Studies in African Linguistics
Volume 10, Number 3, December 1979

VOWEL HARMONY IN IGBO AND DIOLA-FOGNY*

Catherine O. Ringen
University of Iowa

Although both Igbo and Diola-Fogny have vowel harmony systems in which the harmonic feature is [Advanced Tongue Root], superficially they are very different. Aoki [1968] suggests that Igbo vowel harmony is similar to vowel harmony in Uralic and Altaic languages such as Finnish and Hungarian whereas Diola-Fogny has a dominant-recessive system like that found in Nez-Perce. However, analysis of vowel harmony in Igbo and Diola-Fogny reveals that these two languages actually have identical vowel harmony rules; the superficial differences result from a different distribution of [+ATR] vowels in the two languages.

1. Types of Vowel Harmony

Vowel harmony in the Niger-Congo languages of Igbo (a Kwa language spoken in Nigeria) and Diola-Fogny (a West Atlantic language spoken in Senegal) differs from vowel harmony in Uralic and Altaic languages such as Finnish and Turkish in two respects: first, the harmonizing feature is [Advanced Tongue Root] (ATR)[1] rather than [back] (and [round]) and second, prefixes as well as suffixes alternate. In addition, these two distantly related languages differ from each other in that Diola-Fogny

*An earlier version of this paper was read at the Fourth Annual Minnesota Regional Conference on Language and Linguistics, May, 1978. This work was supported, in part, by a Summer Research grant from the University of Iowa, 1978. I am grateful to A. Koutsoudas for his helpful comments on earlier drafts of this paper. I also wish to thank G.N. Clements for making the manuscript of his [1974] paper available to me and for discussing and criticizing the ideas presented here.

[1]Ladefoged [1964] has shown that the phonetic basis of the distinction between the alternating vowels in Igbo is relative advancing of the tongue root. This distinction has usually been labelled tense/lax. For further discussion of [ATR] see Halle and Stevens [1969], Stewart [1967], and Lindau et al. [1972].

roots as well as affixes alternate, whereas in Igbo, as in the Uralic and Altaic languages, roots do not alternate.

Aoki [1968] suggests that *symmetry* is a relevant criterion for classifying vowel harmony systems; according to his classification Igbo is a *symmetric* system, whereas Diola-Fogny is an *asymmetric* system.

> "In a *symmetric* system, any vowel in a certain position can determine the series of vowels for the word. Examples are Finnish, Hungarian, Altaic languages, Twi, and Igbo. On the other hand, an *asymmetric* system has one series dominating the other. In such systems, the presence of a dominant vowel in a word changes the vowels of the non-dominant series." [Aoki 1968:143]

In this paper it will be shown that despite the superficial differences of the Igbo and Diola-Fogny vowel harmony systems, these languages actually have identical vowel harmony rules and that the superficial differences result from differences in the distribution of vowels in the underlying forms of the two languages.

2. Igbo Vowel Harmony

The vowels of Igbo can be divided into two harmonic sets; there are no neutral vowels:

(1)

[+ATR]	[-ATR]
i	ị [ɪ]
u	ụ [ʊ]
e	a
o	ọ [ɔ]

[+ATR] vowels are produced with an advancing of the tongue root which causes an increase in the width of the pharynx whereas [-ATR] vowels are produced without any advancing of the tongue root. [+ATR] vowels and [-ATR] vowels do not generally co-occur in the same word except in loanwords and compounds. The harmonic quality of the vowel or vowels of the root determines the harmonic quality of affix vowels as illustrated by the following examples (roots are enclosed in []):

(2) a. a - [zụ́]-ɪa[2] 'don't buy' (p. 25)
a - [tà]-ɪà 'don't eat' (p. 1)
e - [kè]-ɪè 'don't share' (p. 25)

b. ị - [ɪụ́] 'to marry' ọ̀ - [ɪû] 'marrier'
ị - [tá] 'to eat' ọ̀ - [ta] 'eater'
ị - [vú] 'to carry' ò - [vu] 'carrier'
(all p. 27)

All verb roots are monosyllabic and thus we cannot speak of root harmony for verbs. Nouns, on the other hand, are not so restricted. Many polysyllabic noun roots occur, for example:

(3) anụ 'animal meat' osisi 'tree'
ụlọ̀ 'house' òke 'rat'
akwụkwọ 'leaf, paper'

