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Studies in African Linguistics
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THE HAUSA PARTICLE KŌ: AN UNCERTAINTY MODALITY[1]

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1. Introduction

The morpheme kō in Hausa has been translated as having the meaning 'or, question, really, even, if, even though, and every'. As far as I know, Hausa-ists have never attempted to go beyond observational adequacy in their treatment of kō: they have been content to list meanings, sometimes providing examples.[2] In this paper I attempt to find a meaning for kō which is unique and consistent throughout its uses. I find that there is a very interesting semantic generalization that can be made about kō, taking into account two recent papers on modalities which I will discuss first as background. Next, I will discuss the syntax and semantics of different kinds of sentences containing kō. Finally, I will consider how to incorporate the particle into a transformational grammar of Hausa.

2. Modalities in Language

Two papers, Jackendoff [1971] and later Givón [1973], treat the role that modalities play in the semantics of language. Givón is mainly concerned with referentiality, and those opaque environments which produce ambiguity as to whether or not a noun phrase is referential, i.e. is presupposed to exist. Modalities which occur in a sentence may determine the referentiality of noun phrases within their scope. For Givón, a factive modality is

> one by which a speaker commits himself to the (past or present) truth of a certain proposition--and therefore commits himself to the referentiality of the participating

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[1]Many thanks to my informants Malam Salisu Abubakar and Malam Abba Kano. Earlier versions of this paper were read and criticized by Paul Schachter and Talmy Givón. The paper also benefitted from discussions with Ray Jackendoff and Theo Vennemann.

[2]In his entry for kō in his Hausa dictionary Abraham notes that kō can be prefixed to question words to form indefinites as discussed in section 2.6. He does not, however, attempt to arrive at a unified meaning for kō, nor does he try to account for the meaning change in the derived words.

> nominals. A 'non-factive' modality, on the other hand is one in which the speaker does not make such a commitment [1973:15].

Givón makes the claim that universally all nominals are referential unless they fall within the scope of a non-factive modality. Non-factive modalities include NEG (both negation and inherently negative verbs such as 'doubt'), FUTURE which covers future aspect, future implicative verbs such as 'want', 'plan', 'try', and 'look for', and coercive-manipulative verbs such as 'permit' and 'ask'. Yes-no questions, conditionals, HABITUAL and non-factive verbs such as 'believe', 'hope', 'think' and 'be sure' are also non-factive modalities within Givón's system. If any of these modalities is present in a sentence it may produce ambiguity as to whether a nominal is presupposed to exist--it creates an opaque environment.

Jackendoff [1971] is dealing with very similar linguistic phenomena in his paper. He is concerned with the specificity of noun phrases when they occur after modals. His modals (modal operators) include unrealized, future, possible, negative, multiple, generic, and wh-. The first four are the same as Givón's modalities. Unrealized, possible and future are all included under Givón's FUTURE, negation under his NEG. Multiple is used by Jackendoff to disambiguate sentences with quantifiers such as:

(1) Five of the boys told a story.

where it is unclear whether one or five stories is involved. Givón would probably include multiple under HABITUAL along with generic, but I think that generic and multiple cover slightly different semantic fields.

Jackendoff and Givón differ in the ways that they would account for modalities within a grammar. Givón would posit underlying predicates, Jackendoff would have modal operators which are semantic markers, but they arrive at the same conclusions--that the interpretation of noun phrases may depend on whether or not they fall within the scope of a modal.

In the next section I will show that throughout its varied uses kō is a modal which consistently affects the interpretation of constituents which fall within its scope, assigning to those constituents the interpretation that, although the speaker may be committed to the truth of the rest

of the proposition (asserts the rest of the proposition), he does not assert, in fact is uncertain of, the truth of just those constituents which fall within the scope of kō. As such, kō is a non-factive modal. I will also show that kō interacts with other modals like those discussed in this section in an interesting and predictable way.

2.1 Kō meaning 'or'. Kō has been translated as meaning 'or' in sentences like the following:

(2) Bellò yā sàyi (kō) àyàbà kō rōgò.
'Bello bought (either) bananas or cassavas.'

(3) (Kō) Audù kō Bellò, {ɗayansù / ɗayā (dàgà cikinsù)}, yā sàyi mōtà.
'(Either) Audu or Bello, one of them, bought a car.'

(4) Gòbe (kō) Audù zâi yi kàràtū, kō aikì.
'Tomorrow (either) Audu will read or work.'

(5) (Kō) sun tàfi, kō tā dāwō.
'(Either) they left or she arrived.'

(6) (Kō) yā tàfi, kō zâi tàfi.
'(Either) he left or he will leave.'

(7) Yârā ukù kō huɗū sun zō.
'Three or four children came.'

(8) Yā sàyi jā kō shūɗìyar rìgā.
'He bought a red or blue shirt.'

In all of these sentences where kō is used to mean 'or', kō may precede both members of the conjunction or may appear just once between the two conjuncts. The meaning of sentences with constituents joined by kō is always that the speaker is equally unsure about both conjuncts regardless of whether kō precedes both conjuncts, and never that the sepaker asserts the first conjunct and not the second. The scope of kō, therefore, always includes both conjuncts. One of my informants claims that when kō precedes both conjuncts there is a stronger sense of forced choice between the conjuncts, i.e. you have an 'either-or' situation.

Because of this slight meaning difference between sentences where kō precedes both conjuncts and sentences where it appears only between the conjuncts, I will not derive the latter from the former. Rather I will claim that these sentences are different from each other in their underlying representations, the former having two occurrences of the particle, the latter having only one occurrence of the particle. In the semantic interpretation, a double occurrence of the particle will result in the stronger reading.

Notice that the scope of kō can vary tremendously. In sentences (2) through (8) the particle has NP scope, V scope, sentence scope, aux scope, and adjective scope. Where the sentences are positive and in the perfective or progressive aspects the speaker presupposes everything that does not fall within the scope of kō. Thus, (2) presupposes (2'), while sentence (8) presupposes (8'):

(2') Bellò yā sàyí wanì àbù.
'Bello bought something.'

(8') Yā sàyí rȉ̀gā.
'He bought a shirt.'

In sentence (2) the speaker expresses certainty that Bello bought something, and uses kō to express uncertainty about the thing that Bello bought. In sentence (8) the speaker expresses certainty that he bought a shirt, and uses kō to express his uncertainty about the color of the shirt.

The use of kō to mean 'or' is restricted in the following ways. First, kō can be used to conjoin direct objects as in (2) where the subject of the sentence is in the second or third persons. However, with first person subjects, in the perfective or imperfective, in positive sentences direct objects conjoined with kō are very questionable. My informants consistently strongly rejected sentences like (9) and (10):

(9) ?Nā sàyí àyàbȁ̀ kō rōgȍ̀.
'I bought bananas or cassavas.'

(10) ʔInà sàyɔn àyàbɑ̀ kɔ̄ rɔ̄gɔ̀.
'I am buying bananas or cassavas.'

If a sentence is in the perfective or imperfective with a first person subject and is negated, or if a sentence with a first person subject is in the future or habitual aspect, or occurs after a modal verb such as those discussed in the first section, the direct objects can be conjoined with kɔ̄. So with non-factive modalities:

(11) Bàn sàyi àyàbɑ̀ kɔ̄ rɔ̄gɔ̀ ba.
'I didn't buy bananas or cassavas.'

(12) Zaî sàyi jàrɗɑ̀ kɔ̄ littāfɗ̀.
'I will buy a newspaper or a book.'

(13) Nakàn sàyi jàrɗɑ̀ kɔ̄ littāfɗ̀.
'I usually buy a newspaper or a book.'

(14) Yā yìwu na sàyi àyàbɑ̀ kɔ̄ rɔ̄gɔ̀.
'It's possible that I bought bananas or cassavas.'

Perfective and imperfective are factive modalities within Givón's system. From sentences (9) through (14) it seems that the first person must also be considered as participating in the modal system of Hausa as a factive modality, since it is the <u>combination</u> of first person plus perfective and imperfective aspects that makes the occurrence of kɔ̄ strange in these sentences. The native speakers said of sentences (9) and (10) that a speaker would have to be certain of an action which had happened to him or was happening to him. It was unacceptable to them that the speaker would not assert the <u>entire</u> utterance. The speaker could, however, report uncertainty about what has happened or was happening to another person. Furthermore, if a non-factive modality co-occurred with the first person, showing that the speaker was not asserting the entire utterance, then kɔ̄ could be used to express uncertainty about the direct objects.

Another restriction on kɔ̄ is that it cannot conjoin constituents which function as the subject of matrix sentences. Thus, (15) is ungrammatical:

(15) *(Kō) Audù Bellò yā sàyi mōtà.

'Audu or Bello bought a car.'

As seen in (16) this ungrammaticality extends to sentences containing non-factive modalities as well:

(16) *(Kō) Audù kō Bellò {zâi sàyi mōtà. / bài sàyi mōtà ba. / yakàn sàyi mōtà.}

'Audu or Bello {will buy a car. / didn't buy a car. / usually buys a car.}

In Hausa, subjects are always factive--are always presupposed to exist, unless they are the subjects of embedded sentences which fall within the scope of a non-factive modal. If a constituent falls within the scope of kō it is interpreted as non-factive; if it is the subject of a sentence it must be factive; due to this clash of interpretations, (16) is unacceptable. An acceptable way to express sentence (16) is sentence (3) which I will repeat here for convenience:

(17) Audù kō Bellò, {ɗayansù / ɗayā (dàgà cikinsù)}, yā sàyi mōtà.

'Audu or Bello, one of them, bought a car.'

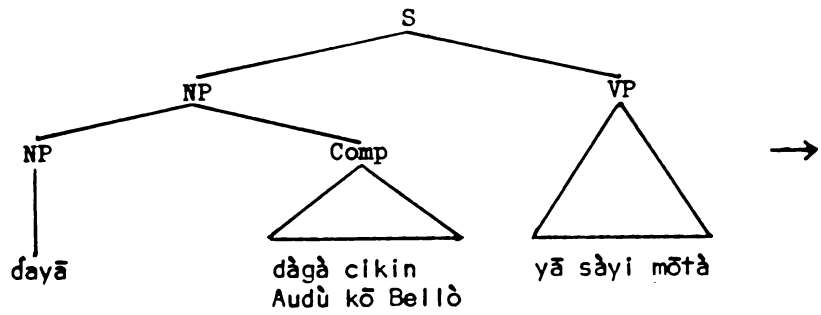
I claim that the underlying representation of (17) is:

(17') Ɓayā dàgà cikin Audù kō Bellò yā sàyi mōtà.

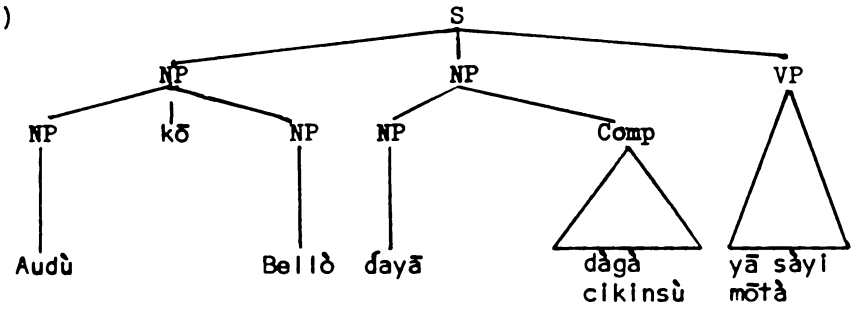
'One out of Audu or Bello bought a car.'

and the subject of the sentence is the factive head noun ɗayā (which is qualified by the phrase dàgà cikin Audù kō Bellò). After a focus copying rule which moves the conjoined NP's out of the qualifier clause and attaches them to the top S-node to the left of the subject NP has applied, sentence (17) results. Sentence (18) is the underlying representation of (17), and (19) is the tree after the transformations have applied:

(18)



(19)



In this way, the constituents quantified by non-factive kō do not serve as the underlying subject of the sentence, and the factive pronoun ɗayā is always present to serve this function.

We have seen that in these sentences where kō has been translated as meaning 'or' the particle functions consistently as a non-factive modal assigning to constituents within its scope the interpretation that the speaker is uncertain about just those constituents. Restrictions on the occurrence of kō within sentences containing factive modalities further support this analysis of the particle.

2.2 Kō as a question particle. Kō seems to be acting as a question particle in sentences like the following:

(20) Yā kāwō kèkē, kō bàì kāwō kèkē ba?
'Did he bring a bicycle or didn't he bring a bicycle?'

(21) Bàì kāwō kèkē ba, kō yā kāwō kèkē?
'Didn't he bring a bicycle or did he bring a bicycle?'

(22) Yā kāwō kèkē, kō?
'He brought a bicycle, didn't he?'

(23) Bàì kāwō kèkē ba, kō?
'He didn't bring a bicycle, did he?'

(24) Kō yā kāwō kèkē?
'Did he really bring a bicycle?'

(25) Kō bàì kāwō kèkē ba?
'He really didn't bring a bicycle?'

Sentences (20) and (21) are yes-no questions conjoined with kō; they are the same kind of construction discussed in the previous section. Kō is not operating as a question particle in these sentences, but conjoins sentences which are already questions adding a stronger sense of uncertainty to both conjuncts.

Sentences like (22) and (23) are very much like tag questions in English. Thus (22) and (23) are very similar to (25) and (26):

(25) Nixon was hiding something, wasn't he?

(26) We didn't believe him, did we?

In sentence (25) the speaker asserts that Nixon was hiding something and adds the tag, not in order to obtain additional information, but rather to ask the hearer to confirm his judgment.[3] In sentence (26) the speaker asserts we didn't believe him and asks the hearer to agree with him in his assertion. Similarly, in sentence (22) the speaker is committed to the truth of the proposition yā kāwō kèkē 'he brought a bicycle', and is asking what my informant called a leading question. The speaker is not asking for information but rather is expressing uncertainty with kō in order to draw confirmation for his assertion. This expression of uncertainty is considered by my informant to be very polite and proper and is a way of including the hearer's judgments in the conversation.

Sentences (24) and (25) are rhetorical questions. These rhetorical questions are much closer in illocutionary force to exclamations than to

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[3]The intonation patterns on tag questions may vary in Hausa as they do in English, with slight meaning differences. However, no matter what the intonation pattern may be it is still the case that the speaker expresses more commitment to the truth of the initial proposition, adding the tag to ask for confirmation.

questions. They do not ask for information but rather enable the speaker to show his attitude towards a proposition. This type of sentence occurs in Hausa when a speaker must admit the truth of a proposition about which he was previously uncertain or doubtful. By the use of kō and question intonation he expresses his surprise that the proposition is true. Thus, in sentence (24) the speaker had previously doubted that yā kāwō kèkē 'he brought a bicycle', and presently admits to the truth of the proposition. We will find this reading of surprise, resulting from the combined interpretations of assertion plus kō-uncertainty, in several other constructions discussed later in the paper.

We have seen that kō occurs in three different types of questions. First, kō conjoins yes-no questions conveying speaker uncertainty about both conjuncts. Second, kō is used following an assertion to express uncertainty, like tag questions in English. Third, kō is used in rhetorical questions where it shows previous uncertainty about a proposition. With all three kinds of questions kō operates as a non-factive modal operator and its meaning remains consistent.

2.3 <u>Kō meaning 'if' or 'whether'</u>. Kō has been translated as meaning 'if' in sentences like the following:

(27) Nā san kō tanà aikì.[4]
'I know if she's working.'

(28) Nā tàmbàyāshì kō tanà aikì.
'I asked him if she was working.'

(29) Yanà cêwā kō sun zō.
'He was wondering if they had come.'

In these sentences kō precedes the sentential complements of the main verb. The speaker asserts in sentence (27) Nā san wani àbù 'I know

[4]Sentence (27) is strange in English as well as in Hausa. Yet it is the case in both languages that this construction is used when a speaker wishes to assert that he knows the truth value of a proposition but he does not wish to assert that the sentence is true or false.

something', but he does not assert that the sentential complement is true. Kō interrupts the scope of the assertion. As such, it is acting as a non-factive modal operator consistent with its other uses.

2.4 Kō meaning 'even'. Kō has been translated as meaning 'even' in sentences like the following:

(30) Kō Bellò (mā), yā zō gidā.
'Even Bello came home.'

(31) Kō (mā) Bellò, tā tàmbayǎ.
'She even asked Bello.'

(32) Kō ìta (mā), tā zō gidā.
'Even she came home.'

(33) Yā yi gudù kō dà karfè biyū (mā).
'He even ran at two o'clock.'

(34) Kō (mā) kwabǒ tā bāsù.
'She even gave them a penny.'

(35) Kō Kanò (mā) tā tàfi.
'She even went to Kano.'

(36) Kō (mā) kèkē, Bellò yā sàyā.
'Bello even bought a bicycle.'

In all of these sentences where kō seems to mean 'even' the particle mā also optionally occurs. In order to understand the constructions with kō it is necessary to examine the structure of sentences with mā like (37). Mā is a particle meaning 'indeed' or 'in fact' which functions as a factive modal, assigning to a constituent within its scope the interpretation of strong emphasis on the part of the speaker. By the use of mā , the speaker is showing his commitment to the fact that that particular constituent is a participant in the proposition represented by the whole sentence. Thus, in sentence (37), Bellò is strongly emphasized, while yā zō 'he came' is not:

(37) Bellò mā, yā zō.
'Bello came.'

Those constituents which are strongly emphasized with mā are almost always in a focused position at the beginning of the sentence, and begin at a higher than normal pitch. Adverbials, such as in sentence (33), are acceptable in post-verbal position, but otherwise my informants preferred that the constituent with kō(mā) be moved to the beginning of the sentence. They always preferred that an object phrase be preposed if it occurred after a factive verb in a positive sentence in the perfective or progressive aspects; if the sentence was negated, or in the future or habitual tenses, or contained a non-factive verb it was acceptable for the object with kō to follow the verb. Locatives were also more acceptable in preposed position with the kō(mā) constructions. Thus, sentences (35) and (36) are preferable to sentences (38) and (39):

(38) ?Bellò yā sàyi kō (mā) kèkē.
kō kèkē (mā).

'Bello even bought a bicycle.'

(39) *Tā tàfi kō Kanò (mā).
kō mā Kanò.

'She even went to Kano.'

