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MENDE TONE[1]

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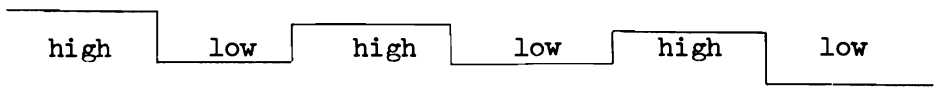
1. Introduction

Downstep is a tonal phenomenon found in many West African languages, including Mende. Those languages exhibiting this phenomenon are known as 'downstep' or 'terrace' tone languages. Stevick [1969] has demonstrated that most Bantu languages also fit into the step tone language classification.

Downsteps generally occur in languages exhibiting a binary tonal opposition:[2] high: [+tone] and low: [-tone] . Downstep occurs when a high tone following a low tone is not as high in absolute pitch as a high tone preceding the low tone. In a series of high-low-high-low etc. each high tone will be lower than the preceding high tone.



Except for the presence of certain conflicting tonal alterations, Mende appears to be a classic example of such a step tone system. When these exceptions are viewed more closely, however, they provide much of the evidence for the conclusion that Mende does have a typical underlying two tone system.

2. Downstep rules

The generally accepted principle for converting a binary phonetic tone system to an n-ary phonetic output is to lower a low following a high by three tonal points, [-3 tone], and to raise a high following a low tone by two tonal points, [+2 tone]. Thus a series of high-low-high would have the n-ary phonetic transcription of [n], [n-3], [n+2], where [n] represents the tonal value of the preceding tone.

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[1] I wish to thank Dr. Meyer Wolf for both his editorial assistance and valuable advice and inspiration. The mistakes are, of course, my own.

[2] Yala, a language with a three way tone contrast (high, mid and low) also exhibits downstep according to Armstrong[1968].

For example, if the initial tone [n] of this sequence has a value of [5], then the second tone [n-3] would have the value [5-3] or [2]. The third tone [n+2] would have the value [2+2] (the value of the preceding tone plus two) or [4]. Thus the sequence [n], [n-3], [n+2] translates into the numerical sequence of [5], [2], [4].

The rules necessary for the description of this tonal behavior are as follows.[3]

(1) Rule 1 $[\alpha\text{tone}] \rightarrow [\text{n tone}] \;/\; [\alpha\text{tone}]\ (c)[\_\_\_]$

(2) bɛ̀lɛ́ 'trousers' → $b\grave{\varepsilon}l\varepsilon^{n}$

(3) pɛ́lɛ́ 'house' → $p\acute{\varepsilon}l\varepsilon^{n}$

A high tone following a high, or a low tone following a low has the same absolute pitch as the preceding tone. Without this rule, a series of contiguous high tones would rise in pitch and a series of lows would fall.

(4) Rule 2 [-tone] → [n-3 tone]

(5) bɛ̀lɛ̀+ŋgà 'some trousers' → $b\grave{\varepsilon}l\varepsilon^{n}+\eta ga^{n}$ → $b\varepsilon^{n-3}l\varepsilon^{n}+\eta ga^{n}$

(6) pɛ́lɛ́+ŋgà 'some houses' → $p\acute{\varepsilon}l\varepsilon^{n}+\eta g\grave{a}$ → $p\varepsilon l\varepsilon^{n}+\eta ga^{n-3}$

Any remaining low tone is three points lower in absolute pitch than the preceding tone.

(7) Rule 3 [+tone] → [n+2 tone]

(8) pɛ́lɛ́ 'house' → $p\acute{\varepsilon}l\varepsilon^{n}$ → $p\varepsilon^{n+2}l\varepsilon^{n}$

Any remaining high tone is two points higher in absolute pitch than the preceding tone.

These rules convert a two tone system into a 'three tone' system

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[3]Bird [1966] and Schachter [1969] among others have also provided rules for the description of the downstep process. We object to Schachter's rules for the reason that they permit the retention of the binary features of tone after they have been converted to their n-ary values. It is not clear that this is a desirable innovation in generative phonology. Our objection to Bird's rules is based primarily on his permitting two different tonal values to occur in the same vocalic segment.

[n], [n-3] and [n+2].[4] The three tone system can then be converted into integral values.

