This is to certify that the

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WESTERN MANDE COMPOUND TONE RULES

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ABSTRACT

WESTERN MANDE COMPOUND TONE RULES

By

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A comparison of the rules applying to the tone of compound nouns in a number of Western Mande languages allows a reconstruction of the Proto-Western form of these rules and an analysis of their diachronic development.

This analysis supports the re-positioning of Soninke. It also provides evidence for some theoretical questions concerning the nature of tone rules and tone representation. It is hypothesized that complete tone spreading is a natural diachronic rule, and support is given to a modified version of Leben's Suprasegmental theory of tone representation.

The first chapter contains a discussion of the classification of Western Mande, the nature of tone and tone rules, and models of tone representation proposed in a generative framework. The second chapter presents data and analyses for eight individual Western Mande languages. The third and final chapter presents a diachronic analysis of the Western Mande compound tone rules, and some general conclusions.

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1.0. Introduction.

A characteristic feature of the Western Mande languages is a set of tone rules which apply to compound nouns, and in some languages, certain other constructions. The versions of these rules found in Mende and in the Bambara dialect of Mandekan have received some attention lately in recent literature on the representation of tone. This study looks at the rules affecting the tone of compounds in the other Western Mande languages as well, and compares the cognate rules in each language. This comparison allows an analysis of the diachronic development of the rules.

A diachronic study of the development of the Western Mande compound tone rules provides evidence for several different sorts of conclusions. One area for which evidence is provided is the internal classification of the Mande family. Specifically, there is support for the reassignment of Soninke that has been proposed by Bimson (1978).

Evidence is also provided for a set of problems that are of more general interest, but whose solutions are much less clearcut. These are the problems involved in the theory of tone representation, and the nature of tone rules. The discussion centers around the hypotheses advanced by Hyman and Schuh (1974) about the nature of tone rules, particularly spreading and shifting rules. Several examples can be shown to support the contention that synchronic shifting rules must be the result of the telescoping of several diachronically independent developments. On the other hand, there is no support for a similar claim about the nature of tone spreading. Based on the evidence from the development of Mande tone spreading it appears

that complete tone spreading may be the result of a single diachronic development.

The nature of tone spreading plays an important role in choosing between several different theories of tone representation. If Hyman and Schuh's characterization of tone spread is correct then this is support for Goldsmith's Autosegmental model (Goldsmith 1975, 1977). But if the model of tone spreading suggested in these thesis can be extended beyond the Mande family to include spreading rules found in any tone language, then Leben's most recent version of his Suprasegmental theory (Leben 1978) is a more adequate model for tone representation.

This thesis is divided into three major sections. The first contains background information and theoretical preliminaries, including a discussion of the classification of the Mande family, of the general properties of tone and of a number of theories of tone representation which have been proposed in the framework of generative phonology, and a brief discussion of some morphological properties of the Mande family which are relevant to the rules discussed in the thesis.

The second chapter contains a synchronic analysis of the rules applying to the tone of compound nouns in eight Western Mande languages: Kpelle, Mende, Loko, Bandi, Loma, Vai, Susu, and the Mandekan dialect cluster. Brief descriptions of the compounding processes in the Extended Western Mande language Soninke and the Eastern Mande language Toura are included to provide a broader perspective on the origins of the Western Mande form of compound formation.

In most of the languages described the compound tone rules apply in other morphological environments as well. However, there will be

no systematic discussion of the morphological conditioning of these rules, for several reasons. First, comparable information is not available for all the languages, making comparison difficult. Second, the details of analysis required would expand the thesis beyond a manageable size. For these reasons, a discussion of the development of the morphological conditioning of the compound tone rules must be left to a further study.

The third chapter presents a reconstruction of the Proto-Western Mande compound tone rules, and their development up to the present, as well as the development of additional rules affecting the tone of compounds in some of the languages discussed. First, each rule is considered individually. Then the development of the rules is summarized by presenting their form at each stage in the history of Western Mande.

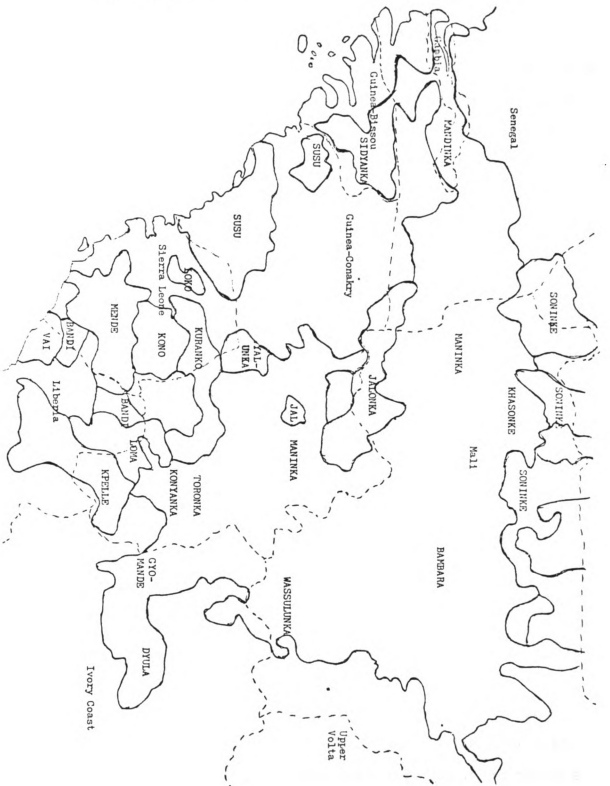
Finally, there is a discussion of the general conclusions that can be drawn from the present work, and suggestions for areas in which further investigation would be useful or interesting.

1.1. The Classification of the Mande Languages.

The Mande languages are spoken primarily in the western end of West Africa, with a few scattered languages as far east as Ghana and Nigeria. A map of the languages this paper is specifically concerned with is given in figure 1.

The existence of the Mande language family was noted as early as 1854, in Koelle's Polyglotta Africana. Since Koelle's time, a number of different attempts have been made at a fuller classification of the Mande family, both internally and externally. The most widely accepted

Figure 1. The Location of the Western Mande Languages (de l'Avergne de Tressan)



external classification of Mande is that included in Greenberg's classification of African languages (Greenberg 1963). He includes the Mande family as one branch of the larger Niger-Congo family.

The most widely accepted and most comprehensive internal classification of the Mande languages is that proposed by William Welmers in 1958. Welmers' classification is shown below in figure 2. In this figure a hyphen separates co-dialects of a language, a comma separates closely related languages, and extra spacing between lines indicates major divisions within a branch.

Figure 2. Welmers' Classification of Mande.

1. NORTHERN-WESTERN DIVISION		2. SOUTHERN-EASTERN DIVISION	
1.1. Northern	1.2. Southwestern	2.1. Southern	2.2 Eastern
Susu-Yalunka	Mende-Bandi	Mano	Southern Samo
	Loko	Dan(Gio)	Northern Samo
Soninke	Loma	Tura	Bisa
		Mwa	Busa
Hwela-Numu,Ligbi	Kpelle	Nwa	
		Gan	
Vai,Kono		Kweni(Guro)	
Khasonke			
Maninka-Bambara-Dyula			

This paper will be concerned only with languages from Welmers' Northern-Western group, which will be referred to for convenience as Western Mande. Western Mande is further subdivided into the Northern and Southwestern subgroups. The relationships within each group require some further discussion.

Within Southwestern Mande, there is abundant evidence for the separation of Kpelle from the other four languages, which Dwyer (1973) has referred to as the Central Southwestern group. It is not possible to make any further clearcut divisions within the Central group. Each

language shares some innovations with each other language. The picture is further complicated by the fact that these languages have been in close contact throughout their existence and a high percentage of their speakers know one or more related languages. It might be better to consider these languages as dialects which have developed a fairly high degree of dissimilarity.

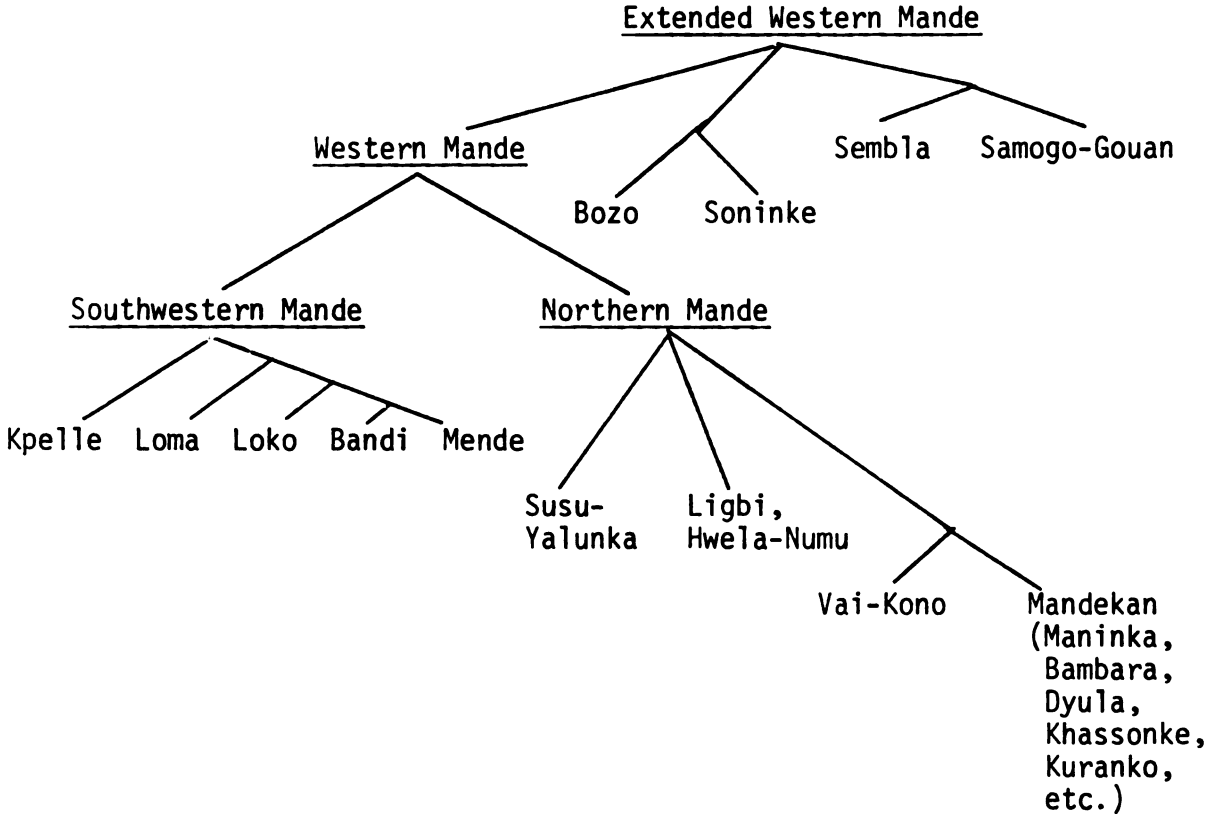
The order in which the Northern Mande languages are listed in Welmers' chart reflects the order in which he feels that they diverged from the common stock, with the Susu-Yalunka cluster diverging first, followed by Soninke, and then the Hwela-Numu-Ligbi cluster. He has estimated that the split between Vai-Kono and the Mandekan dialects of Maninka, Bambara, Dyula, etc. occurred at a fairly late date, since these languages are quite similar. It should be noted that Welmers' initial subgrouping of Northern Mande was based on very limited data, primarily one set of initial velar correspondences and the distribution of the single lexical item /tan/ 'ten'. Thus, it should not be surprising to find that he was at least partly mistaken.

Bimson (1978) has recently taken a closer look at the interrelationships of the Mande languages. Basing his classification on lexicostatistical data, he has suggested at least one major revision in Welmers' classification of Western Mande. This involves the repositioning of Soninke, which Bimson claims, while still a Western Mande language, does not belong in the Northern subgroup. His revised classification is shown in figure 3.

Bimson's statistics show that the percentage of probable cognation between Soninke and the Southwest Mande languages is nearly the same as the percent of probable cognates with Northern Mande. This is most

clearly explained by the hypothesis that Soninke separated from Western Mande before the split between Northern and Southwestern Mande. The larger sub-family that includes Western Mande, Soninke, and several languages not mentioned by Welmers, is named Extended Western Mande.

Figure 3. Bimson's Classification of Western Mande.



Bimson's reclassification of Soninke is especially important for an understanding of the development of Western Mande Compound Formation. Northern and Southwestern Mande Compound Formation share a number of properties lacking in Soninke which must be regarded as common innovations, while Soninke retains the remnants of what must have been the original form of the process.

1.2. Tone and Tone Rules

A tone language can be roughly defined as one in which the contrastive pitch height of any tone bearing segment is relatively independent of the pitch associated with any other segment. This is in contrast to an accent system, in which the full range of contrast occurs at only one place in each word.

However, the freedom of tonal contrast in individual segments is only relative. Some restrictions are always present, including limits on the number of contrastive tone levels, the number of changes in level allowed in a single syllable, the position of contour tones within a word, and on the possible sequences of tones in lexical items. Tone is also affected by phonologically and morphologically conditioned alternations, and by processes associated with intonation such as downdrift. These properties of tone systems will be discussed below, with particular reference to the properties of tone in the languages discussed in this paper. This will be followed by a discussion of the theoretical disputes over the proper formal representation of tone in a generative framework.

1.21. Tone Bearing Elements.

In general, any sonorant may bear tone. All tone languages assign tone to vowels. Most also allow contrast on nasals. This is especially clear when tone contrasts are associated with morphemes consisting of a single nasal segment. Many languages have been described as allowing tone on glides, though in such cases it is not always clear whether there is anything involved but a desire not to ascribe contour tones to a single vowel.

Although tone and tone bearing unit are inseparable at the phonetic level, there is not necessarily a one to one correspondence between them in underlying representations. Some grammatical morphemes are inherently toneless, with their surface tone derived by assimilation or dissimilation with adjacent tones. The Susu definite marker is one such morpheme. It always acquires the tone of the preceding syllable. At the opposite extreme, some morphemes carry only tonal, and no segmental, information. These are commonly referred to as floating tones. One example of such a floating tone is the Bambara definite marker, a low tone whose presence is revealed at the surface chiefly by its effects on preceding and following tones.

1.22. Tone Levels.

Linguists who believe in universal feature inventories have technical difficulties with feature systems for languages with four or five levels of tone. However, no Western Mande language has more than three levels and most have only two. For such languages feature specification is unproblematical. Two contrastive levels can be represented by the single binary feature [±H], with [+H] indicating high tone and [-H] indicating low tone. For three levels two features are required: [±H], and [±L]. High tone is $\begin{bmatrix}+H\\-L\end{bmatrix}$, mid tone is $\begin{bmatrix}-H\\-L\end{bmatrix}$, and low tone is $\begin{bmatrix}-H\\+L\end{bmatrix}$.

These features can be considered the formal notation for tone levels. For the most part, however, more informal notation is used, with tone being indicated either by capital letters or by diacritic marks.

High tone = H, v́

Mid tone = M, v̄

Low tone = L, v̀

1.23. Contour Tones.

The tone of a syllable may remain at a constant pitch or it may change from one level to another. There may be at the most two changes in tone level within a single syllable, and in most African languages only one change per syllable is allowed, so that tone may be either level, falling or rising. Falling and rising tones are best represented as sequences of level tones, whether they occur on a single segment or a sequence of segments in a single syllable. The evidence for this comes from their effect in conditioning tone rules. Rules affecting a preceding tone are conditioned identically by high and falling tone and by low and rising tone. But in rules where the tone subject to change follows the conditioning element high tone is equivalent to rising tone and low tone to falling. These facts can be most adequately explained if rising tone consists of a sequence of low followed by high tone, and falling tone of high followed by low tone.

The formal representation of contour tones represents a theoretical problem, especially when they must be assigned to a single segment. This will be discussed in more detail later on. Short contour tones may be informally represented in the following notation.

Rising tone = $\widehat{LH}$, $\check{v}$

Falling tone = $\widehat{HL}$, $\hat{v}$

1.24. Tone Patterns.

It is rare to find a tone language that allows every logically possible sequence of tones. Most languages have restrictions on the tone patterns of both underlying and surface forms. These restrictions can be divided into those on sequences of level tones and those governing

the occurrence of short contours.

Some general remarks can be made about the tone patterns typically found in Mande languages, particularly if borrowed vocabulary is excluded from consideration. Contour tones are found only morpheme finally, and are predominantly found in monosyllables. With the exception of the L H͡L tone pattern, there is no pattern found in disyllabic morphemes that cannot also be found in monosyllabic morphemes. Since the vast majority of inherited vocabulary is either mono- or disyllabic, this has led some authors, notably Welmers (1962) and Leben (1973), to suppose that the tone patterns may be stated simply as properties of morphemes, with no reference to syllable structure. More will be said about this kind of suprasegmental analysis in a later section.

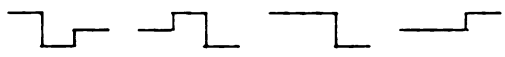
One practical result of this fact involves the representation of tone patterns in this thesis. It will be assumed that any sequence of tones mentioned in a rule may represent either a contour or a sequence of level tones. No specific relationship between tone and syllable will be assumed unless specified by the use of a ligature to indicate contour tone, e.g. L͡H, H͡L.

Another feature, found in all Western Mande tone systems, is a lack of distinctiveness between LH and L patterns in native vocabulary. One tone pattern, sometimes referred to as polarizing tone, has both LH and L as phonetically conditioned alternants, with the LH pattern appearing before L and L appearing before H. The pattern in isolation differs from language to language, sometimes appearing with L and sometimes with LH. The nature of polarizing tone is relevant to some developments in the compound tone rules and will receive more thorough consideration later.

1.25. Downdrift and Downstep.

The declarative mood is frequently signalled in tone languages by a process known as downdrift. While leaving the phonemic contrasts unaffected, downdrift causes the phonetic pitch of tones to be lowered. The pitch interval between a low and a following high is smaller than the interval between a high and a following low. As a consequence, the second of two like tones separated by an unlike tone is pronounced at a lower pitch level than the first. In some languages it has been reported that only high tones undergo downdrift, but in the Mande languages both high and low tone are subject to the process. The effects of downdrift can be shown graphically as in the figure below.

Phonemic tone: H L H L H L H H L L L H

Phonetic pitch: 

The effect of this process is the gradual lowering of pitch level from the beginning to the end of an intonation unit.

Downdrift is found in all the Mande languages, except Vai (Welmers 1976). In this language only an utterance final high tone is lowered.

Another phenomenon associated with downdrift is known as downstep. If a low tone is deleted after the operation of downdrift through syllable loss or simplification of contour tone, a sequence of high tones may occur in which the second high tone is slightly lower in pitch than the first. This is known as a downstepped high and is represented by the symbol 'H or ꜛH.

H L H = H 'H

The treatment of downdrift is somewhat problematical. It is a phonetic rule assigning n-ary values to the features governing tone. However it must apply before such phonological rules as contour simplification, which apply to binary features. This runs counter to the generalization that rules assigning n-ary values to features can apply only after all phonological rules have applied. However, the problem posed by downdrift is not strictly relevant to the issues discussed in this work, and there will be no discussion here of the various attempts to find a solution.