Because of this requirement that the kō constituents be preposed, perhaps it is preferable to analyze this construction as a mā-emphasis construction to which kō has been added. An analysis of the meaning of 'even' supports this hypothesis. We saw in the section on questions that kō sometimes occurs in rhetorical questions where the speaker who previously was not committed to the truth of a proposition was presently convinced of the truth, and we find that combining kō, to show previous uncertainty, with assertion we get a meaning of unexpectedness on the part of the speaker. One of the implications of even in Hausa, as in English, is that the speaker implies that he did not expect the proposition to be true. So in:

(40) Even Pat thinks he's guilty.

the speaker presupposes that many people think he's guilty, asserts that Pat is an additional member of the set who think he's guilty, and implies that I wouldn't have expected Pat to think he's guilty. Similarly in

Hausa, sentence (30) has the following presupposition, assertion, and implication:

(41) presupposition: Àkwai mùtumìn wadàndà sukà zō gidā.
'There are men who came home.'

assertion: Bellò kumā yā zō gidā.
'Bello also came home.'

implication: Nā yi màmākì dà Bellò mā yā zō gidā.
'I'm surprised that Bello came home.'

There is a way to say even in Hausa without this sense of unexpectedness on the part of the speaker.

(42) Kōwā yā zō gidā, harr Bellò.
'Everyone came home, even Bello.'

This sentence asserts that the set of people who came home has one additional member but does not add that it is unexpected that Bello also came home. We can see that it is the use of kō which results in this meaning. Again we have a case where the use of a non-factive modality within the scope of a factive modality results in a reading of unexpectedness. Therefore, kō, even in sentences where it combines with other modals to form a third meaning, is behaving as a non-factive modality and its use is consistent with those discussed previously.

2.5 Kō meaning 'even if'/'even though'. Kō means 'even if' or 'even though' in sentences like the following:

(43) Kō dà yakà tanā dà kyâu banā sontà.
'Even though she's beautiful, I don't like her.'

(44) Kō dà tanā dà kyâu, ba zân so tā ba.
'Even if she were beautiful, I wouldn't like her.'

Sentence (43) is a conditional sentence with the antecedent within the scope of kō, and sentence (44) is a counterfactual conditional. The sentences are very similar in meaning. In sentence (43) the speaker is committed to the truth of a conditional (P → Q); he presupposes that the antecedent holds (P), but adds that, contrary to expectations, the

consequent does not hold (~Q). So, sentence (43) has at least the following interpretation:

(45) implication: (P → Q)
In màcè tanɔ̀ dà kyâu za'à so tà.
'If a woman is beautiful, one will like her.'

presupposition: (P)
Tanɔ̀ dà kyâu.
'She is beautiful.'

assertion: (~Q)
Banɔ̀ son tà.
'I don't like her.'

In sentence (44) we have very much the same meaning. In this sentence the speaker holds the same conditional to be true as in (45), but in this case he says that even if in some possible world the antecedent (P) were true, nevertheless the consequent would not hold (~Q). I claim that kɔ̄ does not carry a conditional meaning in either of these kinds of sentences. It retains its consistent meaning of non-assertion on the part of the speaker. Since the propositions preceded by kɔ̄ (P) and (Q) are held to be true by the speaker, the factive meaning combines with the non-factive meaning of kɔ̄ to form the interpretation that the assertions are contrary to the expectations of the speaker, a combination of meanings which we have found in previous sections. Kɔ̄ therefore is behaving consistently as a non-factive modality.

2.6 Kɔ̄ meaning 'every', 'each' and 'any'. It has been noted by many Hausa-ists (including Abraham, for instance) that kɔ̄ can be prefixed to interrogative words to form indefinites:

(46)

wànè, wàcè	→	kɔ̄wànè, kɔ̄wàcè
'which'		'everyone/anyone'
mɔ̀	→	kɔ̄mɔ̀
'what'		'everything/anything'
ìnɔ̄	→	kɔ̄'ìnɔ̄
'where'		'everywhere/anywhere'

wā	→	kōwā
'who'		'everyone/anyone'
yaùshè	→	kōyaùshè
'when'		'whenever/always/never'

The words in (46) are used as follows:

(47) Mè sukà sàyā?
'What did they buy?'

(48) Sun sàyi kōmè.
'They bought everything.'

(49) Bàsù sàyi kōmà ba.
'They didn't buy anything.'

Givón [1973] points out that these constituent questions or identity questions "involve a presupposed sentence (proposition) in which the identity of one element...is not fully known...and is queried. Thus, the referentiality of the constituent under query is also presupposed" (p. 114). My informant agrees that sentence (47) presupposes:

(50) Sun sàyi wani àbù.
'They bought something.'

This is borne out by the fact that identity questions must be cleft sentences in Hausa. Cleft sentences share the requirement that those portions of the sentence which are not clefted are presupposed.

The derived words formed by prefixing kō to interrogative words are not referential, are not presupposed to exist. Kō, as a non-factive modal, removes this presupposition. The interpretation of these words depends on whether they fall within the scope of a factive or non-factive modality. Thus, in sentence (48) kōmè is referential (to a set) because it falls within the scope of the perfective, a factive modality. In sentence (49) it is non-referential since it falls within the scope of the negative. Kō functions consistently to remove the factivity of these derived words. Its non-assertive meaning combines with the basic meaning of these words depends on whether they occur in a factive or non-factive environment. English lexicalizes these separate interpretations

with separate lexical items. For instance, every-words occur in positive sentences, as subjects of sentences, as objects of positive factive verbs, while any-words occur in negated sentences, in the future and habitual, etc.:

(51) Everyone went home. *Anyone went home.
They broke everything. *They broke anything.
They didn't break anything. ?They didn't break everything.

Although Hausa lexicalizes with kō only, both the factive and non-factive interpretations are available.

3. Summary of the Data

In sections 2.1 to 2.6 we found that kō can be assigned the consistent readings of non-assertion or uncertainty on the part of the speaker. Hausa has many ways of showing the speaker's attitude towards the truth value of a sentence through its system of modalities. Some of those which I have discussed in these sections can be arranged on a scale which shows the degree of assertion assigned to constituents within their scope:

(52)

degree of speaker's commitment to the truth of the proposition ↑		
	mā 'in fact, indeed'	strong or emphatic assertion
	perfective and progressive with factive verbs	assertion
	question (yes-no) in 'if'	neutral, speaker neither asserts nor doubts truth of proposition
	kō the word shakkà 'doubt'	non-assertion, doubt
	negation neg-factive verbs like kāsà 'be unable to'	commitment to falseness

We have also found in these sections that kō can combine with other modals to form a third interpretation, which is different from the interpretation of kō or the other modal. Thus, kō + mā is assigned the reading of unexpectedness on the part of the speaker that a proposition is true. And kō + interrogative word is assigned a neutral reading, so that the constituent depends on its environment for interpretation.

Finally, we found that unless kɔ̄ combines with some other modal to form such a third interpretation, it cannot occur in factive environments such as in subject position in a matrix sentence, or as the object of a factive verb in an affirmative sentence in the perfective or progressive with a first person subject.

The claim that kɔ̄ is an uncertainty modality is supported by a Hausa saying cited by Abraham in his dictionary entry for kɔ̄:

(53) Bā'à̀ sam màganà dà 'kɔ̄'.
literally: 'No one likes speech with "kɔ̄".'
meaning: 'No one likes uncertainty.'

This saying shows that the Hausas have formed a meta-linguistic generalization about kɔ̄ which conforms to my hypothesis about its meaning.

One final note on the use of kɔ̄: I asked one of my informants his feelings about sentences with more than one occurrence of kɔ̄ such as:

(54) Kɔ̄ Bellò mā zâi sàyi àyàbà̀ kɔ̄ rɔ̄gɔ̀̄, kɔ̄?
'Even Bello will buy bananas or cassavas, won't he?

He said that he would never say a sentence like (54), but "that's the way that women talk." Lakoff in a recent paper, "Language and Woman's Place", makes the claim that women use the tag question formation more than men do because we have been 'taught' to speak in a non-assertive manner, and tag questions "provide a means whereby a speaker can avoid committing himself" (p. 17). While neither Lakoff nor I have done a careful study of the distribution of the use of these constructions in women's speech, it is interesting to find that her claim also makes a correct prediction for Hausa, namely, that even Hausa women use uncertainty modalities more than their men.

4. Incorporation of 'kɔ̄' into a grammar

Kɔ̄ will be treated here as a modal operator with a defined predictable scope. Those constituents which fall within its scope are assigned a reading, namely that the speaker does not assert, and is uncertain of, the truth of just those constituents within the sentence. Kɔ̄ can have sentence, NP, V, VP, Aux, adverbial, and adjective scope.

We have seen that kō interacts with other modals in the following way:

(55) a. may not occur within the scope of:
  i. subject position
  ii. direct object of factive verbs with first person subjects, in the perfective or imperfective (i.e. if occurring, it will result in an anomalous reading)

b. is modified in meaning from uncertainty to unexpectedness by:
  i. mā
  ii. rhetorical questions
  iii. counterfactuals and even though conditionals

c. removes a presupposition of referentiality from question words resulting in a neutral reading

The unpredictable way in which kō interacts with other modals is a problem for the theory. When we found that kō could not occur in factive environments, as in the (55a) cases above, we pointed out that this was because of a clash of interpretations; non-factive kō could not occur with factive modals. Yet very much the same clash of interpretations occurs in the (55b) cases above, but the result is not an anomalous utterance, but rather a modification of meaning with one modal operator dominating kō resulting in a weaker, but predictable, interpretation of unexpectedness on the part of the speaker. In the (55c) cases above, kō again clashes with the reading of another modal, a question word in this case, but a third outcome results, namely, kō dominates the other modal and removes a presupposition of referentiality from it. It would be preferable in the grammar if the reading of kō plus any other modal could be predicted just from the meaning of the elements occurring in the sentence, not from knowing the relative strength of the modals in the language. As it stands, it appears that a speaker of Hausa must learn a strength hierarchy of modal operators. He must learn, for instance, that the factivity of subject position is not modified by future, negative, or kō, but the interrogative words are altered; a presupposition of factivity is removed by kō. This means that each

time he learns a new modal he must also learn its strength relative to every other modal in the language. Some of this hierarchy may prove to be universal; subject position seems to be factive in most languages.

My investigation of the particle kō has led me to an attempt to account for what happens when contradictions occur in language, specifically, what kinds of meanings may result from clashes between factive and non-factive modalities when they co-occur. Contradiction is something that occurs in all languages. It is necessary to be able to express that something happened contrary to expectations. At times an assertion must be made that violates an if-then condition that the speaker previously, or even presently, holds to be true. It will be interesting to investigate further how factive and non-factive modalities interact in other languages to form these interpretations.

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RULE INVERSION IN CHADIC: A REPLY

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1. Introduction

In a discussion of some interesting examples of developments in two Chadic languages, Schuh [1972] has attempted to document rule inversion as a mechanism of linguistic change. Rule inversion is said to take place "when a historical change *A > B / X___Y is reflected by a synchronic rule B → A / X___Y" (p. 379). This situation would result in an etymologically basic segment A not being present in underlying forms where it used to appear; for a while, segment A is derived in the appropriate environments from segment B, and where this situation leads to what Schuh calls "conceptual anomaly", the language changes in the direction of eliminating the inverse rule, thereby removing A from surface forms in which it used to appear or bringing about some other simplification.

Schuh states (p. 379) that "the principal empirical evidence for the existence of rule inversion comes from linguistic changes which take place after the original change(s), but which would have no conceivable motivation if the synchronic rules replicated the original diachronic process(es)." Basically, the fact that rule inversion creates a "conceptual anomaly" is what is responsible for subsequent changes: to reduce the level of anomaly, the alternation between B and A is regularized in some fashion, or the alternation is lost completely in favor of the etymologically less basic segment B.

In this paper I argue that Schuh's evidence does not lead to the intended conclusion. The basic objection will be that while the "conceptual anomaly" created by an inverse rule would in some cases be sufficient to motivate a change of the type observed by Schuh, this is not true in all cases; furthermore, it does not appear to be a necessary factor in such developments. Rather the positing of a synchronic stage with "conceptually anomalous" inverse rules constitutes a middleman which it would be advantageous to eliminate in principle from the realm

of possible phonological systems. In the course of the discussion, I will propose alternatives which do not seem to suffer from the empirical and theoretical defects of the analysis involving rule inversion.

2. Kanakuru

In his discussion of Kanakuru, Schuh notes that stops have undergone the following changes in certain phonological environments: labials have become w (or ß in some dialects), alveolars have changed to r, and velars have become ɣ. The weakening of stops to sonorants has taken place intervocalically, except when the stop was both preceded by a short vowel and followed by e, and when the stop was followed by ə. Another place in which this change took place was after a consonant which did not agree with the stop in its specification for the feature [coronal]. muri has r in place of etymological t, ɗəɣi has ɣ for etymological k, and tuwi has w for etymological f. But kape, where p is preceded by a short vowel and followed by e, has not become kawe; and jupəle, where p is followed by ə, has not become juwəle.

Schuh observes that these changes gave rise to synchronic alternations between stops and sonorants, and he proposes that the synchronic rules expressing the alternations were the inverse of the historical process: that is, sonorants become basic "in the more basic syntacto-semantic forms", and stops came to be derived from them. However, the derivation of stops from sonorants led to great complications in the grammar, and these complications subsequently induced the language to change in a certain way. The complications resulting from rule inversion in this case are obvious. For example, if we have a sonorant w, we have no way of predicting whether it will alternate with p, b, or ß; because of this, it will be necessary, for each instance of w that alternates with a stop, to assign it to a morphological category that will tell us which stop it alternates with. Hence, lexical entries may contain w_1, which alternates with p; w_2, which alternates with b; and w_3, which alternates with ß. A further complication is that we must add w_4, the reflex of etymological w, which does not alternate with any stops. Similar measures must be adopted for the alveolar and velar series.

Because this ad hoc marking is "conceptually anomalous", the language is led to regularize the alternations. Schuh observes that regularization was achieved in Kanakuru by converting all sonorant-stop alternations into alternations of sonorant with the corresponding voiceless stop. This simplification was extended even to etymological sonorants, which now began to alternate with the corresponding voiceless stops.

Of course, the proposed explanation for the historical changes is only as valid as the proposed "conceptually anomalous" stage which putatively led to the changes. It is important to note that Schuh presents no direct evidence that the sonorants became basic but rather states that by assuming that this is what happened, it is possible to explain the historical developments. However, if we do not assume that sonorants became basic, it is still possible to explain the historical developments.

Consider first the regularization of the sonorant-stop alternation which led to sonorants alternating only with voiceless stops. In the examples given by Schuh, the voiceless stops resulting from this regularization appeared in a typical devoicing environment, immediately preceding a voiceless stop. duri 'neck', where r is etymologically from d, appears as dut in dut-to 'her neck'; duwi 'to mix', where w is etymologically from ß, appears as dup in dup-ko 'he mixed (it) for you'. Thus even if we assume that the sonorants did not become basic, i.e. that the underlying roots of 'neck' and 'to mix' remained /dud/ and /duß/ for a while, it would still be possible to explain why d and ß alternated with voiceless stops: they appeared in devoicing environments. Meanwhile, with historical weakening incorporated as a synchronic rule (a possibility which Schuh accepts in principle), the basic forms would still be realized as duri and duwi. If, in addition, etymological d, ß, etc., ceased to surface phonetically as voiced stops, then future generations would be presented with no synchronic evidence for setting up underlying voiced stops in these words. Instead, one would be faced with a choice: either voiceless stops became basic and the historical weakening rule was retained, or sonorants became basic and the historical weakening rule became inverted.

Let us see what evidence Schuh offers in favor of the latter alternative. He claims that the fact that sonorant-stop alternations were extended even to historical sonorants, so that they came to have voiceless stop alternants, is evidence for an inverse rule rather than for the original weakening rule. But in fact the only instances he cites of the extension of the alternation to historical sonorants occur in word final position, and Schuh himself notes (p. 386) that "word final is a position of neutralization where stops and sonorants cannot contrast either phonetically or underlying [sic]. At the deepest level, these word final consonants are archiphonemes, unspecified for the feature [sonorant]." Thus it is unnecessary to posit a "conceptually anomalous" stage to account for the extension of the sonorant-stop alternations to etymological sonorants in word-final position. Instead, the motivation for this extension is simply that if a word like mot 'oil' (where t comes from etymological r) were pronounced mor it would violate the otherwise exceptionless pattern of neutralization of stops and sonorants in word final position. The t in mot will naturally be subject to the same alternations as any other instance of t. Hence, it becomes r in mor-i 'the oil'.

Another reason given in favor of rule inversion stems from the following forms:

(1)	Basic verb form	Subj. + Verb + Clitic, etc.	
a.	wupe 'to sell'	a wupə-ro	'he sold (it) to her'
b.	guwi 'to forge'	a gup-ro diɣii	'he forged a hoe for her'
c.	kuke 'to learn'	ši kukə-mai	'he is learning (it)'
d.	duɣi 'to beat'	ši duŋ-ŋai	'he is beating (it)'
	(cf. also a duk-ro 'he beat (it) for her')		

Schuh claims that if we were to take the medial consonants as underlying stops in all of the above verbs, then there would be no way to distinguish the medial consonant in the verb root in (a) from that in (b), and the medial consonant in the verb root in (c) from that in (d), for the purposes of ə-Epenthesis. This is incorrect. Consider first Schuh's own treatment, which he does not formulate explicitly but which may be

pieced together from the following statements.

Kanakuru has a rule which, according to Schuh (p. 384), drops the final -ɨ of verbs in non-utterance-final position. In addition, Schuh observes (p. 381, fn. 2) that the function of ə-Epenthesis is to break up an obstruent-sonorant cluster, and he mentions (p. 387) a rule assimilating ɣ to a following nasal. Since -e in the basic verb form is also replaced by ə before the clitic in (1), Epenthesis has been formulated accordingly in (2b). Finally, this proposal employs a Strengthening rule which is the inverse of the historical weakening process. Schuh regards the underlying verb forms as identical with the surface isolation forms in the left-hand column above. The rules just mentioned might be formulated as in (2) and would apply to the verbs in the second column of (1) as shown in (3).

