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VOWEL HARMONY IN AKAN: A CONSIDERATION OF STEWART'S WORD STRUCTURE CONDITIONS*

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Stewart [1983] presents a new framework for the analysis of Akan vowel harmony in which Word Structure Conditions (WSCs) are introduced to account for word-level phonotactic regularities. It is shown here that the WSCs, rather than simplifying the analysis of Akan, impose unnecessary complexity on it, requiring us to restate the unitary process of vowel harmony as a number of formally unrelated rules. It is concluded that with one further modification, the analysis of Clements [1981] can be maintained.

Stewart [1983] undertakes a new initiative in the analysis of Akan vowel harmony, proposing that certain generalizations in this language can best be captured in terms of a framework providing Word Structure Conditions (WSCs) to account for word-level phonotactic regularities. He suggests that such a framework allows for a more promising approach to the understanding of Akan than the autosegmental treatment presented in Clements [1981]. Stewart does not propose to reject autosegmental analyses altogether, but suggests that they are inappropriate for vowel harmony, at least in the case of Akan. I will show here that the notion of WSC, rather than simplifying the analysis of Akan, complicates it in unnecessary ways in the case of at least one dialect (Asante) by requiring us to restate the unitary process of vowel harmony as a number of formally unrelated rules. At the theoretical level the WSC framework appears to be incompatible with a basic premise of phonological analysis, that predictable phonetic information is excluded from underlying representations. After

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reviewing Stewart's analysis I will show that with one further modification, the analysis of Clements [1981] can be maintained in its original form.

The larger significance of Stewart's article, and one which has stimulated this reply, is that it represents a principled attempt to solve the well-known problems inherent in linear treatments of vowel harmony without abandoning the principle of linearity itself. The problems in question include the need to postulate a complex and powerful rule apparatus and the failure to state vowel harmony as a single, unitary process (see Clements [1981] for discussion of earlier analyses of Akan). Stewart's new proposal attacks these problems directly by introducing a mechanism, the WSC, that is designed to solve both of them at once. What makes this approach particularly interesting is that it is inspired by a theoretical intuition regarding an inadequacy of "standard" generative phonology that goes well beyond the problem at hand and has significant consequences for the treatment of other types of phonological phenomena.

The essence of Stewart's proposal is that WSCs are the appropriate device for expressing surface-true word-level generalizations such as vowel harmony. The structure-preserving character of WSCs, to which I return below, places a significant constraint upon the abstractness and arbitrariness of phonological derivations, while the fact that they apply at the level of the word, rather than the morpheme, is intended to capture the intuition that vowel harmony in languages like Akan is a unitary phenomenon, affecting roots and affixes in like manner.

WSCs formalize the notion of "harmony span" in the following way [Stewart 1983:112]:

> The word is divided into harmony spans within which the vowels are necessarily in harmony, and the disharmony condition for a given dialect defines the harmony spans in that dialect by stating the circumstances under which disharmony between two successive vowels is possible.

The particular type of WSC which Stewart calls a "disharmony condition" is stated as an "if-then" condition of the following general form: "if the second vowel of a VC_0V sequence is in disharmony with the first with respect to a certain feature F, then it must also bear a certain feature G." As Stewart points out, such statements are logically equivalent to statements of the form "if the sec-

ond vowel of a VC_0V sequence does not bear the feature G, then it must be in harmony with the preceding vowel with respect to the feature F." Due to this logical equivalence, disharmony conditions also serve as harmony conditions, and are the essential mechanism for the description of harmony in Stewart's framework.

The main features of Stewart's framework, insofar as it differs from "standard" theory, are summarized in (1):

(1) a. In addition to phonological rules of the familiar type, phonological systems contain Structure Conditions of two types: Segment Structure Conditions (SgSCs) which express implicational relationships between the features contained in a single phonetic matrix, and Sequence Structure Conditions (SqSCs) which express implicational relationships between features in phoneme sequences and which hold at the domain of the word.

b. Both types of Structure Condition may have one or more language-specific automatic phonological rules (A-rules) associated with them, which "link" to the output of phonological rules of all types in such a way that if a given rule creates a representation that violates a Structure Condition, the associated A-rule applies to it to produce a well-formed output.