Clearly, since both prefixes and suffixes assimilate to the harmonic quality of the root vowels, two vowel harmony rules will be necessary to account for Igbo vowel harmony; one to assimilate prefix vowels to the following root vowels, and one to assimilate suffix vowels to the preceding root vowels. Thus, we might postulate the following two rules (which could be collapsed by a convention such as Bach's [1968] neighborhood convention):

(4) a. $V \rightarrow [\alpha ATR] \; / \; \_\_ C_0 \; \underset{[\alpha ATR]}{V}$

b. $V \rightarrow [\alpha ATR] \; / \; \underset{[\alpha ATR]}{V} \; C_0 \_\_$

Assuming for the moment that all non-initial root vowels and all affix vowels are unspecified for the feature [ATR], these two rules would be adequate to account for both root and affix harmony in the forms considered so far. However, when additional data are considered, these rules

---

[2] V̀ = low tone, V́ = downstepped high tone, V̂ = high-low glide, and V (unmarked) = high tone. Unless otherwise indicated, forms cited are taken from Green and Igwe [1963] and page numbers refer to that source.

are seen to be inadequate. The crucial data involve words containing non-alternating suffixes.

Although all prefixes harmonize, there are a number of suffixes which do not. For example, the partitive suffix -tụ the distributive suffix -sị[3] and the emphatic suffix -dị do not harmonize (non-alternating suffixes are indicated by °):

(5) a. non-alternating suffixes

partitive	-tụ
distributive	-sị
emphatic	-dị

b. [nyè]-tụ° m̀ nnu 'give me a little salt' (p. 62)

c. [rí]-tụ° 'eat something' (p. 85)

d. [vù]-sị̀° 'carry' (distributive) (p. 90)

Thus, although the partitive suffix in (5c) follows a [+ATR] vowel in the same word, it does not become [+ATR]. The vowel of such a suffix must apparently be specified lexically as [-ATR] and marked with an exception feature ([-Vowel Harmony]) to prevent vowel harmony from applying to it. Thus, the underlying representation of rí-tụ would be /rí-t ụ/. But applying
[-VH]
the rules in (4) to this form yields incorrect results because although the vowel of the suffix will not undergo harmony, there is nothing to prevent the vowel of this non-alternating suffix from causing the *root* vowel to become [-ATR] as illustrated by the derivation in (6).

(6) /rí-t ụ/
[-VH]

(4a)

↓

*rị-tụ

Furthermore, it is not possible to claim that non-harmonizing suffixes such as -tụ do not *condition* harmony, since such suffixes do determine the

---

[3] Individuals vary; for some -sị does harmonize, for others it does not.

harmonic quality of a following vowel, as illustrated by the examples in (7):

(7) a. abọ anyị ẹ́ -[bho] -sị́° -ghị hâ
basket we pref put load distr emphatic them
on head
'our not helping them to put the baskets on their heads' (p. 137)

b. abọ ḿ [bho] -wé -ghi Ekwê
basket I put load begin emphatic
on head
'my not beginning to help Ekwe put the basket on his head' (p. 137)

(Negation in these examples is marked by a tone pattern distinct from that of the affirmative.) Here, the regularly alternating "emphatic" suffix ghi/ghị has a [-ATR] vowel following the non-alternating suffix -sị but a [+ATR] vowel following the suffix -we which has a [+ATR] vowel.

It might be suggested, in light of these data, that the vowel harmony rules must be restricted to apply only to *affix* vowels; that is, that vowel harmony be reformulated as follows:[4]

(8) a. $\overset{V}{[+\text{affix}]} \rightarrow [\alpha\text{ATR}] \,/\, [\alpha\text{ATR}]\ C_o$ ___

b. $\overset{V}{[+\text{affix}]} \rightarrow [\alpha\text{ATR}] \,/\, \text{___}C_o\ [\alpha\text{ATR}]$

However, consideration of additional data shows that this analysis is also inadequate. Consider the following form:

(9) (mà ha̰) e-[vú]-te-sị°-ghị (abọ) '(if they) don't bring (the baskets)' (p. 129)

Since the non-harmonizing suffix -sị does not cause a preceding suffix (te 'motion toward') to become [-ATR], rule (8b) must apparently be ordered before (8a). Specifically, the underlying representation of e-vú-te-sị-ghị would be /E-vu-tE-sị́°-ghI/ (where capital letters indi-