(2) a. ɨ-Dropping $\quad ɨ \rightarrow \emptyset \;/\; \underset{\text{Verb}}{\_\_\_]}$

CONDITION: ɨ is not utterance final

b. Epenthesis $\quad \left\{ \begin{matrix} \emptyset \\ e \end{matrix} \right\} \rightarrow ə \;/\; [\text{-son}]\_\_\_ \begin{matrix} C \\ [\text{+son}] \end{matrix}$

c. Nasal Assimilation $\quad \left\{ \begin{matrix} k \\ ɣ \end{matrix} \right\} \rightarrow ŋ \;/\; \_\_\_ ŋ$

d. Strengthening $\quad \begin{matrix} C \\ [\text{+son} \\ \text{-nas}] \end{matrix} \rightarrow \begin{bmatrix} \text{-son} \\ \text{-cont} \\ \text{-voice} \end{bmatrix}$ / in the complement of the former weakening environments

(3)

	(a) /wupe-ro/	(b) /guwɨ-ro/	(c) /kuke-maɨ/	(d) /duɣɨ-ŋaɨ/
(2a,b)	wupə-ro	guw -ro	kukə-maɨ	duɣ -ŋaɨ
(2c)				duŋ -ŋaɨ
(2d)		gup -ro		

It is crucial for Schuh that Strengthening be ordered after Epenthesis. If the rules applied in the opposite order, then, for example, guw- would have its w strengthened to p; and then this p, preceding the clitic ro, would incorrectly provide the environment for Epenthesis. This, incidentally, seems to contradict Schuh's assertion (p. 381) that

epenthetic ə is without structural import; in effect, within Schuh's analysis, epenthetic ə signals that the preceding stop has not been derived by Strengthening.

The following alternative makes no use of inverse rules. The underlying forms of the verbs in question all contain medial stops. The rules of i-Dropping, Epenthesis, and Nasal Assimilation are the same as above. In place of Strengthening, we have a rule of Weakening, which is an exact reflex of the historical process.

(4)	(a) /wupə-ro/	(b) /gupi-ro/	(c) /kukə-mai/	(d) /duki- ai/
(2a,b)	wupə-ro	gup -ro	kukə-mai	duk -ŋai
(2c)				duŋ -ŋai
Weakening	-	-	-	-

Weakening does not apply to any of the forms in (4) because, as Schuh notes, the historical change did not affect stops preceded by a short vowel and followed by ə, or stops followed by ə. But Weakening does, of course, apply to some of the isolation forms of the verbs in (1), namely to those ending in -i but not those ending in -ə.

Schuh also mentions sonorant-stop alternations in Kanakuru singulars and plurals. According to Newman [1970:46], plurality is sometimes marked by intervocalic consonant hardening in addition to suffixation; this happens in a small subset of nouns and in a small class of verbs that form plural stems. In these cases, w, r, and ɣ in the singular correspond respectively to p, ɗ, and k in the plural. Schuh proposes that this is an inverse rule, which would imply that the present Strengthening process corresponds to a former Weakening process. I see no good reason for assuming that the former process did involve Weakening in singulars, but even if it were shown that this morphological rule had become inverted, the case for Schuh's other inverse rules would not become any more plausible. For one thing, this morphological rule converts r into ɗ, and thus it does not reinforce Schuh's earlier proposal of a rule to convert r into t. More significantly, plural hardening was said to operate intervocalically in plurals formed

from a small set of singulars. Even if this could be shown to be the inverse of a former weakening process applying to this small set of singulars, the development would not constitute a shift in the direction of greater complexity ("conceptual anomaly"). Thus, such a development, if it occurred, would still not create a precedent for doing the sort of violence to otherwise valid constraints on phonological relationships that is done by the "conceptually undesirable" inverse rules that Schuh posits elsewhere in his paper.

Newman [1970:45] points up another instance of Strengthening, whereby some dialects of Kanakuru have replaced intervocalic w by ɓ. This has happened both to etymological w and to synchronically derived w. Strengthening in these dialects has made the intervocalic weakening of labials inoperative and, therefore, nonexistent. Here is a real case in which a rule ɓ > w / V___V becomes eradicated by a rule w → ɓ / V___V This example, for which there is direct evidence, is in complete contrast with the sorts of examples proposed by Schuh, for which there is no direct evidence (and for which the indirect evidence does not hold up) and which provide phonological theory with an otherwise totally unnecessary set of alternatives to consider in the evaluation of competing analyses.

3. Hausa

Schuh discusses a set of sound changes, known as Klingenheben's Law, that occurred in Hausa. The changes are said to involve the realization of syllable final velar stops and labial consonants as w, and of syllable final alveolar obstruents as r̃. As with the Kanakuru changes, Schuh proposes to treat the alternations resulting from Klingenheben's Law as inverse rules. For example, the w in ɓawnaa[1] 'buffalo' comes from etymological k but was weakened in syllable final position to w. The k still shows up synchronically in the plural ɓak-aa-n-ee, where the underlined segments represent the root of ɓawn-aa. The infixation of -aa- and suffixation of -ee is accomplished by morphological rules applying in the formation of some other plurals, but which would not be

[1]For expository purposes, I will write orthographic au as aw, and orthographic ai as ay. In addition, I will write long uu as uw.

called productive.

Schuh observes that a typical phonological account of the alternation between k and w in forms like these would posit k in the root: /ɓakn-/, and would change k to w when it winds up in syllable final position, as it does in ɓawn-aa but not in ɓak-aa-n-ee. He observes that this analysis would in effect be positing an underlying form which would be an impossible phonetic form; the impossibility of a phonetic form corresponding exactly to the proposed underlying form /ɓakn-aa/ is expressed by Klingenheben's Law. He comments that this fact should not a priori rule out the viability of this underlying form, but he claims that there is good evidence that k is not present in this underlying form, or in other similar cases. Before discussing the evidence, let us sketch the analysis that Schuh proposes. The underlying form of ɓawnaa is regarded as identical to its surface form, and an inverse rule converts w to k in all positions except syllable final. But since w, due to Klingenheben's Law, may arise from k, g, ƙ, f, b, ɓ, m, we need a number of inverse rules and a way of categorizing which w's are subject to which inverse rule. This yields the "conceptually anomalous" situation which Schuh claims to need in order to explain subsequent developments in the language.

Schuh's first bit of evidence involves the way that Hausa deals with syllable final velars introduced by borrowings or by productive derivational processes. In these cases, k is not converted to w but instead assimilates totally to the following consonant. For example, the reduplication form dad-dak-aa 'to pound well' comes from dak-aa 'to pound' by reduplicating the verb stem. The reduplication process yields dak-dak-aa, but the first k does not change to w but rather to d. However, Schuh overlooks the fact that many alveolars which are placed in syllable final position by the same reduplication process are in fact converted by Klingenheben's Law to r: kas-ee (> kašee) 'to kill', kas-kas-ee > kař-kaš-ee 'to kill repetitively'; faaɗ-aa 'to fall', faaɗ-faaɗ-aa > fař-faaɗ-aa 'to fall repetitively'.

Some speakers assimilate this ř in reduplicatives totally to the following consonant, yielding the variants kak-kaš-ee and faf-faaɗ-aa.

The existence of co-variants for alveolars but not for velars shows that the real problem is not to block Klingenheben's Law from applying synchronically but rather to guarantee that velars will undergo total assimilation even when alveolars do not. This problem extends to another reduplication, encountered in the derivation of denominal adjectives. zaaƙ-ii 'sweetness' has the adjectival form zaaƙ-zaaƙ-aa > zaz-zaaƙ-aa, and even underlying w is subject to total assimilation: kyaw 'beauty' has the adjectival form kyaaw-kyaaw-aa > kyak-kyaaw-aa. On the other hand, underlying alveolars become r and only sometimes are subject to total assimilation: faaɗ-ii 'breadth' has two adjectival forms, faɾ̃-faaɗ-aa and faf-faaɗ-aa.

As far as borrowings are concerned, Schuh notes that English 'lecture' is borrowed as lacca rather than *lawca. This might pose a problem if we assumed that borrowed words were incorporated by adopting the phonetic form in the donor language as the underlying form in the borrowing language. If this were the case, it would raise the question of why k in the putative underlying form /lekca/ did not become w by the synchronic version of Klingenheben's Law. However, I do not believe that Schuh would assume this account of borrowing. English 'table' was borrowed by Hausa as teebur, despite the fact that Hausa has no rule or rules that could convert putative underlying syllabic l into the sequence ur. It seems rather that Hausa borrowed both 'lecture' and 'table' by giving them the pronunciation that best approximated the English one while still being consistent with Hausa phonotactics. The k of 'lecture' would not have been consistent with Hausa phonotactics, and the obstruent c was a much more likely (phonetically similar) substitute than the sonorant w would have been. This model explains why Klingenheben's Law was bypassed in borrowing.

To summarize the point thus far, we may conclude that the data from reduplication actually support the existence of a synchronic reflex of Klingenheben's Law; the rule demonstrably applies to alveolars. Furthermore, we may conclude that the facts of recent borrowings provide no support for the position that Klingenheben's Law is not a synchronic rule in Hausa.

Schuh claims to have stronger evidence that k is not basic in synchronic k - w alternations. The evidence comes from the direction of changes in plural formation. He states that plural forms are changing to eliminate k - w alternations, as well as the others that have resulted from Klingenheben's Law. Thus, while the dictionaries give ɓawnaa the plural ɓak-aa-n-ee, Schuh notes that a common alternative to this plural form is ɓawn-aayee, in which the root is treated as if it contained an underlying diphthong rather than ending in a sequence of consonants. A parallel development is noted by Schuh to be taking place in other words:

(5)	Singular	Plural	Regularized Plural	
a.	zuwciyaa (/zukt-/)	zuk-aa-t-aa	zuwciyooii	'heart'
	buwz-uu	bug-aa-j-ee	buwzaayee	'Tuareg'
	fark-ee (/fatk-/)	fat-aa-k-ee	?	'trader'
	juwj-ii (/jibj-/)	jib-aa-j-ee	juwjaayee	'rubbish heap'

Schuh proposes that the obstruents in the old plurals are derived from the sonorants by inverse rules w -→ k, w -→ g, r̃ -→ t, w -→ b, etc. Since these rules require special lexical marking, and since they express an apparently arbitrary phonological relationship, such rules are said to be "conceptually undesirable"; this is offered as an explanation of why the language is regularizing its plurals in a way that eliminates the former sonorant-obstruent alternations in favor of the sonorants. But the proposed solution seems unnecessary, since the regularized plurals are functioning to reduce allomorphy in the singular-plural paradigms. There are perhaps over a dozen different ways of forming plurals in Hausa; a noun may take a number of different plurals, all with the same meaning. A given noun or adjective must be marked for which way or ways its plural is formed. Looking at the correspondence between the singular and the old plural and comparing this to the correspondence established with the regularized plural, it is hardly surprising that the regularized plurals should be gaining ground, to the detriment of the older forms.

Schuh notes that he has no explanation for why faʔkee in (5) does not lose its plural fataakee in favor of a regularized form *faʔaakee. I believe that this may be explained if Schuh's rule inversion proposal is abandoned. First, however, let us explore Schuh's analysis a bit further.

It has already been commented that Schuh's explanation involving rule inversion may not be necessary to explain developments in the language. If this is correct, then we might still wish to examine the question of whether rule inversion was even possible in the cases proposed by Schuh. The key to Schuh's explanation is the arising of a "conceptually undesirable" stage in the development of the language. In this stage, etymological obstruents in singulars were replaced in underlying forms by sonorants, and a number of ad hoc inverse rules were formulated to yield the sonorant-obstruent alternations. If this stage in the history of Hausa occurred, then there is another conceptually undesirable development that Schuh does not discuss. The development involves eliminating an otherwise valid constraint on plural formation. Newman [1972] notes that with certain restrictions stems that end in two consonants have -aa- inserted between these two consonants in the plural, while those which end in a glide-consonant sequence generally have -aa- attached after the glide-consonant sequence. Once the ending -ee is added, certain forms qualify for epenthetic y-Insertion. The derivations are sketched here:

(6)	Plural stem:	ask-	gawl-
	-aa- Insertion	as-aa-k-	gawl-aa-
	-ee Insertion	as-aa-k-ee	gawl-aa-ee
	y-Epenthesis	-	gawl-aa-y-ee

Now, if the "conceptually undesirable" stage that Schuh posits actually existed, it would have been necessary at this stage for the generalization about the environment of -aa- Insertion to have been abandoned. Rather than inserting -aa- only between certain stem-final consonants, the rule necessitated by the intermediate stage invented by Schuh would also have to insert -aa- between certain sequences of glide followed by consonant. This is seen in the following forms, where the underlying

form of the stem is assumed to be that proposed by Schuh in this conceptually undesirable stage:

(7)	Putative stem:	ɓawn-	jiwj-
	Insertion	ɓaw-aa-n-	jiw-aa-j-
	Inverse rules (w -→ k, w -→ b, etc.)	ɓak-aa-n-	jib-aa-j-

There are two strange occurrences in this account. First of all, the putative relaxation of the condition on -aa- Insertion did not have any effect on the derivation of plurals that had pre-existing stems ending in a glide-consonant sequence. Thus, gawl-aa 'idiot' retained its plural gawl-aa-y-ee. In such examples the putative relaxing of the condition on where -aa- was to be inserted did not manifest itself; gawl- and similar examples were not subject to the process that Schuh must posit for (7). If gawl- had been, it would have become *gaw-aa-l-ee; in addition, if an inverse rule had been extended to forms like this one, the w would have been realized as some obstruent. This did not happen.[2]

A second puzzle raised by the inverse rule account is that once the "conceptually undesirable" stage began to be overcome by regularization of the plural forms of ɓawnaa, juwjii, etc., Hausa went back to the old restriction on -aa- Insertion, which permitted -aa- to break up only consonant-consonant sequences (and it retained the same two exceptions noted in fn. 2). That is, in the speech of those who have regularized ɓawnaa, juwjii, etc., the plural of ask-aa is still as-aa-k-ee, while the plural of gawl-aa remains gawl-aa-y-ee. In order for Schuh's analysis to go through, it is necessary for him to posit

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[2]There are two exceptions to the statement that the infix -aa- only breaks up stem final consonant-consonant sequences. In ƙyawree and ƙaymii, -aa- is infixed between the stem final glide-consonant sequence, forming the somewhat irregular plurals ƙyaw-aa-r-ee and ƙay-aa-m-ee. But it would not be plausible to suggest that it was on analogy to these irregular forms that the new plurals for ɓawnaa, juwjii, etc., were produced, since this would not explain why the latter plurals are becoming regularized to ɓawnaayee, juwjaayee, etc., while the putatively parallel forms ƙyawaaree and ƙayaamee remain as they were.

a stage in which the generalization about -aa- Insertion was lost, followed by a stage in which the generalization was rediscovered. This scenario is not only "conceptually undesirable"; it is totally unacceptable.

If it is correct to eliminate the possibility of the rule inversion stage posited by Schuh, then the following account emerges as the only likely possibility that suggests itself at present:

Stage 1. /ɓakn-/ is the underlying form, and ɓawnaa and ɓakaanee are surface forms. Klingenheben's Law is a synchronic rule.

Stage 2. Speakers "notice" that allomorphy can be lessened by treating the surface forms of ɓawnaa as an underlying form, yielding the plural ɓawnaayee. /ɓawn-/ and /ɓakn-/ now compete as underlying representations.

Stage 3. /ɓawn-/ wins out as an underlying representation perhaps because it participates in less complex synchronic derivations, perhaps because /ɓawn-/ is closer to the surface form of the singular, which is "conceptually basic" [Vennemann 1972].

Hausa is currently in Stage 2. The situation, in one respect at least, seems to resemble the variation in the pronunciation of the word status in English. One variant has [ēy] where the other has [æ]. It would be pointless, as far as I know, to propose that the variability in English co-variants such as these is currently due to the existence of a tensing or laxing rule that applies in some dialects and not others, on some occasions and not others. Rather, it seems, the word status simply has two underlying forms at present. Similarly, the existence of the co-variants ɓakaanee and ɓawnaayee in Hausa simply constitutes evidence for two competing underlying forms /ɓakn-/ and /ɓawn-/.

Incidentally, the revised account presented here suggests a possible explanation for why faƙ̃kee, from /fatk-/, has not regularized its plural, fataakee, to *faƙ̃aakee. Recall that the non-occurrence of this development posed a problem for Schuh. If the underlying form of faƙ̃kee is indeed /fatk-/, as its plural form suggests, then it would have to be restructured as /faƙ̃k-/ to permit the more "regular" plural.

However, while the corresponding development met no resistance in ßawnaa and other examples cited above, in this case there is a possible source of resistance: the root /fatk-/ also occurs in the derived noun fatawcii 'trading' (derived by an unproductive process), where w comes from the k in /fatk-/ by Klingenheben's Law. Therefore, restructuring of /fatk-/ as /fa$\tilde{r}$k-/, though it would still succeed in reducing allomorphy in the singular-plural paradigm, would at the same time obscure the relationship of fatawcii to its root. I cannot at present prove that the proposed explanation is correct. If it is correct, however, it would demonstrate that words no longer derived productively in a language are not always mere "fossils" whose structure has no effect on the rest of the system, contrary to the current assumption of some grammarians.

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A COMMENT ON "RULE INVERSION IN CHADIC: A REPLY"

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Leben (in this issue) in replying to specific claims I make about two Chadic languages is actually concerned with a more fundamental issue, viz. the form a linguistic theory should take. Leben sees inverse rules as "a middleman which it would be advantageous to eliminate in principle from the realm of possible phonological systems" (p. 265) because such rules "[do] violence to otherwise valid constraints on phonological relationships" (p. 271). It would therefore be desirable to eliminate all putative cases of rule inversion by either showing that they are specious or that there are alternative solutions using devices more generally accepted by linguistic theoreticians.

A well-tested linguistic theory is an indispensable framework in which to investigate phenomena in languages. I believe, however, that the intuitions of the native speaker and the trained linguist are worth something, and if the theoretical framework forces solutions which fail to give intuitive or formal insights, then changes must be made in the theory. In particular, I reject the notion that it is a theoretical desideratum to keep the available formal devices to a minimum by the elimination of redundancy. For example, even though the syllable can always be formalized using the independently needed symbols for consonants and boundaries, this is no reason to reject the syllable as a valid linguistic unit which should have its own formalization. Likewise, though inverted rules could probably be formally eliminated, linguistic theory would not necessarily be improved by their elimination.

Leben has registered a number of valid criticisms of my analyses using inverse rules. Even if he had successfully destroyed or given alternate solutions for all the cases I propose, I don't believe this would be a demonstration that rule inversion should be eliminated from linguistic theory. However, he has not even succeeded in countering all my proposals.

Let us take the example of 'hardened' plurals in Kanakuru (pp. 387-389 in my article [Schuh 1972]; discussed pp. 270-1 in Leben's reply).