The reader will note an important difference between the notion of Structure Condition formulated by Stewart and the related notion formulated by Stanley [1967]. In Stanley's influential conception, SCs functioned as lexical filters, so that forms not satisfying them were excluded from the lexicon. In particular, Stanley did not propose a mechanism permitting SCs to monitor later stages of a derivation by applying to the output of P-rules.[1] In Stewart's conception, in contrast, SCs function as regulatory devices defining a well-formed "state" which phonological representations must conform to at all levels of a derivation. In this respect the SCs, acting in conjunction with their as-

[1]Stewart (p. 124) interprets Stanley as having claimed that SgSCs apply to the output of P-rules in the course of derivations, citing his remark that "the output of each P rule is automatically subjected to the segment structure rules" [Stanley 1967:404]. In fact, Stanley draws a principled distinction between morpheme structure rules, to which he is referring in this passage, and morpheme structure conditions, which he discusses in later sections of his paper. Unlike morpheme structure rules, morpheme structure conditions do not have the ability to introduce or change features and thus are unable to apply, at least in a non-vacuous manner, to the output of P-rules.

sociated A-rules, have the property of requiring phonological derivations to be "structure-preserving" in the sense that no derived forms at any stage violate the (surface-true) SCs. The SCs thus impose an extremely powerful constraint against abstractness in phonological analysis. Here lies the crux of Stewart's theoretical proposal, and we will now examine its consequences for the analysis of Akan, restricting our attention to the most complex of the Akan dialects from the point of view of vowel harmony, Asante.

The underlying oral vowels of Asante, in Stewart's analysis, are the following:

(2)

	i	ɪ	u	ʊ	e	ɛ	o	ɔ	ə	a
ATR	+	-	+	-	+	-	+	-	+	-

Two of these vowels, [ə] and [a], are in complementary distribution: [ə] occurs before advanced high vowels and [a] occurs elsewhere. In Stewart's approach, both vowels must be included in the set of underlying phonemes, since otherwise the rule needed to derive [ə] from [a] would not be structure-preserving, in the sense explained above; that is, the rule producing [ə] from [a] would violate the SgSC stating that all low vowels are [-ATR]. To express the complementary distribution of these two vowels, therefore, Stewart introduces the SqSC given in (3):

(3) SqSC1 (= Stewart's (11)):

$$\overset{V}{[+low]} \Rightarrow [\alpha ATR] \;/\; \alpha \left[\_\_C_0 \; \overset{V}{\begin{bmatrix} +ATR \\ +high \end{bmatrix}} \right]$$

The double arrow in this rule expresses implication rather than structural change, and the occurrence of "α" in the environment is a variable over the environment itself; that is, if α = + the environment must be satisfied, otherwise it cannot be satisfied. Informally, this condition states that "a low vowel is advanced if and only if it is followed by an advanced high vowel" (120). SqSC1 expands into the following two cases:

(4) a.
$$\overset{V}{[+low]} \Rightarrow [+ATR] \;/\; \_\_C_0 \; \overset{V}{\begin{bmatrix} +ATR \\ +high \end{bmatrix}}$$

b. $\underset{[+low]}{V} \Rightarrow [-ATR] \;/\; elsewhere$

This rule determines underlying representations such as /kasa/ 'speak', /bisa/ 'ask', and /kəri/ 'weigh', while excluding forms like */kəsa/ , */bisə/ , */kari/ , etc.

Let us now consider the SqSC proposed to account for vowel harmony itself. Stewart's analysis, which differs in this respect from all earlier treatments, including that of Stewart [1967], treats every nonhigh vowel as initiating a new harmony span. Under this view, successive vowels in the word agree in the feature [ATR] unless the second vowel of a pair is nonhigh, in which case it need not agree. As this is the major new substantive claim regarding Akan vowel harmony in Stewart's paper, we will examine it in some detail.