[4]Another possibility would be that all disharmonic suffixes are marked as not conditioning (8b), i.e. all non-alternating suffixes are exceptional in that they do not undergo harmony *and* that they do not condition regressive harmony, although they do condition progressive harmony regularly. This proposal can be immediately eliminated. It is totally ad hoc and leaves unexplained and unexplainable why *all* and *only* those suffixes which are exceptions to Vowel Harmony are also exceptional in that they do not condition the sub-rule (8b) of Vowel Harmony.

cate segments unspecified for the feature [ATR]). Although both vowel harmony rules are applicable to E in -ŧE , (8a), but not (8b), makes the correct prediction. In this case the correct output can be obtained by extrinsically ordering (8b) before (8a) as illustrated in (10):

(10) /E + vu + ŧE + si̤° + ghI/
(8b) e + vu + ŧa + si̤° + ghI
(8a) e + vu + ŧe + si̤° + ghi̤

However, Clements [1974] has shown that the rules in (8) will not work for Igbo in general. According to Clements, the suffix -ghi̤ does not alternate in a closely related dialect of Igbo.[5] The form in (11a) shows that the vowel harmony rules cannot apply in the order (8a) before (8b) in this dialect either [Abraham 1967:87]:

(11) a. m̀ - [gbuji̤] - ri - ghi̤° oshishi[6] 'I did not cut down the tree for myself'
b. *m̀ - gbuji̤ - ri̤ - ghi̤

or we will derive *m̀gbuji-ri̤-ghi̤ because (8b) will assimilate the vowel of the suffix -ri to the following [-ATR] suffix vowel. Although the order (8b) before (8a) will also correctly derive forms such as the one in (11), this order will not work in other cases. In the dialect described by Abraham, the inseparable proforms i/i̤ 'you', o/ọ 'he' optionally harmonize with a vowel to the right, provided that the vowel is also a prefix vowel. Thus we have (Abraham, 1967:40,46):

(12) i - gè - è - [shi] 'you'll cook'
i̤ - gè - è - [shi] 'you'll cook'
you fut pref cook
pref

If the rules are applied in the order (8b), (8a) as required to derive the

---

[5]The dialect of Igbo we have been considering is the Ọhụhụ dialect.

[6]The verb gbuji is a compound made up of the two monosyllabic verb roots gbu 'cut' and ji 'snap off'. See Lord [1975] for a discussion of verb compounds in Igbo.

form in (11), then the incorrect derivation in (13) cannot be avoided:

(13) /i̤ + gE + E + shi/
(8b)
↓
i̤ + gE + e + shi
(8b)
↓
i̤ + ge + e + shi
(8a)
↓
i̤ + ga + e + shi
(8a)
↓
*i̤ + ga + a + shi

Thus, the rules (8a) and (8b) are inadequate for at least one Igbo dialect.

Clements goes further, however, suggesting that the preceding argument demonstrates not only that the rules in (8) are inadequate, but also that Igbo vowel harmony cannot be accounted for by any iterative rule of segmental phonology. But, of course, to show that the iterative rules in (8) are inadequate is not to show that there is *no* analysis involving iterative rules which *is* adequate. In fact, Igbo vowel harmony can be accounted for by the iterative rules in (14) if it is assumed that in roots with [+ATR] vowels, the first vowel is specified as [+ATR] and all other vowels are specified [-ATR].

(14) Igbo Vowel Harmony

a. $V \rightarrow [+ATR] / \underset{[+ATR]}{V} \ C_0 \ \_\_\_$

b. $V \rightarrow [+ATR] / \_\_\_ C_0 \ \underset{[+ATR]}{V}$

Note that the rules in (14) are asymmetric in the sense that only [+ATR] vowels condition harmony.

The application of the proposed rules is illustrated in (15); the order of application of the subrules is not crucial.

(15) / a + ke + ɪa / 'don't share' / a + zụ + ɪa / 'don't buy' (cf.(2a))
(14b) (14a) (no rules applicable)
↓ ↓
e + ke + ɪe a + zụ + ɪa

Consider now the derivation of e-vu-te-sị-ghị (see (9)). The underlying representation of this form is / a-vu-ta -sị-ghị / , and -sị is

marked [-Vowel Harmony]. Since the [-ATR] vowels do not condition vowel harmony, the rules of (14) will derive the correct output, as illustrated in (16):

(16)

/ a + vu + ta + si̤° + ghi̤ /		/ a + vu + ta + si̤° + ghi̤ /	
(14a)	a + vu + te + si̤° + ghi̤	(14b)	e + vu + ta + si̤° + ghi̤
(14b)	e + vu + te + si̤° + ghi̤	(14a)	e + vu + te + si̤° + ghi̤

Furthermore, these rules will correctly derive the forms in the dialect discussed by Clements. Consider first the form m-[gbuji̤]-ri-ghi̤ (where ghi̤ is exceptional in that it does not alternate cf. (11a)). The derivation of this form is illustrated in (17).