Leben questions that the present alternations in singulars and plurals resulted from weakening in the singulars. He apparently ignored or questioned the relevance of the cognate items from other languages which I took the trouble to list. While he is correct in noting that the plural rules (which are lexically specific morphological rules) do not make rule inversion more plausible for the cases discussed earlier in the article (which are general morphophonemic rules), he presents no arguments at all, that I can see, against the singular/plural alternations being inverse rules. If they were not we would have to have an underlying stop in a word like /ʈaka/ 'shoe' with a rule weakening the stop, giving ʈaɣa (→ [ʈaa]). But such a solution totally ducks the issue of why the stops in the plurals have all been neutralized, and moreover why even historical sonorants now alternate with stops (cf. the verb 'get out', p. 387 in Schuh [1972]). The obvious answer is that because of the historical sound changes, several stops have been neutralized to a single sonorant (and at the same time with the historical sonorant) in the singulars. I see no reason in Kanakuru to reject the general principle that plurals should be derived from singulars. This being the case, rule inversion gives an automatic and entirely satisfactory answer to why stop neutralization has taken place in plurals.

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VOWEL HARMONY IN EWE[1]

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1. Introduction

This paper examines Ewe vowel harmony and other vocalic alternations within the context of recent developments in the theory of distinctive features. One such development has been the discovery of the role of tongue root advancing in the so-called 'horizontal' vowel harmony systems found widely in Africa and elsewhere. In such systems, vowels are classified into two sets (with possible overlap) such that only members of a single set may cooccur within the domain of harmony; the primary phonetic characteristic distinguishing the two sets, as Stewart [1967] first pointed out, is the position of the tongue root. In the vowels of one set, the tongue root is pushed forward, widening the lower pharyngeal cavity and concomitantly raising and fronting the body of the tongue. In vowels of the other set, such advancing of the tongue root is not observed, and the pharyngeal cavity is relatively narrow, while the tongue body is lower and more retracted. As no distinctions of tenseness or length are consistently associated with either set, it has been proposed on the basis of this and other evidence [Stewart 1967, Halle and Stevens 1969, Perkell 1971, Lindau et al 1972] that an independent feature of tongue root advancing ($\pm$ATR) plays a role in phonological classification in these languages, and perhaps more widely. Such a feature permits the vowel alternations to be interpreted as assimilatory in nature [Stewart 1967:195], and is consistent with the fact that 'advanced' mid vowels

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[1] I am indebted to Morris Halle for valuable help and encouragement in the preparation of this paper; Ken Stevens, Joe Perkell and John Stewart have also contributed to my understanding of the issues raised here. Any errors in the present formulation are the responsibility of the author. Research pertaining to the data on Anlo was supported in part by grants from the Central Research Fund of the University of London and the West African Linguistic Society.

such as [e, o] frequently assume a higher tongue position than 'nonadvanced' high vowels such as [ɪ, ʊ].[2]

An independent development has been the proposal by Halle and Stevens (discussed in [Perkell 1971]) that the traditional feature 'low' is to be replaced by the feature 'constricted pharynx' ($\pm$CP), interpreted as the narrowing or constriction of the lower pharynx in the region of the tongue root. This proposal, motivated by acoustic considerations, is widely supported by X-ray tracings of the low vowels in a number of languages, in which notable retraction of the tongue root can be observed (see e.g. [Delattre 1971]). It now becomes possible to suggest that vowel 'tenseness' may be associated with the active displacement of the tongue root from neutral position, either forward or backward, permitting the traditional tense/lax feature to be eliminated. A further consequence is that while the traditional features 'high' and 'low' were incompatible by definition, 'high' and 'constricted pharynx' are not. In fact, the vowel harmony systems of a few African languages have been described in terms of the relative constriction, rather than widening, of the pharyngeal cavity relative to neutral position (for Anum, see [Painter 1971]; for Igbo and Fante see [Welmers 1973]). It may be the case, then, that vowel harmony results from tongue root advancing in some languages and from pharyngeal constriction (through retraction of the tongue root) in others, in which case simultaneous [+high, +CP] specifications would be found.

On the basis of these two proposed revisions of feature theory, one would expect that vowels characterized simultaneously as [+ATR] and [+CP] would be acoustically counterproductive (tending to have opposed effects on the first formant) and physiologically difficult, or perhaps impossible, to produce. It has therefore been suggested [Perkell 1971] that these two features are incompatible in vowels at the phonetic level. (A weaker claim would be that these two features are phonetically incompatible in back vowels, but not in front vowels; cf. Ladefoged [1971:75].)

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[2] If tongue height were the factor under control, such 'cross-height' alternations should never appear; but if tongue root position is the relevant factor then such alternations would not be unexpected. Instrumental evidence showing Twi [e, o] to be produced with a higher tongue position than [ɪ, ʊ] has recently been published by Painter [1973].

Further evidence for the correctness of these proposals may come from the detailed examination of languages with vowel harmony (or other vowel alternations) based on tongue root advancing. One would be particularly interested in observing how the antagonistic specification [+ATR, +CP] is avoided in phonetic representation. Such specifications might never occur in segments at the classificatory level; or they might occur at that level but be 'filtered' out or otherwise eliminated in the course of derivation. In either case, one would not expect to find languages in which pairs of vowels marked [+CP] are minimally distinguished at the phonetic level by the feature category [ATR].

In Ewe, the vowels [ɛ, a, ɔ] (with their nasal counterparts) form a natural class. They are not of similar tongue height, however; in terms of phonetic quality, [ɛ] is higher than IPA [æ], [ɔ] is higher than IPA [ɒ], and [a] is lower than IPA [ʌ] or [ɐ]. If the system of underlying features is to reflect this fact, there is no single feature provided by the earlier framework which characterizes this class as a whole. Ford [1973] on the basis of vowel alternations described in Sprigge [1967] and Clements [1972], has proposed that these three vowels are uniquely characterized as [-ATR]. If this is the correct analysis, then these vowels no longer present a problem, since the fact that they function as a natural class now follows immediately from their feature composition.

In the discussion which follows, arguments will be advanced to support the view that tongue root advancing is involved in Ewe vowel classification. It will further be proposed that the feature [CP] (or the old 'low') does not play a classificatory role in Ewe. It is only after the application of all phonological rules that a late 'detail' rule[3] need specify the relative degree of pharyngeal constriction (determining relative tongue height) of the vowels [ɛ, a, ɔ]. This claim is of particular interest for its functional significance: since no vowel is assigned a value for the feature [CP] until the detail rule applies, the proscribed feature complex [+ATR, +CP] can never be produced.

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[3]For present purposes a 'detail' rule might be defined as one which need not be ordered before any other rule and which does not respecify classificatory features.

2. Ewe Vowels: the Classificatory Features

Ewe vocalic alternations are reasonably consistent from dialect to dialect. Each dialect selects the members of its vowel system from a basic eight-vowel set (only oral vowels will be under consideration here; Ewe also has nasal vowels which alternate in identical fashion to the oral vowels). This set provides the optimal representations for the application of the various alternation rules of the major dialects as they have been described to date.[4] Divergences in phonological patterning result primarily from the fact that different dialects make a somewhat different selection from the eight-vowel system, giving rise to different underlying representations, and from the fact that not all rules are shared by all dialects. In addition, different dialects may place slightly different conditions on the application of the rules they share, as will emerge from the discussion of the harmony rule. However, differences in rule ordering do not play a role in the restricted subdomain of the phonology examined here.

The Ewe dialects draw their vowels from the following set:

(1)

i		u
e		o
	ɜ	
ɛ		ɔ
	a	

This complete eight-vowel system is reported in Adangbe. However, Anlo [àŋlɜ] does not have [ɛ], while Peki, Kpando and Gɛ̃ do not have the mid central vowel [ɜ]. Thus, the surface system for these five dialects is as follows (the maximal inventories are given):

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[4] The following sources have been used: [Sprigge 1967] (Adangbe); [Clements 1972] and field notes (Anlo); [Ansre 1961] (Peki); [Stahlke 1973] (Kpando); [Schroeder 1936] (Gɛ̃). In the transcriptions, [ɜ] represents the root-advanced mid central vowel of Ewe, described in Adangbe as "approximately the vowel in received British pronunciation of bIrd" [Sprigge 1967:16] and in Anlo as similar to the unstressed a of English sofa, above [Berry 1951]. Tone is marked as follows: v̋ (raised; Anlo only), v́ (high), v (mid), v̀ (low), v̀́ (rising low to high), v́̀ (falling high to low) etc. Cited vowels are enclosed in square brackets except where underlying forms are specifically intended, in which case slants are used.

(2)

Adangbe		Anlo		Peki, Kpando, Gẽ	
i	u	i	u	i	u
e	o	e	o	e	o
ɜ		ɜ			
ɛ	ɔ	ɛ	ɔ	ɛ	ɔ
a		a		a	

The mid central vowel [ɜ] alternates with [a] in at least one dialect, Anlo, where [a] is replaced by [ɜ] and [ɔ] is replaced by [o] in transitive verb stems immediately followed by a direct or locative object; cf. the following examples:

(3)	kpɔ́	'see'	[mɜ kpó gà]	'I saw (made) money'
	nɔ̀	'stay'	[mɜ̀ nò dùá mɜ̀]	'I stayed in the town'
	bɪ́á	'request'	[mɜ byɜ́ gà]	'I asked for money'
	ná	'give'	[mɜ tswée nɜ́ kofɪ]	'I gave it to Kofi'
				(I took it gave Kofi)

Elsewhere the rule does not apply:

(4)	kpɔ́	'see'	[mɜ kpɔ́á gà]	'I make money'
	dzɔ̀	'be born'	[ɜ̃́ dzɔ̀ gbɜ̀vú è]	'He was born a rascal'
	trɔ́	'turn'	[mɜ trɔ́ gɛ̃̀]	'I turned (returned) at Accra'

In the first example, the stem vowel does not immediately precede the direct object, as the habitual formative intervenes. In the second, gbɜ̀vú is not a direct object, but a predicate nominal. In the third, gɛ̃̀ is not a locative object but an adverbial of place, as syntactic tests reveal (for example, it fails to undergo the Nominal Preposing rule).

A second alternation, common both to Adangbe and Anlo, assimilates [ɜ] to an immediately following [a]. If both vowels of the resulting sequence share the same tone, one of the vowels is deleted by a general degemination rule:

(5) Adangbe: ɜ́ lɜ̀ àgblɜ̀ a mɜ 'he is in the farm'
→ [ɜ́ là gblà a mɜ]

Anlo: àfɜ́ á mɜ̀ 'in the house'
→ [àfá mɜ̀]

mɜ̀ à-dzó 'I shall leave'

→ [màdzó]

Such alternations suggest, as a working hypothesis, that [ɜ] differs from [a] in regard to a single feature; if this feature were the same as the one distinguishing [o] and [ɔ] then the stem alternations of (3) could be treated in terms of a single feature change. Since (as we shall see below) [ɔ] is parallel to [ɛ] and [o] to [e] in regard to vowel harmony, let us assume that the single feature of tongue root advancing distinguishes the series /e ɜ o/ from the series /ɛ a ɔ/. We may then propose the following underlying vowel system:

(6)

	-back		+back	
+high	i		u	+ATR
-high	e	ɜ	o	
	ɛ	a	ɔ	-ATR
	-round		+round	

A late 'detail' rule of no systematic importance will account for the phonetic quality of [a] (the low positioning of the tongue body and blade) by specifying all vowel segments which are phonetically unrounded, back and nonadvanced as [+CP]. Thus as far as the operation of the phonological rules is concerned, [a] is distinguished from all other vowels only by the features listed in (6), and perhaps other, redundant features which will be disregarded here.

The vowel system of (6) provides all the distinctions required for the operation of the phonological rules of Ewe in their most general form. It can be shown that the addition of a feature [CP] at the classificatory level would lead to a considerable loss of generality in the phonology with no compensatory advantages; the examination of a few cases will make this clear. We have already observed that the alternations illustrated in (3) and (5) suggest that [ɜ] differs from [a] in terms of a single feature, [ATR]; if [a] were additionally distinct from [ɜ] in terms of the feature [CP] then this feature would have to be respecified

in both rules. The feature system (6) therefore permits the more economical statement.

A further example is the rule described for Adangbe [Sprigge 1967: 134-5] which assimilates the object pronoun ɔ̀ (from underlying wɔ̀), or the homophonous sentence-final negative formative, to a preceding nonadvanced vowel in terms of tongue root advancing and lip rounding, when it occurs in one of the progressive aspect constructions:

(7) wó lɜ̀ kpá a wɔ 'they are dismissing you'
wó lɜ̀ kpɔ́ ɔ wɔ 'they are seeing you'

compare:

ɜ́ lɜ sɛ̀ ɔ̀ wɔ̀ 'it is cutting you'
wó lɜ̀ ʊɜ o wɔ 'they are sniffing at you'

As a result of this rule, [o] is replaced by [a] after [a] and by [ɔ] after [ɔ]. The statement of this rule becomes awkward if /a/ is represented as an underlying [+CP] vowel:

(8) $$\text{ɔ} \rightarrow \left[\begin{matrix} \text{-ATR} \\ \langle \text{+CP} \rangle \\ \text{-round} \end{matrix}\right]_{a} / \left[\begin{matrix} \text{+syl} \\ \text{-ATR} \\ \langle \text{-round} \rangle_{b} \end{matrix}\right] \text{ ——}$$

cond: a only if b

The angled bracket notation is necessary to insure that [o] becomes [a] rather than [ʌ] after [a]. However, if we adopt feature system (6), mention of the feature [+CP] in the structural change becomes unnecessary, and (8) can be reformulated as (9):

(9) $$\text{ɔ} \rightarrow \left[\begin{matrix} \text{-ATR} \\ \alpha\text{round} \end{matrix}\right] / \left[\begin{matrix} \text{+syl} \\ \text{-ATR} \\ \alpha\text{round} \end{matrix}\right] \text{ ——}$$

Clearly the rule should express the fact that [o] assimilates to either a preceding [a] or a preceding [o], or more generally, to a preceding nonadvanced vowel (as [ɛ] does not occur in verb stems); rule (9) expresses the alternation as a purely assimilatory process but (8) does not.

Quite generally, no vowel [ʌ] nor any vowel characterized as [+ATR, +CP] appear at the phonetic level in any described Ewe dialect. This fact follows as a direct consequence of the adoption of vowel system (6) together with the late rule assigning [a] its correct phonetic value. It would not follow from a vowel system in which /a/ was underlyingly characterized as a [+CP] vowel; in such a system, a totally fictitious 'conspiracy' is created, as it becomes an accident that no rules create either of the nonoccurring vowels. There is no reasonable explanation for the fact that every rule which would otherwise create one of these vowels, if stated in its most general form, is conditioned in such a way as to insure that they are not created. For example, there is no explanation on grounds of phonetic naturalness for the existence of a 'conspiracy' against the segment [ʌ], which would not be more highly marked than [ɜ] in any theory of markedness.

Parallel arguments can be based on the fact that [æ] and [ɒ] do not occur in Ewe. Thus, if /a/ were marked [+CP], any rule fronting or rounding it would have to be conditioned in such a way as to prevent the creation of these nonoccurring vowels. We do in fact find rules of this type. Westermann [1930:193-5] describes a rule assimilating a postclitic /a/ to the preceding stem vowel in backness and roundness, in an unidentified Western Interior dialect:

(10)

bɪ́ɾ+á	→	bɪ́ɾɛ́	'the corn'
dù+á	→	duɔ	'the town'
tɛ̀+á	→	tɛɛ	'the yam'
tó+á	→	tóɔ́	'the mountain'
kɔ̀+á	→	kɔ̌	'the knot'
gà+á	→	gǎ	'the money'

(where V̌ is notationally equivalent to V̀V́).

This rule is optional before the plural morpheme wó: àzɪ́ɛwó or àzɪ́áwó 'the groundnuts', providing evidence that the underlying form of the postclitic must in fact be /a/. The effect of the rule is to respecify /a/ as [ɛ] after a front vowel and as [ɔ] after a rounded vowel. If /a/ were underlyingly [+CP], then we should have expected the rule to yield

[æ] and [ɒ]; to prevent this result, the rule would have to be expressed as involving not only the assimilation of [a] to the preceding vowel but also the respecification of [a] as [-CP]. This, again, is not necessary if feature system (6) is adopted.

Rules to be discussed in the next section offer further evidence that CP does not function as a classificatory feature in Ewe. (6) therefore appears to be the correct representation of the underlying feature composition of Ewe vowels.

3. Vowel Harmony

Vowel harmony in Ewe is a process applying to certain postclitic vocalic affixes. Under harmony the affix assimilates to the immediately preceding stem vowel in terms of the features [high] and [ATR]. This affix represents a wide range of lexical and grammatical functions, varying from dialect to dialect; however, all dialects share the use of this affix as the third person singular object pronoun and as a lexical affix creating derived nouns from noun bases.

Closely associated with vowel harmony are a number of alternations which affect stem vowels immediately preceding a harmonic affix. These alternations vary somewhat in form and scope from dialect to dialect, and have tended to obscure the unity of the harmony principle in earlier descriptions. Once they are abstracted from the total set of changes, however, the essential identity of the harmony rule from dialect to dialect becomes evident. Below the total set of vowel changes for three representative dialects is given. Gaps in the columns indicate that the corresponding underlying sequence at left does not occur in base representations in the dialect in question; optional variants are parenthesized:

(11)

	surface		
underlying	Adangbe	Kpando	Anlo
i + e	ɪ + i	ɪ + ɪ	ɪ + ɪ
u + e	u + ɪ	u + ɪ	u + ɪ
e + e	e + e	e + e (ɪ + ɪ)	
ɜ + e	e + e		ɪ + ɪ
o + e	o + e	o + e (u + ɪ)	u + ɪ

	surface		
underlying	Adangbe	Kpando	Anlo
ɛ + e	ɛ + ɛ		
a + e	ɛ + ɛ	ɛ + ɛ	e + e
ɔ + e	ɔ + ɛ	ɔ + ɛ	o + e

As the table indicates, the full set of alternations is realized only in Adangbe, where all eight underlying vowels occur in noun stems. Examples follow, where the postclitic vowel represents the topicalization particle [Sprigge 1967:115 and errata]:

(12)	ɜ̀si + é	→	ɜ̀si ɾ	'it's water'
	àvù́ + é	→	àvù ɾ	'it's a dog'
	ɜye + é	→	ɜye é	'it's a spider'
	ɜnyɜ + é	→	ɜnye é	'it's me'
	ɜwo + é	→	ɜwo é	'it's you'
	ɜ̀vlɛ + é	→	ɜ̀vlɛ ɛ́	'it's a weaver bird'
	àgbà + é	→	àgbɛ̀ ɛ̀́	'it's a load'
	ɜ̀sɔ́ + é	→	ɜ̀sɔ́ ɛ́	'it's a horse'

Evidence for the postclitic nature of the topicalization particle consists of the fact that stem vowel changes occur in two of the forms; these changes do not occur across word boundaries. They will be accounted for by rule (13):

(13) Stem vowel fronting

$$\begin{bmatrix}+\text{syl}\\-\text{round}\end{bmatrix} \rightarrow [-\text{back}] / \_\_ + \begin{bmatrix}+\text{syl}\\-\text{back}\end{bmatrix} \#$$

As for the Kpando forms, the vowel changes recorded by Stahlke [1973] differ from those of Adangbe only in respect to the shift of the stem vowels [e, o] to [ɪ, u] respectively before the postclitic; this can be stated as in (14):[5]

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[5] Conditions on the application of this rule are somewhat arbitrary. It is optional for verb-postclitic sequences, but obligatory in certain complex lexical forms, such as nyúíé 'good, it's good' from /nyó + é # é/. Furthermore, Stahlke observes that there are no final phonetic sequences of the form [...ee] in Kpando nouns, suggesting either that a morpheme structure condition rules out such sequences, or else that (14) applies obligatorily to such sequences wherever they occur (though only optionally to ...o+e sequences).