The examples in (5)-(7) illustrate the fact that any vowel harmonizes with a following high vowel; on this point there is no disagreement in the literature.

(5)	esĩnĩ	/ɛ-sĩnĩ/	'piece'
	ɛpɔ̃nɔ̃	/ɛ-pɔ̃nɔ̃/	'door'
	osusui	/ɔ-susu-ɪ/	'he measured (it)'
	ɔfərɔɪ	/ɔ-fərɔ-ɪ/	'he went up'
(6)	abetu	/a-bɛ-tu/	'he has come and pulled it out'
	akotu	/a-kɔ-tu/	'he has gone and pulled it out'
(7)	otiɛɪ	/ɔ-tie-ɪ/	'he listened'
	miẅiɛɪ	/mɪ-ẅie-ɪ/	'I finished'

The appropriate SqSC takes the form of the following disharmony condition:

(8) SqSC2 (= Stewart's (12a)):

$$\underset{[\alpha ATR]}{V} \; \underset{0}{C} \; \underset{[-\alpha ATR]}{V} \Rightarrow [-high]$$

This condition states that "a noninitial vowel may be in disharmony with the preceding vowel only if it is itself nonhigh" (120). This condition is logically equivalent to the harmony condition in (9):

(9) $\quad V \quad C_0 \quad V_{[+high]}$

$\quad\Rightarrow\ [\alpha ATR] \qquad [\alpha ATR]$

This version reads "any noninitial high vowel is in harmony with the preceding vowel."

Stewart assumes that all affixes are underlyingly [-ATR] in Akan. What happens, then, to underlying vowel sequences that violate SqSC2, which arise when such affixes are added to a [+ATR] root (cf. (5)-(7))? Such forms will be subjected to the following A-rule:

(10) V → [+ATR] (= Stewart's (12c))

This rule is "linked" to SqSC2 in the sense that it applies to any vowel sequence that fails to satisfy its implication. It thus maps /ɛ-sĨnĨ/ into [esĨnĨ] and /ɔ-susu-ɩ/ into [osusui] , etc.[2]

Let us now consider the claim that mid vowels do not form part of the same harmonic span as the preceding vowel, but introduce a new harmonic span. In

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[2]If we examine SqSC1 and SqSC2 more closely, we see that they contain an important redundancy: all sequences of the form

$$a \quad C_0 \quad \begin{bmatrix} +ATR \\ +high \end{bmatrix}$$

violate both (4a) and (9), and by virtue of the latter violation undergo A-rule (10) (Stewart provides no A-rule associated with (4a). This means that the complementary distribution of [ə] and [a] is not being accounted for exclusively by SqSC1, as one might first have thought, but also by SqSC2. Why this redundancy? A closer examination shows that it is a direct consequence of the structure-preserving nature of the system. As already explained, [ə] must be present underlyingly in roots like /kəri/ 'weigh' since if it were not, the rule a → ə required to account for it would not be structure-preserving. However, [ə] is not present underlyingly in affixes, which by hypothesis are all [-ATR]. Thus the underlying representation of [ədi] 'he has eaten' is /a-di/ , not /ə-di/ , and the correct surface form is produced by the operation of A-rule (10). We could not say that low vowel prefixes are underlyingly [+ATR] rather than [-ATR] since then we could not account for the prefix vowel [a] before [-ATR] roots such as [atɩ] 'he has heard' from /ə-tɩ/ without adding a new and otherwise superfluous rule. It follows from our assumptions that there must be two mechanisms for accounting for the complementary distributions of [ə] and [a] : SqSC1 for the case of roots and SqSC2 for prefix-root sequences.

Stewart's discussion, this claim is based upon examples of the type given in (6) and (7) above. The examples in (6) show that low vowel prefixes do not harmonize with following mid vowel prefixes. This fact, however, follows independently from SqSC1 and does not constitute any evidence for the claim that mid vowels introduce new harmony spans. To verify this claim, we need to examine the status of mid vowels following nonlow vowels, which do not fall under the provisions of SqSC1.

