

VOWEL HARMONY IN EWE<sup>1</sup>

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1. Introduction

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

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

such as [e, o] frequently assume a higher tongue position than 'nonadvanced' high vowels such as [i, u].<sup>2</sup>

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

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

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

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

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

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

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<sup>3</sup>For present purposes a 'detail' rule might be defined as one which need not be ordered before any other rule and which does not specify classificatory features.

## 2. Eve Vowels: the Classificatory Features

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

The Eve dialects draw their vowels from the following set:

(1)	i	u
	e	o
	ɜ	
	ɛ	ɔ
	a	

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

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

(2)	<u>Adangbe</u>		<u>Anlo</u>		<u>Peki, Kpando, Gɛ</u>	
	i	u	i	u	i	u
	e	o	e	o	e	o
	ɛ	ɔ	ɛ	ɔ	ɛ	ɔ
	a		a		a	

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

(3)	kpɔ́	'see'	[mɔ́ kpɔ́ gà]	'I saw (made) money'
	nɔ́	'stay'	[mɔ́ nɔ́ dɔ́s mɔ́]	'I stayed in the town'
	bɛ́s	'request'	[mɔ́ bɛ́s gà]	'I asked for money'
	ná	'give'	[mɔ́ tswéé ná koff]	'I gave it to Kofi' (I took it gave Kofi)

Elsewhere the rule does not apply:

(4)	kpɔ́	'see'	[mɔ́ kpɔ́á gà]	'I make money'
	dzɔ́	'be born'	[ɔ́ dzɔ́ gbɔ́vú è]	'He was born a rascal'
	trɔ́	'turn'	[mɔ́ trɔ́ gɔ́]	'I turned (returned) at Accra'

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

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

(5)	Adangbe:	ɔ́ lɔ́ àgbɛ́lɔ́ a mɔ́	'he is in the farm'
	+	[ɔ́ lɔ́ gbɛ́lɔ́ a mɔ́]	
	Anlo:	àfɔ́ á mɔ́	'in the house'
	+	[àfá mɔ́]	

mɔ̀ à-dzɔ̀ 'I shall leave'  
 → [màdzɔ̀]

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

(6)

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

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

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

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

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

- (7)  $w\acute{o}$   $l\grave{e}$   $kp\acute{s}$   $a$   $w\acute{o}$  'they are dismissing you'  
 $w\acute{o}$   $l\grave{e}$   $kp\acute{s}$   $\circ$   $w\acute{o}$  'they are seeing you'

compare:

- $\acute{s}$   $l\acute{e}$   $s$   $l$   $\delta$   $w\delta$  'it is cutting you'  
 $w\acute{o}$   $l\grave{e}$   $u\acute{s}$   $\circ$   $w\acute{o}$  'they are sniffing at you'

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

- (8)  $\delta \rightarrow \left[ \begin{array}{l} -ATR \\ +CP \\ \langle -round \rangle_a \end{array} \right] / \left[ \begin{array}{l} +syl \\ -ATR \\ \langle -round \rangle_b \end{array} \right] \text{ ---}$   
 cond: a only if b

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

- (9)  $\delta \rightarrow \left[ \begin{array}{l} -ATR \\ \text{around} \end{array} \right] / \left[ \begin{array}{l} +syl \\ -ATR \\ \text{around} \end{array} \right] \text{ ---}$

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

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

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

- (10) bɪf+á → bɪfé 'the corn'  
 dù+á → dùɔ 'the town'  
 t̃à+á → t̃əɛ 'the yam'  
 tó+á → tóó 'the mountain'  
 k̃à+á → k̃ɔ 'the knot'  
 g̃à+á → g̃ə 'the money'  
 (where  $\check{V}$  is notationally equivalent to  $\check{V}\check{V}$ ).