(17)

/ m̤ + gbuji + ri̤ + ghi̤ /		/ m̤ + gbuji + ri̤ + ghi̤° /	
(14a)	m̤ + gbuji + ri̤ + ghi̤	(14b)	not applicable
(14b)	not applicable	(14a)	m̤ + gbuji + ri̤ + ghi̤°

Now consider the forms i-ge-e-[shi] , i̤-ge-e-[shi] (cf. 12). As can be easily determined, only permissible surface forms can be derived by rules in (14) regardless of the order in which they are applied to the underlying form / i̤°-ga-a -shi / (assuming the proform i̤ is somehow marked to optionally undergo (14)).

Notice that the analysis proposed here would be easily falsifiable: it depends crucially on the claim that all affix vowels in Igbo are underlyingly [-ATR], since an underlying [+ATR] suffix vowel would cause a preceding *root* to have [+ATR] vowels. Thus, all that is necessary to show that this analysis is incorrect is one clear case of a *non-alternating* suffix with a [+ATR] vowel since such a suffix would have to be analyzed as having an underlying [+ATR] vowel. To my knowledge there are no such cases.[7]

---

[7] Green and Igwe classify the non-alternating forms -bè 'yet, ever' -mò 'lest', which have [+ATR] vowels, as *suffixes.* The basis for this classification is as follows:

> "[There is] difficulty ... finding any clear formal distinction between compound verbs (verb plus verb) and verb plus suffix... One of

We turn now to consider the vowel harmony system of Diola-Fogny, which is quite different (superficially, at least) from Igbo.

> the characteristics of compound verbs, however, is absence of vowel harmony between the vowels of the two stems ... When, therefore, we find a compounding element in which ... the vowel of this element does not harmonize with the vowel of the stem it follows, we have to see whether, on semantic grounds, it can be associated with any verb. If it can, we tentatively classify it as a verb, if not, as a suffix." [Green and Igwe, 1963:53]

Presumably, Green and Igwe classify these forms as suffixes because they cannot be associated with any free verb on semantic grounds. If this classification is correct, then these forms are counter-examples to the claim that all non-alternating suffixes have [-ATR] vowels. There are, however, a number of reasons for believing that their classification is incorrect, and that bè and mò are not suffixes, but rather compounding elements. First, bè and mò always follow verb roots. For example, the non-alternating suffix -sị occurs not only after verb roots (see (7c)) but also after the suffix -te (see (9)); -te must be a suffix because it alternates. But the fact that -bè and -mò never do follow suffixes suggests that they form compounds with the preceding verbs. The fact that these forms do not alternate can then be explained in the same way as the non-alternation of the second member of a compound is explained, that is, by a preceding word boundary which blocks the application of vowel harmony.

Additional evidence that -bè and -mò are not true suffixes is their tonal behavior. Almost all suffixes have high tone, whereas -bè and -mò have *low* tone. Green and Igwe [1963:62-64] list five such low tone suffixes (three with [-ATR] vowels, -bè and -mò) none of these low tone suffixes alternate. Green and Igwe state:

> "There are a few low tone suffixes with somewhat restricted distribution, whose tonal behavior, so far as has been observed, is *the same as that of the second member of a compound verb* when that member, by itself, is a low tone verb." (Green and Igwe [1963:53]; emphasis added, COR)

Finally, Welmers [1970] discusses similar bound morphemes which he calls *base formatives*. These form compound like verb bases but do not occur as independent verbs. One of his examples is -hyè, indicating action done in a wrong way or by mistake (-gáhyè 'go in the wrong way' (obj. 'road') -gá 'go'). Welmers notes that about thirty such base formatives have been identified in Igbo. Thus bè and -mò are not unique and should, apparently, be considered base formatives which, like true verb roots in a compound, neither undergo vowel harmony nor condition harmony in the other member of the compound (cf. the compound -gáfè 'go across' ← -gá 'go' + -fè 'cross, pass over' [Welmers 1970:54].