Turning then to the examples of (7), we see that in certain cases (Stewart's examples all involve verb roots followed by the past tense suffix /ɩ/[3]) a root-final mid vowel harmonizes to a following [+high,-ATR] vowel. As a result of this, a disharmonic sequence arises just in case the first vowel of the verb root is [+ATR], as in the examples in (7). To account for these forms, Stewart proposes the further A-rule stated in (11), which is associated with SqSC2 and thus links to its output:

(11) $\begin{matrix} V \\ [-high] \end{matrix} \rightarrow [-ATR] \; / \; \_\_C_0 \; \begin{matrix} V \\ [+high \\ -ATR] \end{matrix}$ (= Stewart's (12b))

This rule resolves the underlying disharmony between the last two vowels in each of the examples in (7) by assimilating the first to the second. The resulting disharmonic sequence within the root violates no SqSC, and A-rule (10) applies to the prefix vowel to create the surface form.

Now the problem with this analysis is that except for the special cases involving the past tense suffix /i ∿ iɛ/ and the nominalizing suffix /iɛ/ , mid

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[3]In addition to this case, disharmonic sequences of this type occur in one other morphological context: between a root ending in a mid mowel and the nominalizing suffix /-ɩɛ/ , as in the following examples:

a-wiɛ-ɩɛ 'the end' /a-wie-ɩɛ/

a-siɛ-ɩɛ 'cemetery; place where things are stored' /a-sie-ɩɛ/

I would like to thank Dr. Florence Dolphyne for providing me with this information. Although implying a process of greater generality than is in fact the case, Stewart's formulation in (11) is descriptively correct as it stands, since the rule is vacuously satisfied in root-internal sequences as well as between prefixes and roots as a result of SqSC2.

vowels regularly harmonize with a preceding nonlow vowel in Asante. This fact is illustrated by the examples in (12):

(12) a. A nonlow prefix vowel harmonizes with a following mid vowel

obetu	/ɔ-bɛ-tu/	'he comes and pulls it out' (root: tu)
ɔbɛtɷ	/ɔ-bɛ-tɷ/	'he comes and throws it' (root: tɷ)
otene	/ɔ-tene/	'it (news) spreads'
ɔkɔdɪɛ	/ɔ-kɔdɪ-ɛ/	'eagle'

b. Mid vowel suffixes harmonize with a preceding root vowel

ebuo	/ɛ-bu-ɔ/	'nest'
ɛbɷɔ	/ɛ-bɷ-ɔ/	'stone'
okusie	/ɔ-kusi-ɛ/	'rat'
ɔkɔdɪɛ	/ɔ-kɔdɪ-ɛ/	'eagle'

c. Within the root, mid vowels harmonize with a preceding vowel except as defined in (11)

akɷkɔ	/a-kɷkɔ/	'fowl'
dompe	/dompe/	'bone'
kotojʷe	/kotojʷe/	'knee'
cɪrɛ	/cɪrɛ/	'show'
ẅie	/ẅie/	'finish'

As these examples suggest, the number of cases in which mid vowels fall into the same harmonic span as the preceding vowel far outnumber the few cases where they do not. Exceptions to the statements given in (12) are rare and doubtful. Clements [1981] presents two apparent exceptions to generalization (12c), consisting of the verb roots [pɪɲcɛ] 'to come close' and [ɲɪnsɛɲ] 'to be pregnant'. If we assume these roots to constitute single formatives, they form the only exceptions known to me in an extremely large set of polysyllabic noun, verb, and adjective roots (see Stewart [1966] for a representative wordlist). Thus even with these two exceptions, (12c) expresses a significant generalization about the phonological patterning of Akan. And if Stewart is correct in his assessment of these examples as compounds [Stewart 1983:125-127],[4] even

[4]Stewart's arguments for treating these examples as compounds hold strict-

these exceptions are spurious.