1.26. Types of Tone Rules.

The most widely accepted typology of tone rules, at least in African linguistics, is that given by Hyman and Schuh (1974). Their evidence is taken primarily from West African languages, including several Mande languages, so it is not surprising that their rule types fit the data in this study well. I wish to suggest only one modification in their ideas, concerning the nature of tone spread.

A major distinction in Hyman and Schuh is between synchronic and diachronic naturalness. For them, a diachronically natural rule is equivalent to a possible sound change. The class of natural diachronic rules is included in the class of natural synchronic rules. On the other hand, some natural synchronic rules are not possible sound changes. Such diachronically unnatural rules are said to arise from the telescoping of a series of diachronic changes. The familiar example of palatalization is given. Rule c) below represents two separate innovations. First, rule a) creates a fronted <u>k</u>. Then at some later time another rule is developed which changes the fronted velar to a palatal.

a) k → kʲ / __ i

b) kʲ → č / __ i

c) k → č / __ i

After both rules have been established they may be collapsed into a single rule. Telescoping analyses of this kind are often proposed even when there is no evidence for the independent existence of the intermediate stage. These analyses appear to be motivated by the belief that sound changes may not involve a change in more than one feature at a time. However, such a generalization is of no value if it is maintained merely by the postulation of hypothetical intermediate steps which are not empirically motivated.

Six of the rule types discussed by Hyman and Schuh are relevant to this study. Of these, the first three are assumed to be diachronically natural, and the last three only synchronically natural.

Diachronically Natural Rules

1) Absorption

H͡L L → H L

L͡H H → L H

Contours whose final tone matches the tone of the following syllable are often simplified, as shown in the examples above. This is extremely common word internally, and in some languages applies everywhere but before pause boundary. Hyman and Schuh regard this phenomenon not as the deletion of the final tone of the contour but as a delay in the onset of the change in tone. This is an attempt to provide a physiological explanation for the occurrence of absorption.

2) Simplification

$\widehat{LH}\ L \rightarrow H\ L$

$\widehat{HL}\ H \rightarrow H'H$

Contours may also reduce when followed by unlike tones. A noteworthy aspect of simplification, as compared to absorption, is that simplification reduces both rising and falling tones to high tone. Falling tone never simplifies to low. Rising tone simplifies to low only in two environments: the absorptive environment mentioned above, and occasionally in another environment not mentioned by Hyman and Schuh, that is, when utterance final.

The simplification of a $\widehat{HL}$ H or H $\widehat{LH}$ sequence almost invariably results in surface H'H tone, with downstep on the second high, in languages with downdrift.

3) Spreading

$H\ L \rightarrow H\ \widehat{HL}$ $\qquad$ $H\ L\ L \rightarrow H\ H\ L$

$L\ H \rightarrow L\ \widehat{LH}$ $\qquad$ $L\ H\ H \rightarrow L\ L\ H$

Spreading, like absorption, is seen as the result of an adjustment in the timing of tone change. However, while absorption eliminates contours, spreading creates them. Spreading rules are of two types: partial spreading, which creates contour tones; and complete spreading, which spreads a tone over an entire syllable. These two types are illustrated above, with partial spreading on the left, and complete spreading on the right.

Hyman and Schuh maintain that only partial spreading is diachronically natural. Complete spreading results from the telescoping of partial spreading and absorption.

H L L → H $\widehat{HL}$ L → H H L Partial Spreading followed by Absorption

H L L → H H L Complete Spreading

This claim would appear to involve the prediction that at least some languages should contain a partial spreading rule with no accompanying absorption rule. In fact, this may not be true. A definite statement on this question must be postponed until a thorough examination of all the available evidence has been made. However, an examination of the examples given in Hyman and Schuh, and a preliminary survey of some Bantu languages, as well as the evidence from the Mande languages, all show that the contour tone created by spreading rules exists on the surface only before a boundary or before an unlike tone, i.e. in cases like $\widehat{HL}$# or $\widehat{HL}$ H. The only exceptions to this generalization are the special case of spreading rules in which the nature of an intervening consonant is relevant.

In all the Western Mande languages, contour tones produced by spreading exist at the surface only on word final syllables, where absorption does not apply. On medial syllables absorption may apply, with the result that no surface contours exist in this position. The fact that absorption is found throughout Western Mande suggests at the very least that both spreading and absorption were present in Proto-Western Mande. There is no evidence that they arose at different times. Although one such example is not enough in itself to disprove Hyman and Schuh's hypothesis, it is suggestive. It may be that there is some kind of special link between spreading and absorption so that even at the earliest stage of development spreading rules create contours only on final syllables.

Synchronically Natural Rules.

4) Replacement

Tonal replacement rules replace the lexical tones of a word or part of a word with a fixed tone pattern which serves the function of an affix. These rules may indicate the tense of verbs, the plurality of nouns, the formation of compounds, or any other grammatical information which may be indicated by segmental morphemes. The morphological nature of replacement rules suggests that they arise historically from affixes which have lost their segmental information but retained their tones. These morphemes are then realized only by their effect on the tones of the base to which they are attached. An origin of this type will be proposed for Proto-Western Mande Lowering, one of the rules involved in compound formation.

5) Dissimilation

$L\#L \rightarrow \widehat{LH}\#L$

As far as I know, underlying H H sequences never result in surface $\widehat{HL}$ H tone, but it is possible for low tone to rise before a following low. While not wishing to completely rule out such dissimilation rules as possible sound changes, Hyman and Schuh claim that they typically develop from the re-interpretation of an absorption rule. They might propose the following historical development of the Mandekan dissimilation rule, with a), b), and c) representing successive diachronic stages.

a) $LH \rightarrow L / \_\_\#H$

b) $LH \rightarrow L / \_\_ \begin{Bmatrix} \#H \\ \text{utterance final} \end{Bmatrix}$

c) $L \rightarrow LH / \_\_ \#L$ (by rule inversion and reanalysis of underlying forms)

I will present arguments in a later section to support the contention that this is in fact the correct historical analysis for the Mandekan and Kpelle dissimilation rules.

6) Shift

L H L → L L $\widehat{HL}$

L H L L → L L H L

H L H → H H $\widehat{LH}$

H L H H → H H L H

Tone Shift refers to a rule which displaces a tone from one syllable to a neighboring syllable. Such a rule may shift every tone in a word, as in the Kikuyu tone shift rule, or it may apply only to high tone surrounded by lows, as in the Mande languages. When all the tones of a word are shifted, the tone of the first syllable is copied to the right, but it also remains on the first syllable, since there is no other tone available to displace it. This suggests that shifting rules consist of two steps, one spreading tone over a neighboring syllable, the second absorbing the original tone into the spread tone.

$\widehat{LH}$ L	Base tone
→ $\widehat{LH}$ $\widehat{HL}$	Spreading
→ L $\widehat{HL}$	Absorption

This view of tone shift is supported by the facts in Mande. In all languages but Kpelle, the apparent shift of the final high tone of morphemes with polarizing tone to the next syllable in compounds is the result of two independently motivated rules, one of spreading and one of absorption. Even in Kpelle, where these rules are not

independently motivated, dialectal developments support the thesis that shifting rules are the result of two separate innovations.

1.3. Theories of Tone Representation.

There has been much discussion in recent years on the proper representation of tone in a generative model. The first theory, advanced in SPE, was that tone is a feature of individual segments. However, several difficulties have been noted with regard to this theory, and at least three different non-segmental theories have been proposed. This section will begin with a discussion of the inadequacies of a segmental model of tone representation, then proceed to a consideration of the Suprasegmental theory proposed by Leben (1973), Goldsmith's Autosegmental theory (Goldsmith 1975, 1977), and Clark's Dynamic theory of tone (Clark 1978). The strengths and weaknesses of each theory will be examined and a theory of Syllabic tone representation will be proposed which is free from the flaws found in previously proposed systems.

1.31. Inadequacies of Segmental Representation.

The arguments against assigning tone as a feature of individual segments have to do with two different types of phenomena: 1) those which cannot be handled at all segmentally, except by extensions of the formalism which essentially make the notion of segment vacuous; and 2) those which can be adequately described in a segmental framework, but which can be more naturally expressed suprasegmentally.

In the first category are the problems of floating tone and short contour tones. Floating tone is a problem for a segmental theory for the simple reason that it is not the property of any normal segment. It is frequently expressed as the property of a zero element, but such

an element is a segment only by convention, having none of the properties normally associated with segments, such as occurring in real time, or being specified for all phonetic features.

The expression of short contour tones involves the same sort of problem. In the generative literature, Woo (1969) was the first to note that contour tones were best represented as sequences of level tones in order to account for their behavior both in conditioning and undergoing phonological rules. She also saw that if such sequences were ascribed to a single segment, a theoretically undesirable complex feature would be necessary, on the other of [+[+H] followed by [-H]]. Such a feature would require special interpretation rules in order to be workable at all, rules which would tacitly recognize that it is actually composed of a sequence of two features. Woo's solution was to maintain the segmental nature of tone by denying that contour tones ever occur on short vowels. Contours on long vowels can be handled by assuming the long vowel to be a sequence of two like vowels, and assigning one tone to each. Unfortunately for Woo's generalization, numerous counterexamples have been cited, including evidence from Mende (Dwyer 1971) and Maninka (Spears 1968).

One kind of solution to this problem involves the postulation of a zero element as a holder for the excess tone, as in the treatment of floating tone. A solution of this kind was proposed in the proceedings of the Ibadan conference on tone in Generative Phonology (Maddieson 1971), suggesting the use of the feature [-syllabic] for this purpose. This requires some way of distinguishing actual glides from glides which are posited simply as tone holders. This second category of

glide is unusual in that it takes no time to pronounce and never differs from the preceding vowel except in the value of its tone features.

Fromkin (1972) proposes a similar solution, using the feature [-segmental] to indicate the zero element to which the second tone is attached, with the addition of the feature [±boundary] to differentiate it from boundary markers.

Both of these solutions require the redefinition of an already existing feature for the purpose of distinguishing a special segment which lacks almost all the properties of ordinary segments. It would perhaps be more honest to use the feature [±real] for this purpose.

Further, Fromkin realizes that her proposed $\begin{bmatrix}\text{-segment}\\ \text{-boundary}\end{bmatrix}$ segments are not really possible elements at the phonetic level. Thus, her overall solution requires both a zero element at the underlying level to hold floating tones, and conventions to convert these elements into complex tone features on the preceding vowel at the phonetic level. This leads to the conclusion that tone can be maintained as a segmental feature only by the use of two special conventions, one of which violates the principle of strict segmentality, and the other the principle of the phonetic reality of segments.

1.32. Leben's Suprasegmental Theory.

Dissatisfaction with segmental representation of tone led to a number of different proposals. The first of these was Leben's Suprasegmental theory (Leben 1973). Leben's proposals were prompted not only by inadequacies in the current theory but by a desire to account for such facts as constraints on possible tone sequences which could be stated without reference to the number of syllables in a word, rules

which behaved identically in respect to $\overset{\frown}{LH}$ and L H sequences or to H and H H sequences, and also for the fact that tone within a single language might have both segmental and suprasegmental properties.

To account for all these factors, Leben posited the following postulates for a theory of Suprasegmental tone representation:

1) Tone in underlying forms is entirely independent of other phonological information, consisting solely of a string of tone features. There can be no sequences of like tones at this level, i.e. H H is indistinguishable from H.

2) Some tone rules apply only to these suprasegmental tones and cannot be sensitive to segmental information.

3) At some point in the derivation, differing from language to language, tones are mapped onto the segmental string by a well defined set of mapping rules.

4) After mapping has occurred, tone may be affected by rules which take account of segmental information, but cannot be affected by rules which are suprasegmental in nature.

Mende is cited as an example of a language in which constraints on tone sequences can be cited independently of syllabic structure. According to Leben Mende morphemes must have one of a small class of tone melodies, which are the same for morphemes of any length. A LHL sequence, for instance, is $\overset{\frown}{LHL}$ on a monosyllable, L $\overset{\frown}{HL}$ on a disyllable, and L H L on a trisyllable. Such a generalization can be expressed only in a very clumsy way in a segmental framework. More recently, Dwyer has claimed that the generalization expressed reflects only a general tendency, and not an absolute constraint, since a number of morphemes exist with other tone patterns, and there is no attempt to

fit borrowed vocabulary into the class of inherited tone patterns (Dwyer 1978). The same claim concerning restrictions on tone patterns was advanced for Bambara-Maninka, based on the work of Spears (1968) and Bird (1966, 1968), and was subject to the same sort of refutation by Courtenay (1974), who cited a number of items with exceptional tone patterns.

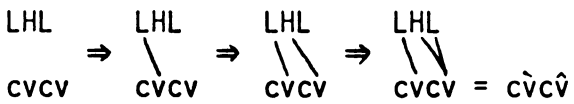
As well as allowing certain generalizations about tone patterns to be more easily expressed, a Suprasegmental analysis allows a more economical statement of some tone rules. A good example of the type of rule that can be best expressed suprasegmentally is the High Tone Spreading rule found in most Western Mande languages, where a high tone spread onto a low toned monosyllable produces a H͡L tone, but when spread onto a low toned disyllable creates a H L sequence. This can be accounted for by a single suprasegmental rule which changes L to HL without specifying any association with particular syllables. The correct surface distribution is then provided by the mapping rules.

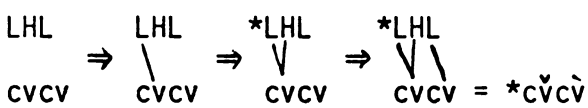
H#L → H#HL (High Tone Spread)

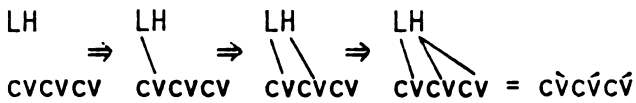
H # HL
cv # cvcv ⇒ cv́#cv́cv̀ (by mapping conventions)
H # HL
cv # cv ⇒ cv́#cv̂

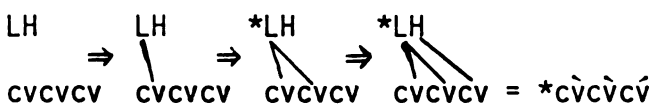
express such processes in a unitary fashion is one of the most attractive features of Leben's system.

The mapping rules proposed by Leben are very restrictive, allowing only a narrow range of potential tone patterns. They operate according to the following simple algorithm: the first tone is mapped onto the first syllable, the second onto the second syllable, and so on, until either tones or syllables run out. Excess tones are all mapped onto the final syllable, creating a contour. Conversely, the last tone is spread over any extra syllables to which tones have not been assigned. This mapping convention allows such sequences as L͡H, L H, L H͡L, L H H, but not such sequences as L͡H L, L L H, or H H͡L.









It is unfortunate for Leben's theory that morphemes with these impermissible sequences do exist in the languages which he cited as examples of the existence of the constraints on tone patterns expressed by his mapping conventions. Dwyer (1978) cites a contrast between H L and H H͡L in Mende. A similar contrast between L H͡L and L͡H L can also be shown. Welmers (1949) cited trisyllabic words in Maninka with both

L L H and L H H patterns. Taking account of such examples it becomes more attractive to suppose that tones are associated more directly with segments at the level of underlying forms. Dwyer also notes another criticism of Leben's mapping conventions. These conventions presume that there is no limit on the number of tones that can be mapped onto a single segment. But Dwyer notes that there are never more than two tones mapped onto a single segment. Examples cited by Leben like Mende mbã̀ 'owl' really have long vowels, according to Dwyer, giving the mapping mbàâ with no more than two tones per segment.

Another criticism was made by Fromkin (1972). She noted that although Leben solved the problem of contours and floating tones at the underlying level, exactly the same problems as before surfaced for him after tone mapping, since tone becomes a segmental feature at that point.

A final point that can be made has to do with the interaction between segmental and suprasegmental rules, an area which has not received much investigation. Leben predicts that all suprasegmental rules must precede all segmental rules. The discussion of Loko in chapter 2 will show that some Loko tone rules present a counterexample to this generalization. In this language a segmental rule simplifying falling tone must apply between two different 'suprasegmental' High Tone Spreading rules.

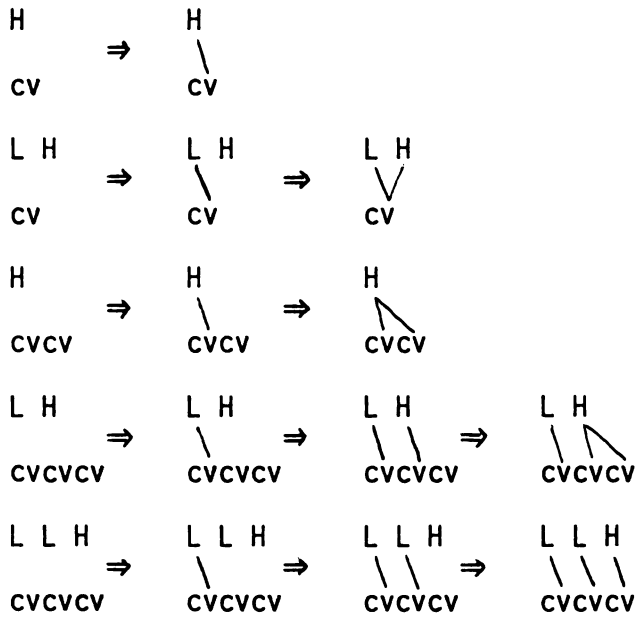
1.33. Goldsmith's Autosegmental Theory.

Goldsmith (1975, 1977) has proposed a theory that eliminates some of the problems found in Leben's theory. Like Leben, he postulates two levels of representation in underlying forms, tonal and segmental.

Unlike Leben he maintains the separation of tones and segments throughout the derivation. The relationship between a tone and the segment it is ultimately realized on is indicated not by making the tone a segmental feature at some stage, but by drawing lines of association which indicate which tones goes with which segment. These lines of association are not present at the underlying level, but are added before any phonological rules apply, by an algorithm which is basically identical to that used by Leben (Goldsmith 1977).

Goldsmith's model makes a weaker claim about the interaction of segmental and suprasegmental rules than Leben's. Because both phonological levels are autonomous but related, rules referring to segmental information may apply before rules which do not. The fact that there is no division into pre- and post mapping stages, also eliminates Fromkin's criticism of Leben that after mapping has applied contours must still be represented segmentally.

Since Leben and Goldsmith use similar mapping conventions, surface tone patterns that present a problem for one are also a problem for the other. However, Goldsmith does allow one device that allows for the derivation of patterns like L L H or H HL. He allows sequences of like tones in underlying representations, so that a surface H H pattern, for instance, could have two non-distinct underlying tone representations: H and H H. Some examples of the formation of association lines are given below.



Another device is available which might allow the production of $\widehat{LH}$ L patterns and the like. This is a device called the star, which was proposed for use in accent languages to mark the accented syllable. Under a special convention, an association line is drawn first between the star tone in the accent pattern and the starred syllable in the segmental string. This would allow such derivations as the following:

Goldsmith apparently wants to restrict the use of the star to accent languages. At any rate, the use of a star is equivalent to lexical assignment of tone, so that some of the best examples of languages said to be without lexical assignment contain at least some examples of words that require lexical assignment of tone to segment.