(14) Stem vowel raising

$$\begin{bmatrix}+\text{syl}\\+\text{ATR}\end{bmatrix} \rightarrow [+\text{high}] / \_\_\_\_ + \begin{bmatrix}+\text{syl}\\-\text{back}\end{bmatrix} \#$$

Vowel harmony must be able to apply to the output of (14); this will account for the fact that the postclitic shifts in height if the stem vowel is high:

(15) Vowel harmony

$$[+\text{syl}] \rightarrow \begin{bmatrix}\alpha\text{ATR}\\ \beta\text{high}\end{bmatrix} / \begin{bmatrix}+\text{syl}\\ \alpha\text{ATR}\\ \beta\text{high}\end{bmatrix} + \_\_\_\_ \#$$

These three rules account in a straightforward way for the Adangbe and Kpando alternations.

The comparable vowel changes in Anlo can be illustrated by the following examples of verb-postclitic object sequences:

(16)	dyí + è	→	dyíì	'seek it'
	vù + è	→	vùì [vwì·]	'move it'
	kpɔ́ + è	→	kpíì	'meet him/her'
	kɔ̀ + è	→	kùì [kwì·]	'laugh at him/her'
	ná + è	→	néè	'give it'
	tsɔ́ + è	→	tsóè [tswéè]	'take it'

Here, stem vowel shifting has gone a step further. Not only do rules (13) and (14)--here obligatory--apply, but there is a further rule advancing all unadvanced stem vowels before the post-clitic:[6]

(17) Stem vowel advancing

$$[+\text{syl}] \rightarrow [+\text{ATR}] / \_\_\_ + \begin{bmatrix}+\text{syl}\\-\text{back}\end{bmatrix} \#$$

The three stem vowel adjustment rules (14), (13), and (17) together with vowel harmony (15) now give the following derivations for Anlo:

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[6] It is tempting to see this as a special case of the stem vowel advancing rule illustrated by the examples of (3). There is, however, no obvious way of collapsing the two rules, since object pronouns other than the third person singular postclitic do not cause advancing: [mɜ kpɔ́ wɔ̀] 'I saw you', etc.

(18)	i + e	u + e	ɜ + e	o + e	a + e	ɔ + e	
	-	-	ɨ + e	u + e	-	-	(by 14)
	-	-	i + e	-	ɛ + e	-	(by 13)
	-	-	-	-	e + e	o + e	(by 17)
	i + i	u + i	i + i	u + i	-	-	(by 15)

In fact, since the three stem vowel adjustment rules apply successively in Anlo, and since none of them is optional or subject to any special conditions, it seems likely that Anlo has restructured them into a single, complex phonological process. We may then take advantage of the fact that [-ATR] vowels are redundantly [-high], and [+round] vowels are redundantly [+back], and collapse them by means of alpha variables. This gives the following stem vowel shift rule for Anlo:

(19) Stem vowel shift (Anlo)

$$\begin{bmatrix} -\text{syl} \\ \alpha\text{round} \\ \beta\text{ATR} \end{bmatrix} \rightarrow \begin{bmatrix} \alpha\text{back} \\ \beta\text{high} \\ +\text{ATR} \end{bmatrix} / \underline{\quad} + \begin{bmatrix} +\text{syl} \\ -\text{back} \end{bmatrix} \#$$

Through the application of (19) all stem vowels become advanced before a nonback postclitic. Its effect, therefore, is to render Vowel Harmony (15) vacuous insofar as the feature ATR is concerned; the harmony process has been reduced to simple assimilation of tongue height. The interaction of (19) and (15) provides an interesting illustration of the way in which rule innovation may automatically bring about rule simplification or loss elsewhere in the phonology. The fact that Anlo does not have a vowel harmony rule properly speaking is merely a consequence of the addition of (17) and clearly should not be taken as indicating a fundamental typological distinction among the dialects. This conclusion can be generalized: absence of vowel harmony in one member of a linguistic group in which vowel harmony is prevalent does not provide a valid basis for drawing comparative or historical conclusions; one rather looks at the underlying vowel system and in particular at the vowel classes provided by its set of classificatory features, which tend to be highly resistent to change through restructuring. The development of a correct theory of features is therefore not a trivial matter of

choosing among notations, but has important consequences for the problem of reconstructing the sets of sound changes which define lines of historical divergence. Conversely, the degree of success of a theory of features in providing such a definition, where independent evidence is available to support it, provides an important test of the explanatory adequacy of the theory (for one application of a closely similar framework to the problem of historical reconstruction see Stewart [1970]).

The set of rules (13)-(15) appears to be valid for all other described Western and Central dialects of Ewe with minor, idiosyncratic deviations involving the scope of the harmony rule itself. These deviations occur in at least Peki, Kpando and Gẽ, and may be more general. In the case of Peki, we find that the postclitic affix e, while elsewhere undergoing harmony, is 'opaque' to it just in case it follows a verb whose stem vowel is [ɔ] [Ansre 1961:10,52,66]:

(20)	mɛkpɔ́è	'I saw him'
	mɛ̀xɔ̀è sè	'I believe it'
	compare:	
	aĺẽ nɔɛ́	'small ewe'
	á` tùì (< tù+è)	'he will catch up with her'

Ansre considers the opacity of [e] in this environment to be 'Standard' in contrast, for example, to the nonstandard Hohoe form mɛtsɔ́è 'I took it' (p. 10). However, other evidence suggests that this is an idiosyncratic feature of Peki; thus, compare the forms dɔ́ɛ 'send it' in Kpando [Stahlke 1973:126];[7] Adangbe mɜkpɔ́ɛ 'I saw him' [Sprigge 1967: 116], as well as the variety of Ewe described by Westermann [1930], who gives e.g. ywɛ̂ < yɔ́ɛ̀ < yɔ́è 'call him' (p. 34).

Conditions on the domain of rule application of this type can be expressed by means of readjustment rules which assign rule features to individual segments. Such readjustment rules, forming an ordered block and applying before the phonology, abstract dialectally and synchronically

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[7] The published version of this text is unfortunately spotted with typographical errors in the rules and examples; in the present case, ɛ should be read for e in (32ii).

variable conditions on rules from the general form of the rule; the need for rules of this type has been argued by Schane [1973]. Let us then assign (21a) below to Peki:

(21a) [+syl] → [-rule 15]/$\left[\begin{smallmatrix}\text{ɔ}\\+\text{verb}\end{smallmatrix}\right]$ + ____

The situation is somewhat more complicated in Gẽ, where beside the regular postnominal affixes of e.g. gbɔ́gbɔ́é 'goat', zã́tɔ́é 'rat' we find both harmonizing and nonharmonizing affixes after the verb stem vowel [ɔ]: thus wɔ́lɔ̀̃ɛ̀̃ 'they loved him' but wɔ́wɔ̀è 'they did it', wɔ́kpɔ́è 'they saw him' [Schroeder 1936:24,42,39,30,33]. Gẽ will therefore have rule (21a), but some verbs such as lɔ̀̃ 'to love' will be lexically marked as not providing a context for it; for such verbs (21a) will not assign the minus rule feature to the affix, and harmony will apply in the normal way.

A further use of readjustment rules of this type may be required in Kpando. Stahlke has shown that the topicalization particle e may assimilate to a preceding [-ATR] vowel across a word boundary, becoming ɛ: tsí é 'it's a ladle', dzo é 'it's fire', ga é 'it's metal', mɔ é 'it's a trap' ([Stahlke 1973:133]; read ga for gá). We might want to consider this as a process entirely unrelated to vowel harmony, especially as it appears to be unique to Kpando. However, it can be incorporated into the harmony rule in the following way. Suppose that Vowel Harmony (15) is restated so that it may apply across word boundaries: (#) will be inserted immediately before the morpheme boundary in (15). Readjustment rule (21b) is assigned to all dialects, and (21c) is assigned to Kpando alone:

(21b) [+syl] → [-rule 15] / # ____

(21c) [+syl] → [+rule 15] / [-ATR] # ____

Rule (21b) accounts for the absence of e.g. *tsí í for tsí é 'it's a ladle' in Kpando and most other dialects, while (21c) allows vowel harmony to extend across a word boundary in Kpando only if the preceding vowel is [a] or [ɔ], giving ga é 'it's metal', etc.

This discussion has so far failed to justify the choice of [e] as the underlying form of the harmonic affix in the Ewe dialects considered. The rule would appear to apply correctly if any other front vowel were selected, or an archiphoneme unspecified for the features [high] and [ATR]. The selection of [e] is based upon environments in which the normally harmonic affix alternates with a nonharmonic form; in this case the vowel always has the form [e]. We have seen examples from Peki and Gẽ above, where the postclitic vowel failed to harmonize after the stem vowel [ɔ]; in these cases, the affix appears as e. Further evidence can be introduced from Adangbe and Anlo:

In Adangbe, the normally clitic topicalizing particle may in certain circumstances be isolated from the preceding stem vowel by [y]. In such cases harmony is not defined, and the vowel has the form [e] [Sprigge 1967:123-4]:

(22) àsí kà ye` 'which hand is it?'
hand which TOP
cf. àsí kɛ̀ (< àsí kà è) (same meaning)

In Anlo we find several relevant alternations. First of all, the postclitic is exempt from harmony when a consonant intervenes between the stem vowel and the postclitic, as in ditransitive progressive constructions:

(23) mɜ nú fíá-ḿ è 'I'm teaching him' (I thing teach-ing him)
cf. mɜ fíá nú-ì 'I taught him' (I taught thing-him)

Secondly, the normally clitic 'pronoun of accompaniment' is not clitic, and therefore exempt from harmony, whenever it follows a noun phrase:

(24) mɜ tsɔ́ tukpá tso mɔ̃nú è 'I crossed the threshold
I take bottle cross threshold with a bottle'

Compare the following, where the 'pronoun of accompaniment' follows the verb stem and is clitic to it:

(25) mɜ tsɔ́ tukpá dzú -ì (< dzó + è) 'I left with a bottle'
leave

Thirdly, the topicalizing particle is clitic only to an immediately preceding lá (definite article) or kàá (interrogative morpheme):

(26) tukpá é 'it's a bottle'

but:

àgbò lé (< lá + é) 'it's the ram'

amɜ keè (< kàá + é) 'who is it?'

If, then, the postclitic affix is to be represented /e/ in underlying representations, the rules of stem vowel shift given previously will be revised accordingly, and the postclitic will be fully specified in the structural descriptions. Since as it happens /e/ is the only front postclitic vowel, this may appear to be a pointless complication; the clitic vowel could simply be identified as nonback and the rules will apply correctly with an apparent saving of features. I believe this to be the wrong approach in this case, however, since this solution, though simpler in terms of a feature-counting metric, fails to make explicit the nature of the phonological process involved in (17) (and (19)), namely, an assimilation of the stem vowel to the clitic vowel in tongue root advancing. Only the fully specified form of the rule displays the type of process involved, and provides a basis for explaining why one dialect, Anlo, should have acquired such a rule: such assimilatory processes are frequent innovations across weak boundaries.

4. Ewe and the Typology of Vowel Harmony Systems

Ewe has sometimes appeared to present typological deviances with respect to other members of Greenberg's 'Western Kwa' group; one such apparent deviance has been the structure of its vowel system. Ford [1973], basing his observations on the underlying system of vowel features rather than on superficial aspects of the phonology, was the first to show its close typological similarity to other members of the group. He further suggested how its vowel alternations might be related to those of the neighboring Togo Remnant languages.[8]

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[8] No Togo Remnant language is closely related to Ewe. A lexical comparison between Ewe and thirteen Togo Remnant languages based on the Swadesh 200-word list showed an average 17.1% common vocabulary [Heine 1968].

Even in terms of its vowel harmony system as such, Ewe presents interesting parallels to certain members of the Togo Remnant group. While vowel harmony typologies are generally of little interest for the study of genetic relationships among languages, they may be of considerable interest for the theory of phonology. It might be of interest, therefore, to try to place Ewe within the context of other vowel harmony systems based on the features [high] and/or [ATR].

Vowel harmony systems found elsewhere in the Kwa group, and widely in Africa [Hall et al 1974], characteristically divide their vowels into two harmonic 'sets' differentiated by the feature [ATR] (or perhaps in some cases, [CP]). Its normal domain is the phonological word (roughly coextensive with the morphological word). In this respect the highly restricted Ewe system might appear quite dissimilar. Nevertheless, we seldom find completely unrestricted harmony systems; typically, harmony is 'blocked' by certain nonharmonic affixes, or by nonharmonic vowels (usually [a], as in Asante Twi; see Stewart [1967]), or else it is unidirectional, as in Anum [Painter 1971], or non-iterative, as in Likpe [Ford 1973]. We might expect to find systems presenting several of these features at once, and Ewe is a rather extreme, but not atypical, case.

Setting aside such variable characteristics, then, the Ewe harmony system appears typologically deviant in one significant respect. Whereas the more widespread harmony systems classify their vowels into two sets, Ewe (excluding Anlo) distributes its cooccurring vowels into three sets, as follows:

(27)

set 1	set 2	set 3
+high	-high	-high
+ATR	+ATR	-ATR
i u	e o	ɛ ɔ

Contiguous vowels within a word can only be drawn from one of these sets (with the Peki and G$\tilde{\varepsilon}$ exceptions noted above); this follows from the

fact that the harmony rule involves two dimensions, tongue height and tongue root advancing.[9]

Such 'three-set' systems are not entirely unknown in Kwa, however. A system which appears to be of this type is found in Likpe [Ford 1973]. The facts are rather more complex than in Ewe, as the following paradigm of verb forms will suggest:

(28)

		bu 'rot'	bo 'bend'	bɔ 'exit'
sing.	1	mbu	mbo	mbɔ
	2	ɜbu	abo	abɔ
	3	ubu	obo	ɔbɔ
plur.	1	bubu	bobo	bɔbɔ
	2	bibu	bebo	bɛbɔ
	3	bɜbu	babo	babɔ

These and similar alternations in Likpe suggest the three-set system [i,u,ɜ] - [e,o,a] - [ɛ,ɔ,a]. We observe partial set overlap in that [a] occurs in both the second and the third set; a further complication is that some stems with the high vowels [i,u] require set three prefixes.

A harmony system more similar to that of Ewe is found in Sɛlɛ (also called Santrokofi), another Togo Remnant language; I am indebted to Christine Allen for providing me with the following information, amplifying the material presented in Ford [1973]. In Sɛlɛ, both two-set and three-set harmony is found. Two-set harmony, involving the feature [ATR] alone, causes verbal prefixes to harmonize to following verbal stems, and noun prefixes consisting of single vowels to harmonize to the following noun stem. Three-set harmony, involving both tongue height and tongue root advancing as in Ewe, causes noun prefixes of the form CV to harmonize to the following noun stem, provided V is not [a]. Thus, for example, the singular noun prefix for nouns of class II has the following set of allomorphs:

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[9] It is clearly this fact, and not a surface restriction on vowel sequences, that accounts for the equal-height condition on vowel sequences observed in Kpando [Stahlke 1973].

(29) | | | | |
|---|---|---|---|
| di | before | i,u | in noun stems |
| ɪe | before | e,o | in noun stems |
| ɪɛ | before | ɛ,ɔ,a | in noun stems |

The plural class II prefix, however, is invariably [a] before all stem vowels. SɛlɛSɛlɛ harmony is not observed within roots, or between roots and suffixes. Furthermore, the vowel [a] is 'opaque' to harmony in the sense that it prevents the spread of harmony leftward from a verb stem; cf. the following forms:[10]

(30) | | |
|---|---|
| ó-ɪóɔ̀-fè | 'he isn't going' |
| ɔ́-ɪɔ́ɔ̀-wa | 'he isn't coming' |
| but: | |
| ɔ́-ɪɔ́ɔ̀-bà-ɪɔ̀ɪa̰à̰ | 'he won't spoil' |
| ɔ́-ɪɔ́ɔ̀-bà-ɪɔ | 'he won't quarrel' |

Such examples suggest that harmonizing affixes in SɛlɛSɛlɛ, unlike those in Ewe, are underlyingly [-ATR] vowels, at least in the case of verbal prefixes.

Three-set harmony of the Ewe type, then, appears to be a typological possibility which is realized in at least a few languages; further investigation may show this type of harmony to be more widely distributed. The association of the features [high] and [ATR] is not, of course, surprising from the point of view of articulatory phonetics. The advancing of the tongue root has the effect, as noted in the introduction, of raising and advancing the body of the tongue and consequently the blade, and it can be observed that the articulatory gesture(s) responsible for raising the tongue blade are often associated with a concomitant advancing of the tongue root (cf. the X-ray tracings published in Perkell [1971:130], as well as the instrumental findings of Lindau et al [1972]). The two features are acoustically related as well, since both have the lowering of the first formant as a primary effect. As a consequence it would seem that the three vowel grades in Ewe may be located along a

[10] In this transcription, v̀ represents 'raised' low tone and v̰ represents low tone.

scale of roughly similar articulatory and acoustical steps, a possibility that suggests the interest of carrying out instrumental investigation in this area.

In view of the phonetic symmetry of the three-set system, it is perhaps surprising that it is so much less common than systems involving only tongue root advancing. One possible explanation would be that this system results in considerably greater loss of phonemic distinctions than the two-set system, and therefore can only be tolerated when it is extremely restricted in scope, as in Ewe, Likpe and Sɛlɛ.

5. Conclusions

A theory of vowel classification in Ewe has been presented which permits a comprehensive account of vowel harmony and related phenomena in a number of dialects on the basis of a few simple, phonetically plausible rules. The Ewe vowel system now appears to be rather similar to those of related languages in its general characteristics, in particular in the distinctive role played by tongue root advancing. The absence of the feature CP at the classificatory level is a rather surprising result, as in terms of SPE marking conventions (interpreting [CP] as 'low') such systems should be relatively marked. It remains to be determined to what extent this property may be shared by other languages with root-advancing alternations, and what consequences it may have for further developments in the theory of markedness.