The generalizations in (12) show clearly that mid vowels regularly fall within the same harmonic span as the preceding vowel in Akan. However, since the special case of examples illustrated in (7) present surface exceptions to this generalization, it is not surface-true and cannot be formulated as a SqSC in Stewart's framework. Accordingly, the regularities expressed in (12) must be accounted for in terms of a new set of rules, specific to each of the morphologically defined cases listed in (12). Generalization (12a) is accounted for in Stewart's analysis by the phonological rule stated in (13a):

(13) a. $\begin{matrix} V \\ [-low] \end{matrix} \rightarrow [+ATR] \; / \; \_\_ \;]_{pfx} \; C_0 \; \begin{matrix} V \\ [+ATR \\ -low] \end{matrix}$ (= Stewart's (14))

Generalizations (12b) and (12c) receive no discussion in Stewart's article, but there seems to be no alternative but to add further rules to account for these cases. For the sake of concreteness, rule (14) might be proposed to account for the data in (12b):

(14) $\begin{matrix} V \\ [-low] \end{matrix} \rightarrow [+ATR] \; / \; \begin{matrix} V \\ [+ATR] \end{matrix} \Big]_{rt} \; C_0 \; \_\_$

Case (12c) is more difficult to handle. The problem here is that we require a rule having the effect of making a mid vowel harmonic to the preceding vowel within the root just in case it does not satisfy the description of A-rule (11). Such a rule cannot be stated within the WSC framework, due to the fact that WSCs must express surface-true generalizations, and the rule in question would be contradicted on the surface by the root vowel sequences in (7), as we have seen.[5] It is this fact—the structure-preserving nature of WSCs—that leads to

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ly only for the Akuapem dialect, and may not generalize to Asante. The two Asante te speakers whom I consulted for my 1981 study were unable to recognize any internal structure in these two items, although they were able to recognize compounds with no difficulty in other cases. This seems sufficient grounds for claiming that at least for these speakers, the forms in question are noncompounds and thus genuine exceptions.

[5]We could, of course, devise a rule that would account for the forms in (12c) while excluding those in (7) by simply listing, one after another, all the

the proliferation of rules in Stewart's framework, and, eventually, to the inability to express Asante vowel harmony as a single phonological process.

Let us now consider the third and last of the WSCs proposed for Asante. This condition is intended to account for cases of apparent disharmony involving roots beginning with one of a class of palatal and palatalized consonants C^{γ} followed by the vowel /a/ . This class consists of the members /c^{w} j j^{w} s^{γ} $s^{w\gamma}$ $ɕ^{w}$ ɲ/ , as well as /s/ from the historical */s^{γ}/ in dialects no longer having /s^{γ}/ . As the following examples show, these roots select [+ATR] prefix vowels in all cases:

(15)	ɔc^{w}a	/a-c^{w}a/	'he has cut it'
	oc^{w}aɩ	/ɔ-c^{w}a-ɩ/	'he cut it'
	wubej^{w}arɩ	/wɑ-bɛ-j^{w}arɩ/	'you will bathe'

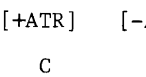
In Clements [1981] it is proposed that the roots in question begin with a floating occurrence of the feature [+ATR] which determines [+ATR] harmony in prefix vowels whenever they are present and which is otherwise phonetically unrealized. Stewart's current proposal is to assign these roots not a floating feature, but a floating vowel characterized by the feature [-durational] indicating that it has no phonetic duration. Since no other roots contain more than one vowel in a single syllable, the distribution of the feature [durational] is determined by SqSC3, stated in (16):

(16) SqSC3 (= Stewart's (19))

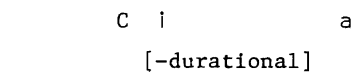
$$[\ C_0\ (V_1\ )\ V\ ]_{\text{syllable}}$$
$$\Rightarrow\quad [\text{-durational}]\ [\text{+durational}]$$

These two approaches are summarized in (17):

(17) a. Clements [1981]



B. Stewart [1983]



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environments that constitute the complement set to the environment of rule (11), but such an approach would clearly miss the relevant generalization concerning the relation between the two rules.

where in both cases, "C" represents any consonant of the class C^{Y} .