Goldsmith has noted another property of tone which provides evidence for an autonomous level of representation. This is what he

refers to as stability, the tendency for a tone to remain as a floating tone when the vowel it is associated with is deleted. An example of this phenomenon is shown in the following Bambara contraction process:

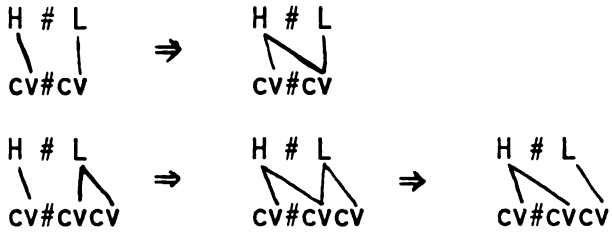
/ò táará só kà ǐ dá/ ⇒ ò táará só k'ǐ̆ dá

'he went home to lie down'

This kind of behavior, along with the phenomenon of floating tone, suggests that tone is not simply a segmental feature.

The Autosegmental framework is quite flexible and allows for a simple treatment of most tonal phenomena. However, the treatment of tone spreading rules resembles the approach taken by Hyman and Schuh to these rules, and suffers from the same defect. Hyman and Schuh, as discussed in section 1.26., argue that rules of complete tone spreading must arise historically from an original partial spreading rule, followed by a later innovation of an absorption rule, producing the effect of complete spreading. This analysis ignores the fact that partial spreading appears to be found synchronically only in the special case of spreading rules conditioned by intervening consonants, and that in other cases spreading is accompanied by absorption.

Goldsmith extends Hyman and Schuh's two step analysis to the synchronic description of tone spreading. He allows tone rules to operate either by the addition or deletion of tone features, with appropriate adjustment of association lines, or by adding or deleting association lines. He would typically represent tone spreading by the addition of an association line, as shown below:



Spreading onto a disyllable must be followed by absorption to produce the correct surface form. This is in contrast to the Suprasegmental treatment of spreading, as discussed above in section 1.32., which allows spreading onto both mono- and disyllables to be handled by one rule, in a single step.

1.34. Clark's Dynamic Tone Theory.

Clark (1978) has recently proposed a theory of tone representation which differs radically from the more widely accepted theories of Leben and Goldsmith. The most striking aspect of the theory is the decision to abandon the use of features marking pitch height in favor of markers indicating the direction and extent of pitch changes between successive stretches of level pitch. A tone pattern which in a level tone system would be written as L H, would be represented in dynamic tone marking as ↓S ↑S, where S=syllable. The downwards arrow in front of the first syllable indicates that this syllable begins at a level lower than rest position, while the upwards arrow between syllables indicates the change from low to high at this boundary. Pitch change markers (pcm's) may also optionally appear after the final syllable if they differ from the last pcm to appear. When pcm's appear in final position they are conventionally interpreted as indicating contour tones on the last syllable: ↑S↓ = $\widehat{HL}$, ↓S↑ = $\widehat{LH}$. It is important to note that this is the

only device available for marking contours on short vowels. Long contours can be represented by breaking them down into two morae and showing pitch change between morae rather than syllables, but there is no way to indicate change within a segment. This leads to the generalization to which few, if any, exceptions are found in the Mande family.

The proposal to mark changes in pitch rather than relative pitch heights is a very interesting one and has allowed some strikingly simpler solutions to problems of tone in certain languages, most notably Chaochow (Clark 1978). A complete evaluation of this proposal is beyond the scope of this paper and will not be attempted here, since it is not of direct relevance. However, the use of a dynamic tone representation has forced Clark to some other conclusions which are quite interesting, and bear directly on the question of the representation of tone rules.

The decision to represent the transitions between pitch heights necessitates a model which places markers at the boundaries of syllables, rather than in or on them. It will be shown below that the potential site of pitch change at the final boundary is very useful in the statement of tone spreading rules. It is also necessary to provide a convention which erases all but the first in a sequence of identical pcm's. It should be clear that a representation like ↑S ↑S indicates not a sequence of high-high but of high-extra high, since the second up arrow has the meaning 'raise pitch to a higher level'. The convention allowing only the first in a series of syllables with the same tone to be marked requires the corrolary that the tone of an utterance stays at the same level until specific instructions are received to change. This

partial specification of tone allows the same kind of suprasegmental statement of rules as in Goldsmith or Leben's models while at the same time providing lexical tone assignment. Clark's model of tone representation is nearly identical to the model which Lockwood (1976) has referred to as the switchmatrix, with the exception that Clark has adapted the model for the representation of only one phonological property, leaving the rest in the traditional matrix model.

A switchmatrix representation of tone allows for a more economical model of tone spreading, which requires no intermediate stages that do not appear at the surface. In Clark's model tone spread is represented by rules shifting the position of pcm's. The diagrams below show how High Tone Spread can be handled by a single rule which accounts for the surface tone of both monosyllables and disyllables.

High Tone Spread

↑...S...## ↓S... ⇒ ↑...S...## S↓...

↑S## ↓S S ⇒ ↑S## S ↓ S (spread onto a disyllable)
(H## L L) (H## H L)

↑S## ↓S ⇒ ↑S## S↓ (spread onto a monosyllable)
(H## L) (H## HL)

Unfortunately, this economy of statement does not extend to rules inserting tone, such as the Mandekan or Kpelle Dissimilation rules.

Kpelle

sēŋ	'thing'	pērē	'path'
sēń pūū	'ten things'	pērḗ pūū	'ten paths'

It can be seen that a mid toned monosyllable in Kpelle becomes M̂H before low tone, while a mid toned disyllable becomes M H in the same

environment. This can be described quite simply by a suprasegmental rule.

Kpelle Dissimilation (Suprasegmental version)

M → MH / __ + -H

In a Dynamic treatment of this phenomenon the surface form of monosyllables can be produced by a single rule of tone insertion, but a second rule shifting the inserted tone one syllable to the left must apply to produce the correct surface form of disyllables.

↓S+↓S ⇒ ↓S↑+↓S (= cv̌+cv̀)

↓S S+↓S ⇒ ↓S S↑+↓S ⇒ ↓S↑S+↓S (= cv̀cv́+cv̀)

1.35. Conventions of Tone Representation.

Each of the models of tone representation discussed here is inadequate in some respect. The segmental model cannot do justice to the facts without the use of conventions which violate the principles of segmentality. Leben's Suprasegmental model cannot represent certain underlying tone patterns which do not conform to his mapping conventions, and predicts falsely that no segmental tone rule can apply before a suprasegmental one. Goldsmith's Autosegmental model has problems with some of the same underlying tone patterns that are also a problem for Leben, and does not allow an economical statement of spreading rules. Clark's Dynamic tone theory does not allow the representation of any morpheme internal short contour tones. Also, while it allows a simple statement of spreading rules, it cannot provide a similarly simple treatment of tone insertion.

The model used through the rest of this paper represents a compromise position. I will assume that tone is represented on an autonomous level, as in the Autosegmental theory, but with two modifications in that theory. First, it will be assumed that association lines are present at the underlying level. The second modification is a convention saying that contours created by the action of tone rules are automatically simplified in absorptive environments, i.e., when a contour tone is followed by a tone identical to the final tone of the contour. The rule that does this behaves like a structure constraint in that it applies any time its conditions are met, and therefore may apply more than once in a derivation and in different positions among the ordered rules. This convention simplifies the rising tone created by Dissimilation rules as well as the falling tone created by rightward tone spreading. Since the convention is present throughout the Western Mande family, and probably in all tone languages, it will not be specified in descriptions of individual languages.

A further convention is purely for notational convenience. Rather than showing two tiers of phonological information in rules, one tonal and one segmental, only the tonal string will be shown. The only segmental information which must be indicated is the presence of contour tones. These will be shown by a ligature connecting the two tones which occur on a single syllable. As mentioned earlier, if a rule specifies only a certain sequence of tones in its environment both contours and sequences of level tones which match the specification will condition the rule. However, if a contour is specified in the rule, only a contour tone will be appropriate conditioning. Spreading rules will be represented by the insertion of a tone marker, i.e.

H+L → H+HL. This is to be interpreted as the addition of an association line to the right of the tone being spread.

1.4. Some Morphological Properties of Western Mande.

This section concerns two aspects of Western Mande morphology that are of direct relevance to the discussion of the Compound Tone Rules. First, the formation of possessives will be discussed. Then a phenomenon known as consonant mutation, occurring in the SouthWestern Mande languages, will be described.

1.41. Possessives.

The Western Mande languages distinguish between two types of nouns as far as possession is concerned: 1) those which refer to objects which do not inherently belong to their possessor, but must be acquired, such as houses, clothes, wives, etc. These are referred to as alienable nouns; 2) those which refer to things which by their nature must belong to the possessor, such as parts of the body or family members. These are referred to as inalienable nouns. In some languages it is necessary to further subdivide this category into familial and corporeal nouns.

Alienable possessives are distinguished from inalienable possessives by an affix that appears between the possessor and the possessed noun, or by a distinct set of possessive pronouns that seem to have arisen historically through a merger of pronoun and alienable possessive marker. Inalienable possessives are formed by a simple juxtaposition of possessor and possessed. Some examples are given below.

Mandekan (Bambara dialect) (Bird 1978)

só 'house' (alienable)	bóló 'hand, arm' (inalienable)
mùsó ká só 'the woman's house'	mùsó bó́ló 'the woman's hand'
ŋ́ ká só 'my house'	ḿ bóló 'my hand'
à ká só 'his house'	à bóló 'his hand'

Kpelle (Welmers 1970)

péré 'house' (alienable)	pólù 'back' (inalienable)
gálɔ̀n̄ ŋɔ péréí 'the chief's house'	gálɔ̀n̄ pólù 'the chief's back'
ná péréí 'my house'	ḿ bólù 'my back'
kú péréí 'our house'	kú pólù 'our backs'

1.42. Consonant Mutation.

Stem initial consonants in the SouthWest Mande languages undergo an alternation known as Consonant Mutation. A fortis version of the initial consonant appears when it immediately follows a nasal consonant, while a more lenis version appears in other circumstances. Some examples from Bandi are given below, from Dwyer (1973).

Gloss	the house	my house	the old house	the old chief
Base	ǹ-pɛ́lɛ́-í	ní-pɛ́lɛ́-í	ǹ-pɛ́lɛ́+pɔ́lɔ́-í	ǹ-màsáŋ+pɔ́lɔ́-í
Surface	p̲ɛ̀lɛ́-î	ní-v̲ɛ́lɛ́-'î	pɛ̀lɛ́+v̲ɔ́lɔ́-'î	màsà+p̲ɔ́lɔ́-'î

There are several points to note. The nasal element which conditions the strong form of initial consonants does not show up on the surface, except under certain circumstances in Kpelle. However, there is more evidence than the consonant alternation for the presence of such nasals in underlying forms, especially in Bandi and Loma, where low toned nasal prefixes condition both the strong form of a following consonant

and also Low Tone Advancement.

For a more thorough discussion of consonant mutation and references on other treatments of it see Dwyer (1974).

2. Individual Language Data.

Information on the process of noun compound formation is not available for every Western Mande language, but enough of them are represented to make a reconstruction reasonably secure. Published descriptions of the process are available for the entire Southwestern branch, and for Susu, Vai, and Mandekan in Northern Mande. Information on Soninke compounds is derived from an analysis of some word lists published for this language, as well as personal communication from Charles Bird. Further, a description of Toura, an Eastern Mande language, contains information on a compounding process which bears an interesting similarity to the Western Mande forms.

The following sections on individual languages will contain just enough background information to make the discussion of particular rules intelligible. Only rules which affect the tone of compound nouns will be discussed. This includes both morphologically conditioned rules which apply only or mainly in this context, and more general rules with only phonological conditioning. Only a general sketch of morphological conditioning will be offered here, since the amount of detail available varies widely from language to language. What information is available suggests that the morphological development of the compounding rules is quite interesting, but an examination of this topic will have to be left for another time.

2.1. Kpelle

The Kpelle data are taken from two articles by Welmers (1962, 1970), describing the dialect spoken in the southwestern part of the Kpelle speaking area.

Kpelle has three contrastive tone levels, which combine in five different tone patterns on mono- and disyllabic morphemes: M, H, HL, M H̄L, and L. It can be seen that there are no rising tones on underlying forms, and that falling tone occurs only morpheme finally.

2.11. Surface Tone Patterns of Compounds.

The following table gives examples of compounds with initial elements from each of the five major tone patterns of Kpelle.

	Base Tones	Surface Tone
1) M	kɔ̄lɔ̄ 'paper' + láá 'leaf'	kɔ̄lɔ̄ láà 'page'
	pəlā 'sore' + kpɔlɔ́ŋ 'scar'	pālā kpɔ́lɔ̀ŋ 'scar of a sore'
2) H	ɤálóŋ 'moon' + kɔ̄lɔ̄ 'paper'	ɤálóŋ kɔ̀lɔ̀ 'calendar'
	tóú 'palm nut' + wúlɔ́ 'oil'	tóú wùlɔ̀ 'palm oil'
3) HL	ɤálà 'god' + tāā 'town'	ɤálà tàà 'heaven'
	súà 'garden' + lóŋ 'child'	súà lòŋ 'small garden'
4) M H̄L	kpɔ̄nô 'young bush' + kwālā 'monkey'	kpɔ̄nô kwàlà 'young bush monkey'
5) L	bàlàŋ 'trousers' + nina 'new'	bàlàŋ nìnà 'new trousers'

The base tone of the second constituent is irrelevant to the surface tone pattern of a compound. Its surface tone is determined completely by rule, being affected by one morphologically conditioned rule, Lowering, and two phonetically conditioned rules, Dissimilation and High Tone Insertion.

2.12. Lowering.

Lowering replaces any tone in the second constituent of a compound noun with low tone. The operation of this rule is seen in 2 through 5 above.

Lowering (Kpelle)

H → L/ [[ ] [... __ ...]]

The following examples show the application of Lowering to compounds with more than two ultimate constituents.

ɣílà 'dog + ŋūŋ 'head' ɣílà ŋùŋ 'dog head'

ɣílà ŋùŋ + kpâŋ '"medicine" used to catch thieves'

ɣílà ŋùŋ kpàŋ 'medicine made from a dog's head'

kɔ̄lɔ̄ 'skin' + fela(not recorded independently) kɔ̄lɔ̄ félà 'sickness'

pālā 'sore' + kɔ̄lɔ̄ félà pālā kɔ́lɔ̀ fèlà 'sickness associated with sores'

Such multiple compounds could be produced equally well by a cyclic application of Lowering or by an iterative version constrained to apply to all but the first morpheme. However, one other type of compound described by Welmers indicates that Lowering is cyclic. This type of compound consists of an object-verb collocation followed by a head noun. In this construction Lowering applies only to the final morpheme.

pélè 'play' + ké 'do' + sɛ̄ŋ 'thing' pélè ké sèŋ 'toy'

kɔ̄lī 'iron' + ɣálé 'beat, forge' + nûû 'person' kɔ̄lī ɣálé nûû 'blacksmith'

Welmers does not make it clear whether the object-verb construction may occur independently, as is the case in some other Mende languages, but it is clear in any case that the elements in these compounds are grouped [[ab] c], with the closest association between the first two morphemes. The failure of Lowering to apply to the second of the three constituents can be explained if Lowering is given a cyclic application. On the

first cycle, there is a construction in which Lowering does not apply, and on the second cycle Lowering applies as specified to the second constituent of that cycle, namely the third ultimate constituent.

2.13. Phonetically Conditioned Rules.

When the initial element of a compound is mid toned, the second element appears with a HL rather than a L tone pattern distributed over the morpheme. This is the result of the application of High Tone Insertion (HTI).

2.131. Dissimilation.

Although Dissimilation does not play a role in the synchronic derivation of the tone patterns of Kpelle compounds, it requires discussion here because of the role it played in the historical development of HTI. This topic is discussed further in chapter 3.

Dissimilation converts mid toned morphemes into a MH tone pattern when followed by a non-high tone, as shown by the examples below.

pērē	'path'	sēŋ	'thing'
pērē lóolú	'five paths'	sēŋ lóolú	'five things'
pēré pūū	'ten paths'	sḗŋ pūū	'ten things'

The MH tone pattern created by Dissimilation does not usually surface when a low tone follows, due to the operation of High Tone Insertion. However, certain low toned pronouns are lexical exceptions to HTI, so that Dissimilation may apply in these cases. These forms lead to the generalization that Dissimilation is conditioned by a following non-high tone.

sūā 'animal'

sūá è pà 'an animal (it) came'

Dissimilation is given the following formal expression.

Dissimilation (Kpelle)

M → MH / __ # -H

2.132. High Tone Insertion.

Low toned morphemes appear with a surface HL tone pattern following mid tone.

kálì tɔ̀nɔ̀	'one hoe'	kālī tɔ́nɔ̀	'one snake'
kpíníí sù	'at night'	tāāī sû	'in town'
è bóá kàà	'he saw a knife'	è sūā káà	'he saw an animal'

The simplest account of this alternation is given by a rule of High Tone Insertion (HTI), preceding Dissimilation.

High Tone Insertion (Kpelle)

L → HL / M+ __

This rule must precede Dissimilation in order to block its application. The second set of examples in section 2.131. above shows that in cases where low toned morphemes exceptionally fail to undergo HTI, Dissimilation is not blocked on a preceding mid tone. The following derivations show the interaction of HTI and Dissimilation in various circumstances.

Underlying Forms	kālī tɔ̀nɔ̀	pērē pūū	sūā è pà
High Tone Insertion	kālī tɔ́nɔ̀	--------	--------
Dissimilation	---------	pērḗ pūū	sūá è pà

The analysis of Kpelle tone alternations presented here is motivated by the desire to postulate a synchronic analysis which requires the minimum number of intermediate stages in the derivation of each form. This principle of simplicity of derivation reflects a wish to produce a model of competence which is as close as possible to a model of performance.

A criticism of the analysis presented here is that HTI, as stated, appears to be phonetically unmotivated, and the fact that it occurs following the same tone that in other circumstances undergoes Dissimilation is not explained. Dwyer (1973) has proposed a more complicated analysis, in which Dissimilation applies first, feeding a High Tone Spread rule, which in turn creates the environment for the application of an Absorption rule. This set of rules would produce the following derivations.

Underlying Forms	kālī tɔ̀nɔ̀	pērē pūū
Dissimilation	kālí tɔ̀nɔ̀	pēré pūū
*High Tone Spread	kālí tɔ́nɔ̀	--------
*Absorption	kālī tɔ́nɔ̀	--------

These derivations undoubtedly reflect the diachronic development of the alternation more closely, as will be shown in section 3.22., and a quote from Welmers (1962) makes it appear at first that this more complicated analysis provides a better explanation of certain dialect developments.

> The sequences mid-mid and mid-low have interesting dialectal variations. In mid-mid, for the dialect being described here, the first mid has a slightly rising allotone, as stated. In some areas, the first mid is level but the second mid begins a little higher and drops quickly to the level of the first. In still other areas, both phenomena occur: the first mid ends a little higher, and the second begins a little higher...