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ON THE NATURE OF THE BAMBARA TONE SYSTEM

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1. Introduction

Mandekan is a cover term for a language complex including, among others, Bambara, Dyula, Guinean Maninka and Gambian Mandinka, which are spoken over a wide area of mostly Francophone West Africa. Bambara, Dyula and Maninka are mutually intelligible; Mandinka seems to be less closely related.[1]

One or another of these languages is frequently quoted in the literature as illustrating a peculiar sort of tone system, differing in kind from those found in other West African languages such as Yoruba or Twi. Nancy Woo [1969] has called Bambara a 'tone harmony' or 'pitch accent' rather than a lexical tone language. William Leben [1973] has used Maninka (and to some extent Bambara) as an illustration of a language in which tone is suprasegmental, that is, one which does not have segmental tone features in underlying lexical representations. He claims that the same suprasegmental tone patterns can be mapped onto the segments of Mandekan words regardless of the number of syllables in the words. Further, Mandekan supposedly has a tone rule which must refer to suprasegmental tones or suffer loss of generality.

The reasons for such conclusions are two. The first is the general belief that Mandekan has an extremely limited number of lexical tone patterns: two or perhaps three. Therefore, as William Welmers [1949] pointed out concerning Maninka, tone can be regarded as a property of the whole morpheme, rather than of the individual syllable or tone-bearing segment. The second is the existence of a rule for noun compounds (which includes noun + adjective(s)) by which the tone of the first noun determines the tone of the whole compound. Nancy Woo compared this rule to one of vowel

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[1]My principal informant for this study has been Sori Kulubali (Ibrahima Coulibaly) of Bamako; others who have been very helpful in my general study of Bambara are Goundo Magassa de Thandt, Cheickna Singaré, Ousmane Macalou, Mamadou Koita and Mariame Sidibe Sy. Mistakes are, of course, my own.

harmony.

I am challenging both Woo's and Leben's conclusions on the grounds that they are based on incomplete and therefore misleading data, for Bambara at least. It is possible, however, that their claims may hold up for other parts of Mandekan.

2. Lexical tone

Charles Bird [1969] has presented a good outline of the general way in which tone works in Bambara. It is not necessary to review this here, since the characteristics of terraced-level languages are well known. However, all the facts of lexical tone in Mandekan, or at least in Bambara, cannot be learned from the literature to date. Scholars writing on these languages, including Bird, have dealt with only two, or at the most three, of the tone patterns found in lexical items. Welmers [1949] states that Maninka has one-, two-, and three-syllable words. There are only two tone patterns in the one- and two-syllable words: all-low or all-high; the three-syllable words can have either of these or a third pattern: low-high-high. Rowlands [1959] and Spears [1966, 1968] also mention only these three lexical tone patterns for Mandinka and Maninka respectively. Bird, writing on Bambara in 1966 and 1968, deals with only two patterns, all-low and all-high.

It is therefore easy to see why Leben, given only this information, should have concluded that Mandekan lexical tone could be treated in one of two ways. If there were in fact only two tone patterns possible for a lexical item, it could be assigned one of two underlying suprasegmental contours which could later be mapped onto the separate vowels. If there were in fact three, each word could be marked with a diacritic feature which would specify which vowel would be assigned the first high tone. This last solution would be possible because by Leben's analysis all words contain at least one high tone. All final tones previously considered as underlyingly low have been reanalyzed as high; e.g., LLL is LLH for Leben (and for me as well, since I agree with him on this point). This will be discussed in detail below.

I have no first-hand experience with Maninka or Mandinka, and therefore cannot quarrel with the statement that they have only three tone

patterns in lexical items. It definitely is not the case, however, that Bambara has only three. In view of the conclusions which have been drawn by several scholars from this erroneous assumption, I will illustrate this point in (1) where occurring (and non-occurring) tonal patterns for a Bamako dialect of Bambara are given.[2] (The supporting data for this display can be found in Appendix I.)

(1)

Number of syllables	Tone patterns[3]				
1	H	L̂H	L		
2	HH	LH	(LL)		
3	HHH	LLH	(LLL)		
	HHL	LHH	(HLL)		
	HLH	LHL			
4	HHHH	LLLH	(HHHL)	(HLLH)	(LHHL)
	HHLH	LLHH	(HLLL)	(LLLL)	
	HLHL	LLHL	(HHLL)	(LHHH)	
		LHLH	(HLHH)	(LHLL)	
5	HHHHH	LLHHH			
6		LLLHHH			

(non-occurring patterns are shown in parentheses)

The Bambara language has many words borrowed from Arabic and French. In general the Arabic loans occurred earlier; however, a considerable part of the Bambara population has been Islamized quite recently, and Islam is still in the process of spreading to other Bambara communities not now Muslim. It is possible that some Arabic loans are quite recent. The French

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[2] Ségou Bambara tone is no less complex, but somewhat different. It will not be dealt with here in the interest of clarity.

[3] [l] can be tone bearing where a vowel has been lost, as in the words tl̀é (from tìlé) 'day' and fĺé (from fílé) 'look at'. Such words are still two-syllable, in spite of the loss of a vowel. The difference between one- and two-syllable words can most easily be heard in LH nouns followed by the 'definite article' realized only as low tone: they have quite different stress patterns:

sɔ̌ [˄] sàgà [ˍ˄]

tɔ̌ [˄] tl̀é [ˍ˄]

This difference is maintained even when a consonant is lost, as in some dialects' version of 'sheep': sàá.

loans have been taken into Bambara in the last eighty years for the most part. The fact that many Arabic and French loans have 'non-basic' (i.e., not H or 'rising') tone patterns would indicate that these patterns are still productive in Bambara, at least for borrowed words.

Loanwords exist with most of the tone patterns I have listed (blanks in the list below indicate patterns not occurring in my data):

(2)

		Arabic		French[4]	
1a.	H	---		bi	'soccer goal'
b.	L̂H	---		npɔn	'bridge'
c.	L	---		---	
2a.	HH	jinyɛ	'world'	siman	'cement'
b.	LH	hakɛ	'wrong'	kuran	'electricity'
c.	HL	Awa	'Eve'	kɔmi	'like, as'
3a.	HHH	lahara	'afterlife'	sinuwa	'Chinese'
b.	LLH	kibaru	'news'	tabali	'table'
c.	LHL	Dawuda	'David'	pɛtɛti	'perhaps'
d.	HLH	miseli	'needle'	buteli	'bottle'
e.	LHH	atayi	'tea'	lekɔli	'school'
f.	HHL	Amadu	(name)	---	
4a.	HHHH	madarasa	'Muslim school'	limɔnati	'lemonade'
b.	LLLH	jahanama	'hell'	alimɛti	'match'
c.	LHLH	lagansara	'a prayer'	---	
d.	LLHH	mutukali	'gold measure'	dɔgɔtɔrɔ	'doctor'
e.	HHLH	---		---	
f.	LLHL	Isiyaka	'Isaac'	---	
g.	HLHL	---		---	
5a.	HHHHH	---		gɔfɛranaman	'government'
b.	LLHHH	---		---	
6.	LLLHHH	---		---	

Other tone patterns exist for which I have only a single example, e.g. HLLHL salonnasini 'year before last', LLLLLHH kirikirimashiyɛn 'epilepsy'. There are undoubtedly others which I have not yet discovered. The very fact that there are so many tone 'patterns' (cf. (1) and Appendix I) would seem to indicate that the concept of Bambara tone as a property of the word as a whole is not very useful.

At a very rough guess, about 85% of the Bambara lexicon is either H or 'rising', but that does not let us escape the fact that there are hundreds of words in the language which do not fit these patterns, that they are part of the language and must be accounted for, and that they are subject

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[4] Cf. Appendix II.

to the tone rules of the language and must be able to function as inputs to those rules. Certainly those words which do not fit the 'basic' patterns cannot reasonably be dealt with by assigning them a suprasegmental pattern and then mapping this onto the vowels. Each vowel would better have a tone assigned to it in the lexicon.

That some 85% of Bambara words do have one of two tonal configurations is an interesting fact which should be expressed in the lexicon; but not, I think, by making tone suprasegmental in that part of the lexicon and segmental in the rest. Although by no means are all the possible tone combinations present in Bambara (and indeed tone combinations are completely free in few tone languages), enough are present so that every vowel must be specified for tone. Nothing would be gained by specifying all words not fitting the 'usual' patterns as [+ideophonic], [+foreign] or [+proper], simply because they are in a minority. Nor do any of my informants seem to feel that these words are in any way 'deviant'. Bambara may be in state of transition from a segmental tone language to a suprasegmental one; but, if so, the changeover is still far from complete. In the meantime Bambara will have to be considered a lexical tone language.

3. Tone-spreading

Most scholars writing on Mandekan have considered the language to have two basic tonal patterns: all-high and all-low (with low-high-high added by some). In Leben's formulation there are no all-low words. Instead there are words with a 'rising' tone pattern: $\widehat{\text{LH}}$ sa 'snake', LH fini 'cloth' and LLH kurusi 'pants'. Words of this tone configuration can be considered to have either 'all-low' or 'rising' as their underlying pattern, since they are 'all-low' before a high tone or before pause, and 'rising' before a low tone as in (3).[5] (In the following examples, ` indicates low tone, ´ high tone. Bambara is a terraced-level language, but downstep will not be indicated after low, where it is automatic. Adjacent vowels will be shown uncontracted.)

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[5]Cf. Appendix III.

(3)	Before pause	Before high tone	Before low tone
	Ń yé à kùnu̲n.	Ń yé à kùnu̲n dɛ́!	Ń yé à kùnú̲n wà?
	'I swallowed it'	'I swallowed it!'	'Did I swallow it?'
	À tɛ́ ya̲n.	À tɛ́ ya̲n sísàn.	À tɛ́ yǎ̲n bí.
	'It's not here'	'It's not here now'	'It's not here today.'

If the 'all-low' pattern be considered basic in such words, then their behavior before a low tone would be a case of dissimilation, going so far as to add a high tone to the underlying low tone in the case of one-syllable words. As Hyman and Schuh [1974] note, however, cases of dissimilation are rare in tone as they are in other areas of phonology. If the 'rising' contour is taken as basic, on the other hand, the all-low variation before high results from rightward spreading and absorption, two diachronic tone rules which Hyman and Schuh have shown to be very common in tone languages. Tone spreading is a kind of perseverative assimilation, whereby a tone continues into the domain of a following tone. In the case being discussed here, a low tone perseveres into the domain of a high one, producing a rising tone:

(4) ... kùnú̲n dɛ́ --→ ... kùnŭ̲n dɛ́ ... yǎ̲n sísàn --→ ... yᵕǎ̲n sísàn

The first high tone is then absorbed into the second one:

(5) ... kùnŭ̲n dɛ́ --→ ... kùnù̲n dɛ́ ... yᵕǎ̲n sísàn --→ ... yᵕà̲n sísàn

'Absorption' is a kind of spreading which takes place when a rising or falling tone is immediately followed by a tone which is the same as the end of the contour tone: that is, H after a rising tone and L after a falling tone. Synchronically, the intermediate stage with the contour tone never appears in Bambara. The tone change can be accomplished directly in one shifting rule (this rule does not apply within a word, and there are other limitations on its applicability which will be discussed below):

(6) $H \rightarrow L \;/\; L \_\_ \left\{ \begin{matrix} H \\ \# \end{matrix} \right\}$

(The Loss of the high tone before pause probably has a different historical origin, namely in the tendency of high tones in many languages to lower

before pause.)

Leben's reformulation of the 'all-low' words as 'rising', then, is supported strongly by what is known about natural tone processes. As Paul Schachter has pointed out (personal communication), the analysis of such words as 'rising', combined with the spreading rule, helps to explain many of the gaps in the chart of occurring tone patterns in (1), i.e., the lack of patterns with final LL. This comprises all the gaps in two- and three-syllable words, and four out of the nine in four-syllable words. If there were at some time in the history of the language words ending in LL, they would in most contexts have fallen together with words ending in LH, since the latter are LL in all contexts save that of a following low tone. Perhaps 'rule inversion' then occurred, with LH words reinterpreted as LL and a new rule L --→ H / L __ L established. There would then have been no contrast between underlying LL and LH, as is the case today with the exception of one-syllable words. Other gaps in the tone patterns are probably inexplicable, at least with our present knowledge; see Appendix I, footnote 4 for further discussion of this point.

Leben goes on to show that in Maninka the tone-spreading rule is quite general. In Bambara, however, it is considerably less so. In both languages the rule applies in the following cases: final syllables of 'rising' words, H tense markers, and H copulas. Maninka, though, also applies the rule to H verbs in final position, H quantifiers, and H postpositions. The following examples will illustrate applications of the rule in the two languages (Maninka examples from Spears [1968]):

(7) a. Maninka

À yǿ yɛ́lɛ́ -lá --→ À yə̀ yɛ̀lɛ̀-là

he pres. laugh 'He is laughing'

Bambara

À bɛ́ yɛ́lɛ́ -lá --→ À bɛ̀ yɛ́lɛ́-lá

'He is laughing'

(Here the Maninka rule applies to verb and tense markers; the Bambara rule only to the latter.)

b. Maninka

wɔ̀ dɔ́ --→ wɔ̀ dɔ̀
that some 'some of that'

Bambara

ɔ̀ dɔ́ --→ ɔ̀ dɔ́
'some of that'

(Here the Bambara rule does not apply to the pronoun 'some'; the Maninka rule does.)

c. Maninka

À bárá lá kúnúŋ --→ À bàrà là kùnùŋ
He past caus. wake 'He was awakened'

À bárá lá kùnùŋ --→ À bàrà lá kùnùŋ
It past pass. caus.swallow 'It was swallowed'

Bambara

À lá kúnún -ná --→ À lá kúnún-ná
He caus. wake past pass. 'He was awakened'

À (lá) kùnùn -nà --→ À (lá) kùnùn-nà
It caus. swallow past 'It was swallowed'

In example (7c) after the application of the rule, the Maninka sentences are distinguished solely by the tone of the causative marker la, while Bambara still distinguishes them by the tone of the verb. In Bambara only the tense marker is affected by the rule.

Maninka apparently has no contrast between high and low verbs in certain contexts:

(8) Maninka

À bɔ́ -rá --→ À bɔ̀-rà
He go past out 'He went out'

À fùà -rá --→ À fùà-rà
He die past 'He died'

But compare the two sentences in Bambara:

(9) À bɔ́ -rá --→ À bɔ́-rá
He go past out 'He went out'

À fàgà -rá --→ À fàgà-rà
He kill past pass. 'He was killed'

Bambara has minimal pairs for verbs in this context as well as all other contexts:

(10)	À bán -ná	vs.	À bàn -nà
	It end past		He refuse past
	'It ended'/'He died'		'He refused'
	À yé à súsú	vs.	À yé à sùsù
	He past it suck		He past it pound
	'He sucked it'		'He pounded it'

My Bambara informants reject the idea that such sentence pairs can be said alike except in one case: when an intonation expressing 'assertion with finality' is being used. Much remains to be learned about the interrelationship of tone and intonation in Bambara.

Although the Bambara tone spreading rule is less general than the Maninka rule, it clearly supports Leben's reanalysis of the all-low words as 'rising.'

4. The 'Noun-Compound' Rule

Leben, working with limited data, concluded that the suprasegmental nature of Maninka and Bambara tone is demonstrated by the existence of a rule which treats the tone patterns of words as suprasegmental entities. This is the tone-spreading rule as applied to noun compounds. I will show that this rule cannot in fact apply to such compounds, at least in Bambara: the true noun-compound rule lends no support to the idea that Bambara tone is not segmental.

As Leben says, the noun-compounds of Bambara work as follows (but only as far as the H and 'rising' words are concerned, as we shall see):

(11) a. If the first word is H, then every vowel of the compound is H.

b. If the first word is 'rising', then all vowels preceding the last word in the compound are L, and the last word is H.

Examples are given in (12):

(12)	a.	yírí	+ sùrùnmán	+ nín	-->	yírísúrúnmánnín
		tree	short one	small		'very short tree'
	b.	dùté	+ fínmán	+ dúmán	-->	dùtèfínmàndúmán
		tea	black one	good one		'good black tea'

Leben points out that this rule is only a description of compound tone in Bambara, not an explanation. Any other rule would seemingly make just as much sense. Leben's explanatory rule is as follows:

(13) a. Copy the last tone of the first word onto all noninitial words in the compound.

b. Perform tone spreading: H --> L / L ___ H iteratively.

If this rule is applied to segmental tones, the output is wrong in (12b) as seen in derivation (14):

(14) dùté-fínmán-dúmán

L	H	H	H	H	H	by (13a)
L	L	H	H	H	H	by (13b)
L	L	L	H	H	H	by (13b)
L	L	L	L	H	H	by (13b)
L	L	L	L	L	H	by (13b)

By interpreting the rule as applying to suprasegmental tones, one obtains the correct results (in this instance):

(15) LH
dute- finman- duman

LH H H by (13a)
dute- finman- duman

L H H by (13b)
dute- finman- duman

L L H by (13b)
dute- finman- duman

This ingenious solution, though, often fails when the initial word in a compound is one of the words with 'non-basic' tone. Of course, Leben had no way of knowing about most of these words; and his solution would have worked for the LHH words, which he was aware of. Part of his 'explanation' of the noun-compound rule, however, seems to rest on the idea that the whole compound reproduces the underlying tone of the first noun; and this would not be true of the LHH nouns any more than for the other words with 'non-basic' tone.

In fact, the tonally 'irregular' words when initial in a compound change their tone to that of their initial vowel; the last word is H, and any intervening words take the tone of the first one. My rule, which

follows, works for Bambara words of any tonal configuration:

(16) CRa. All vowels of the last word in a compound are high.

CRb. All other vowels in the compound are the same tone as the first vowel.

Examples follow:

(17) a. bloodsucker- big one- big

mɩrʃkɩtʃ- bɛ̀lɛ̀bɛ́lɛ́- bá

H by CRa

L L L L L L L L by CRb

'very big bloodsucker'

mɩrɩkɩtɩbɛ̀lɛ̀bɛ̀lɛ̀bá

(By Leben's rules this would come out mɩrʃkɩtɩbɛ̀lɛ̀bɛ̀lɛ̀bá since the tone spreading rule would not apply to a high tone followed by a low.)

b. afternoon prayer- long one- big

sɛ́lɩfánɛ́- jànmànján- bá

H by CRa

H H H H H H H by CRb

'very long afternoon prayer'

sɛ́lɩfánɛ́jánmánjánbá

Thus the entire tonal shape of a compound can be predicted by the tone of the first vowel of the first member of the compound. This solution is unfortunately not explanatory; nor does it neatly fit in with the tone-spreading rule which is needed elsewhere in Bambara, but it does fit the facts and does not introduce unnecessary false steps.