The differences between (17a) and (17b) are precisely those imposed by Stewart's framework. First, since Stewart's framework does not permit the postulation of separate, parallel tiers (at least for the case of nontonal phenomena), the "floating" vowel i must be sequenced between the two other segments in the root. Accordingly, while (17a) claims that C and a are adjacent, (17b) claims that they are separated by the vowel i , which although unpronounced, is present in the representation. Secondly, since Stewart's framework does not allow the expression of underspecification, i must be a fully specified vowel. The consequence here is that while in (17a) the "unpronounced" portion of the representation consists of only the feature [+ATR], in (17b) the "unpronounced" portion consists of all the features constituting the vowel i , including [+high], [-back], and so forth.

Now clearly one does not postulate information in underlying representations unless one has good reason to require it, and the burden of proof is all the greater on the linguist who proposes to recognize underlying features that are unrealized on the phonetic surface. The only unpronounced information proposed under analysis (17a) is the feature [+ATR], and this feature is justified on two independent grounds, as discussed in detail in Clements [1981]: not only does it account for the type of disharmony illustrated in (15), it also accounts for a set of "positive exceptions" to a rule of Vowel Raising. Analysis (17b), on the other hand, postulates a set of additional unpronounced features, and to show that this analysis is correct we must cite evidence showing that these additional features play an explanatory role in the phonology.

This is precisely what Stewart proposes to do. He writes as follows (pp. 133-134):

> The floating vowels account not only for the otherwise unexplained advancing of prefix vowels before nonadvanced low vowels but also for otherwise unexplained phenomena: consonant "palatalization" before low vowels [S[chachter] & F[romkin] 1968:89-91], consonant rounding before nonround vowels [S&F 1968:87-88], and, in Fante, rounding of prefix vowels before nonround vowels [S&F 1968:102-104]. Clements says nothing about the implications of his autosegmentalization for what remains of the traditional zero vowels.

Let me address these points here. In fact, it will be sufficient to address the first of them, since my remarks will extend in a straightforward way to the re-

maining two.

In their 1968 analysis, Schachter and Fromkin propose to derive all instances of the surface palatals [c j ẅ ɸ] from the underlying nonpalatals /k g w h/ , respectively before front vowels. Thus no palatal consonants appear in their underlying representations, and words like cɛ 'divide' and jɩ 'receive' are represented as /kɛ/ and /gɩ/ underlyingly. (Rounded palatal consonants are derived in a similar way.) Their palatalization rule P-11 is stated below, with omission of detail irrelevant to present concerns.

(18) Palatalization (Schachter and Fromkin):

$$\begin{bmatrix} -\text{voc} \\ +\text{back} \end{bmatrix} \rightarrow [+\text{pal}] \; / \; \_\_ \begin{bmatrix} +\text{voc} \\ +\text{pal} \end{bmatrix} \; X$$

condition: X ≠ (V) t/s Y

This rule palatalizes velar and glottal consonants before front ("palatal") vowels provided the next syllable does not begin with [t] or [s] . The latter condition is intended to take account of numerous exceptions to palatalization such as kɛtɛ 'mat', kɛsɩɛ 'large', and kɩtɩwa 'small'.

Before examining the relevance of the palatalization facts to Stewart's analysis it would be appropriate to consider the adequacy of (18) within a synchronic grammar of Asante. There are, in fact, several factors that weigh against any analysis involving this rule. First of all, the rule accounts for no alternations. Its justification must therefore lie in the complementary distribution of palatals and their respective nonpalatal sources, but it turns out that no such complementarity exists in the present-day language. Thus we find palatal consonants appearing before syllables beginning with [t] in jata 'lion', ɸʷɩtɩ 'to scratch', cʷetia 'to circumcise', cʷitaɩ 'file', jʷɩtɛ 'silver', ojaṭɛɲ 'torch', and jatɔ 'yaws' and nonpalatal consonants appearing before front vowels *not* followed by [t] or [s] in akenteɲɲʷa 'chair', kɛntɛɲ 'basket', ŋkɩra 'blood', ɔkɩramãɲ 'dog', kijʷo 'lucky day', kakɩra 'few', kɩra 'to order', and kɛntɛɲ 'to spread out', as well as the English loanword kakii 'khaki'. Furthermore, there are many occurrences of palatal consonants before *back* vowels in Asante, including əjʷuma 'work', jʷɷm 'song', jʷɷnsɔ 'urine', jʷɔŋkuo 'hip', jʷɷnɷ 'white hair',