> in most dialects, the sequence mid-low does not occur unless the low is pre-consonantal; low is morphophonemically replaced by high-low. But within the dialect described here there is a smaller area in which mid does occur before low except that low is replaced by high-low at the end of questions; mid before low in this area has the same rising allotone. (Welmers 1962, p. 87)

The various dialects described by Welmers appear to show different stages in the generalization of High Tone Spread (HTS). A comparison with other Western Mande languages suggests that HTS was originally constrained to a narrowly defined set of morphological environments, namely those in which Lowering could apply. The description given by Welmers suggests the following stages in the development of HTS as a purely phonological rule.

Dialect 1a	M#L ⇒ M#HL (only at end of question)
	M#M ⇒ MH#M
Dialect 1b	M#L ⇒ M#HL
	M#M ⇒ MH#M
Dialect 2	M#L ⇒ M#HL
	M#M ⇒ MH#HM
Dialect 3	M#L ⇒ M#HL
	M#M ⇒ M#HM

These dialect developments seem to argue against an Insertion analysis, since in that account, the development of a HM alternant for mid following mid cannot be formally related to the rule producing a HL alternant for low following mid.

However, a study of the dialect development in terms of Spreading and Absorption shows that in this analysis the second spreading rule must also be formally unrelated to the first, since the first spreading rule precedes Absorption, while the second is originally innovated in an ordering following Absorption, as shown below.

1. 1) Dissimilation
   2) HTS (L → HL)
   3) Absorption

2. 1) Dissimilation
   2) HTS_1 (L → HL)
   3) Absorption
   4) HTS_2 (M → HM) (added on at end of rules)

3. 1) Dissimilation
   2) HTS (-H → H-H) (merger of 2 and 4)
   3) Absorption

Although the comparison of dialect differences in Kpelle tone rules fails to support either of the competing analyses of the L-HL alternation it is nevertheless worth discussion because of the support it provides for Hyman and Schuh's claim that tone shifts must develop diachronically in two stages, one with Spreading only, and a later stage with both Spreading and Absorption. This support is provided by the dialect with surface MH#HM tone, where only the first stage in the development of tone shifting has occurred.

2.2. Mende.

The following description of Mende is taken from Dwyer (1973) and Innes (1967). Mende has two contrastive levels of tone. Both falling and rising contours appear in underlying forms, falling tone only in final position, but rising tone may also appear in non-final position. Declarative sentences undergo downdrift.

2.21. Surface Tones of Compound Nouns.

		Underlying Tones	Surface Tones
1.	(L)LH	tă̌ 'town' + màhă̌ 'chief'	tà máhà 'town chief'
2.	H	ngúlú 'wood' + mìtă̌ 'spoon'	ngúlú mítà 'wooden spoon'

	Underlying Tones		Surface Tones
3.	HL	ngílà 'dog' + hìndâ 'business	ngílà hìndà 'dog business'
4.	L H͡L	nyàhâ 'woman' + hìndâ	nyàhá hìndà 'woman business'
5.	L	pùù 'European' + hálé 'medicine'	pùù hàlè 'European medicine'
6.	L H	mɛ̀ndé 'Mende' + nyɛ́ 'fish'	mɛ̀ndé nyɛ̂ 'Mende fish'
7.	L̂H L	ndɔ̌lɔ̀ 'country' + màhǎ	ndɔ̌lɔ̀ màhà 'paramount chief'

Three rules apply to the tones of compound nouns. Lowering is conditioned solely by morphological factors, High Tone Spread has both morphological and phonological conditioning, and Absorption is completely phonological in nature.

2.22. Lowering.

This rule replaces the tones of the second constituent of compound nouns with low tone, as shown in 3, 4, 5, and 7 above in section 2.21. It also applies in noun-adjective constructions and alienable possessives, but not in inalienable possessives. Some examples of these constructions are shown in the following section.

Lowering (Mende)

H → L / [[ ] [... __ ...]]

It is assumed that, like its Kpelle counterpart, Mende Lowering is cyclic, although no conclusive evidence is available on this point.

2.23. High Tone Spread.

HTS differs in two respects from its Kpelle cognate. On one hand, it has morphological as well as phonological conditioning. On the

other hand, the phonological conditioning has simplified. Instead of being conditioned only by a preceding polarizing tone, it is triggered by any lexical morpheme with final high tone, as shown in 1, 2, and 6 in section 2.21.

High Tone Spread (Mende)

$$L \rightarrow HL \;/\; [\,[\quad H][\_\_\ \ldots]\,] \quad [+\text{lex. stem}]$$

It is necessary to specify that the preceding high be found on a lexical stem because of examples like the following.

ndòpô 'child'	mbówà 'knife'	ndòpóǐ ná bòwɛ̀í 'that child's knife'
màhǎ 'chief'	nyàhâ 'wife, woman'	màhɛ̀í nyàhɛ̀í 'the chief's wife'

In these examples <u>ná</u> 'that' and -<u>í</u> 'definite marker' fail to condition HTS even though the morphological and phonological conditioning is met.

In general, HTS may apply whenever Lowering has applied as shown below.

númú 'person'	nyámû '(be) bad, ugly'	númú nyámù 'bad person'
màhǎ	nyàhâ	màhà nyáhà 'a chief's wife'
ngǐ 'his'	pèlě 'road'	ngì pélèí 'his road' (Al. Poss.)
but		
ngǐ 'his	tòkǒ 'hand'	ngí lòkòí 'his hand' (Inal. Poss.)

2.24. Absorption.

The effect of Absorption is shown in 1 section 2.21., where <u>tǎ</u> has a surface tone of simple low. Morphemes ending in LH tone simplify this

to L when a high tone follows, including the high tone created by HTS.

Absorption (Mende)

$\widehat{LH} \rightarrow L \; / \; \_\_ + H$

The following examples show the surface alternations of morphemes with final LH tone.

tǎ	'town'	pèlé	'road'
tǎ fèlé	'two towns'	pèléngà	'some roads'
tɛ̀í	'the town'	pèlèí	'the road'

Notice that the underlying $\widehat{LH}$ in bisyllabic morphemes never appears on the surface, being reduced to L by Absorption, or H by a simplification rule discussed in the next section. This is to differentiate forms which undergo absorption from those like mèndé, which do not. (c.f. mèndé nyɛ̀ 'Mende fish')

Leben (1978) has claimed that polarizing morphemes should be marked with a suprasegmental LH pattern, and LH words not undergoing absorption be marked as lexical exceptions. There are several arguments against this. First, Dwyer argues that if non-polarizing LH morphemes are exceptions to Absorption, it is not very clear why most recent loan vocabulary with a LH pattern has in fact been marked as an exception to this regular rule. If on the other hand, Absorption is conditioned only by the abstract underlying L $\widehat{LH}$ forms, the behavior of recent borrowings becomes much more understandable. Second, Leben's analysis implies the possibility of monosyllabic $\widehat{LH}$ morphemes which are not subject to Absorption. Such forms do not appear to exist, a fact

easily explained by the analysis accepted here.

2.25. Simplification Rules.

Rising Simplification applies to any underlying L L͡H pattern whose final high tone has not been erased by Absorption, reducing it to a surface L H tone pattern.

Rising Simplification (Mende)

L͡H → H / L __ #

Falling Simplification applies to morphemes final H͡L tone, reducing it to H anywhere but before pause.

nyàhâ 'woman' hìndâ 'business' nyàhá hìndà 'woman business'

ngètê 'pestle' ngèténgà 'some pestles' ngètéi᷈ 'the pestle'

This simplification applies after Downdrift, resulting in a downstep on succeeding high tone.

Falling Simplification (Mende)

H͡L → H / __ # [+segment.]

2.3. Loko.

The description of Loko is taken entirely from Dwyer (1973). Loko has two contrastive levels of tone, combining in the tone patterns (L)L͡H, LH, H, (H)H͡L, L H͡L, L, and H L. As well as the rules applying to compounds, Loko tones are affected by downdrift.

2.31. Surface Tones of Compound Nouns.

	Base Tones	Surface Tones
1a. (L)L̂H	nìkǎ 'cow' + kútú '(be) short'	nìkà wútú ńá 'the short cow'
b. L H	màhá 'chief' + súkùlù 'school'	màhá súkúlù ná 'the chief's school'
2. H	pɛ́rɛ́ 'house' + mbǎ 'rice'	pɛ́rɛ́ bá ńá 'the house rice'
3. (H)HL̂	njíâ 'dog' + kútú	njíá wútù ná 'the short dog'
4. L ĤL	nyàhâ 'woman' + kútú	nyàhá wútù ná 'the short woman'
5. L	bɛ̀lɛ̀ 'trousers' + kútú	bɛ̀lɛ̀ wùtù ná 'the short trousers'
6. H L	kɔ́pà 'money' + hàndâ 'business'	kɔ́pà hàndà 'money business'

The surface tone patterns of compound nouns are produced by the operation of Lowering, High Tone Spread, Second High Tone Spread, Absorption, and Contour Simplification. The same rules also apply in noun-adjective constructions and alienable possessives.

2.32. Lowering.

The Loko version of this rule is exactly like its Mende counterpart in its phonological effect and morphological conditioning, replacing the tones of all non-initial constituents with low tone in compounds, noun-adjective constructions and alienable possessives.

Lowering (Loko)

H → L / [[ ] [... __ ...]]

2.33. High Tone Spread.

A final high tone on an initial constituent in constructions where Lowering has applied is spread onto the following syllable.

High Tone Spread (Loko)

L → HL / [[ ] [—]]

This rule also applies optionally in inalienable possessives, at least in forms with possessive pronouns. No examples of noun-noun possessives are given.

Base Forms	with HTS	without HTS
bí gbàkí ná 'your shoulder'	bí gbákǐ ná	bí gbàkí ná
nǐ gbàkí ná 'our shoulder'	nì gbákǐ ná	ní gbàkí ná
ngǐ ndɛ́ɣɛ́ ná 'his brother'	ngì ndɛ́ɣɛ́ ná	ngí ndɛ́ɣɛ́ ná

The surface alternations between low and high in nǐ and ngǐ are accounted for by the Absorption and Contour Simplification rules discussed in later sections. When a high tone is spread onto the first syllable of a L H word, as in the first two examples, a L̂H pattern is created which becomes H'H through the operation of Downdrift and Contour Simplification.

2.34. Second High Tone Spread.

This rule applies after HTS, giving the surface result of spreading high tone over the second syllable of forms to which HTS has applied. The same rule applies to forms whose initial constituent ends in underlying falling tone, spreading high over the first syllable of the second constituent in these cases. Examples of the operation of 2nd HTS by itself are shown in 3 and 4 of 2.31. A rule simplifying morpheme final

H͡L to H must apply after HTS, but before 2nd HTS. It is a matter of theoretical preference whether to state this simplification as a separate rule, or to include it in the simplification rule which applies to derived falling tones. If the second alternative is taken it must be assumed that this rule may apply whenever its conditions are met since in some cases it must apply twice in the same derivation. But if this is true it is difficult to explain why it does not apply before HTS, resulting in the application of both HTS and 2nd HTS to forms with underlying final H͡L tone. For this reason, it is assumed that there is a separate rule of Low Loss applying between the two HTS rules. Since both HTS rules are suprasegmental in nature, while Low Loss must refer to segmental information, this situation presents a counterexample to Leben's claims about the separation of segmental and suprasegmental tone rules.

Low Loss (Loko)

HL → L / __ #

2nd High Tone Spread (Loko)

L → HL / [[... H __ ...]]

Example 1b in section 2.31. shows that HTS and 2nd HTS together spread a high tone over only the first two syllables of the second morpheme, while 2 shows that 2nd HTS applies vacuously to monosyllables, and does not eliminate the final low tone before downdrift can apply. In the case of multiply imbedded compounds, high tone may be spread over more than two syllables, attesting to the cyclic nature of 2nd HTS.

Gloss	the old hospital	the old woman's house
Base forms	[[pɛ́rɛ́ hálé] óhá ná]	[[nyàhâ pɛ́rɛ́] óhá ná]
1st cycle		
Lowering	pɛ́rɛ́ hàlè	nyàhâ pèrè
HTS	pɛ́rɛ́ hálè	----------
Low Loss	---------	nyàhá pèrè
2nd HTS	pɛ́rɛ́ hálê	nyàhá pérè
2nd cycle		
Lowering	pɛ́rɛ́ hálê òhà ná	nyàhá pérè òhà ná
HTS	----------	----------
Low Loss	pɛ́rɛ́ hálé òhà ná	----------
2nd HTS	pɛ́rɛ́ hálé óhà ná	nyàhá pɛ́rɛ́ òhà ná

One unusual feature of Loko 2nd HTS is its behavior in compounds whose first constituent ends in the abstract nasal suggested by Dwyer to condition a strong consonant in following morphemes.

Gloss	'the short spirit'	'the short boundary'
Base	ɲ̀-ɔ̀fɔ̂ŋ+kútú-ná	ɲ̀-tébɛ̂ŋ+kútú-ná
Surface	ngɔ̀fɔ́+kùtù-ná	tébé+kùtù-ná

2nd HTS fails to apply in these constructions although the conditioning is met. Dwyer suggests that high tone is spread only as far as the morpheme final nasal and does not reach the second constituent. When the nasal is deleted by the rules governing consonant mutation, all evidence of the operation of 2nd HTS is lost.

2.35. Absorption.

Unlike the cognate rule in other Western Mande languages, Loko Absorption applies only in the morphological environments which condition HTS. It resembles these rules phonologically, reducing morpheme final rising tone to low before high tone.

Absorption (Loko)

L͡H → L / __ # H

Some examples of the application and non-application of Absorption are given below.

nìkǎ 'cow'

nìkà wútú ńá 'the short cow'

nìká ná 'the cow'

It should be noted that all Loko words conditioning strong consonants in following forms which are cognate to Kpelle and Mende words with polarizing tone have restructured in Loko from L L͡H to L H tone. These restructured morphemes do not undergo Absorption.

Gloss	the short cow	the short chief	
Base	ǹ-nìkǎ+kútú-ná	ǹ-màháŋ+kútú-ná	
Surface	nìkà+wútú-ńá	màhá+kútú-ńá	cf. Mende màhà+wóvɛ̀ í 'the old chief'

2.36. Contour Simplification.

Because the definite suffix has become obligatory in Loko in NP final position, base forms of nouns never appear in isolation at the surface. This means that the final contour tone in nouns with underlying L L͡H, H H͡L, and L H͡L tone is an abstract marker which never appears on the surface. Rising tone is used to mark those nouns which undergo absorption, while final falling tone explains the application of downdrift on following high tones and the non-application of HTS in compounds. A late rule simplifies any contour to high tone. In the following rule, % indicates mirror image application.

Contour Simplification (Loko)

L → H % __ H

2.4. Bandi.

Information on Bandi tone and tone rules is from Dwyer (1973). Bandi has two contrastive tone levels, a downdrift rule, and the following contrastive tone patterns on underlying forms: 1a) (L) L͡H, 1b) L H, 2) H, 3) L, 4) H L and 5) L H. Pattern 5 occurs only on recent loanwords and differs from 2 in that it fails to condition High Tone Spread or undergo Low Tone Advancement. Morphemes cognate with Loko H H͡L and L H͡L patterns have merged with H and L H in Bandi. This has had some interesting effects on the formulation of HTS, which will be discussed in section 2.43. Underlying contours are found only in L L͡H nouns, where the final rising tone never appears on the surface. There are no surface contours of any kind on noun stems. However a simplification rule is needed to apply to falling tones created by spreading. This rule applies after downdrift, resulting in surface downstep on following high tones.

2.41. Surface Tones of Compound Nouns.

	Base Tones		Surface Tone	
1a) (L) L͡H	nìkă 'cow'	+ pɔ́lɔ́ 'old'	nìkà vɔ̀lɔ́ ˈî	'the old cow'
1b) L H	màsáŋ 'chief'		màsà pɔ́lɔ́ ˈˈî	'the old chief'
2) H	pɛ́lɛ́ 'house'		pɛ̀lɛ́ vɔ́lɔ́ ˈî	'the old house'
3) L	bɛ̀lɛ̀ŋ 'trousers'		bɛ̀lɛ̀ pɔ̀lɔ̀ î	'the old trousers'
4) H L	dálà 'dollar'		dálà vɔ̀lɔ̀ î	'the old dollar'
5) L H	kɔ̀hín 'coffee'		kɔ̀hí pɔ̀lɔ̀ î	'the old coffee'

These tone patterns can be accounted for by the rules of Lowering, High Tone Spread, Absorption, Low Tone Advancement, and Contour Simplification. A further rule of Inalienable High Tone Spread operates in inalienable possessives.

2.42. Lowering.

Bandi Lowering is phonologically and morphologically identical to its Loko and Mende counterparts. It lowers any high tone in the non-initial constituent of compound nouns, noun-adjective constructions, and alienable possessives.

Lowering (Bandi)

H → L / [[ ] [... __ ...]]

2.43. High Tone Spread.

Bandi HTS is different in several interesting ways from the corresponding Loko phenomenon. These developments can be attributed to the effect of the merger of morpheme final H and H̋L. The result of this merger was to eliminate all underlying falling tones in Bandi. Thus, in compounds, either HTS and 2nd HTS both apply, or else neither applies. I suggest that this has resulted in a present day Bandi HTS rule which combines the effect of both former rules, shifting high tone over two places to the right.

High Tone Spread (Bandi)

L → HHL / [[H] [__]]

The rule is formulated so as to create derived falling tones in morpheme final position, to account for the surface downstep on a

following high toned suffix, as in 1a, 1b, and 2 in 2.41. above.

This final falling tone also accounts for the non-cyclicity of Bandi HTS. In the example below, high tone is not spread onto the third morpheme, as in the comparable Loko examples in section 2.34.

màsáŋ 'chief' + pɛ́lɛ́ 'house' + pɔ́lɔ́ 'old'

màsà pɛ́lɛ́ vɔ̀lɔ̀ ɪ́ 'the old [chief's house]'

This lack of spreading is explained by the fact that HTS is conditioned by preceding high tone, and therefore cannot be conditioned by the falling tone created on the first cycle. This falling tone cannot be simplified by Low Loss to feed HTS, since Low Loss has been lexicalized through the merger of underlying H and HL and is no longer a live rule. Even if it were still active it would presumably be ordered after HTS, as in Loko.

Base	màsáŋ	pɛ́lɛ́	pɔ́lɔ́
1st cycle			
Lowering	màsá	pɛ̀lɛ̀	
HTS	màsá	pɛ́lɛ̂	
2nd cycle			
Lowering	màsá	pɛ́lɛ̂	vɔ̀lɔ̀
HTS	----------	----------	----------
non-cyclic			
Low Tone Advancement	màsà	pɛ́lɛ̂	vɔ̀lɔ̀
Simplification	màsà	pɛ́lɛ́	vɔ̀lɔ̀

While in environments where Lowering applies, HTS and 2nd HTS have merged into a single rule, in inalienable possessives high tone is still spread only one syllable to the right. Lowering does not apply in this environment.

kɛ̀ɣɛ́ 'father'	tòkǒ 'hand'
nǐ kɛ́ɣɛ̌ 'my father'	ǐ lókǒ î 'your hand'
ngì kɛ́ɣɛ̌ 'his father'	tì lókǒ î 'their hand'

This remnant of the earlier HTS rule is renamed Inalienable HTS, to indicate the morphological environment where it applies.

