows:

\[(76)\]
\[
a. \quad \text{ne} + \text{r̃ērē} \implies \text{ne}_+\text{r̃ērē} '\text{his wife}'
\]
\[
b. \quad \text{ne} + \text{pa}_+\text{pa} \implies \text{ne}_+\text{pa}_+\text{pa} '\text{her father}'
\]
\[
c. \quad \text{ne} + \text{w̃ofa} \implies \text{ne}_+\text{w̃ofa} '\text{her uncle}'
\]
\[
d. \quad \text{ne} + \text{na}_+\text{ña} \implies \text{ne}_+\text{na}_+\text{ña} '\text{his grandparent}'
\]

Notice that if the possessive pronoun ne is assumed to be toneless, then its "polarized" tone in these examples follows automatically from the assumption that the word level pcm lies at the beginning of the word in Asante.

Now consider the examples of (73), which involve Vowel Elision. These phrases have the underlying representations shown below:

\[(77)\]
\[
a. \quad \text{ne} + \text{e} + \text{t̃i}
\]
\[
b. \quad \text{na} + \text{a} + \text{son} \quad \text{(after assimilation of [e] to [a])}
\]

The deletion of the underlying vowels in these forms by Vowel Elision creates an unacceptable output, since the word initial + will end up at the same syllable boundary as the following + . This ill-formedness is eliminated by means of the following rule:

\[(78) \quad \text{Pcm-Shift (Leftward)}\]

\[
σ \quad \text{pcm} \quad \text{pcm}
\]

S.D. 1 2 3

S.C. Move 2 to the left of 1.

Condition: The boundary to the left of 1 is not already occupied by a pcm.

Vowel Elision and pcm-Shift apply to the underlying strings (77) to derive the (correct) surface forms shown in (79):

\[(79)\]
\[
a. \quad \text{tne}_+\text{t̃i} '\text{her head}'
\]
\[
b. \quad \text{tna}_+\text{ña} '\text{his ear}'
\]

Now consider the phrases of (74) and (75). Let us assume, with Nyaggah, that phrases of this type contain a (purely tonal) associative morpheme; we depart from Nyaggah in analyzing this morpheme as a pitch rise marker +
rather than as a floating high tone. These phrases will then have the un­
derlying representation shown below, where the circled + is the associ­ative morpheme:

(80) a. na + akon + wa (after assimilation of [e] to [a])
    b. ne + po + ma
(81) a. na + a + fuo (after assimilation of [e] to [a])
    b. ne + e + pono

vowel Elision now applies to produce the intermediate forms below:

(82) a. na + kon + wa
    b. ne + po + ma
(83) a. ne + fuo
    b. ne + pono

The massive conflict of pcm's at the syllable boundary between the two con­stituents is now resolved as follows: first, the + + sequences of (82) are eliminated by means of a rule which shifts the + to the following syllable boundary. A statement of this rule is given below, along with the output which is obtained by applying it to (82):

(84) + Shift (Rightward)
    + + σ
    S.D. 1 2 3
    S.C. Move 2 to the right of 3.

(82') a. na + kon + wa => na + kon + + wa
    b. ne + po + ma => ne + po + + ma

Notice that rule (84) cannot apply to the forms of (83) because the rightward movement of the + is blocked by the following +. Instead, these forms undergo rule (78), which shifts the associative + to the left, creating the intermediate forms shown in (83'):

(83') a. ne + fuo => + ne + fuo
    b. ne + pono => + ne + pono

Finally, the remaining + + sequences are eliminated by means of an
"addition" rule which merges a \( + + \) sequence into a small pitch drop ( ' ).

The application of this rule produces the (correct) output tone contours shown below:

\[
\begin{align*}
\text{(82')} & \quad \text{a. } n_\uparrow \text{kon } ʷ\text{wa} & \quad \text{her chair} \\
\text{b. } n_\uparrow \text{po } ʷ\text{ma} & \quad \text{her walking stick} \\
(83') & \quad \text{a. } n_\uparrow \text{fu}_\uparrow \text{o} & \quad \text{her farm} \\
\text{b. } n_\uparrow \text{p}_\uparrow \text{ono} & \quad \text{his table}
\end{align*}
\]

In summary, the changes from lexical tone in Asante alienable possessive phrases arise, in this view, from the presence of an associative marker + at the constituent boundary of the phrase. The presence of this "extra" pcm, along with the rule of Vowel Elision, creates a pcm conflict at the constituent boundary. This conflict is resolved by means of rules which (i) move one of the conflicting pcm's to an adjacent syllable boundary or (ii) merge a \( + + \) sequence into a single small sized pitch drop ( ' ).

Because this analysis is based on such a small set of data, it must be regarded as very tentative. Nevertheless, the analysis is important, I believe, as an illustration of the sorts of tonal alternations which would, in principle, be expected to occur in the environment of a morpheme which consisted of a "bare" + . I think it is significant that the rules which are found to apply in this case are of the same form as those which we observed in connection with the + 's of Igbo and Kikuyu. This is a very satisfactory result, since it suggests that there are strong, specifiable constraints on the tonal alternations which may be expected to occur in the environment of grammatical formatives whose phonological realization is purely tonal.