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

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

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

### 3. Vowel Harmony

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

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

(11)

	<u>surface</u>		
<u>underlying</u>	<u>Adangbe</u>	<u>Kpando</u>	<u>Anlo</u>
i + e	i + i	i + i	i + i
u + e	u + i	u + i	u + i
e + e	e + e	e + e (i + i)	
ɔ + e	e + e		i + i
o + e	o + e	o + e (u + i)	u + i

	<u>surface</u>		
<u>underlying</u>	<u>Adangbe</u>	<u>Kpando</u>	<u>Anlo</u>
ɛ + ɛ	ɛ + ɛ		
a + ɛ	ɛ + ɛ	ɛ + ɛ	e + ɛ
ɔ + ɛ	ɔ + ɛ	ɔ + ɛ	o + ɛ

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

- (12) ʔsi + é + ʔsi f 'it's water'  
 àvù' + é + àvù f 'it's a dog'  
 ɔye + é + ɔye é 'it's a spider'  
 ɔnyɔ + é + ɔnye é 'it's me'  
 ɔwo + é + ɔwo é 'it's you'  
 ʔulɛ + é + ʔulɛ é 'it's a weaver bird'  
 àgbà + é + àgbè è' 'it's a load'  
 ʔsɔ + é + ʔsɔ é 'it's a horse'

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

- (13) Stem vowel fronting  

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

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

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

(14) Stem vowel raising

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

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

(15) Vowel harmony

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

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

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

- (16) dyf + è + dyfɪ 'seek it'  
 uù + è + uùl [uwɪ] 'move it'  
 kpɛ́ + è + kpɛ́l 'meet him/her'  
 kò + è + kùl [kwɪ] 'laugh at him/her'  
 ná + è + nêè 'give it'  
 tsɔ́ + è + tsòè [tswòè] 'take it'

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

(17) Stem vowel advancing

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

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

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

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

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

- (19) Stem vowel shift (Anlo)
- $$\begin{bmatrix} \text{-syl} \\ \text{around} \\ \text{BATR} \end{bmatrix} \rightarrow \begin{bmatrix} \text{aback} \\ \text{\beta high} \\ \text{+ATR} \end{bmatrix} / \text{ \_\_\_\_ } + \begin{bmatrix} \text{+syl} \\ \text{-back} \end{bmatrix} \#$$

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

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

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

- (20) mekpɔ̃ɛ                    'I saw him'  
 mɛxɔ̃ɛ sɛ                    'I believe it'
- compare:
- a'ẽ nɔ́ɛ                    'small ewe'  
 ɔ́ tùl̩ (< tù+à) 'he will catch up with her'

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

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

<sup>7</sup>The published version of this text is unfortunately spotted with typographical errors in the rules and examples; in the present case, *ɛ* should be read for *e* in (321i).

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

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

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

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

(21b) [+syl] → [-rule 15] / # \_\_\_\_\_

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

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



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

- (26) *tukpá é* 'it's a bottle'  
 but:  
*àgbò lá* ( < *lá + é*) 'it's the ram'  
*ámá kèè* ( < *kàs + é*) 'who is it?'

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

#### 4. Eve and the Typology of Vowel Harmony Systems

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

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

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

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

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

(27)	set 1	set 2	set 3
	+high	-high	-high
	<u>+ATR</u>	<u>+ATR</u>	<u>-ATR</u>
	i u	e o	ɛ ɔ

Contiguous vowels within a word can only be drawn from one of these sets (with the Peki and Gē exceptions noted above); this follows from the

fact that the harmony rule involves two dimensions, tongue height and tongue root advancing.<sup>9</sup>

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

(28)		<u>bu 'rot'</u>	<u>bo 'bend'</u>	<u>bo 'exit'</u>
	sing. 1	mbu	mbo	mbo
	2	ɔbu	abo	abo
	3	ubu	obo	obo
	plur. 1	bubu	bobo	bobo
	2	bibu	bebo	bebo
	3	bɔbu	babo	babo

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

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

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

- (29) di before i,u in noun stems  
 ie before e,o in noun stems  
 ic before ε,ɔ,a in noun stems

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

- (30) 6-160-fè 'he isn't going'  
 5-153-wa 'he isn't coming'
- but:
- 5-153-bà-1ò1àà 'he won't spoil'  
 5-153-bà-1ɔ 'he won't quarrel'

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

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

<sup>10</sup> In this transcription, ỳ represents 'raised' low tone and Ỳ represents low tone.