(9) Rule 4 [n tone] → [5 tone] Sentence Boundary

The first $_{n}$ is assigned a value.[5] Then proceeding from left to right, the $_{n}$ tone is converted to a numerical pitch value which is the same as the preceding tone. An [n+2] tone will have a value two points higher than the preceding tone and an [n-3] will have a value three points lower.

(10) $b\varepsilon^{n-3}|\varepsilon^{n}+\eta ga^{n} \rightarrow b\varepsilon^{2}|\varepsilon^{2}+\eta ga^{2}$

(11) $p\varepsilon^{n+2}|\varepsilon^{n}+\eta ga^{n-3} \rightarrow p\varepsilon^{7}|\varepsilon^{7}+\eta ga^{4}$

3. Mende tone

These rules form the core of the step tone system. In addition, many step tone languages display other tonal behavior which requires further description. Mende is no exception, in fact, it appears that Mende cannot possibly be treated in the same way as other step tone languages. For example, a sequence high-step ($cv^{n}cv^{n-1}$) which occurs in the surface representation in Mende (cf. example (16)) cannot be generated by applying rules 1-4 to an underlying representation having a single binary tone contrast. Other patternings also appear to make it necessary to establish additional underlying tones, rendering a description based on a single tonal contrast impossible.

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[4]These tones correspond roughly to the phonetic transcription of Welmers [1959]. His drop tone is equivalent to our n+2 tone. His low tone includes all n-3 tones as well as those n tones which contiguously follow an n-3 tone. Those n tones contiguously follow an n-2 tone are equivalent to Welmers' same tone.

[5]The choice of an integral value for n is arbitrary, though it presumably should correspond to the fundamental frequency of the speaker. An increase in the integral value of n indicates an increase in pitch and a decrease in the integral value of n indicates a decrease in pitch. If the first tone of a sentence was originally high, then it would become n+2 by rule 3. After rule 4, the tone would become 5+2 or 7. In the same way, an initial low tone would become n-3 by rule 2 and 5-3 or 2 after rule 4.

These problems are illustrated in the definite and indefinite forms of the Mende noun. Normally, the definite is formed by suffixing a high tone morpheme ˊ to the noun. In some cases the result is as anticipated.

Following lows and some highs, the suffix has a high tone.

(12)	gbɛ̀hɛ́	'a stool'	gbɛ̀hɛ́+ˊ	'the stool'
	$gb\varepsilon^{2}h\varepsilon^{4}$		$gb\varepsilon^{2}h\varepsilon^{4}+i^{4}$	
(13)	bɛ̀lɛ̀	'a trouser'	bɛ̀lɛ̀+ˊ	'the trouser'
	$b\varepsilon^{2}l\varepsilon^{2}$		$b\varepsilon^{2}l\varepsilon^{2}+i^{4}$	
(14)	pɛ́lɛ́	'a house'	pɛ́lɛ́+ˊ	'the house'
	$p\varepsilon^{7}l\varepsilon^{7}$		$p\varepsilon^{7}l\varepsilon^{7}+i^{7}$	

However, in addition to these anticipated results, there are some unexpected results. Following some highs, the high of the noun is changed to a low.

(15)	fàndé	'a thread'	fàndè+ˊ	'the thread'
	$fa^{2}nde^{4}$		$fa^{2}nde^{2}+i^{4}$	

Following a falling tone, the falling tone of the noun is changed to high and the high tone of the suffix is downstepped.

(16)	hînî	'a man'	hînî+ꜜ	'the man'
	$hi^{2}ni^{4-1}$		$hi^{2}ni^{4}+i^{3}$	

Linguists have been aware of these problems for some time. Crosby [1944] described this situation by assigning morphemes of like tonal patterning to different grammatical classes. Spears [1967] posited four separate and nonfeatured morphophonemic tones to account for these alternations. While both of these approaches are descriptively adequate, there are some further generalizations which the above descriptions cannot explicitly make.