Inalienable High Tone Spread (Bandi)

L → HL / [[H] [__]]

2.44. Absorption.

Absorption, as in Loko, applies to those class 1 morphemes ending in L͡H but not to those which have restructured as L H. It is not possible to determine whether it applies in all morphological environments, or, as in Loko, only in those morphological environments which condition HTS. This is due to the addition of the rule of Low Tone Advancement.

Absorption (Bandi)

LH → L / [[__] [H]]

2.45. Low Tone Advancement.

This rule applies to nouns in initial position in a noun phrase. In high toned words the first syllable acquires a low tone. In words with initial low tone the low tone is extended one syllable to the right. Dwyer accounts for the low tone spread onto the first syllable of high toned nouns by positing a low toned prefix whose main phonetic effect is to condition the strong form of initial consonants. Given the presence of this prefix, LTA can be formulated as the spread of NP initial low tone one syllable to the right.

Low Tone Advancement (Bandi)

H → LH / NP [[L (] [) __ ...]]

The effect of this rule in simple NP's is shown below. Notice that nouns of tone class 4 and 5 are exceptions to LTA, and that low tone is not spread onto the definite marker in 3). LTA applies in all other cases.

	Base	Surface	
1a)	nìkǎ-í	nìkà-î	'the cow'
1b)	màsáŋ-i	màsàng-í	'the chief'
2)	pɛ́lɛ́-í	pɛ̀lɛ́-î	'the house'
3)	bɛ̀lɛ̀ŋ-í	bɛ̀lɛ̀ng-í	'the trousers'
4)	dálà-í	dálà-î	'the dollar'
5)	kɔ̀híŋ-í	kɔ̀híng-í	'the coffee'

The surface low tone of nìkà-í can be ascribed either to LTA, or to Absorption in this morphological environment. It is not possible to determine empirically which rule is responsible. In other environments both rules may apply, combining to spread low tone two syllables to the right.

nìkǎ 'cow' + pɔ́lɔ́ 'old' nìkà vɔ̀lɔ́-î 'the old cow'

2.46. Contour Simplification.

This rule exists only to reduce the contour tones produced by spreading. The existence of such contours at an intermediate level is shown by the operation of downdrift, conditioned by the final low tone.

Falling Simplification

$\widehat{HL} \rightarrow H$ / __ [+seg]

The interaction of the spreading rules, downdrift, and contour reduction is shown in the following derivations.

Base	pɛ́lɛ́ pɔ́lɔ́-î	í kɛ̀ɣɛ́
Lowering	pɛ́lɛ́ vɔ̀lɔ̀-î	------
HTS	pɛ́lɛ́ vɔ́lɔ̂-î	------
In. HTS	----------	í kɛ̂ɣɛ́
LTA	pɛ̀lɛ́ vɔ́lɔ̂-î	------
Downdrift	pɛ̀lɛ́ vɔ́lɔ̂-î	í kɛ̂ɣɛ́
Cont. Simp.	pɛ̀lɛ́ vɔ́lɔ́-î	í kɛ́ɣɛ́

2.5. Loma.

This description of Loma is based on the discussion of the Gbunde dialect in Dwyer (1973). Loma has undergone an interesting historical process, which has reversed the tones of both underlying forms and the rules which operate on them, so that Loma high tone corresponds to low tone in other Southwest Mande languages, and vice versa. Along with the tone reversal there have been several simplifications in the form of the tone rules. The major result of these simplifications is that there is no longer any reason to suppose that any of the rules are contour creating. These rules copy tone onto entire morphemes, with one interesting exception. The rules are melody preserving in the sense that given a starting pattern like H#LL#H, H will spread only onto the first low syllable, preserving the original low tone on the second syllable when an unlike tone follows. This is in contrast to the operation of similar rules in other Southwest Mande languages, where a surface H'H pattern would result. Loma has downdrift, but no downstep.

2.51. Surface Tones of Compounds.

1) H H̄L	níkâ 'cow' + kòlèŋ 'white'	níká wólèg-í 'the white cow'
2) L	pɛ̀lɛ̀ 'house'	pɛ́lɛ́ wòlèg-í 'the white house'
3) L L̂H	ɣùlùŋ́ 'cobra'	gúlù kólég-í 'the white cobra'
4) H L	túkpɔ̀ 'staff'	túkpɔ̀ wòlèg-í 'the white staff'

The surface tones of Loma compounds are produced by the operation of Raising, Low Tone Spread, Absorption, and High Tone Advancement. Raising applies in noun compounds, adjective phrases, and alienable possessives. LTS applies in these environments plus inalienable possessives. Absorption and HTA apply in all morphological environments.

2.52. Raising.

This rule, the counterpart of the Lowering rule found in other languages, replaces the base tone of non-initial constituents with high tone. The effect of Raising is sometimes obscured by the operation of Low Tone Spread on the second constituent of a compound when the first constituent ends in a low tone, and when the first constituent ends in high tone the effect of Raising on the second constituent could equally well be attributed to High Tone Advancement. However, in comounds with more than two elements the effect of Raising is clearly seen. Moreoever its operation is always indirectly reflected in the tone of the definite suffix, as will be shown in section 2.55. The following examples show the application of Raising in multiple compounds.

másá pɛ̀lɛ̀ wóozá níinɛ́-í	nà pɛ̀lɛ̀ wóozá níinɛ́-í
chief+house+long+new-the	my+house+long+new-the
the new long royal house	my new long house

Raising may be formally expressed as follows.

Raising (Loma)

L → H / [[ ] [... __ ...]]

2.53. Low Tone Spread.

Low Tone Spread (LTS), applying after Raising, spreads a final low tone on the first constituent over the entire second constituent. The effect of this rule can be seen in 2) and 4) and the second syllable of 1) in section 2.51. This rule is not cyclic, and never applies to any constituent after the second in a compound.

Low Tone Spread (Loma)

H → L / [[ ] [... __ ...]

2.54. Absorption.

Absorption applies after LTS to morpheme final contour tones, both rising and falling. This rule has applied in 1) and 3) in section 2.51. Because Absorption applies in all morphological environments, the underlying final contours of H H͡L and L L͡H tone patterns exist only to condition the correct application of LTS in following morphemes. Absorption must follow LTS and precede HTA, but in the case of rising tones it also applies after HTA. This will be discussed further in section 2.55. In the rule below, T = any tone.

Absorption (Loma)

$\alpha\overset{\frown}{T}\ -\alpha T \rightarrow \alpha T\ /\ \_\_\ -\alpha T$

2.55. High Tone Advancement.

High Tone Advancement (HTA) spreads a high tone from a morpheme final high onto the next morpheme. It also applies to phrase initial morphemes, which led Dwyer to postulate an abstract high toned nasal in phrase initial position which both conditions HTA and also conditions the strong form of initial consonants.

The examples below show the application of HTA in simple definite NP's.

	Base	Surface	Gloss
1)	lɔ́bɔ̂+ì	dɔ́bɔ́-í	'the bush'
2)	kòmìŋ+ì	kómíg-ì	'the bee'
3)	ɣùlùń+ì	gúlùg-í	'the cobra'
4)	kícì+ì	kícì-ì	'the kitchen'
5)	bàzà+ì	bàzà-ì	'the rice bird'

The surface tones of the forms above are derived as follows:

Base	lɔ́bɔ̂-ì	kòmìŋ-ì	ɣùlùŋ́-ì
Suffix Cycle			
Absorption	dɔ́bɔ́-ì		
HTA	dɔ́bɔ́-í		gùlùǵ-í
Absorption			gùlùg-í
Stem Cycle			
HTA		kómíg-í	gúlùg-í

HTA must apply to the rightmost constituent first, then on the preceding morphemes. Thus in some cases it may apply twice in the same word.

Another peculiarity of Loma HTA is that it spreads only onto syllables followed by low tone. This is demonstrated in the derivation of gúlùg-í above, and of níká wólèg-í and gúlùg kólég-í below.

High Tone Advancement (Loma)

L → H / H+ __ (+) L

The following derivations show how Raising and HTA act together to account for the invariant high tone on definite suffixes in compounds, as well as demonstrating the application of all the rules affecting tone in compounds.

Base	pɛ̀lɛ̀ kòlèŋ-ì	níkâ kòlèŋ-ì	ɣùlùŋ̀ kòlèŋ-ì	túkpɔ̀ kòlèŋ-ì
Raising	pɛ̀lɛ̀ kóléŋ-ì	níkâ kóléŋ-ì	ɣùlùŋ̀ kóléŋ-ì	túkpɔ̀ kóléŋ-ì
Suffix Cycle				
LTS Absorption				
HTA Absorption	pɛ̀lɛ̀ kóléŋ-í	níkâ kóléŋ-í	ɣùlùŋ̀ kóléŋ-í	túkpɔ̀ kóléŋ-í
Adj. Cycle				
LTS	pɛ̀lɛ̀ kòlèŋ-í	níkâ kòlèŋ-í		túkpɔ̀ kòlèŋ-í
Absorption		níká kòlèŋ-í		
HTA		níká kólèŋ-í		
Absorption			ɣùlùŋ kóléŋ-í	
Noun Cycle				
LTS Absorption				
HTA Absorption	pɛ́lɛ́ kòlèŋ-í		ɣúlùŋ kóléŋ-í	
Surface	pɛ́lɛ́ wòlèg-í	níká wólèg-í	gúlù kólég-í	túkpɔ̀ wòlèg-í

2.6. Vai.

This description of Vai is taken from Welmers (1976). The two contrastive tone levels of Vai combine freely with each other. The four most common tone patterns on mono- and disyllables are LH, H, HL,

and L. With a relatively small group of exceptions which appear to be borrowed vocabulary, contour tones have a restricted distribution. Rising tone occurs predominantly in monosyllables. Falling tone occurs on monosyllables, and final syllables of longer morphemes.

It is interesting to note the great similarity between the Vai and Kpelle forms of Compound Formation. The only difference lies in the different underlying form of polarizing tone in the two languages.

2.61. Compound Tone Patterns.

	Base Tones	Surface Tones
1) LH	kŭŋ 'head' + kpàsá 'kerchief'	kùŋ kpásà 'head cloth'
	jàmbá 'leaf' + mɔ̌ 'person'	jàmbà mɔ́ɔ̀ 'herbalist'
2) H	jí 'water' + sóó 'hole'	jí sòò 'water hole'
	bóló 'hand' + lólì 'young'	bóló lòlì 'finger'
3) HL	zíì 'clan' + mànjá 'chief'	zíì mànjà 'clan chief'
4) L	màà 'anger' + wùlú 'dog'	màà wùlù 'mad dog'

The surface tones of Vai compound nouns are produced by three rules: Lowering, High Tone Spread, and Absorption. Lowering and High Tone Spread are restricted entirely to compound nouns. Absorption occurs in any morphological environment except within a possessive.

2.62. Lowering.

Lowering applies to the second immediate constituent of a compound noun and replaces its tones with low tone.

Lowering (Vai)

H → L / [[ ] [... __ ...]]

The following examples show the cyclic nature of Lowering. Notice that in the second of the multiple compounds cited, the first immediate constituent is an object-verb nominalization which does not undergo Lowering.

màí 'insulting behavior' + lùlù-wólò 'language'

mài-lúlù-wòlò 'boasting'

fén 'thing' + lɔ́ŋ 'eat' + bóló 'hand'

fén lɔ́ŋ-bòlò 'right hand'

2.63. High Tone Spread.

HTS occurs in the same morphological environment as Lowering, and like the cognate rule in Kpelle, is conditioned only by morphemes with polarizing tone. It creates a $\widehat{HL}$ pattern on monosyllables, and a H L pattern on disyllables. Because the operation of HTS always conditions Absorption on the preceding polarizing tone it appears as if a tone shift has occurred, displacing a high tone one syllable to the right. This shift is best expressed as two separate rules, because of the fact that Absorption occurs independently of HTS in environments other than in noun compounds.

High Tone Spread (Vai)

L → HL / [[LH] [__]]

2.64. Absorption.

Morphemes with LH tone appear with the alternate form of L when followed by a high tone. It is not necessary to specify that this alternation applies only to final rising tones, as in Mende, Loko and

Bandi, since there are no disyllables with L H tone which fail to undergo Absorption.

wùlú 'dog'	nìí 'cow'
wùlú fìimá 'black dog'	nìí fìimá 'black cow'
wùlù náaní 'four dogs'	nìì náaní 'four cows'

The following examples show that Absorption must be restricted from occurring in possessives, both alienable and inalienable.

mùsú 'woman'

mùsú á kòlá 'a woman's cloth'

mùsú tɔ́ɔ́ 'a woman's name'

Absorption can be expressed formally by the following rule.

Absorption

H → L / + L __ + H

2.7. Susu.

The description of Susu is based on data from Houis (1963). Susu's two contrastive tone levels combine in three major tone classes for mono- and disyllables: LH, H, and HL. No L pattern occurs in underlying forms. The distribution of contour tones is restricted to final syllables, except for a few forms with internal rising tone before low. Downdrift occurs, but no examples of downstep are given in the data.

2.71. Compound Tone Patterns.

1) LH	kìrá 'road' + xǔ 'head'	kìrà xǔyì 'crossroads'
	sǎ 'foot' + kɔ̌ 'neck'	sà kɔ̃yì 'ankle'
2) H	pɔ́pí 'to pump' + sɛ̌ 'thing'	pɔ́pí sê 'pump'
	dɛ́ 'mouth' + xàbê 'hair'	dɛ́ xábè 'beard, moustache'
3) HL	yókà 'manioc' + bɛ́xí 'to be sweet'	yóká bɛ́xì 'sweet manioc'
	bâ 'the sea' + sɛ̌ 'thing'	bá sê 'fish'
4) L H̋L	bɔ̀tô 'cloth bag' + dî 'small'	bɔ̀tɔ̀ dî 'small bag'

The tone pattern imposed on Susu compounds falls into three parts, described by the rules of First Tone Copy, Raising, and Lowering. First Tone Copy applies to the first morpheme of the compound, while Raising and Lowering combine to provide the tone pattern spread over the rest of the compound.

2.72. First Tone Copy.

Each syllable of the first morpheme in a compound has its base tone replaced with the tone of the first syllable. The first morpheme in a compound thus has either all high or all low tone, depending on whether it begins with high or low tone underlying.

First Tone Copy

$\alpha H \rightarrow \beta H$ / [[βH... __ ...]

2.73. Raising.

Raising, unlike the cognate High Tone Spread rules in other Western Mande languages, has no phonological conditioning. It applies whenever

its morphological conditions are met, replacing the base tone of non-initial morphemes with high tone.

Raising

L → H / [[ ] [... __ ...]]

2.74. Lowering.

The final syllable of a compound appears with low tone, except in the case of mono-syllabic final morphemes, which appear with a falling tone. The final low tone of compounds is the result of the application of Lowering.

Lowering

H → HL / [... __]]

2.75. Multiple Compounds.

The tone patterns found on multiple compounds show that First Tone Copy is definitely not cyclic, and that Lowering probably is not cyclic. The following represent some of the few examples of multiple compounds included in Houis' data.

xɔ̀ní 'bird' + dí 'little' xɔ̀nì dì 'little bird'

xɔ̀nì dì + kare (not independently attested)

xɔ̀nì dí kárè 'circle on top of thatch roof'

xǔ 'head' + sá 'to put or place' + sě 'thing' xǔ sá sê 'pillow'

If First Tone Copy were cyclic it would apply to the second morpheme in each of these forms on the second cycle, producing *xɔ̀nì dì kárè, for example, rather than the attested xɔ̀nì dí kárè.

The case of Lowering is less clearcut. It is stated as a non-cyclic rule here in order to allow the easiest statement of Raising. If Lowering is post-cyclic then Raising may apply simply to the second immediate constituent of a compound. If Raising and Lowering are both cyclic then Raising may be required to apply to part of the first immediate constituent as well after the first cycle, simply to erase the effect of Lowering.

The derivation below shows the incorrect surface tone produced by a cyclic Lowering rule.

Base	xɔ̀ní	dí	kare
1st cycle			
Raising		dí	
Lowering		dî	
2nd cycle			
Raising			káré
Lowering			kárè
FTC	xɔ̀nì		
Surface	*xɔ̀nì	dî	kárè

The simpler derivation proposed here is illustrated below.

Base	xɔ̀ní	dí	kare
Cyclic			
Raising		dí	
Raising			káré
Non-cyclic			
FTC	xɔ̀nì		
Lowering			kárè
Surface	xɔ̀nì	dí	kárè

2.76. Absorption.

The Susu Absorption rule is not used to account for the alternation between L and LH tone in polarizing morphemes as in other Western Mande languages. Disyllabic LH stems appear with surface low tone only in compounds, where their surface tone is accounted for by FTC. Susu Absorption applies only to contour tones, but includes falling as well as rising tones.

Absorption

$\alpha\overset{\frown}{H\ -\alpha}H \rightarrow \alpha H \ /\ \_\_\_\ -\alpha H$

This rule is illustrated below.

Base	Definite form	Gloss
xŭ	xů̀yí	head
sŏ	sòé	horse
sû 'to fast'	sů̂yì	a fast, fasting
kókósô	kókósóè	village of captives

The Susu definite suffix is inherently toneless and acquires the tone of the immediately preceding syllable. When this syllable has a contour tone, then the final tone of the contour is copied onto the definite suffix. This creates the environment for Absorption to apply, simplifying the contour.

2.8. Mandekan.

Mandekan consists of a number of dialects spoken over a considerable area and is by far the most widely spoken of the Mande languages. Descriptions with tonal data are available for three major dialects which are widely separated geographically. These are Bambara (Bird

1966, 1968, 1977), (Courtenay 1974), Guinean Maninka (Welmers 1949), (Spears 1968, 1973), and Gambian Mandinka (Rowlands 1959). Compound Noun Formation does not differ in any respect in these three dialects, leading to the assumption that it is the same throughout Mandekan.

The examples throughout the rest of this section will be Bambara, taken primarily from Courtenay, with some supplements from Bird (1977) and personal notes. The rules given are essentially as formulated by Courtenay.

Mandekan has two contrastive levels of tone. Downdrift occurs and surface downstep is also found, conditioned by the definite suffix, which consists of a floating low tone. The great majority of morphemes fall into two tone classes: H, and LH (polarizing). Rising tone is found only on monosyllables, either underlying or produced by contraction. Falling tone exists only utterance finally, produced by the attachment of the floating low toned definite suffix.

2.81. Compound Tone Patterns.

1) L	kɔ̀rɔ́ 'elder sibling' + mùsó 'woman'	kɔ̀rɔ̀ músó 'older sister'
	kǔn 'head' + tìgí 'owner'	kùn tígí 'leader'
2) H	yírí 'tree' + sùrùnmán 'short'	yírí súrúnmán 'short tree'
	só 'house' + mɔ̀gɔ́ 'person'	só mɔ́gɔ́ 'family member'
3)	mìríkìtí 'bloodsucker' + bèlèbélé 'big'	mìrìkìtì bélébélé' 'big bloodsucker'

The surface tone patterns of compounds are produced by the rules of Raising and First Tone Copy. These rules also apply to noun-adjective constructions.