Leben remarks that his compound rule could be restated to apply cyclically to bracketed forms if iterative phonological rules are not allowed. In fact, bracketing is independently motivated for Bambara compounds because

of forms like the following:

(18) kàràmɔ̀gɔ́kúntʃgʃ 'principal' which is from

kàrá(n) 'teaching' } kàràmɔ́gɔ́ 'teacher'
mɔ̀gɔ́ 'person' }

and

kŭn 'head' } kùntʃgʃ 'leader'
tʃgʃ 'owner, possessor' }

By either Leben's or my rules, a bracketing like [[kàrá][mɔ̀gɔ́][kŭn][tʃgʃ]] would produce the wrong results as in (19):

(19) [[kàrá][mɔ̀gɔ́][kŭn][tʃgʃ]]

H H by CRa

L L L L L by CRb

*kàràmɔ̀gɔ́kùntʃgʃ

But a different bracketing as in (20) produces the desired output:

(20) [[[kàrá][mɔ̀gɔ́]][[kŭn][tʃgʃ]]]

H H H H by CRa

L L L by CRb

H H H by CRa

L L L L by CRb

kàràmɔ̀gɔ́kúntʃgʃ

(after the first application of CRa & b, the intermediate kùntʃgʃ is treated as one word)

(21) sɛ̀nnúnkún 'tip of the foot', which is from

sɛ̆n 'foot'

and

nún 'nose' } 'tip'
kŭn 'head' }

([[sɛ̆n][nún][kŭn]] would produce sɛ̀nnùnkún, which is wrong. The correct bracketing must be [[[sɛ̆n][nún][kŭn]]].)

The noun-compound rule is apparently responsible for the idea put forth by Nancy Woo that Bambara is a 'tone harmony' language, analagous

to a 'vowel harmony' language in that the tone of the first word determines the tone of the whole compound. I think that the importance of this rule has been greatly exaggerated by several scholars, at least as far as its influence on the tonal character of the language is concerned. It is actually a very restricted rule, applying in few contexts; not all noun compounds follow the rule. It applies in one case where no noun compound is involved.

The rule does apply in the following cases:

(22) a. Most nouns derived from combinations of other nouns.

kɔ̀rɔ́ + mʊ̀sɔ́ --→ kɔ̀rɔ̀mʊ́sɔ́

'elder sibling' 'woman' 'elder sister'

b. Nouns derived from various combinations of word classes + derivational suffix.

kɔ̀gɔ́ + kɛ́ + lán --→ kɔ̀gɔ̀kɛ̀lán

'salt' 'put' 'instrumental' 'salt shaker'

bǐn + ń + kǎn + lǐ + kɛ́ + lá --→ bǐnǹkànnǐkɛ̀lá

'fall' 'me' 'on' 'gerund suffix' 'do' 'agent suffix' 'mugger, highwayman'

c. Certain other nouns derived from noun + verb:

kɔ́ + bǐlá + nyá --→ kɔ́bǐlányábǐlá

'back' 'put' 'front' 'open-sided shirt'

d. Verb + adverb phrases derived from noun + verb:

sɔ̀bɛ̀kɔ́rɔ́ + bʊ̀gɔ́ --→ sɔ̀bɛ̀kɔ̀rɔ̀bʊ́gɔ́

'seriousness' 'beat' 'beat seriously'

e. Noun + 'adjective(s)', where the adjective is actually a noun derived from an adjective-verb (like 'to be red') + a nominalizing suffix:

cɛ̌ + nyʊ̀mán (from nyǏ + -mán) --→ cɛ̀nyʊ́mán

'man' 'good' 'be good' 'nominalizing suffix' 'good man'

(-bá 'big' and -nǐn 'small' are two other adjectives which follow this rule)

The rule does <u>not</u> apply in the following cases involving nouns:

(23) a. Some nouns derived from combinations of nouns.[6]

mɔ̀gɔ́ + fú + fǎ + fú --→ mɔ̀gɔ̀fúfàfú

'person' 'nothing' 'father' 'nothing' 'hereditary good-for-nothing'

b. Certain nouns derived from noun + verb or 'identifier'.

cɛ̌ + tɛ́ + mɔ̀sɔ́ --→ cɛ̀tɛ́mɔ̀sɔ̀tɛ́

'man' 'is not' 'woman' 'homosexual'

c. Noun + demonstrative.

mɔ̀sɔ́ + nɔ̀n --→ mɔ̀sɔ́ nɔ̀n

'woman' 'this' 'this woman'

d. Noun + numeral.

fàbúràmá + fìlá --→ fàbúràmá fìlà

'purple potato' 'two' 'two purple potatoes'

e. Nouns in apposition.

dɛ́nyɛ́rɛ́nɔ̀n + kàsɔ̀làbá --→ dɛ́nyɛ́rɛ́nɔ̀n kàsɔ̀làbá

'baby' 'big cryer' (itself a compound) 'baby (which is a) big cryer'

f. Nouns in possessive phrases.

súngúrún + sɛ̀n + ˋ --→ súngúrún sɛ̀n

'girl' 'leg' 'definite article' 'the girl's leg'

It can now be seen that the 'noun compound' rule does not simply erase the underlying tones of the non-initial words of any noun phrase in the language. I am afraid that one can get just that impression from incomplete accounts of the rule. Bambara is perhaps a little further along the way to becoming a 'tone harmony' language than, say, Igbo, which has a rather more complicated tone rule involving nouns. It may have an overwhelming majority of words with two tone patterns. But it is still at this point in time a lexical tone language, in which tone must be represented as a feature on segments; and as I have shown, it is not in fact very different from other West African tone languages.

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[6] All tone changes in (23), such as mɔ̀gɔ́ to mɔ̀gɔ̀ in (a) and nɔ̀n to nɔ̀n in (c), result from the tone shifting rule (6).

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Appendix I

Examples:

		a. H		b. L̂H		c. L	
1.	nouns	ba	river	ba	goat	(none)	
		san[1]	sky	san	year		
	verbs	di	give	di	shave	(none)	
		si	grind	si	spend the night		
	misc.	ye	completive	tun	perfective	ka	inf. mrkr.
		ka	subjunct.	u	3rd pl. pro.	a	3rd sg. pro.
		a. HH		b. LH		c. HL[2]	
2.	nouns	fini	fonio	fini	cloth	kunun	yesterday
		kɔnɔ	stomach	kɔnɔ	bird	Saran	(name)
	verbs	kunun	wake up	kunun	swallow	(none)	
		tugu	close	tugu	follow		
	misc.	mana	if	joli	how much?	sani	before
		pewu	completely	kana	subjunct. negative	wali	or

---

[1]A word final n in the orthography means that the preceding vowel is nasalized: don [dõ] 'enter'. Before an [o], word-final n is [ŋ]: sàn ó sàn [sàŋ ó sà] 'every year'. Word-medial n is homorganic with a following consonant: kénínge [kéníŋgé] 'kind of millet'. Tone-bearing syllabic nasals are also homorganic with a following consonant: Ń bé táá [ḿ bé táá] 'I will go'.

[2]HL words are phonetically high-falling before a H and high-downstep (?) before a L: (data from pitch extractor)

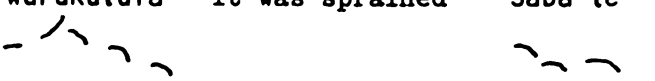
134 hz Sa̲rán té 'It's not Saran' Sa̲rán dòn 'It's Saran'

92 hz

The other phonetic manifestations of L in the two examples above are regular; but the underlined L is anomalous, since the first of two successive L's usually falls slightly rather than being level or even rising slightly as in this case:

140 hz À wùrúkùtùlà 'It was sprained' Sàbà té 'It isn't three'

92hz



Judging from the first tone of the first example just above, I would guess that determining factor for falling or level (including slightly rising?) low tones is word boundary; but a great deal of work remains to be done on

		a. HHH		b. LLH	
3.	nouns	mininyan	boa	funteni	heat
		keninge	kind of millet	npɔliyɔ	kind of fish
	verbs	tagama	walk	nyininka	ask
		nimisa	regret	nyɔngiri	kneel
	misc.	tuguni	again	barisa	because
		walasa	in order to		
		c. LHL		d. HLH	
	nouns	kunanjɛ	heron	mangoro	mango
		doodo	kind of fish	Misira	section of Bamako
	verbs	(none)		(*)	
	misc.	layila	(exclamation)	(none)	
		laala	perhaps		
		e. LHH		f. HHL	
	nouns	jakuma	cat	Garaba	(name)
		sabara	shoes	Keyita	(surname)
	verbs	(*)		(none)	
	misc.	kabini	since	(none)	
		a. HHHH		b. LLLH	
4.[3]	nouns	kulukutu	sphere	karankafe	sideburns
		mɛnɛmɛnɛ	ant	peresidan	president
	verbs	kucukucu	rinse out	balabala	boil
		koyokoyo	be ashy	kolonkolon	roll
	misc.	(none)		(none)	
		c. LHLH		d. LLHH	
	nouns	mirikiti	bloodsucker	kalamana	strabismus
		faburama	kind of potato	karakoro	kind of fritter

---

the phonetics of Bambara tone. It should be noted also that for some speakers, at least some of the HL words are HL̂H: kún̂ún instead of kúnùn. For such speakers the second syllable of a HLH word has a pronounced rise before low tone.

[3]It is possible to at least guess at a polymorphemic origin for a few of the four-syllable words; but even if the guesses are correct, the tones of the original words have been changed very irregularly, and the four-syllable words cannot be derived from them in any simple way. Examples: babugunin LHLH 'sand castle' from ? ba H 'river', bugu LH 'thatched house', nin H 'small'
fitirinin LHLH 'kind of bat' from ? fitiri LHH 'dusk', nin H 'small'
kunasini HLHL 'day before yesterday' from ? kunun HL 'yesterday', sini HH 'tomorrow'

	verbs	wurukutu	sprain	kisikasa	reel
		nɛmɛnɛmɛ	do slowly	kolokala	stroll
	misc.	(none)		(none)	
		e. HHLH		f. LLHL	
	nouns	fogonfogon	lung	Malisajo	(name)
	only	gɛrɛgɛrɛ	continuous bad luck	Molobali	(name)
		g. HLHL			
	nouns	kunasini	day before yesterday		
	only	ncincɔkincɔ	(in expression 'didn't say <u>any thing</u>')		
		a. HHHHH		b. LLHHH	
5.	nouns	gɔfɛranaman	government	kengenkokoyo	mumps
	only	kartidante	identification card	nponponpogolo	elephantiasis
		LLLHHH[4]			
6.	nouns	mililkimalaka	zigzag		
		kolobokalaba	carelessness		

[4]This particular tone pattern seems to be similar in meaning to the Yoruba ideophonic pattern High Mid Low Mid denoting 'irregularity' or 'deviation from the norm'. William Leben (personal communication) has stated "the fact that words like mililkimalaka and kiribikaraba are composed of two parts that are partial copies of each other, and that the first part has a level L while the second has a level H makes the notion that Bambara tone is completely lexical (i.e. associated with individual segments or syllables) a little difficult to believe unless there is some other reason to believe that tone patterns like LHLHLH don't occur on words of this sort." It is, however, quite common for ideophones to have restricted tone patterns and to have sections which are partial copies of each other. In Yoruba, for example, the type mentioned above with the tone pattern HMLM (e.g. kpɛtɛkpɛtɛ 'muddy', yalayala 'in shreds') has a very specific and inexplicable tone pattern; there are no ideophones with the patterns LMHM, HLLH or MHML, for instance, though there is no obvious reason why there shouldn't be. Another Yoruba type is kɔ̀rɔ̀bɔ̀t 'fat', fɛ̀rɛ̀gɛ̀dɛ̀ 'broad' where the first and third consonants must be -coronal, the second r and the fourth +coronal; the tone must be all low. An explanation for this would be very difficult to find. Yoruba also restricts the initial tone of vowel-initial nouns to low or mid. I have never heard anyone advance the hypothesis that Yoruba is not a lexical tone language; indeed, I think such restrictions are normal for tone languages. Sometimes they can tell us something about the history of the tone system, as in the case of the lack of distinction between final LL and final LH in most Bambara noun types; sometimes they are beyond our competence to explain, at least at this stage of linguistic knowledge.

verbs	kiribikaraba	be worthless
	ŋanamuŋanamu	act restless
misc.	(none)	

(*) indicates tone patterns which appear in verbs only when the verb can be analyzed as verb + prefix: HLH la-jigin 'lower' from LH jigin 'descend'; LHH man-dimi 'hurt (place already injured)' from HH dimi 'hurt'. Such prefix + verb combinations also produce other tone patterns which are usual for verbs without prefixes: HHH la-cinyɛ 'cause to spoil' from HH cinyɛ 'spoil'; LHLH ma-jigin 'submit' from LH jigin 'descent'; LH ma-da 'submit' from H da 'lie down', etc. It might be better in some cases to consider the L ma(n)- prefix as simply the first syllable of a verb, where the original verb cannot be identified: LHLH man-tɔ 'be quiet' from ? LH *tɔ.

Some tone patterns are restricted to certain kinds of morphemes. Several are restricted to nouns, and 3f (HHL) and 4f (LLHL) to proper nouns. Words of pattern 5a (HHHHH) are borrowed from French. Patterns 4g (HLHL) and 5b (LLHHH) are rare, at least in my data. Most nouns of pattern 3d (HLH) have an alternate pronunciation of HHH in this dialect; perhaps the HLH versions are dialect borrowings from Ségou.

Appendix II

The tone of Bambara words borrowed from French is little understood, and is currently under investigation by the author. Preliminary findings are these:

a) French loans in Bambara often have more syllables than the French originals, because of epenthetic vowels added between consonants (except clusters with l or r, where the l or r becomes tone-bearing in Bambara) or after final consonants.

b) French words may be borrowed with their definite or indefinite articles: LHH lecɔli 'school' from l'école, LH dute 'tea' from du thé. Whole French phrases may be borrowed as one Bambara word: LLHH latikɔlɔn 'cologne' from l'eau de Cologne, HHHHH kartidante 'ID card' from carte d'identité. In such cases, unstressed particles in French are usually L in Bambara.

c) There is some tendency for monosyllabic French words to be borrowed as H: bi 'soccer goal' from but, kɛsu 'box' from caisse, lɛtri 'letter' from lettre. But there are many LH: trɛn 'train' from train, rɔbu 'dress' from robe, zu 'yoke' from joug. There are even some HL: kɔmi 'like, as' from comme.

d) Two-syllable French nouns tend to become LH in Bambara: balon 'ball' from ballon, kaye 'notebook' from cahier, butigi 'boutique' from boutique. Again, however, there are many exceptions: (H) nilɔn 'nylon' from nylon, biye 'ticket' from billet, simisi 'shirt' from chemise; HLH buteli 'bottle' from bouteille.

e) Longer French words tend to become H in Bambara: siniman 'movie' from cinéma, isamɛn 'examination' from examen, kapitalisimu 'capitalism' from capitalisme. There are still exceptions: LLLH alimɛti 'match' from allumette, LLH mangasa 'store' from magasin, LLHH politigi 'politics' from politique.

f) Some French words are borrowed without their initial syllables: HH sansi 'gasoline' from essence, LH pranti 'apprentice' from apprenti, HH taari 'hectare' from hectare.

g) Some French borrowings have different tones for different speakers of the same dialect: HHH or LLH mobili 'car' from (auto-)mobile, HH or LH klasi 'class' from classe.

So far, at least, the tones of borrowed words shed very little light on the nature of Bambara tone in general, besides confirming the fact, already known, that there is a connection between stress and high tone in this language as in many African tone languages.

Appendix III

It has long seemed odd to me that nearly all Bambara words should end in an underlyingly H tone. One would not expect any suffix that this might be the remnant of to apply to more than one word class. My hypothesis is that the H ending may have started historically as some sort of noun suffix (since noun class suffixes are widely attested in Niger-Congo, while verb suffixes are not), and have later spread to verbs and other word classes when the contrast between final LH and LL was blurred by spreading rules.

I have just learned from William Welmers (personal communication) that in Liberia there is a language related to Bambara called Manya, in which most tones are the reverse of Bambara tones. Most nouns cognate with Bambara LH nouns are HL in Manya, while Bambara LH verbs are H in Manya. This fact may indicate that the reversal of tones in Manya took place before the hypothetical H noun suffix had spread to other word classes. (Monosyllabic nouns are, however, exceptions in that Bambara LH corresponds to Manya H, as in verbs.) Examples:

	Bambara	Manya	English gloss
	(verbs)		
	dá	là	'lie down'
	táá	tàà	'go'
	nǎ	ná	'come'
	sùnyá	súnyá	'steal'
	(nouns)		
	túlú	tùlù	'oil'
	bólò	bòlò	'hand'
	jí	jì	'water'
	sú	sù	'night'
	bàmá	bámà	'crocodile'
	jɔlɔkɔ	jɔlɔkɔ	'chain'
but	sǎ	sá	'snake'
	jě	jé	'pumpkin'

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ABSTRACT ANALYSIS AND BANTU RECONSTRUCTION: A LUGANDA EXAMPLE

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1. Introduction

The pioneering work done by European linguists in comparative Bantu phonology provides a solid foundation on which present-day generativists can build. The traditional comparative method used in these studies, however, leaves a number of questions unanswered concerning such problems as the exact form of phonological rules, their relative ordering, and so forth. What I hope to do in the present paper is to show how the types of problems which theories of comparative Bantu are capable of handling can be expanded by incorporating into the comparative method abstract levels of analysis adapted from the theory of generative phonology. This welding of traditions can contribute new and deeper insights, while affirming what is sound in the early work.

An example of the thoroughness of the pioneering studies in the Bantu family is Malcolm Guthrie's Comparative Bantu [1967-71]. However, it is not clear from the presentation of forms where Guthrie's starred items fit into the over-all grammatical description of the hypothesized proto-language, in terms of such problems as allomorphy and phonemic distribution. For example, he frequently supplies two or more reconstructions where it looks obvious that we would want to trace all the entries to a single source item, e.g. *-joka, *-yoka.. 'snake'; *-nama, *-yama .. 'meat'. Although Guthrie provides some discussion of the relationships of such pairs in his notes, this is not an integral part of his method and the original distinctions are poorly motivated. Another set of generalizations which Guthrie's system fails to capture is the distribution of phonological segments within the reconstructed list. For example, the segment *j is found only in nasal clusters, while *y occurs intervocalically; consequently, the apparent contrast between the initial consonants of the stems *-jobe 'antelope' and *-yoyo 'heart' is really a function of the fact that *-jobe normally takes the Class 9 prefix

*N- (a homorganic nasal), while *-yoyo takes the Class 3 prefix *mu-.