I would like to propose an analysis which in addition to showing that the problem can be dealt with in terms of binary features, provides an explanation of why these tonal alternations are alogical and natural consequence of our assumptions about phonology. Such an analysis requires that a more abstract representation of morphemes of the

type fàndé (cf. example (15)) be given as:

(17) fàndèé 'thread'

and those of the type hǐnǐ (cf. example (16)) be given as:

(18) hǐnǐǐ 'man'

When this is done, the description of the above tonal variations as well as many other alternations (cf. section 4) can be explained by two rules: Vowel elision and High tone dissimilation.

a. Vowel elision

Since this rule follows the rules which assign the step tones (rules 1 through 4) the tonal values are expressed in n-ary terms.[6]

(19) Rule 5 Vowel elision

$$[x \text{ tone}] \rightarrow [\emptyset] \;/\; \left\{ \begin{array}{ll} [y \text{ tone}] & \underline{\quad}+[+\text{segment}] \\ \underline{\quad} & [y \text{ tone}]+ \end{array} \right\} \quad \text{where } x < y$$

In a complex morpheme final syllable, cvv-, the vowel containing the lowest tone value is deleted when followed by another segment. When the values of the two tones are the same, one of these vowels will be deleted.[7]

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[6]If the binary values of the tones had been retained in addition to the n-ary values (which are clearly necessary to account for the phonetic sequence high-step) as Schachter suggests, rule 5 would be much easier to state:

$$[-\text{tone}] \rightarrow [\emptyset] \;/\; \left\{ \begin{array}{l} \underline{\quad}\,v \\ v\,\underline{\quad}+[\text{segment}] \end{array} \right\}$$

Thus we either have to accept the convention of the retention of binary tone values in the n-ary conversion process or accept the more awkward statement of the generalization.

[7]The generalization on which this rule is based is much simpler than its formalization indicates.

(20)

More abstract representation	After rule 4	After rule 5
fàndèé	$fa^{2}nde^{2}e^{4}$	$fa^{2}nde^{4}$
hĭnfĭ[8]	$hi^{2}ni^{4}i^{1}$	$hi^{2}ni^{4}i^{1}$
hĭnfĭ+f	$hi^{2}ni^{4}i^{1}+i^{3}$	$hi^{2}ni^{4}+i^{3}$

Rule 5 demonstrates how it is possible to have the sequence high-step. It also explains how the indefinite tonal form of nouns like fàndèé are derived. However, another rule is necessary in order to account for the tonal pattern of the definite form of these nouns.

b. High tone dissimilation

When a string of contiguous lows is followed by a string of contiguous highs, and a syllable of the type cv̀v́ is at the point of change from low to high, the result is that the change from low to high is 'delayed' one syllable.

(21) . . .cv̀cv̀v́+cv́. . . → . . .cv̀cv̀v̀+cv́. . .

Rule 6 High tone dissimilation

[+tone] → [-tone] / + $(cv)_{o}$cv __ + (c)v. . .

In a morpheme final complex syllable of the type cv̀v́, preceded by either a low tone syllable or a morpheme boundary and followed by a high tone, the high tone of the complex syllable becomes low.

(22) fàndèé+f → fàndèè+f

Rule 6, must precede rules 1, 2, 3, 4 and 5. Thus fàndèè+f will undergo rules 1 through 4 to produce:

(23) $fa^{2}nde^{2}e^{2+}i^{4}$

It will then undergo rule 5, which will delete one of the low tones of the complex final syllable:

(24) $fa^{2}nde^{2+}i^{4}$

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[8]Because the final low tone of hĭnfĭ is not followed by a segment, f will not be deleted by rule 5.

c. Exceptions

There are a very small number of morphemes in Mende ending in a double vowel for which rule 6 (high tone dissimilation) does not apply. In some cases, these double vowels can be shown to be the result of a deleted medial consonant.

(25)	cvcv	cvv[9]	
	sàwá	sàá	'three'
	pɔ́lɔ̀	pɔ́ɔ̀	'mud'
	nɨ̀kʃɨ̀	nɨ̀kʃɨ̀	'groundnut'

These apparent exceptions can be eliminated if the rule deleting these medial consonants is placed after the tonal alternation rules so that the double vowels produced through consonant deletion appear after the vowel elision rule.