2.82. Raising and First Tone Copy.

Raising replaces the base tones of the second constituent of a compound with high tone.

Raising (Mandekan)

$L \rightarrow H$ / [[ ] [... __ ...]]

First Tone Copy (FTC) spreads the first tone of the initial constituent of a compound over the remainder of that constituent.

First Tone Copy (Mandekan)

$\alpha H \rightarrow \beta H$ / [[βH ... __ ...] [ ]]

Raising and FTC apply cyclicly, as the following examples demonstrate.

dùté 'tea' + fìnmán 'black' — dùtè fínmán 'black tea'

dùmán 'good' — dùtè fìnmàn dúmán 'good black tea'

mìrìkìtì bélébélé 'big bloodsucker'

mìrìkìtì bèlèbèlè bá 'very big bloodsucker'

nǔn 'nose' + kǔn 'head' — nùn kún 'tip'

sěn 'foot' — sèn nún kún 'tip of the foot'

kàrán 'study' + mɔ̀gɔ́ 'person' — kàrà mɔ́gɔ́ 'teacher'

kùn tígí 'leader' — kàrà mɔ̀gɔ̀ kún tígí 'principal'

The cyclic application of these rules is shown in the following derivations.

Base	[[dùté fìnmán] dúmán]	[kàrán mɔ̀gɔ́][kùn tìgi]]
Raising	fínmán	mɔ́gɔ́ tígí
FTC	dùtè	kàràn kùn
Raising		kàrà mɔ́gɔ́ kún tígí
FTC	dùtè fìnmàn dúmán	kàrà mɔ̀gɔ̀ kún tígí

2.83. Polarizing Tone.

Morphemes which have been represented here with low tone occur in two surface forms: L and LH.

sò 'horse' sò kélén 'one horse' sǒ fìlà 'two horses'

mùsò 'woman' mùsò kélén 'one woman' mùsó fìlà 'two women'

Since the LH alternant appears only before following low tone most writers (Welmers, Spears, Bird) analyze the L pattern as basic and derive LH by a dissimilation rule. Leben (1973) proposed instead that the alternation results from an absorption rule applying to underlying LH tone. The two alternatives can be formally represented as follows:

Dissimilation

$L \rightarrow LH \; / \; \_\_ \; L$

Absorption

$H \rightarrow L \; / \; L \; \_\_ \; \left\{ \begin{matrix} H \\ // \end{matrix} \right\}$

I will argue here for the solution using Absorption and against the solution involving Dissimilation.

Leben proposed an absorption analysis primarily to provide phonetic motivation for Raising. Working from descriptions which claimed that only H and L morphemes are found in Maninka (Spears 1966) Leben noted that under his analysis all morphemes would end in high tone. Thus

Raising could be postulated as a simple copying or spreading rule. FTC, applying only to LH tone, would be subsumed under the more general Absorption rule.

Courtenay (1974) responded to this by citing numerous examples of Bambara words with tone patterns other than H or LH. Examples such as in 3) in section 2.81. show that Bambara requires a phonetically unmotivated Raising rule and a FTC rule independent of polarization.

However, Courtenay still wished to maintain underlying LH tone for several reasons. First, she cited Hyman and Schuh's claim of the relative unnaturalness of dissimilation rules as compared to absorption. Dwyer (1978) has responded to this argument by claiming that while dissimilation rules are less common than absorption rules, they occur frequently enough so that they are undoubtedly natural. Furthermore, any supposed advantage from positing a more natural rule type is offset by the increased complexity required in the statement of the conditioning of the rule.

Another motivation Courtenay advanced for underlying LH tone has to do with the existence of an absorption rule applying to H morphemes in the environment L+__+H. If polarization is handled by an absorption rule then the two phenomena may be collapsed into a single rule. An argument against this is the fact that the absorption of H morphemes is subject to morphological restrictions that are irrelevant to absorption applying to LH tone. That is only certain H morphemes, notably auxillaries and some other particles, are subject to Absorption in most dialects. This requires that a boundary be allowed between the alternating H and the conditioning L for these cases. (H → L / L(+) __ +H) But if this is built into the regular Absorption rule, the rule will

apply to H morphemes which should not be affected.

The preceding arguments have been somewhat inconclusive. However, a further fact which has not been considered by either Courtenay or Dwyer clearly favors an underlying LH tone. Trisyllabic morphemes may have either LLH or LHH patterns. But both patterns alternate with L in absorptive environments.

sàbàrà 'shoes'	mòbìlì 'car'
sàbáráø 'the shoes'	mòbìlíø 'the car'
sàbàrà náaní 'four shoes'	mòbìlì náaní 'four cars'

In the above examples the definite suffix is a floating low tone (ø) whose presence is shown by the LH surface tone of preceding polarizing morphemes.

If both LLH and LHH words are subject to the same alternation, it is clearly quite awkward to derive them both from LLL by Dissimilation. However, in a non-segmental analysis, the same Absorption rule can easily apply to both as L H tone patterns, producing surface L.

2.9. Soninke.

Less information is available on Soninke than on the other Mande languages discussed here. The following statements about Soninke Compound Formation are based on an analysis of compound nouns found in an extensive word list published by Monteil (1966). This word list does not appear to have reliable tone marking. In Monteil's disccusion of his transcription system he is not clear as to whether he is marking tone or stress. If his tone transcription is accurate, then it appears that there are no consistent tone changes associated with Soninke compounds such as are found in other Western Mande languages.

However, some compounds are marked with a nasal affix appearing between the two elements of the compound. The following data shows examples both of compounds containing the nasal affix and compounds not containing it.

laxa 'mouth' + ji 'water'	laxa-n-ji 'saliva'
yaaxe 'eye' + yinte 'hair'	yaaxa-n-yinte 'eyelash'
kambe 'tooth' + golle 'mortar'	kamba-golle 'molar'
ma 'maternal aunt' + teyne 'co-wife'	ma-teyne 'co-wife of father'
yaxare 'woman' + xoore 'adult'	yaxare-n-xoore 'adult woman'
yugo 'man' + xoore	yugo-xoore 'adult man'

It is clear, especially from the last pair of examples, that the presence of the nasal affix is not productive at this time, but is determined by individual lexical items. It may be inferred however that it was formerly a productive process.

Bird (personal communication) states that the nasal affix, though not regularly present in compounds, is productively inserted in pronoun-noun possessives and in pronoun-verb sequences. He does not provide any examples.

2.10. Toura.

An interesting comparison can be made between the Lowering rule found in the Western Mande languages and a similar but not identical rule in the Eastern Mande language Toura. In the following examples from Bearth (1971) the four contrastive tone levels of Toura are marked as follows: high=v́, high-mid=v̄, low-mid=v, low=v̀.

tɔ́ɔ́ 'gourd'	wɪ̄ɪ-tɔ̀ɔ̀ 'wine gourd'
tɔ́ŋ̄ 'law'	péē-tɔ̀ŋ 'village law'
ɓáálá 'work'	boí-ɓààlá 'field work'
mɔ̄ā 'adult man'	péē-mɔ̀ā 'man of the village'

It can be seen that Toura Lowering applies, roughly speaking, only to the first syllable of the second constituent, as shown in the last two examples. It differs significantly in this respect from the Western Mande Lowering rules, which affect the tone of an entire constituent. It is also interesting to note that there appears to be no form of tone polarization in Toura. There is however, an absolute restriction against rising tone on a single syllable.

2.11. Comparative Summary of Western Mande Compound Tone Patterns.

The following figure gives a comparison of the surface tone patterns found on compound nouns in the Western Mande languages described in this chapter, arranged in terms of the underlying tone of the initial constituent and the surface tone that results on the final constituent.

Figure 4: The Surface Tone Patterns of Western Mande Compounds.

Base Tone of 1st Constituent	Surface Tone of 2nd Constituent	Examples	
Vai			
LH	HL	kǔn + kpàsá	kùn-kpásà
H	L	bóló + lólì	bóló-lòlì
HL	L	zíì + mànjá	zíì-mànjà
L	L	màà + wùlú	màà-wùlù
Kpelle			
M	HL	kɔ̄lɔ̄ + láá	kɔ̄lɔ̄-láà
H	L	tóú + wúló	tóú-wùlò
M H͡L	L	kpɔ̄nô + kwālā	kpɔ̄nô-kwàlà
HL	L	súà + lóŋ	súà-lòŋ
L	L	bàlàŋ + nina	bàlàŋ-nìnà
Mende			
(L)L͡H	HL	tǎ + màhǎ	tà-máhà
H	HL	ngúlú + mìtǎ	ngúlú-mítà
LH	HL	mɛ̀ndɛ́ + nyɛ́	mɛ̀ndé-nyɛ̂
L H͡L	L	nyàhâ + hìndâ	nyàhá-hìndà
HL	L	ngílà + hìndâ	ngílà-hìndà
L	L	pùù + hálé	pùù-hàlè
Loko			
(L)L͡H	HHL	nìkǎ + kútú	nìkà-wútû
H	HHL	pɛ́rɛ́ + mbǎ	pɛ́rɛ́-mbâ
LH	HHL	màháŋ + súkùlù	màhá-súkúlù
L H͡L	HL	nyàhâ + kútú	nyàhá-wútù
(H)H͡L	HL	njíâ + kútú	njíá-wútù
HL	L	kɔ́pà + hàndâ	kɔ́pà-hàndà
L	L	bɛ̀lɛ̀ + kútú	bɛ̀lɛ̀-wùtù
Bandi			
(L)L͡H	LHL	nìkǎ + pɔ́lɔ́	nìkà-vɔ̀lɔ̂
H	HHL	pɛ́lɛ́ + pɔ́lɔ́	pɛ̀lɛ́-vɔ́lɔ̂
LH	HHL	màsáŋ + pɔ́lɔ́	màsà-pɔ́lɔ̂
HL	L	dálà + pɔ́lɔ́	dálà-vɔ̀lɔ̀
L	L	bɛ̀lɛ̀n + pɔ́lɔ́	bɛ̀lɛ̀-pɔ̀lɔ̀
Loma			
(H)H͡L	HL+H	níkâ + kòlèŋ	níká-wólèg-í
L	L+H	pɛ̀lɛ̀ + kòlèŋ	pɛ́lɛ́-wòlèg-í
HL	L+H	túkpɔ̀ + kòlèŋ	túkpɔ̀-wòlèg-í
L L͡H	H+H	ɣùlǔŋ + kòlèŋ	gúlù-kólég-í
Susu			
LH	H*L	kìrá + xǔ	kìrà-xûyì
H	H*L	dɛ́ + xàbê	dɛ́-xábè
HL	H*L	yókà + bɛ́xí	yóká-bɛ́xì
Mandekan			
L	H	kǔn + tìgí	kùn-tígí
H	H	yírí + sùrùnmán	yírí-súrúnmán

3. Diachronic Analysis and Conclusions.

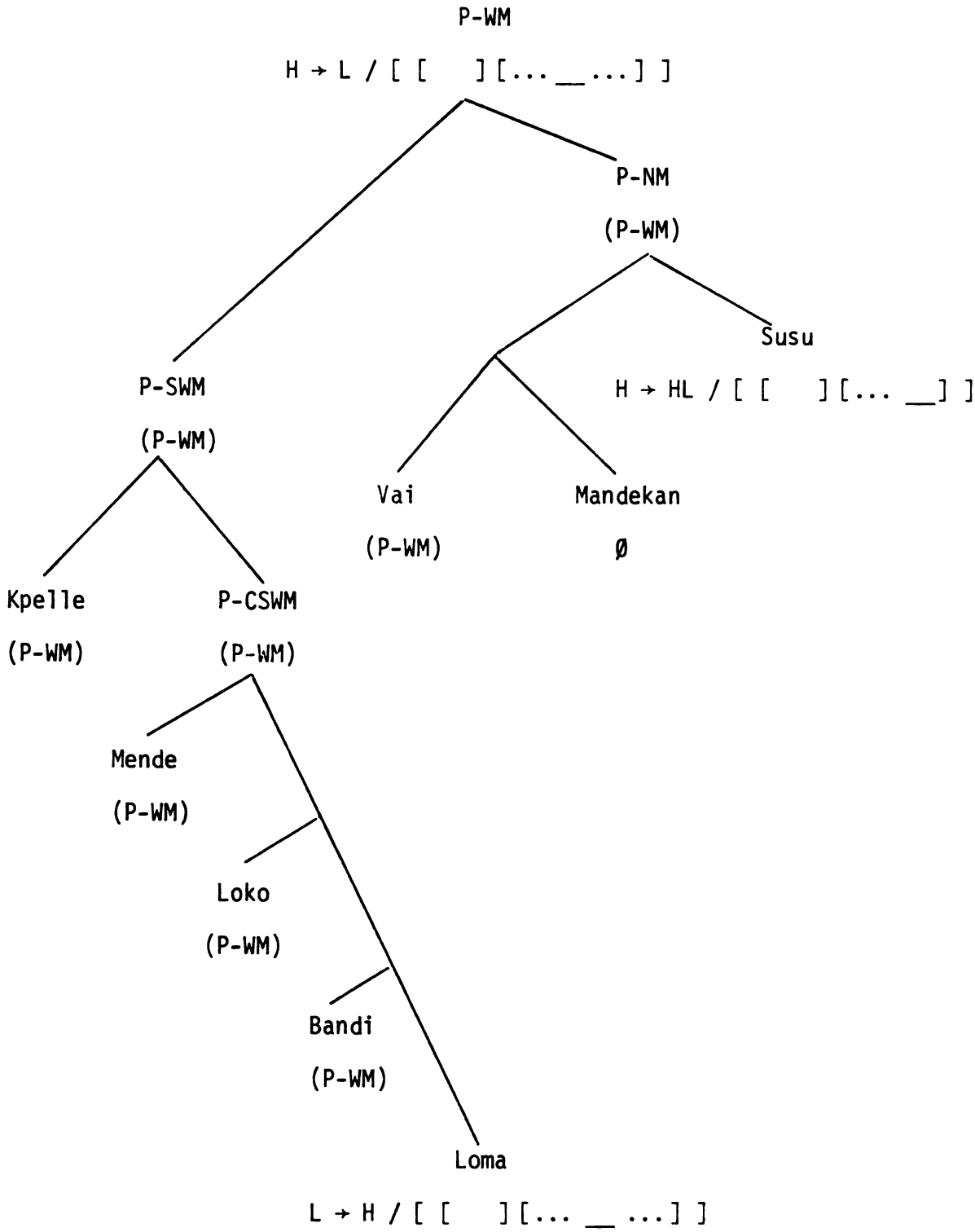
A comparison of the compound tone rules found in each Western Mande language shows numerous similarities which lead to the conclusion that the rules are cognate with each other. This chapter reconstructs the rules of Proto-Western Mande and follows their development through each stage of Western Mande up to the modern languages. First, each rule is considered individually. After each rule has been discussed separately, a summary of the development of Western Mande compound formation is presented by showing the form of all the rules at each stage in the development of Western Mande.

After the diachronic analysis has been presented, a final section contains some general conclusions and suggestions for further research. Conclusions are expressed regarding evidence for the position of Soninke in Western Mande, and on the best way to represent tone spreading and insertion rules. The nature of the morphological conditioning of the compound tone rules raises some interesting theoretical questions, which are briefly outlined, along with some suggestions as to the probable nature of the answers that might be provided by further research.

3.1. Lowering.

This section begins with a discussion of the nature of Lowering in Proto-Western Mande, then discusses changes in the rule in Loma and in Susu, and its loss in Mandekan. The development of Lowering throughout the history of Western Mande is shown in figure 5.

Figure 5. The Development of Lowering.



3.11. Proto-Western Mande Lowering.

Identical Lowering rules are found in all the Western Mande languages, with the exception of Loma, where the change is due to a general process of tone reversal, and Susu and Mandekan, where the surface effect of Lowering has been wholly or partially blocked out by an expansion of High Tone Spread. It is reasonable to assume that the Proto-Western version of the rule is the same as that still retained in Vai, Kpelle, Mende, Loko, and Bandi.

Lowering (Proto-Western Mande)

H → L / [[ ] [... __ ...]]

P-WM Lowering applied cyclicly. It did not apply to the suffixes such as the definite marker and the plural marker which chould be attached to the ends of noun phrases. These suffixes would not be found within the inner brackets which marked the limits of the application of Lowering. A cyclic application would in general allow Lowering to apply to all but the initial morpheme of a multiple compound, regardless of the internal structure, as shown below.

[[T] [[T] [T]]]	[[[T] [T]] [T]]	Base
[[ ] [L]]	[[ ] [L]]	1st cycle
[[ ] [L L]]	[[ ] [L]]	2nd cycle
T L L	T L L	Surface

A non-cyclic rule applying to any non-initial morpheme would produce the same effect, but Lowering is postulated as a cyclic rule to account for such forms as Vai [[féη lɔ́η] bɔ̀lɔ̀] 'right hand', and Kpelle [[pélɛ̀ kɛ́] sɛ̀η] 'toy'. These forms contain a complex first constituent

of a morphological type not subject to Lowering. The non-application of Lowering on the second cycle as well is produced by cyclic application of the rule, but not by a non-cyclic version.

3.12. Developments in Loma.

Lowering participated in the general tone reversal which occurred in Loma, substituting H for L and L for H in both underlying forms and rules. The Loma Raising rule which resulted is identical to P-WM Lowering in all respects except that the tones of the second constituent are replaced with high rather than low tone.

Raising (Loma)

$L \rightarrow H \; / \; [\; [\quad]\; [\ldots \; \_\_ \; \ldots] \;]$

3.13. Developments in Susu and Mandekan.

The development of High Tone Spread in Susu, discussed further in section 3.2., was such as to eliminate the effect of Lowering on all but the final syllable of a compound. It is thus likely that the present Susu Lowering rule has changed so that it only applies to the final syllable of a compound.

Lowering (Susu)

$H \rightarrow HL \; / \; [\; [\quad]\; [\ldots \; \_\_] \;]$

A further development of High Tone Spread in Mandekan resulted in the occurrance of high tone throughout the entire second constituent of a compound, including the final syllable. As a result, the Lowering rules has disappeared in Mandekan.

3.2. High Tone Spread.

This section follows the development of High Tone Spread from its form in Proto-Western Mande to the rules found in the modern languages. Changes in the Southwest Mande languages include the loss of morphological conditioning in Kpelle, expansion of phonological conditioning in Proto-Central Southwest Mande, and the addition of a second HTS rule in Loko, which in Bandi merged with HTS. The result of this merger underwent a tone reversal in Loma.

In Northern Mande, Susu and Mandekan share the change of HTS into the purely morphological rule of Raising, which applies in all phonological environments. In Susu, the scope of application of Raising widened to include all but the final syllable of a compound. In Mandekan it widened still further to include the entire second constituent.

These changes are discussed in the remainder of this section. The discussion is followed by figure 6, which summarizes the changes graphically.