In brief, then, Guthrie's methodology for comparative Bantu work fails to characterize the phonological system of the parent language, and the details of development in the individual daughter languages. This may not have been a specific goal of his four-volume study, but it is certainly one that linguists have to deal with at some point. The purpose of this essay is to tackle that problem through a reconstruction based on the morphophonemic alternations within a single Bantu language, Luganda. The analysis is consistent with the reconstruction of Luganda presented in Meeussen [1955], but goes beyond that study through the introduction of generative-type rules written in a sequence ordered across time.

2. Phonological Rules

2.1 Luganda j and y. As noted above for Proto-Bantu, we find in Luganda that the affricate j occurs in nasal clusters, while the palatal glide y occurs intervocalically (and initially; these environments are pretty well exhaustive, since a nasal-plus-obstruent is the main consonant cluster in Luganda). This gives rise to the following phonological alternations when there is a change in the nominal prefix of certain stems (the surface break between prefix and stem is marked by a hyphen):

(1)	eñ-jovu[1]	'elephant'	DIM	aka-yovu	'little elephant'
	eñ-julu	'reeds for making baskets'	sg.	olu-yulu	

The alternation also occurs in verb stems, in the contrast of the infinitive prefix oku- and the first person, singular marker N-. For example:

(2)	oku-yiga	vs.	ñ-jiga	'I learn'
	oku-yita		ñ-jita	'I call'

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[1]Tone is not marked since it is not relevant to the concerns of this paper. The initial vowel of all nominal prefixes can be deleted, for syntactic reasons.

The main source of data was: E. Ashton, E. Mulira, E. Ndawula, and A. Tucker [1954].

The change can be described-by a rule of the form:

R.1 y-Formation

$$j \rightarrow y \;/\; [-nas]\ \_\_\_$$

When y is followed by a non-high vowel (e, a, o), it is generally deleted (there are some exceptions such as okuyaamba 'to help', for which I can provide no principled explanation). For example:

(3)	eñ-jala	'finger-nails'	sg.	olw-aala
	eñ-jeyo	'brooms'		olw-eeyo
	ñ-jagala	'I love'	INF	okw-aagala
	ñ-jera	'I sweep'		okw-eera

The above data call for a rule of the form:

R.2 y-Loss

$$y \rightarrow \emptyset \;/\; [+syll]\ \_\_\_ \begin{bmatrix} +syll \\ -hi \end{bmatrix}$$

Note that after y-Loss has applied, a rule of Devocalization applies to the u of the prefix olu- or oku-, with compensatory lengthening of the following vowel. Thus, olwaala can be derived synchronically from underlying olu-jala, by the successive application of y-Formation, y-Loss, and Devocalization (olu-jala → oluyala → oluala → olwaala).[2]

2.2 Meinhof's Rule. In some stems in which, according to the above rules, we would expect to find a j, we in fact find ñ. For example:

(4)	eñ-ñuumba	'house'	DIM	aka-yuumba
	ñ-ñiimba	'I sing'	INF	oku-yiimba
	ñ-ñoongera	'I add to'		okw-oongera

What the stems above have in common is that the initial j segment is followed by a nasal consonant in the next syllable; it is in this environment that 'Meinhof's Rule' applies, a process whose form and distribution has been described in a preliminary way in Meeussen [1962]. Meinhof's

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[2] Rules governing the initial vowel o and the consonant l have been ignored.

Rule converts a nasal cluster whose second member is a voiced non-continuant to a geminate nasal cluster, whenever a nasal consonant follows in the next syllable. For example:

(5)	em-maambo	'peg'	DIM	aka-baambo
	eŋ-ŋoombe	'horn for blowing'		aka-goombe
	en-nimiro	'(garden) plot'		aka-limiro
	n-niinda	'I wait'	INF	oku-liinda
	ŋ-ŋaamba	'I say'		oku-gaamba
	m-muumba	'I mould clay'		oku-buumba

Note that where we expect d above, we find l. The alternation of d and l is illustrated more clearly in stems such as:

(6) n-deeta 'I bring' INF oku-leeta

The rule that converts d to l is parallel to y-Formation, and has the form:

R.3 Lateralization[3]

$$d \rightarrow l \;/\; [-nas] \_\_\_$$

To return to Meinhof's Rule, the form of that rule is:

R.4 Meinhof's Rule

$$\begin{bmatrix} -cnt \\ +voi \end{bmatrix} \rightarrow [+nas] \;/\; [+nas] \_\_\_ [+syll]_1^2 [+nas]$$

Given these rules, the forms eññuumba and akayuumba (cf. (4) above) can be derived from the underlying forms eN-juumba and aka-juumba respectively, with application of Meinhof's Rule in the former case and y-Formation in the latter.

2.3 Consonant Gemination. The next problem we need to consider is the form of the Consonant Gemination rule in Luganda. Obstruents and nasals can all occur in geminate clusters, which are predictable by a general

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[3] The segments l and r are in complementary distribution. In general, r occurs after front vowels, l elsewhere.

rule.[4] The major clue to this process is found in verb stems with initial geminate clusters. When the first person, singular marker is added to stems of this type, the following changes take place:

(7)	n-zita	'I kill'	INF	oku-tta
	n-ziba	'I steal'		oku-bba
	n-zigala	'I shut'		oku-ggala

Note that when the nasal prefix is added, the CC cluster is replaced by a sequence zIC. The underlying source of this z segment is suggested by stems with an initial nasal:

(8)	ñ-ñima	'I begrudge'	INF	oku-mma

The appearance of ñ in the place of z in this verb indicates the operation of Meinhof's Rule on an underlying j (that is, N-jima -> ñjima -> ññima). Suppose now that we started out in the infinitive form as well with -jima. According to the rules already developed, j would be in inter-vocalic position and y-Formation would apply. Since y-Loss does not apply when there is a following high vowel, the form would have been realized as *okuyima at the time that Consonant Gemination was introduced into the language. In other words, we would have the development: *okuyima > okumma; in more general terms, yIC > CC. This is the form of the Gemination rule which I will propose here,[5] with one important modification. It is necessary in modern Luganda to distinguish two types of high front vowels, according to the rules which these segments undergo (rather than by any phonetic distinction). For example, the (underlying) i of the Causative extension (/-i-/) in verbs causes spirantization of a preceding non-continuant (with fronting to the position of s or z), whereas the i of the Applicative extension (/-id-/) does not cause spirantization but does undergo vowel harmony, that is:

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[4]Although most geminate consonants arise from the Consonant Gemination rule (cf. Mould 1974) nasal geminates also arise from the operation of Meinhof's Rule. Cf. the forms in (4) and (5).

[5]The form of this rule follows both Guthrie and Meeussen.

(9)	-lima	'cultivate'	Cs.	-limya	Ap.	-limira
	-siga	'plant'		-siza		-sigira
	-genda	'go'		-genza		-gendera
	-weta	'bend'		-wesa		-wetera
				(<-wet-i-a)		(<wet-ir-a)

(In the Causative forms, the devocalized i is deleted after s or z; the clusters sy and zy do not occur in Luganda.) The two i's of the synchronic grammar reflect the Proto-Bantu phonetic contrast between 'close' *ɩ and the more open high front vowel *i (this fact is well established in the literature on the basis of comparative studies). Since the i involved in the Gemination rule also triggers Spirantization (cf. (7) above), it can be identified historically with *ɩ. The diachronic description of the Gemination rule is therefore:

R.5 Gemination

$$yɩC \rightarrow CC$$

The historical contrast of *ɩ and *i thus accounts for the present difference between forms such as okutta 'to kill' (*okujɩta) and okuyita 'to pass' (*okujita).

The relevant form of the Spirantization rule illustrated in (9) is:

R.6 Spirantization

$$[-cnt] \rightarrow \begin{bmatrix} +cnt \\ +ant \\ +cor \end{bmatrix} / \_\_\_ \; ɩ$$

Given all of the foregoing rules, the stages in the historical development of the forms kumma, kubba, ññima, and nziba can be schematized as below:

(10)	*kujɩma	*kujɩba	*ñjɩma	*ñjɩba
y-For	kuyɩma	kuyɩba		
M's R			ññɩma	
Spir				nzɩba
Gem	kumma	kubba		
Vow-Lax			ññima	nziba

There are a number of interesting points in the chronological ordering of the consonant rules above. For example, y-Formation blocks the later application of Spirantization to intervocalic j's, because their surface realization when the spirantizing rule was introduced was a glide y and not a non-continuant. At the same time, y-Formation preserves (and creates) historically the environment for the later development of Gemination. Moreover, note that Meinhof's Rule takes precedence over Spirantization (thus, ññima, NOT nzima --because the earlier rule blocks the later one). Thus, the analysis suggests that Meinhof's Rule is a very old process, and thereby gives independent support to a hypothesis put forward by Meeussen [1962], on the basis of comparative work: "Reviewing all the evidence, one gains the impression that Meinhof's rule dates back to Proto-Bantu, at least for the eastern half of its distribution."[6]

2.4 Palatalization. I would now like to turn to the recovery of a historical rule for Luganda which is no longer productive of any surface alternations in the language. I will try to show that by inferring such a (completely abstract) rule, we can provide a simple and natural explanation for a number of linguistic facts.

Class 5 nouns with simple initial consonants have, in place of a prefix of the form (V)CV-, a gemination effect on the initial segment. For example:

(11)	eppeesa	'button'	pl.	ama-peesa
	ettabi	'branch'		ama-tabi
	effumu	'spear'		ama-fumu

However, stems in this class with an initial vowel or geminate cluster take the prefix eri-, as the following examples show:

(12)	eri-ñña	'name'	pl.	ama-ñña
	eri-ññó	'tooth'		ama-ññó

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[6] A. E. Meeussen [1962:27].

ery-aato	'canoe'	ama-ato
ery-eemvu	'banana'	ame-emvu[7]

On the basis of the Gemination rule we already have, we would want to derive the stem -ññna from *-j|ña (cf. Swahili jina, maj|na 'name(Xs)'), in the derivation: *edij|ña > eriy|ña > eriñña. In a parallel manner, ettabi 'branch' could be derived from *ej|tabi -- that is, if the prefix were *ej|- rather than *eri-, the behaviour of stems with an initial simple consonant would be straightforward. I propose to reconstruct this prefix as *(e)d|-, and add a Palatalization rule, ordered before y-Formation, of the form:

R.7 Palatalization

$$d \rightarrow j \; / \; \_\_\_ \; |$$

The steps in the derivation of ettabi will then be: *ed|tabi > ej|tabi > ey|tabi > ettabi. (The fact that Palatalization has not applied to the prefix in forms such as eriñña and eryaato will be discussed below.)

Evidence that Proto-Bantu *| has exerted a palatalizing influence on consonants is not lacking within Luganda, nor in comparative Bantu studies. For example, the Spirantization rule incorporates a process of assimilation, so that the following changes take place:

(13) $\begin{matrix} p & t & c & k \\ b & d & j & g \end{matrix} \rightarrow \begin{matrix} s \\ z \end{matrix} \; / \; \_\_\_ \; |$

Meeussen[8] notes as well the development n > ñ under the influence of *|, in forms such as:

(14)	omugeñi	'stranger'	-gen|	Gr
	ensoñi	'shame'	-con|	Gr

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[7]The second vowel of the prefix assimilates to the following vowel (that is, ama-emvu --> ameemvu).

[8]Meeussen [1955:173]. The abbreviation Gr indicates that the reconstruction is from Greenberg.

A Palatalization rule would help to explain another observation by Meeussen, namely:[9] "Le grand nombre de thèmes verbaux commençant par *j| en bantou commun est assez surprenant; la même chose vaut pour le thème nominal...;" the proposed Palatalization provides at least two underlying sources for *j|- that is, *d| and *j|. Furthermore, the rule gives one clue to the relationship among the four forms of the Class 5 prefix that Guthrie reconstructs: *d|-, *dl-, *y|-, *yl-. There is independent support in the residual form jl- of the Class 5 prefix in Swahili (jl- is found before monosyllabic stems of this class).[10] And finally, the Palatalization rule provides a simple and natural explanation for the behaviour of d and j in Luganda, and greatly simplifies the grammar.

2.5 'Perfect' stem. To see how that works, we need to consider another set of alternations in verb stems. Besides a Causative and an Applicative extension, every verb stem has a modified or 'Perfect' form that derives originally from the stem plus the suffix *-|de (this is clear from comparative evidence).[11] In Luganda, however, a number of phonological processes have affected this suffix, producing considerable surface allomorphy. The stem alternations that interest us here are those that affect stems with final l. For example:

(15)	-lokola	'save'	Cs.	-lokoza	Pf.	-lokodde
	-kebera	'look at'		-kebeza		-kebedde

The rules (R.7, R1-6) presented above, give the following derivation for -lokoza: *-dokod|a > -dokoj|a > -lokoy|a > ?. The problem here is that y-Formation has been allowed to apply in a place where we want to preserve j so that Spirantization can apply. A simple remedy that is consistent with all other cases of a similar sort is to constrain the environment of y-Formation so that it only applies if there is a following

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[9] Meeussen [1955:177].

[10] Cf. Hinnebusch [1973] for further discussion concerning the derivation of Class 5 prefix forms from *d| (or conversely *l|).

[11] Cf. Mould [1972] for a somewhat different view of the 'Perfect' stem.

vowel and a consonant (the constraint is relevant only to verbs, however; cf. omwooyo 'heart' > *omujojo). It is then possible to derive -lokoza and -lokodde historically in the following way:

(16)

	*-dokod|a	*-dokod|de
Palatal.	-dokoj|a	-dokoj|de
y-For/Lat	-lokoj|a	-lokoy|le
Spir	-lokoz|a	---
Gem	---	-lokodde[12]
Devoc, etc.	-lokoza	---

Note how the operation of Spirantization will in every case wipe out the evidence for the Palatalization rule, since the environments for the two are the same. Moreover, note how Palatalization prevents Lateralization from applying to the second underlying d in -lokoza; if this d had not palatalized, we would have been forced either to incorporate l into the Spirantization rule, or to prevent Lateralization from applying in an ad hoc manner, or to claim that Spirantization has been inserted into the grammar ahead of Lateralization. None of these solutions is as simple or effective as the Palatalization rule.[13]

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[12]The fact that l geminates as dd is considered here as a phonetic fact.

[13]A slight complication with mono-syllabic l-final stems involves the loss of the consonant of the suffix and the retention of the second consonant of the stem. The Perfect form of these stems is parallel to stems such as -lima and -leeta; that is:

-lima	'cultivate'	Cs. -limya	Pf.	-limye
-leeta	'bring'	-leesa		-leese
-kola	'work'	-koza		-koze
-gera	'weigh'	-geza		-geze

The Cuasative forms are regular, but the Perfect forms indicate a loss of the consonant suffix (a change that appears to be morpheme-specific). All of the stems above can be derived correctly, however, if we include a step that deletes the consonant at the proper point, and if we add a constraint to y-Formation to the effect that it cannot apply to the second consonant of a monosyllabic verb stem. The historical development of -leese, -limye, and -koze will then be represented as:

2.6 Class 5 prefix. Let's return finally to the question of the Class 5 prefix in Luganda. The three types of stems in this class are illustrated again below:

(17) eri-ñña 'name' pl. ama-ñña
ery-aato 'canoe' ama-ato
ejjiba 'dove' ama-yiba

Some stems that are similar to ejjiba have an alternate form parallel to eryaato. For example:

(18) ejjovu OR eryoovu 'foam'

Certain adjective stems also have alternate forms with the Class 5 prefix:

(19) ejjiinsi ejjatifu OR eryaatifu 'cracked stone'
cf. entamu eñjatifu 'cracked cooking-pot'
ejjeembe ejjole OR eryoole 'carved horn'

If we reconstruct ejjovu 'foam' as *edǀjovu, we can derive it in two ways. In one derivation, we allow Palatalization and y-Formation to apply to the first consonant (d), but suppress them in the second consonant because they have already applied in a neighbouring segment. Thus: *edǀjovu > ejǀjovu > eyǀjovu > ejjovu. In the other derivation, we reverse the situation: y-Formation applies to the second consonant, and both Palatalization and y-Formation are suppressed in the first, giving Lateralization a chance to operate. Thus: *edǀjovu > erǀyovu > erǀovu > eryoovu. In each case, a similar principle is at work; that is, the behaviour of one consonant with respect to certain rules is influenced by the rules that a consonant immediately to the right or left is subject to. Note that in the first derivation, the principle of suppression makes the operation of Gemination straightforward, by eliminating

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	*deetǀde	*dimǀde	*kodǀde
Palat.			kojǀde
y-For/Lat	leetǀle	limǀle	kojǀle
Spir	leesǀle		kozǀle
l-Delet	leesǀe	limǀe	kozǀe
Devoc.	leese	limye	koze

the necessity of deriving ejjovu historically from *ey|yovu (thus, new rules are always allowed to operate on surface strings). On the other hand, the suppression of Palatalization in the prefix allows Lateralization to apply, and this in turn blocks Spirantization. This provides further evidence that Spirantization did <u>not</u> apply to those (underlying) d's that were realized as l's at the time of the introduction of Spirantization; and therefore, there must have been a Palatalization rule which converted d to j and so preserved it as a candidate for the spirantizing rule in forms such as -lokoza, -kebeza, etc. (cf. (15) above).

The notion of rule suppression was first suggested to me by the following pair of forms presented in Meeussen [1955]:

(20)	empisi	'kidney'	-p|t|	Mh[14]
	emfudu	'tortoise'	-kydy	Gr

In each case, Spirantization has been suppressed in one segment, after having applied in a neighbouring one. In empisi, the consonant that precedes is affected; in emfudu, the consonant that follows.

3. Conclusion

The use of abstract rules in the foregoing analysis has, in effect, added to Meeussen's description of Luganda history a third dimension. The technique proves to be a powerful tool, for it makes possible inferences about phonological processes which are only indirectly attested by the information in the surface phonological strings of the modern language. The use of abstract rules, ordered across time, can thus help to recover considerably more information concerning the history of the Bantu languages than the simple comparative method. Moreover, such rules are capable of revealing many of the fundamental grammatical regularities of a language such as Luganda.

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[14] Mh = Meinhof, Gr = Greenberg.

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