In other cases, until the reason for not undergoing tonal alternation becomes clear, the morphemes must be marked as exceptions. For example:

(26)	kɛ̀lɛ́ɛ̀	'except'	tàá	'and'
(27)	ngèwɔ́ɔ̀	'God'	kɔ̀ɔ́	'in order that'

4. Additional supporting arguments

a. Range of application

It is important to point out that the tonal alternation mentioned in section 3 occurs in verbs and other parts of speech in addition to nouns, and that this analysis permits this description with no further additions to the rules.

b. Tone mutation

Tone mutation in Mende takes place in a number of grammatical constructions which belong to the general category of nominal compounds.[10]

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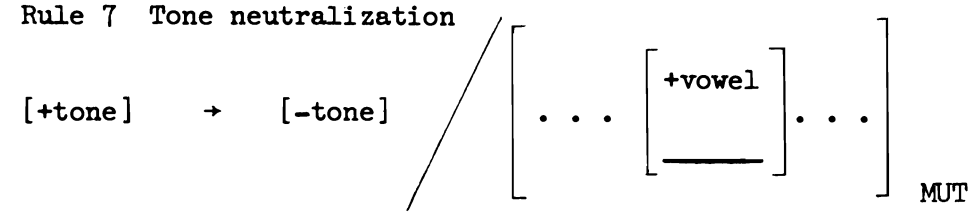
[9]The rule which deletes these consonants is an optional and a relatively late rule. Both sàwá and sàá etc. are permissable surface forms apparently in free variation.

[10]Although all the examples given here involve a head and a single modifier, it is possible to have several modifiers, all of which undergo tone mutation.

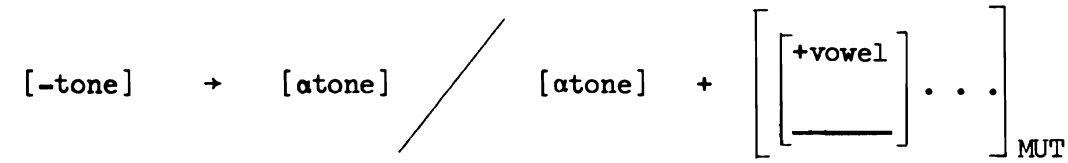
It involves two rules:

(28) Rule 7 Tone neutralization



MUT is an abbreviation for those environments requiring tone mutation. This rule when properly defined will lower all tones in the second and succeeding elements of these nominal compounds to low.[11]

(29) Rule 8 Low tone assimilation



The first vowel of the second element of these constructions has the same tone as the last tone of the preceding element. Thus, following a final high vowel in the first element, the initial vowel of the second element will be high. Following a final low vowel in the first element, the first vowel of the second element will have a low tone.[12]

In order to produce the correct surface forms, rules 7 and 8 must precede rules 6, 1, 2, 3, 4 and 5.

Below are some examples demonstrating tone mutation. They all contain nyámù 'ugly' as the second (mutating) element.

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[11]Both rule 7 and a variant of rule 8 occur in Kpelle, another Southwestern Mande language [Welmers 1970]. Because of the highly restricted form of rule 8 in Kpelle, the existence and form of rule 7 can be more easily seen.

[12]Variants of this rule are found in the Northern Mande languages: Maninka [Spears 1966], Bambara [Bird 1966] and apparently Soso [Houis 1956] as well as in the Southwestern Mande languages.

(30)

More abstract representation	gbɛ̀hɛ́#nyámù	bɛ̀lɛ̀#nyámù
after rule 7	gbɛ̀hɛ́#nyàmù	bɛ̀lɛ̀#nyàmù
after rule 8	gbɛ̀hɛ́#nyámù	bɛ̀lɛ̀#nyàmù
after rule 1	gbɛ̀hɛ́#nya^{n}mù	bɛ̀lɛ^{n}#nya^{n}mu^{n}
after rule 2	gbɛ$^{n-3}$hɛ́#nya^{n}mu^{n-3}	bɛ$^{n-3}$lɛ^{n}#nya^{n}mu^{n}
after rule 3	gbɛ$^{n-3}$hɛ$^{n+2}$#nya^{n}mu^{n-3}	bɛ$^{n-3}$lɛ^{n}#nya^{n}mu^{n}
after rule 4	gbɛ^{2}hɛ^{4}#nya^{4}mu^{1}	bɛ^{2}lɛ^{2}#nya^{2}mu^{2}
after rule 5	gbɛ^{2}hɛ^{4}#nya^{4}mu^{1}	bɛ^{2}lɛ^{2}#nya^{2}mu^{2}
gloss	ugly stool	ugly trousers