jʷɔ 'be cold', kʷəjʷɔ 'Kwadwo' (proper name), ɲʷunu 'leak', ɲʷɔnɔ 'weave', and ɕʷɔwə 'testicles'; indeed we find a minimal pair in ẅɔ 'do' vs. wɔ 'pound'. While it is true that Schachter and Fromkin's theoretical framework allowed them to postulate extremely abstract underlying representations in which rules like (18) could apply without exception, it is unlikely that most linguists would follow such an analysis today.

A rule such as (18) cannot be incorporated within Stewart's framework in any case, for the obvious reason that it is non-structure-preserving. Thus both palatal and nonpalatal consonants must occur in underlying representations. If the palatalization rule has any status at all within a framework employing WSCs it is as a SqSC requiring that nonanterior consonants are palatal if and only if they are followed by a front vowel, under the further condition stated in (18). Clearly, however, the arguments raised above against the incorporation of (18) into a synchronic grammar of Asante weigh equally heavily against the incorporation of a WSC based on the same empirical claim. There is no evidence in the distributional pattern of palatal and nonpalatal consonants that would lead the learner of modern Asante to the conclusion that these two sets of forms are in complementary distribution at some level of analysis. In particular, not even the cases of exceptional harmony cited in (15) constitute such evidence, since at best they argue for a floating [+ATR] vowel, but are neutral with regard to whether such a vowel is [-back] or [+back]. We may just as well say that both palatals and nonpalatals occur before both front and back vowels in underlying representations and spare ourselves the trouble of postulating any sort of palatalization rule.[6]

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[6]At one time, a rule similar in effect to Schachter and Fromkin's rule (18) gave rise to the modern palatals. Subsequent events, however, had the effect of making the original rule synchronically irrecoverable. Concerning the change of kw , gw to cʷ , jʷ , Christaller [1933:xix] wrote as follows: "This transformation originally took place before ɛ , e , i ; but when followed by a final m or w , these vowels have usually been changed into ɔ , o , u , and have retained this form when the final w was dropped." Once the final consonant was dropped the conditioning environment for vowel rounding became irrecoverable, and one must assume that rephonemicization of the original front vowels as back rounded vowels took place; once this occurred, palatals no longer occurred uniquely before front vowels.

I will not offer extended discussion of two further arguments offered for nondurational vowels (pp. 133-134). The first concerns what Stewart calls "sporadic cases of rightward vowel shift" briefly illustrated with examples like the following: Am. [gʷarɩ] , Fa. Abura [gura] 'wash'. Stewart evidently assumes that the second form is historically derived from the first, which under his analysis is represented /gu̯arɩ/ , where /u̯/ is the nondurational vowel. There is some reason to think, however, that both forms derive from the earlier *guarɩ as suggested in Clements [1981:150-151].[7] Stewart's final argument involves the observation that given his nondurational vowel analysis, we find similar constraints on vowel sequences in both monosyllables and disyllables (see his (20)). This observation does not constitute an argument for nondurational vowels, however, but merely shows that the rules accounting for the distribution of nondurational vowels in monosyllables are independently motivated and do not add to the complexity of the analysis. An analysis that does not recognize nondurational vowels is equally cost-free, of course, since it recognizes no vowel sequences in monosyllables at all.