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

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

#### 5. Conclusions

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

#### REFERENCES

- Ansre, G. 1961. The Tonal Structure of Ewe. Hartford Studies in Linguistics No. 1. Hartford: Hartford Seminary Foundation.
- Berry, J. 1951. The Pronunciation of Ewe. Cambridge: Heffer's.
- Clements, G. N. 1972. The Verbal Syntax of Ewe. University of London doctoral dissertation.
- Delattre, P. 1971. "Pharyngeal features in the consonants of Arabic, German, Spanish, French, and American English." Phonetica 23:129-155.
- Hall, B. L., R. M. R. Hall, M. D. Pam, A. Myers, S. A. Antell, and G. K. Cheronon. 1974. "African vowel harmony systems from the vantage point of Kalenjin." Afrika und Übersee LVII:241-267.

- Halle, M. and K. Stevens. 1969. "On the feature advanced tongue root." Quarterly Progress Report No. 94, Research Laboratory of Electronics, pp. 209-215. Cambridge, Mass.: M.I.T.
- Heine, B. 1968. Die Verbreiterung und Gliederung der Togorestsprachen. Berlin: Dietrich Reimer Verlag.
- Ford, K. 1973. "On the loss of cross-height vowel harmony." Research Review Supplement No. 4: Papers in Ghanaian Linguistics (Transactions of the Linguistic Circle of Accra), pp. 50-80. Legon: Institute of African Studies, University of Ghana.
- Ladefoged, P. 1971. Preliminaries to Linguistic Phonetics. Chicago: University of Chicago Press.
- Lindau, M., L. Jacobson, and P. Ladefoged. 1972. "The feature advanced tongue root." Working Papers in Phonetics 22:76-94, Los Angeles, Calif.: U.C.L.A.
- Painter, C. 1971. "Vowel harmony in Anum." Phonetica 23:239-248.
- Painter, C. 1973. "Cineradiographic data on the feature 'covered' in Twi vowel harmony." Phonetica 28:97-120.
- Perkell, J. S. 1971. "Physiology of speech production: a preliminary study of two suggested revisions of the features specifying vowels." Quarterly Progress Report No. 102, Research Laboratory of Electronics, pp. 123-139. Cambridge, Mass.: M.I.T.
- Schane, S. A. 1973. "The formalization of exceptions in phonology," in M. Gross, M. Halle, M.-P. Schützenberger eds., The Formal Analysis of Natural Languages, Paris and The Hague: Mouton.
- Schroeder, J. 1936. Formenlehre des Gē-Dialektes der Ewesprache. Baden: Christliche Verlagsdruckerei Gebr. Tron.
- Sprigge, R. G. S. 1967. "Collected field reports on tone in the Adangbe dialect of Ewe." Collected Language Notes No. 8. Legon: Institute of African Studies, University of Ghana.
- Stahlke, H. 1973. "Surface restrictions of vowel sequences in Ewe," in C. W. Kisseberth, ed., Studies in Generative Phonology, Edmonton, Alberta: Linguistic Research, Inc.
- Stewart, J. M. 1967. "Tongue root position in Akan vowel harmony." Phonetica 16:185-204.
- Stewart, J. M. 1970. "Tongue root position in the Volta-Comoe languages and its significance for the reconstruction of the original Bantu sounds." African Language Studies 11:340-350.
- Welmers, W. E. 1973. African Language Structures. Berkeley: University of California Press.
- Westermann, D. 1930. A Study of the Ewe Language. London: Oxford University Press.

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