More abstract representation	hìnfì#nyámù	fàndèé#nyámù
after rule 7	hìnfì#nyàmù	fàndèé#nyàmù
after rule 8	hìnfì#nyàmù	fàndèé#nyámù
after rule 1	hìnfì#nya^{n}mu^{n}	fànde^{n}é#nya^{n}mù
after rule 2	hi^{n-3}nfi^{n-3}#nya^{n}mu^{n}	fa^{n-3}nde^{n}é#nya^{n}mu^{n-3}
after rule 3	hi^{n-3}ni^{n+2}i^{n-3}#nya^{n}mu^{n}	fa^{n-3}nde^{n}e^{n+2}#nya^{n}mu^{n-3}
after rule 4	hi^{2}ni^{4}i^{1}#nya^{1}mu^{1}	fa^{2}nde^{2}e^{4}#nya^{4}mu^{1}
after rule 5	hi^{2}ni^{4}#nya^{1}mu^{1}	fa^{2}nde^{2}#nya^{4}mu^{1}
gloss	ugly man	ugly thread

The existence of complex syllables makes it possible to provide a simple explanation for this rather complex tonal behavior. It explains why the final syllable of 'thread' sometimes acts like a high, as in rule 8, and sometimes acts like a low, as a result of rule 6. It explains why the final syllable in 'man' sometimes acts like a low, as in rule 8, and sometimes acts like a high as a result of rule 6.

c. High-step

The series high-step can be derived from a more abstract v́v̀+v́ by rule 5. However, there exist two morphemes in Mende which are stepped in situations where the underlying representation of the preceding syllable can not be v́v̀.

(31) $nya^{7}+nje^{6}$ 'my mother'[13]

(32) $nya^{7}+k\varepsilon^{6}$ 'my father'

It is clear that nyá 'my' cannot have *nyáà as its more abstract representation because when combined with kényà 'uncle', it would incorrectly produce the nonoccurring $*nya^{7}+ke^{6}nya^{3}$ instead of the correct $nya^{7}+ke^{7}nya^{4}$ 'my uncle'. Because the surface form $nya^{7}+nje^{6}$ does not have *nyáà+njé as its more abstract source, it appears to be a crucial counterexample to our assumption that all step tones are the consequence of an underlying low tone and that the series high-step can only be derived by the deletion of a low tone (rule 5). However if the more abstract representation of 'mother' is given as njèé and 'father' is given as kèɛ́, the correct surface forms will be produced.

(33) nyá+njèé (rules 1-4) $nya^{7}+nje^{4}e^{6}$ (rule 5) $nya^{7}+nje^{6}$

(34) nyá+kèɛ́ $nya^{7}+k\varepsilon^{4}\varepsilon^{6}$ $nya^{7}+k\varepsilon^{6}$

The reason why kèɛ́ and njèé were not previously proposed as more abstract forms is perhaps because both belong to a special class of kinship terms which do not take the definite suffix. When njèé enters into compounds of type requiring tone mutation, it clearly acts as a complex syllable of the type cv̀v́.

(35) njèé#wùlò → $nje^{2}\#wu^{4}lo^{1}$ 'aunts and father's other wives'

5. The underlying representations of v̀v́ and v́v̀

So far, v̀v́ and v́v̀ have not been proposed as underlying representations, but only as more abstract than their corresponding surface forms. While it is possible to end the analysis at this point, our intuition tells us that a simpler underlying representation of these forms is possible. Our main argument is the fact that with the exception of complex syllables, which occur only morpheme finally, the normal cannonical pattern of the syllabe is cv. This suggests that perhaps cv̀v́ and cv́v̀ can be traced back to underlying representations of the cv

[13]For an explanation of the integral values in these examples, see footnote 5.

type.

One not too promising possibility is that these complex syllables were developed through the loss of an intervocalic consonant.