3.21. Proto-Western High Tone Spread.

Proto-Western HTS applied on the first syllable of the second constituent of a compound when the first constituent had polarizing tone.

High Tone Spread (P-WM)

$L \rightarrow HL \; / \; [\; [LH]\,[\_\_ \ldots]\;]$

The restriction of the range of conditioning for HTS to include only a preceding polarizing tone pattern is based both on the principle of reconstructing the most restricted form of a rule and on matching similarities in the form of HTS in both branches of Western Mande. In Vai,

in Northern Mande, and in Kpelle, in Southwestern Mande, HTS occurs only when the first constituent of the construction has polarizing tone. The underlying representation of polarizing tone, different in these two languages, will be discussed in section 3.5. In Proto-Western Mande it is assumed that polarizing tone has an underlying LH pattern.

With the exception of Kpelle, the Southwest Mande languages allow HTS to apply when the first constituent has any tone pattern ending in high tone. The principle that rules develop by broadening their conditioning favors a rule similar in this respect to the version found in Kpelle for the reconstructed Proto-Southwest Mande language.

Similarly, in Northern Mande, Vai HTS applies only after polarizing tone, but the Susu and Mandekan versions apply no matter what tone pattern is found on the first constituent. This clearly involves a broadening and simplifying of the conditioning of HTS in Susu and Mandekan, with the loss of all phonological information.

Because of the structure of the family relationships within Northern Mande, the similarity between Susu and Mandekan versions of HTS must be due to borrowing if the Vai version is chosen as most like that of Proto-Northern Mande. Susu and Mandekan do not share any common ancestor not also shared by Vai, so similar developments in the two languages must be the result of separate events. The number of shared characteristics in the tone patterns found on compounds in Susu and Mandekan make it seem likely that the similarities are due to borrowing and not independent innovation.

The decision to reconstruct a HTS rule that applies only after polarizing tone in both P-SWM and P-NM is strengthened by the fact

that the proto-rules in the two branches of Western Mande are identical to each other in this respect. Each branch also contains languages with broader conditioning but the broader versions do not resemble each other. The choice of the most restricted environment for P-WM HTS is also the simplest in terms of the number of separate innovations required.

The argument involving the scope of application of P-WM HTS is exactly parallel with the argument given above. In Northern Mande, the most restricted form of HTS in terms of scope of application is found in Vai, where HTS may spread high tone over only the first syllable of the second morpheme of a compound. The scope of application spreads rightward in both Susu and Mandekan, to include all but the final syllable in Susu and the entire second constituent in Mandekan. Similarly, in Southwest Mande, Kpelle and Mende HTS applies only to a single syllable, but Loko, Bandi, and Loma share an innovation which spreads high tone over a second syllable. The conclusion is that Proto-Western HTS spread over only a single syllable.

3.22. Kpelle.

Two separate developments occurred in Kpelle. One was the loss of morphological conditioning. In contrast to the other Western Mande languages, Kpelle allows the application of HTS in any morphological environment, whenever a low toned morpheme, derived or basic, follows a mid tone.

The second development in Kpelle HTS involved the restructuring of the conditioning tone. This development probably occurred in a series of stages similar to those shown below.

Stage I (P-SWM)

(L)L͡H+L (Input to rule)
(L)L͡H+HL (HTS)
(L)L+HL (Absorption)

Stage II (Restructuring of polarization)

M+L (Input to Dissimilation)
MH+L (Dissimilation)
MH+HL (HTS)
M+HL (Absorption)

Stage III (Restructuring of HTS)

M+L (Input to HTI)
M+HL (HTI)
M+HL (Dissimilation-blocked)

The changes occurring in Kpelle resulted in the modern rule of High Tone Insertion, preceding Dissimilation.

High Tone Insertion (Kpelle)

$L \rightarrow HL / M+ \_\_$

3.23. Proto-Central Southwest Mande.

HTS underwent only one change in P-CSWM. The conditioning expanded to include any tone pattern ending in H, so that H and LH as well as (L) L͡H tone patterns conditioned the rule.

High Tone Spread (P-CSWM)

$L \rightarrow HL / [\ [\ldots\ H]\ [\_\_\ \ldots]\ ]$

This form of the rule has been retained in Mende.

3.24. 2nd High Tone Spread.

Loko, Bandi, and Loma show different stages in the development of a rule which extended the high tone spread by HTS one syllable further to the right. In Loko 2nd HTS is clearly separate from HTS. It is

assumed that this represents the earliest stage. In compounds whose first constituent ends in high tone both HTS rules apply, spreading high tone over a total of two syllables. In compounds with a first constituent ending in falling tone, 2nd HTS applies by itself, following the application of a rule simplifying falling tone to high before low tone. This results in the spread of high tone one syllable to the right. Loko HTS is the same as HTS in P-CSWM.

2nd High Tone Spread (Loko)

L → HL / [[... H] [(H) __ ...]]

Loko 2nd HTS is cyclic and there are some examples given of multiple compounds where re-application of the rule results in the spread of high tone across the entire second morpheme and onto the third morpheme of the construction, e.g. pέré hálé óhà ná 'the old hospital'.

In Bandi the merger of final underlying HL with H tone resulted in the coalescence of HTS and 2nd HTS into a single rule spreading high tone two syllables to the right. This rule does not spread high tone onto the third morpheme of a multiple compound, e.g. màsà pέlέ vɔ̀lɔ̀ î 'the old chief's house'. This is either because Bandi HTS is not cyclic or because it applies on the second cycle before the rule simplifying the final H͡L tone produced by its application on the first cycle takes effect, and thus its conditions for application are not met.

High Tone Spread (Bandi)

L → HHL / [[... H] [__ ...]]

The effect of tone reversal in Loma changes HTS to LTS. Dwyer also claims that the rule applies throughout the entire morpheme subject to the rule, rather than counting a specific number of syllables. He fails, however, to include examples whose second morpheme has more than two syllables, so the truth of this statement cannot be verified. Because of the supposition that the Loma tone rules apply backwards cyclicly, applying first to the rightmost morpheme of a construction, then to the morpheme immediately to its left, and so on, it is not necessary to write Loma LTS so as to create a morpheme final contour tone. It can be expressed instead as a simple replacement rule.

Low Tone Spread (Loma)

H → L / [[... L] [... __ ...]]

3.25. Susu and Mandekan Raising.

The development of HTS into Raising is found both in Susu and Mandekan. The presence of the same innovations in these two languages may be attributed to borrowing. Based on the assumption that rules are more likely to simplify rather than become more complicated when they spread by borrowing, it can be concluded that the innovations probably occurred first in Susu and then spread to Mandekan.

The tone of the first constituent of a compound is irrelevant to the operation of the Susu Raising rule, which invariably applies in the appropriate morphological environments. The spread of high tone is not limited to a specific number of syllables or to a single morpheme, as in Southwest Mande. Rather it applies throughout all the non-initial constituents of a compound regardless of their number or length. Only the finally syllable of the compound fails to show a

surface high tone. This can be accounted for by a Lowering rule which follows the application of Raising.

Raising (Susu)

$L \rightarrow H \; / \; [\; [\quad]\, [\ldots \_\_ \ldots] \;]$

The Susu Raising rule was borrowed unchanged into Mandekan. The overall tone pattern of Mandekan compounds was simplified by the loss of Lowering, so that high tone is spread across the entire second constituent of a Mandekan compound at the surface.

3.3. First Tone Copy.

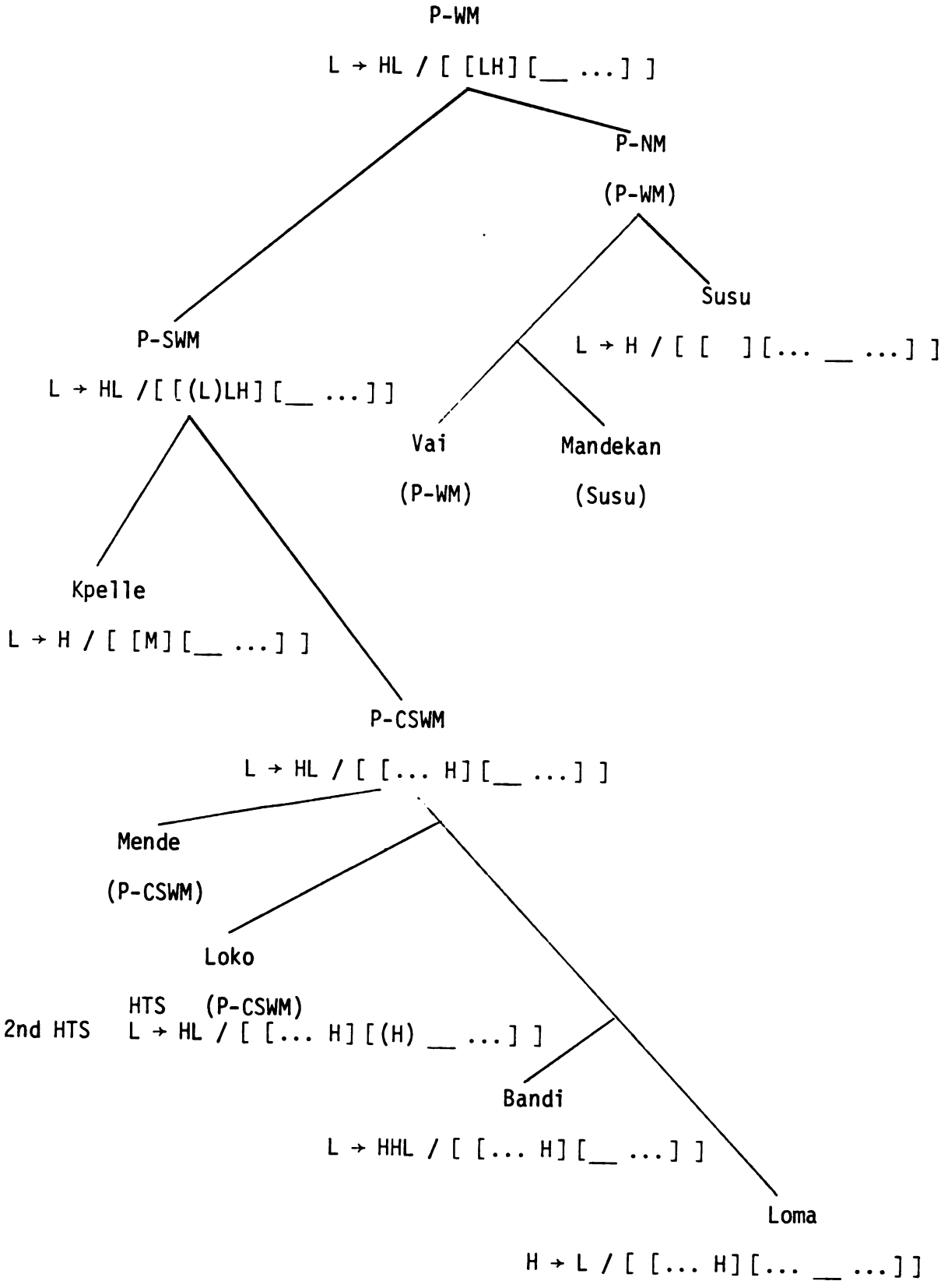
This rule represents another innovation in Susu which was borrowed into Mandekan. It spread the initial tone of a compound over the remaining syllables of the first constituent. The Susu version of the rule appears to be non-cyclic, and applies only to the first morpheme of a compound.

First Tone Copy (Susu)

$\alpha T \rightarrow \beta T \; / \; {}_{CN}[+\beta T \ldots \_\_ \ldots +$ (non-cyclic)

It is likely that the development of FTC and Raising are related. Most Susu morphemes have either H, LH, or HL tone. If a rule developed changing HL to H in compounds it would then be the case that the first constituent of all (or almost all) compounds would end in H, thus meeting the conditions for the application of HTS. It is conceivable that a rule simplifying HL to H developed with an ordering before HTS. This would lead directly to the expansion of application of HTS resulting in its morphologization. It might also have been the case that this rule

Figure 6. The Development of High Tone Spread.



originally applied after HTS, by analogy with Absorption, which also deletes the second in a sequence of unlike tones. In this case there would have been a stage at which HTS was opaque at the surface, i.e. compounds with the surface tone HH#LL produced by the rule simplifying HL sequences would look as though HTS had failed to apply. This opacity could be eliminated by reordering, with the ultimate result of the mrophologization of HTS. With the loss of phonetic conditioning for HTS the rule simplifying HL patterns could merge with Absorption, resulting in the more general rule of FTC, which applies not only to LH and HL patterns, but more complicated ones as well, like L $\hat{HL}$. It is also possible that the rule simplifying HL patterns when compound initial is related to the merger of HL with H underlying tone in all environments in Mandekan, though the exact nature of the relationship is unclear at this time.

The Mandekan version of FTC is like that found in Susu except that it applies cyclicly, and thus may affect more than one morpheme in a compound. If this represents a simplification in the formulation of the rule then it appears that this rule as well was borrowed from Susu into Mandekan.

First Tone Copy (Mandekan)

$\alpha T \rightarrow \beta T$ / [[βT ... __ ...] [ ]]

3.4. Absorption.

Cognate words with polarizing tone can be found throughout Western Mande, so it is clear that the phenomenon existed in Proto-Western Mande. There are three possibilities in regards to the underlying tone associated with P-WM polarization: 1) underlying low tone, subject to

Dissimilation before low, 2) LH tone, subject to Absorption before high tone, 3) (L)L̂H tone, with Absorption. The first alternative can probably be ruled out, and the second alternative seems preferable to the third.

For the purposes of this thesis it is not particularly important to choose between LH and (L)L̂H, since in both cases an Absorption rule is required. If Absorption was present in P-WM then the development of HTS can be seen as the simple addition of a spreading rule. However, if polarizing tone had an underlying low tone pattern, then there would be reason to suppose that HTS began as a tone shifting rule. Further, the innovation of this shifting rule would have occurred in a single step, contrary to Hyman and Schuh's contention that tone shift is not a natural diachronic rule. The two possibilities are shown below.

1)			2)		
	L # L			LH # L	
	LH # L	Dissimilation		LH # L	HTS
	LH # HL	HTS		L # HL	Absorption
	L # HL	Absorption			

The first alternative requires the simultaneous innovation of HTS and a special Absorption rule conditioned only by the output of HTS. Under the second alternative, Absorption is already present, and only the addition of HTS is required.

3.41. Proto-Western Mande Absorption.

An examination of the Northern Mande languages makes it seem likely that Proto-Northern polarizing tone can be reconstructed with a LH base tone. This underlying tone is found in both Vai and Mandekan, although in Mandekan this LH tone is reduced to L before pause as well as before high tone. Susu does not provide any evidence on the question,

although the situation is consistent with a supposition that at an earlier stage an active Absorption rule was present. Susu nouns are either part of a compound or are followed by an obligatory suffix. This suffix, now toneless, probably had an earlier L͡H tone, like the cognate Vai definite suffix. This suffix would condition LH tone on a preceding noun regardless of the underlying tone. Similarly, the operation of FTC would produce surface low tone regardless of the base tone chosen. Consequently, Susu does not provide evidence for either alternative. Some evidence from another Northern Mande language is also available on this question. A word list compiled by Colin Painter for Ligbi gives the tones of nouns in isolation. Words cognate with polarizing morphemes in other Northern Mande languages appear with LH surface tone in this list. This supports a reconstruction of underlying LH tone in P-NM.

The reconstruction of polarizing tone in Proto-SouthWestern Mande depends primarily on an analysis of its development in Kpelle. Kpelle tone differs from that of the other SWM languages in several respects. Kpelle is the only Western Mande language to have three contrastive tone levels. Polarizing morphemes are represented with level mid tone, subject to Dissimilation. The other SWM languages have an underlying (L)L͡H tone for polarizing morphemes.

According to Dwyer (1973) Kpelle tone is very much like the tone system of P-SWM. He postulates three levels of tone for P-SWM, and five tone patterns: H, M, HL, MH͡L, and L. He supposes that this system developed from a two level system through the borrowing of words with extra-low tone, produced at a lower pitch level than the non-high tone inherited from P-WM. This resulted in a contrast between two non-high

levels. Later, in Proto-Central SouthWestern Mande, the polarizing mid tone restructured to MH. This allowed the two non-high tone levels to collapse into a single level while still maintaining the contrast between each of the tone patterns.

I disagree with one of the basic premises of this reconstruction. It does not seem likely to me that borrowed vocabulary, no matter what its pitch level in its original language, would be adapted with a tone that was not already part of the language. While there are instances of borrowings introducing new sounds into a language, it is much more common to find that the pronunciation of borrowed vocabulary is adjusted to fit the existing phonological system.

There is a simpler explanation for the contrast between polarizing tone and non-polarizing low tone in P-SWM. This is to assume that polarizing tone had the underlying representation LH. Thus, words borrowed into the language with low tone were phonetically distinct from polarizing tone and quite naturally were not affected by the P-SWM Absorption rule. This contrast has persisted in the Central South-Western Mande languages upto the present, but due to the innovation of a low raising rule and the restructuring of polarizing tone Kpelle has developed its present system. The following chart shows the tone correspondences between Kpelle and P-SWM.

P-SWM	Kpelle
1) (L)$\widehat{LH}$	M
2) H	H
3) HL	HL
4) L $\widehat{HL}$	M $\widehat{HL}$
5) L	L

The distribution of mid tone is somewhat restricted in Kpelle, never occurring after high in the same morpheme. It always corresponds to P-SWM low before high. I suggest that at some stage Kpelle developed the commonly found rule of Low Raising, which raises low tones to a phonetic mid level when they precede high tone. When this phonetic mid tone was phonologized due to the restructuring of polarizing tone from MH to M it created a contrast between L and M morphemes.

Contrast between polarizing tone and non-alternating LH tone is found only in Central Southwest Mande, where polarizing tone is given the underlying representation (L)$\widehat{LH}$ in order to differentiate the two patterns. Since no contrast of this type is found in Kpelle, it seems best to ascribe the underlying (L)$\widehat{LH}$ pattern to P-CSWM, and reconstruct an ynderlying LH pattern for P-SWM. With a reconstruction of LH tone in both P-SWM and P-NM, it seems likely that this was also the underlying tone of polarizing morphemes in P-WM. This results in postulating the following P-WM Absorption rule.

Absorption (P-WM)

$H \rightarrow L \; / \; + L \_\_ + H$

3.42. Kpelle.

The following stages are proposed in the development of Kpelle polarization from the P-WM form. First, LH underwent a diachronic change to MH, although M at this point was stillnot phonemic.

$L > M \; / \; \_\_ H$

Next was an expansion of the conditioning of Absorption so that it also applied in utterance final position.

$$MH \rightarrow M \; / \; \_\_ \; \begin{Bmatrix} H \\ // \end{Bmatrix}$$

The final step was a process of rule inversion in which MH tone became M underlyingly. At this point mid tone was clearly contrastive. The inverted form of Absorption is the modern Kpelle Dissimilation rule.

Dissimilation (Kpelle)

$M \rightarrow MH \; / \; \_\_ + -H$

3.43. Central Southwest Mande.

A contrast arose in Central Southwest Mande between native LH vocabulary subject to Absorption, and new words introduced into the language with a non-alternating LH tone pattern. The restructuring of p-CSWM polarizing tone to (L)$\widehat{LH}$ is suggested mainly for use as diacritic to distinguish the two patterns.