For reasons such as these one is forced to conclude that the WSC framework does not offer a fully satisfactory account of vowel harmony in at least one Akan dialect, that of Asante. We have seen numerous instances in which this framework imposes unnecessary complexity on the analysis, requiring us to state the unitary process of vowel harmony as a number of unrelated rules and introduce the otherwise unnecessary concept of nondurational vowels. There seems no reason not to believe, on the other hand, that an autosegmental framework provides us with a fully adequate and explanatory treatment. The autosegmental account of Akan is extremely simple, amounting essentially to the two rules "autosegmentalize the feature category [ATR]" and "low vowels are opaque". Given

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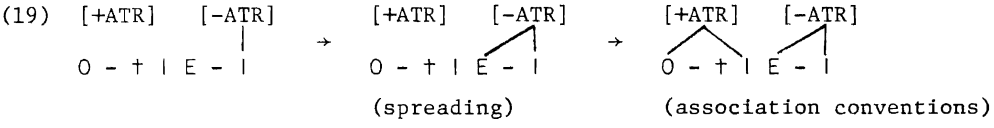
[7]Apart from considerations of phonetic naturalness, which seem relevant here, we find philological support for this analysis in the alternate forms ɛguí:se , ɛgwia:se 'market' for modern Asante [ejʷa] and guia:re , gwia:re 'bathe' for modern Asante [jʷarɩ] recorded by Koelle [1854]. Similarly, Christaller [1933] (first edition 1881) records these as e-gua and guare , respectively, in the Akuapem dialect; Christaller normally used the sequence gu to represent g followed by "a very short ŭ " [Christaller 1875:6-7], although he may not have been everywhere consistent in this usage.

these rules, together with an independently-needed rule of Vowel Raising which accounts (among other things) for the complementary distribution of [a] and [ə] , all of the facts described above are accounted for in a straightforward way. The only forms not dealt with in my 1981 analysis are those given in (7), which can be accounted for quite simply if we make two further assumptions: first, that high vowel suffixes are specified with the opaque feature [-ATR] after roots ending in mid vowels, and second, that this feature is spread onto the preceding vowel. We thus have derivations like the following, for otiɛt 'he listened' (capital letters here represent vowels unspecified for the feature ATR):



The association conventions apply after the spreading rule by the precedence principle proposed by Odden [1984], according to which any rule that makes crucial reference to a free melody-bearing unit precedes the application of the association conventions; this principle is independently required for the analysis of tone languages. Thus these forms pose no particular problem for autosegmental analysis.

As I have tried to show in the course of this discussion, Stewart's new framework is based upon a principled linguistic intuition, namely that phonological derivations are predominantly structure-preserving in character. I believe, however, that Stewart's particular formalization of this principle is too strong. If derivations are truly structure-preserving in Stewart's sense, they will never produce segments that do not also occur in underlying representations. It was for this reason, as we saw earlier, that the segment [ə] could not be eliminated from underlying representations even though it was in complementary distribution with [a] .

A rather surprising consequence of this position is that the notion "phoneme" has no apparent status in Stewart's framework. Any two phones that appear in surface representations also appear in underlying representations, including those that are predictable on the basis of the usual techniques of phonemic anal-

ysis. Thus the WSC framework leads us to a position which is fundamentally at variance with a basic premise of phonological analysis since the time of the Prague School, namely that predictable phonetic information is eliminated from underlying representations (see Kenstowicz and Kisseberth [1979:Chapter 2] for a recent defense of this position).

Now while I would be quick to agree that traditional views must come under continual review if linguistic science is to retain its strength and vitality, conservatism has a role to play as well: one is justifiably reluctant to abandon fundamental premises of one's theory without considering the full range of supporting evidence and determining that better, or at least equally satisfactory explanations, are available elsewhere. In the present case, this evaluation has not been carried out. No further motivation has been offered for the abandonment of the principle of phonemic contrast other than the fact that it is inconsistent with the structure-preserving character of the WSC framework. Surely at this point, the whole notion of structure-preservation should be brought under reexamination.

Perhaps the solution here lies along the lines suggested in recent work on lexical phonology, according to which phonological rules fall into two large classes: lexical rules, which are structure-preserving in character, and postlexical rules, which are not. For example, Kiparsky [1983] shows that such a model of phonological organization is fully consistent with an autosegmental analysis of Akan vowel harmony, on the assumption that the rule accounting for the distribution of [ɑ] and [ə] is a postlexical rule. If such an approach is correct, we can preserve the core of Stewart's insight into Akan within the context of autosegmental phonology, allowing us the best of both worlds.

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