[Editor's note: A reply to this article by George N. Clements and John Goldsmith, with a rebuttal by Mary M. Clark will appear in a future issue.]
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Thursday, April 10

KEYNOTE ADDRESS

Joseph H. Greenberg, "Some areal phenomena of African languages and the problem of their explanation"

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Charles M. Nelson, "Nilotic and Cushitic prehistory in East Africa"
Jean-Marie Hombert, "The languages of the Cameroonian grassfields and their closest relatives"
Paul Newman, "An Afroasiatic conjugational pattern of gender and number agreement"
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Russell G. Schuh, "Change in gender marking systems"
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M. Lionel Bender, "The Eastern Jebel languages"
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Lee Becker and Ellen Contini-Morava, "Analogical rule restructuring in Kinyarwanda"
Hazel Carter, "Extraneousness in supra-segmental phonology: some Bantu cases"
Hounkpatin Capo, "Nasal vowels and nasalized consonants in Gbe: case of rule ordering"
Donald Churma, "More on Rule Inversion in Chadic"

M.A. Uwalaka, "Deixis and the Igbo motion verbs ibia and iga; ila and ilo"

Robert A. Leonard, "Swahili demonstratives: the one-to-many relation of meaning and message"

Keith Allan, "Anaphora, cataphora, and topic focussing: functions of the object prefix in Swahili"

Evening

Eyamba G. Bokamba, "Evidence against the cyclicity of verbal agreement"

Discussants: Talmy Givón (University of California) and Alexis Takizala Masoso (Université nationale du Zaire)

George N. Clements, "The hierarchical representation of tone features"

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Charles Kisseberth and David Odden, "Aspects of tone assignment in Kimatumbi"

Charles Kisseberth and Winifred Wood, "Tone displacement in Digo"

John Stewart, "Horizontal assimilation in Asante Twi tonology"

Mary M. Clark, "Ewe and the theory of tone spreading"

David Dwyer, "Tone in Achooli"

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Tony Obilade, "Language hybridization and the pidginization model in language acquisition"

S. Saloné, "Doubt and more or less uncertainty in Swahili"

Talmy Givón, "Krio verb complements and the hierarchy of manipulation"

Mallafé Dramé, "Complex structure conspiracy and the grammar of Mandingo complementation"

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Airen Amayo, "Tone rules and derivational history in Edo phonology"
Dominique Bossé, "The tonal behavior of nominal constructions in Bete"
Susan U. Stucky, "The syntax of relative clauses in Makua"
Carol Eastman and Okoth Duncan Okombo, "A functional interpretation of Swahili verbs"
Ann Biersteker, "Some problematic 'case frames' in Swahili, Kikuyu, and Embu"
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Ellen Broselow, "Cliticization in Cairene Arabic"
John McCarthy, "Arabic broken plurals: an autosegmental account"
M.H. Mustafa, "Emphatic spread in Sudanese Standard Arabic"

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Linda Hunter, "Language attitudes in Hausa literature"
Madziwanyika S. Tsomondo, "The rule of Shona linguistic formalism in maintaining the African traditional status quo in Zimbabwe"
Eustace Yawo Egblewogbe, "Language as a reflection of culture: a sociolinguistic examination of Ewe personal names"
John M. Keegan, "Literacy in the Sara languages: a state of the art report"
John Goldsmith, "An autosegmental account of Tonga tone and accent"
Rebecca Agheyisi, "The development of modern scientific terminologies in African languages: problems and prospects"

Saturday, April 12

Morning  PHONOLOGY

Alexis Takizala Masoso, "Nasals and Bantu phonology"
Robert K. Herbert, "Bantu ejectives and aspirates: a perceptual origin"
J.W. Snyman, "The Zu/'hoasi language: a Bushman language of South West Africa/Namibia"
Barbara F. Wallace-Gadsden, "/a/ within the system of Maasai Vowel Harmony"
Mona Lindau, "Some phonetic differences among Nigerian languages"
James F. Fordyce, "The ideophone as a phonosemantic class: the case of Yoruba"

HISTORICAL SYNTAX

Linda Arvanites, "Serial verb or cognate object: evidence from semantic change"
Paul Kozelka, "Verbs as prepositions in Ewe—an SOV language 'over-the-hill'?
Nahed El Adly, "Present state of word order in the Nobiin dialect as spoken in Cairo"
Beatrice Hall and R.M.R. Hall, "Paradigmatic alternation in Atuot"
Grover Hudson, "Significant exceptions in Masqan and Gogot"

SYNTAX II AND CLASSIFICATION

John Hutchison, "A reinterpretation of Kanuri subordination"
Larry G. Hutchinson, "The complexity of Temne emphatics"
André Dugas, "Phrases clivées en vata"

The Twelfth Conference will be held at Stanford University.
PUBLICATIONS RECEIVED

(Write M. Lionel Bender, Department of Anthropology, Southern Illinois University, Carbondale, IL 62901, USA)

A brief grammatical sketch and lexicon of Gaam (Ingessana), a Nilo-Saharan language of Greenberg's Eastern Sudanic group which is spoken in the Sudan. The grammatical introduction contains such features as basic derivational processes; nominal inflections; demonstrative, pronominal, and verbal paradigms; and brief notes on syntax. The bulk of the book is a Gaam-English lexicon. This is followed by an English-Gaam lexicon and appendices listing various types of classified vocabulary (color terms, kin terms, numerals, place and tribe names, unidentified flora, and untranslated terms).


Vute [vútèê] is classified by Greenberg as a Bantoid language, and is spoken by about 14,000 people in the United Republic of Cameroon. This work concerns the Mbanjock dialect, which is considered to be identical with the dialect used in Yoko, the town located in the geographical center of the Vute region. The work contains a brief ethnological introduction, followed by a study of the phonology of the language with notes on the Mangai dialect, and a proposal for a practical alphabet which could be used for preparing manuals for literacy programs. The chapter on composition and derivation describes the basic procedures used to form new lexical items. The work concludes with a Vute-French glossary with sample sentences showing how the lexical entries are used.


A collection of papers on Punu, a Bantu language classified B 43 by Guthrie. The contents are as follows:
Chapitre I  Esquisse phonologique du punu (J. Kwenzi Mikala)
Chapitre II  La tonalité des thèmes nominaux en punu (G. Puech)
Chapitre III  La numération (J. Blanchon)