Two further developments in Loko and Bandi are of particular interest in terms of the information they provide on possible directions of rule change. In Loko, morphological restrictions have been added to the Absorption rule so that it no longer applies except in compounds. The same development may have occurred in Bandi, although the development of LTA, discussed in section 3.5., makes it impossible to determine at this point.

Another development found in both languages is a restructuring of those polarizing morphemes which condition the occurrence of the strong alternant of following consonants. These morphemes no longer undergo Absorption in any morphological environment, including compounds.

Both of these changes are clearly innovations in these languages. Furthermore, they both represent a narrowing of the range of application

of Absorption. This contradicts the oversimplified notion that rules always develop by broadening their conditioning to allow application in more environments.

3.44. Susu.

Two processes have combined in Susu to produce the loss of Absorption in the present-day language. At some point the definite suffix became obligatorily attached to every NP. Cognate morphemes in Vai and Mandekan have L̂H and L tone, respectively, so it is reasonable to assume that the Susu suffix had at least an initial low tone, conditioning LH tone on polarizing nouns to which it was attached. After the suffix became an obligatory NP marker it lost its inherent tone, acquiring the tone of the preceding syllable. This resulted in the loss of any phonetic motivation for the occurrence of the LH alternant of Susu polarizing tone.

The second development was the innovation of First Tone Copy. Any Susu noun not followed by the definite suffix must be followed by either an adjective or another noun. First Tone Copy applies in both these environments. This broader rule masks the effect of Absorption, and thus there is no longer any need to posit the rule.

3.45. Mandekan.

Absorption has increased its range of application in Mandekan, applying now before pause as well as before high tone. This change is related in an interesting way to the development of the definite suffix into a floating low tone. Polarizing nouns cited in isolation show the contrast between definite and indefinite only by their tone patterns, with the definite version appearing with LH tone, and the

indefinite version with L tone. Such a contrast is possible only because of the change that allows Absorption to apply pre-pausally. It is not clear however, whether this change in the conditioning of Absorption preceded the development of the floating tone, allowing the development to occur, or followed it, with the effect of maintaining the contrast between definite and indefinite nouns.

3.5. Low Tone Advancement.

This rule is found in Bandi and Loma. Dwyer (1973) attributes the development of this rule to the presence of an abstract nasal prefix cognate with a prefix of prereference found in Kpelle. Dwyer postulates that this low toned morpheme has become obligatorily present in Central Southwest Mande, where it accounts for the strong form of initial consonants. Presumably, the low tone of the prefix was spread onto the first syllable of the noun to which it was attached. Then this effect was generalized so that all NP initial low tones were spread one syllable further to the right. The resultant Bandi rule applies after Absorption in compounds, producing a low tone on the first syllable of the second constituent.

Low Tone Advancement (Bandi)

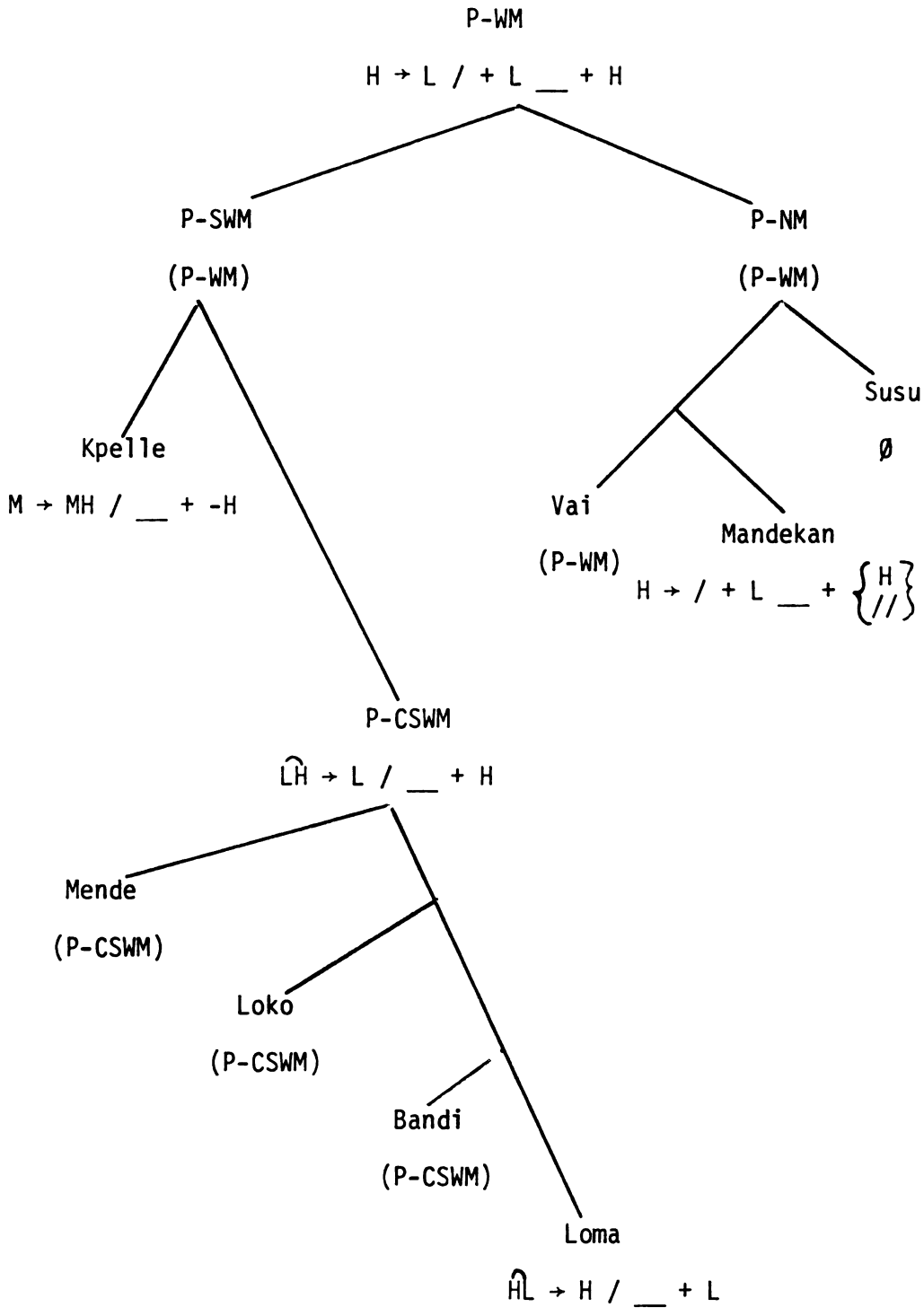
$H \rightarrow LH \; / \; {}_{NP}[\; [L\; (\,]\,[\,)\; \_\_\; \ldots\,]\;]$

In keeping with general developments in Loma, Low Tone Advancement changed into High Tone Advancement and generalized to spread over an entire morpheme.

High Tone Advancement (Loma)

$L \rightarrow H \; / \; H+ \; \_\_ \; (+)\; L$

Figure 7. The Development of Absorption.



3.6. Contour Simplification.

There are a number of restrictions on the surface occurrence of contour tones in the Western Mande languages, some which may be ascribed to constraints on underlying structure, and some which result from the application of phonological rules.

There is an absolute constraint against morpheme internal falling tone in underlying forms in all the Western Mande languages. It never occurs, whether followed by high or low tone. In contrast, in some languages, e.g. Mende, Loko, and Susu, morpheme internal rising tone is found, but only when followed by low tone. This rising tone is never simplified. Rising tone followed by high in the same morpheme is never found in any Western Mande language.

Both rising and falling tones are found in morpheme final position in underlying forms. These contours sometimes surface and sometimes are simplified by several different rules.

$\widehat{LH} \rightarrow L$

This change occurs when a high tone follows, and is the result of the application of Absorption. Because of the restructuring of polarizing tone in Central Southwest Mande, Absorption in these languages applies only to contour tones, but in the other languages simplification of rising tone before high is due to the operation of a rule that applies to disyllabic LH morphemes as well.

$\widehat{LH} \rightarrow H$

This rule is found only in Central Southwest Mande, necessitated by the postulation of an underlying form for disyllabic polarizing morphemes

which does not appear on the surface. Dwyer (1978a) has suggested that L͡H monosyllables in Mende appear with surface high tone. However, sufficient information is not available to determine the extent of this process in Mende or in other Mande languages, so nothing further can be said about it.

A similar simplification occurs in Kpelle, changing M͡H into H. This is due to the way Dissimilation is formulated. According to the conventions discussed in section 1.35., Dissimilation is a contour creating rule. The M͡H contour created by Dissimilation surfaces on monosyllables, but on disyllables it must be simplified to H.

H͡L → L

There is only one instance of such a process, which is a result of the particular formulation given for Susu Lowering. This rule is stated so as to attach low tone to the final syllable of a compound. Since it occurs after the application of Raising a H͡L contour is created, which is simplified to L when the final morpheme is not monosyllabic.

H͡L → H

There are two different circumstances in which this process occurs. The operation of HTS produces H͡L contours. When these are followed by L in the same morpheme they must be simplified to H. This simplification is found in all the Western Mande languages. As mentioned earlier, it is also true that H͡L L sequences are not allowed on underlying forms.

With the exception of Vai and Kpelle, morpheme final H͡L tone is also simplified to H when it is not utterance final. This simplification occurs both on underlying H͡L contours and those created by HTS,

and applies with following high as well as low tone.

3.7. The Overall Development of the Compound Tone Rules.

The form of the tone rules applying to compound nouns in each stage in the development of the modern Western Mande languages is shown in figure 8 below. The figure begins by giving the rules of Proto-Western Mande. Next the development of the rules in Southwest Mande is shown. After each stage in the development of the Southwest Mande languages is given, the development of the rules in Northern Mande is shown in the same way. The individual stages are presented as much as possible in relative chronological order.

Figure 8: Phonological Development of Western Mande Compound Formation.

Proto-Western

1) Lowering

H → L / [[ ] [... __ ...]]

2) High Tone Spread

L → HL / [[LH] [__ ...]]

3) Absorption

LH → L / __ + H

Proto-SouthWestern Mande

1) Lowering (P-WM)

2) High Tone Spread (P-WM)

3) Absorption (P-WM)

Kpelle

1) Lowering (P-WM)

2) High Tone Insertion

L → HL / M + __

3) Dissimilation

M → MH/ + __ + -H

Proto-Central SouthWestern Mande

1) Lowering (P-WM)

2) High Tone Spread

L → HL / [[... H] [__ ...]]

3) Absorption

$\widehat{LH}$ → L / __ + H

Figure 8 (continued)

Mende

1) Lowering (P-WM)

2) High Tone Spread (P-CSWM)

3) Absorption (P-CSWM)

Loko

1) Lowering (P-WM)

2) High Tone Spread (P-CSWM)

3) Absorption (P-CSWM)

4) Second High Tone Spread

L → HL / [[... H] [(H) __ ...]]

Bandi

1) Lowering (P-WM)

2a) High Tone Spread

L → HHL / [[... H] [__]]

2b) Inalienable High Tone Spread

L → HL / [[... H] [__]]

3) Absorption (P-CSWM)

4) Low Tone Advancement

H → LH / $_{NP}$[[... L (] [) __ ...]]

Figure 8 (continued)

Loma

1) Raising

$L \rightarrow H \; / \; [\; [\quad][\ldots \_\_ \ldots] \;]$

2) Low Tone Spread

$H \rightarrow L \; / \; [\; [\ldots L][\ldots \_\_ \ldots] \;]$

3) Absorption

$\overset{\frown}{HL} \rightarrow H \; / \; \_\_ + L$

4) High Tone Advancement

$L \rightarrow H \; / \; H+ \_\_ \; (+) \; L$

Proto-Northern Mande

1) Lowering (P-WM)

2) High Tone Spread (P-WM)

3) Absorption (P-WM)

Vai

1) Lowering (P-WM)

2) High Tone Spread (P-WM)

3) Absorption (P-WM)

Susu

1) Raising

$L \rightarrow H \; / \; [\; [\quad][\ldots \_\_ \ldots] \;]$

2) Lowering

$H \rightarrow HL \; / \; [\; [\quad][\ldots \_\_] \;]$

3) First Tone Copy

$\alpha H \rightarrow \beta H \; / \; {}_{CN}[\; [\beta H \ldots \_\_ \ldots] \;$ (non-cyclic)

Figure 8 (continued)

Mandekan

1) Raising (Susu)

2) First Tone Copy (Susu)
(cyclic application)

3) Absorption

$$H \rightarrow L \;/\; L \_\_ + \begin{Bmatrix} H \\ // \end{Bmatrix}$$

3.8. Conclusions and Suggestions for Further Research.

Three separate topics are considered in this section. First, there is a discussion of the source of Proto-Western Mande Lowering, and the evidence this provides for a reclassification of Soninke. Following this is a final discussion of the relationship between the nature of tone spreading and theories of tone representation. This discussion contains a brief look at some recent modifications in Leben's Suprasegmental theory which may make it a more satisfactory theory than those considered earlier in this work. The final section concerns the morphological properties of the compound tone rules, comparing them with some claims made about the properties of morphological rules made in Aranoff (1976). Then some interesting aspects in the development of the morphological conditioning of the rules are considered.

3.81. The Source of Lowering and the Position of Soninke.

There are several possible sources for Proto-Western Mande Lowering, including the Soninke nasal affix described earlier in section 2.9. and an associative marker of the kind discussed in Welmers (1963).

I assume that Lowering developed from an earlier segmental morpheme through loss of segmental information. The Soninke nasal affix could be a reflex of the morpheme which developed into Lowering in P-WM, given several assumptions. It is probably safe to say that this affix was productive at some earlier stage of Soninke as a marker for compounds. It is more risky to assume that it had a low tone. However, if this assumption is granted, then a Proto-Extended Western Mande -n̰- compound marker can be reconstructed which is the ancestor of both P-WM Lowering and the Soninke nasal affix.

Another potential source for P-WM Lowering is an associative marker of the kind that has been found in numerous Niger-Congo languages. Welmers discusses morphemes with the phonological shapes à and ká which serve to link compounds and possessive phrases in the Bantu, Mande, and Kwa languages. In all of the cases he discusses à and ká seem to be variants of a single morpheme. If à is considered as the source of Lowering then it will have to be assumed that the two forms were contrastive in Proto-Extended Western Mande, since high toned ká is still in use in modern Mande languages as a possessive marker.

If the nasal affix is considered the source of Lowering, then it is simplest to exclude Soninke from the Western Mande family, since to include it would involve postulating the separate development of Lowering in each branch of Western Mande. However, even if Lowering developed from associative à, it is still simpler to exclude Soninke from Western Mande, since both Northern and SouthWestern Mande share rules not found in Soninke, i.e., Lowering and HTS. Their presence in each branch of Western Mande can be ascribed to inheritance from P-WM, and their absence in Soninke, to the fact that Soninke is not a Western Mande language.

The presence of a Lowering rule similar to, but not the same as P-WM Lowering in Toura, an Eastern Mande language, suggests that whatever the source of P-WM Lowering, it was also present at an earlier stage, possibly even in Proto-Mande. Of course a number of further languages must be considered before any firm conclusion can be made on this suggestion.

3.82. Tone Spreading and the Theory of Tone Representation.

The complete absence at the surface level of any morpheme internal contours created by tone spreading in Western Mande suggests a view of tone spreading in which complete spreading is a natural diachronic rule. Unfortunately, this lack may also be related to a constraint against morpheme internal contours in underlying representation that is also found in Western Mande, so that other languages must be investigated before conclusions about complete tone spreading can be taken as fact.

However, if the notion that complete tone spreading is a natural diachronic rule is accepted then it presents a problem for some currently popular theories of tone representation, particularly Goldsmith's Autosegment theory. Leben's Suprasegmental theory, while inadequate in some other respects, gives a very good account of tone spreading rules. In a recent work (Leben 1978) he has proposed several modifications which seem to eliminate the problems of the original theory while still allowing a simple and natural handling of tone spreading. Specifically, he adopts Goldsmith's association lines. Rather than mapping tone into segments he proposes that tones be linked with segments by association lines. This eliminates Fromkin's objection that the Suprasegmental theory in fact requires segmental representation.

A second modification allows the specification of underlying tone patterns that cannot be produced by his mapping conventions. This is done by allowing partial specification of tone in some underlying representations. A $\widehat{\text{LH}}$ L pattern, for instance, would have the following underlying representation: L H L. While the underlying tone of some

cv cv

morphemes is partially specified, complete mapping does not take place until after the application of the suprasegmental rules, including tone spreading rules.

Because I became aware of these proposals only quite recently, it was not possible to incorporate them into the body of the thesis or make a thorough examination of their value. However, Leben's revised Suprasegmental theory appears to be one of the most adequate representations of tone to be proposed in a generative framework, and merits further investigation.

3.83. Morphological Aspects of the Compound Tone Rules.

Aranoff (1976) has proposed a treatment of morphology based on the concept of the Word Formation Rule (WFR). This concept allows a unified treatment of segmental morphemes and of morphemes which are expressed by a phonological process, such as reduplication or tone replacement. The statement of a WFR consists of a base to which the rule applies, a phonological operation (either a string of segments or a phonological rule), and semantic and morphological information about the resultant word. Western Mande Lowering has many of the properties of a WFR. However, it violates one of Aranoff's principles completely. He requires that a WFR apply to a uniquely specified base. That is, the same rule cannot form a word from nouns and adverbs, for example. But Lowering applies in many languages to several quite distinct bases, e.g. compound nouns, noun-adjective constructions, and possessive phrases. These different constructions cannot be collapsed into a larger natural class that does not include constructions to which Lowering does not apply.

It is not clear to me what purpose is served by the principle of the uniquely specified base. Further investigation of this question might be made to determine whether it is more important to maintain the principle or to acknowledge the morphological nature of rules like Lowering.

A consideration of the development of the morphological conditioning of Lowering reveals some interesting facts. The original rule was restricted to compound nouns. In various languages other morphological categories were added, but not in a way that would involve a broadening of the conditioning to a larger natural class. In Mende, for example, Lowering applies to compounds, noun-adjective and alienable possessives. The only natural morphological class that includes all of these constructions is the noun-phrase. However, many classes of noun phrases, such as nouns followed by quantifiers or postpositions, or inalienable possessives, do not undergo Lowering. The rule seems to enlarge its morphological environment simply by adding unrelated categories. The only property common to the various constructions that undergo Lowering is their structural framework. That is, Lowering always applies within brackets of this shape: [[ ] [... __ ...]].

While Lowering appears to be diffusing through the repertoire of morphological constructions category by category, it also appears to be diffusing lexically within certain categories. Since descriptions of individual languages often give only a few examples of each kind of construction it is difficult to compile an extensive comparative description of the tone alternations applying to numerals and post-positions, but it appears from what information is available that in these categories Lowering applies to some lexical items but not to others. A

more complete investigation of this question would be of interest in terms of the evidence it would provide on the kinds of diachronic development that may occur in the morphological conditioning of rules.

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