(36) cvcv → cvv

While the loss of an intervocalic consonant is common in Mende (cf. 3.c.), there are two very strong arguments against using this as the explanation of the source of cvv. First, as far as can be determined, when v̀v́ and v́v̀ are produced in this manner, they do not apper to undergo the tonal alternations expected of complex syllables. This is why we earlier suggested that the rule for deleting these consonants must follow the tone alternation rules. Secondly, one would expect a Mende morpheme of the type cvcvv which does undergo tonal alternation to have cognantes of the type cvcvcv in other Mande languages. This does not appear to be the case:

(37)	Mende	Soso	Kono	Mandingo	Gloss
	màhàá	mange	mansa	mansa	chief
	kwàlàá	kule	kola	sula	monkey
	nɨ̀kàá	ninge	ningi	nisi	cow

A much more promising source of v̀v́ and v́v̀ can be deduced from a frequency count of tonal types. A tabulation of 200 items produced the following distribution:

(38)		
	cv́cv́	37%
	cv́cv̀	10%
	cv̀cv́	5%
	cv̀cv̀	4%
	cv̀cv̀v́	25%
	cv̀cv́v̀	18%
	cv́cv́v̀	1%
	cv́cv̀v́	0%

One would expect that cv̀cv́ and cv̀cv̀ would have a much higher frequency of occurrence than cv̀cv̀v́ and cv̀cv́v̀ due to their lesser complexity. This could be explained if cv̀cv̀v́ and cv̀cv́v̀ were represented in their underlying forms as cv̀cv̀ and cv̀cv́, followed by the rule:

(39) Rule 9 Tone contouring

$$\emptyset \rightarrow \begin{bmatrix} -\alpha\text{tone} \\ +\text{vocalic} \end{bmatrix} \Big/ + (cv)_o \; c \begin{bmatrix} \alpha\text{tone} \\ +\text{vocalic} \end{bmatrix} \_\_ +$$

A morpheme final tone will be changed to a sequence of that tone followed by its complement, if when preceded by syllables in the same morpheme, those syllables have a low tone.

(40) cv̀cv́ → cv̀cv́v̀
cv̀cv̀ cv̀cv̀v́
cv́cv́ cv́cv́ (no change)
cv́cv̀ cv́cv̀ (no change)

In the few cases where this rule does not apply, the morphemes must be marked as exceptions presumably indicating that these words are recent borrowings. Many of these exceptions are obvious borrowings.[14]

(41) kɩ̀cɩ̀ 'kitchen'
kɔ̀kɔ́ 'koko yam'
kɔ̀fɩ́ 'coffee'

Rule 9 does not seem so peculiar when one takes into consideration that many other Mande languages have variants of this rule. In Kpelle [Welmers 1970], Bambara [Bird 1966] and perhaps Loko [Innes 1964] there is a rule which changes a low to a high at a morpheme boundary when before a following low in much the same way as rule 9. In addition to having a low to high rule, Spears [1968] claims that Maninka has a high to low rule.

6. Summary

The final order of the rules is as follows:

(42) Rule 9, Tone contouring
Rule 7, Tone neutralization
Rule 8, Low tone assimilation
Rule 6, High tone dissimilation

[14] Many of the arguments given by Welmers [1961] for the identification of recently borrowed morphemes in Kpelle, such as their failure to undergo consonant mutation can be applied successfully to Mende as well.

Rule 1
Rule 2
Rule 3 } Step tone assignment
Rule 4
Rule 5, Vowel elision

This investigation has focused primarily on Mende nominal constructions (compounds, definite and indefinite noun forms). Much of what was found also applies to other parts of the grammar (object + verb, noun + postposition, etc.), although it is clear that much more investigation will be necessary before these areas of the grammar are fully understood.

The analysis proposed in this paper has several advantages over previous descriptions of Mende tone. First, it has assumed that the underlying tones of Mende lexical representations are natural and therefore should be expected to behave like other tone systems. As other languages in the area have a basic two tone system, it should not be considered unusual that Mende has a two tone system. Secondly, the rather awkward surface tonal alternations can be described most appropriately through the use of a binary feature of tone (rule 8 for example, can be most generally stated only when a binary feature of tone is assumed). Thirdly, once Mende rules are cast in this form, their similarity to other Mande languages becomes apparent. Fourthly, the intermediate forms of cv̀v́ and cv́v̀ explain whay morphemes in which they are found appear to have both high and low tones in their final syllables. Finally, the previously un-explained tonal behavior of 'mother' and 'father' becomes clear when their intermediate forms are given as nj ɛ̀ɛ́ and kɛ̀ɛ́.

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