3. Diola-Fogny Vowel Harmony

The Diola-Fogny vowels can be divided into two harmonic sets; there are no neutral vowels:

(18)

[+ATR]	[-ATR]
i	ɪ
e	ɛ
ə	a
o	ɔ
u	ʊ

Morphemes in Diola-Fogny fall into one of two classes: alternating and non-alternating. Non-alternating morphemes have [+ATR] vowels (these are the dominant vowels), whereas alternating morphemes have two alternates, one with [+ATR] vowels and one with [-ATR] vowels. When a non-alternating morpheme occurs in a word with an alternating morpheme, the alternating morpheme has [+ATR] vowels. When a word is made up only of alternating morphemes, then all the vowels are [-ATR] (these are the non-dominant or recessive vowels). For example, the root for the verb 'to have', baj/bəj , alternates; it has a [-ATR] vowel when occurring alone or with other alternating morphemes, but has a [+ATR] vowel when occurring with the non-alternating suffix -ul · This is clearly illustrated by the examples in (19):[8]

(19) (baj/bəj 'have', jitum 'lead away', -ɛn/en 'causative', nɪ/ni- 'I', -ʊ/u 'you' (pl. objective, -ul 'towards the speaker'))

a.	[baj]	'have'	f.	[jitum]	'lead away'
b.	[baj]-ɛn	'cause to have'	g.	[jitum]-en	'cause to lead away'
c.	nɪ-[baj]-ɛn-ʊ	'I have caused you to have'	h.	ni-[jitum]-en-u	'I have caused you to be led away'
d.	[bəj]-ul	'have from'	i.	[jitum]-ul	'bring'
e.	ni-[bəj]-ul-u	'I have from you'	j.	ni-[jitum]-ul-u	'I brought you'

[8]All Diola-Fogny data are from Sapir [1965].

This system is clearly very different from Igbo, for here roots as well as affixes alternate. Yet the very same rules which were needed to account for Igbo vowel harmony will account for this system as well. The rules are repeated here for convenience in (20) and sample derivations are given in (21).

(20) Diola Fogny Vowel Harmony[9]

a. $V \rightarrow [+ATR] / \underset{[+ATR]}{V} \; C_0 \; \_\_$

b. $V \rightarrow [+ATR] / \_\_ C_0 \; \underset{[+ATR]}{V}$

(21)

	/nɪ + baj + ɛn + ɔ//baj + ul/		/nɪ + baj + ul + ɔ/
			↓
20a	---	---	nɪ + baj + ul + u
		↓	↓
20b	---	bəj + ul	nɪ + bəj + ul + u
			↓
20b			ni + bəj + ul + u

Thus, the only difference between Diola-Fogny and Igbo vowel harmony is that Diola-Fogny, but not Igbo, has affixes as well as roots with underlying [+ATR] vowels. For example, the Diola-Fogny suffix -ul has an underlying [+ATR] vowel.

4. Summary

Superficially, Diola-Fogny and Igbo have very different vowel harmony systems. According to Aoki's classification, vowel harmony in Igbo and the Uralic and Altaic languages, e.g. Turkish, is *symmetric*, whereas vowel harmony in Diola-Fogny is *asymmetric*. Nevertheless, closer examination of vowel harmony in Igbo and Diola-Fogny reveals that this classification is inadequate. First, Igbo and Diola-Fogny actually have identical vowel harmony rules; the superficial differences are a result of the different distribution of [+ATR] vowels in the two languages. In particular, Diola-Fogny, but not Igbo, has underlying affixes with [+ATR] vowels. Second,

---

[9]Essentially this formulation of Diola-Fogny vowel harmony is proposed by Lightner [1972]. Hall et al. [1974] have shown that this same vowel harmony rule is shared by several Nilotic languages.

the vowel harmony system of Igbo should not be classified with the Uralic and Altaic vowel harmony systems as Aoki suggests. Specifically, in languages such as Finnish, Turkish, and Hungarian, vowel harmony rules are *alpha* (or, following Aoki's terminology, *symmetric*) rules whereas in Igbo, vowel harmony is a *non-alpha* (or *asymmetric*) rule. For example, Turkish vowel harmony can be described as in (22),[10] whereas Igbo (and Diola-Fogny) vowel harmony is described by (23):

(22) Turkish Vowel Harmony [Lightner 1972]

$$V \rightarrow [\alpha back] \; / \; \underset{[\alpha back]}{V} \; C_o \; \_\_$$

(23) Igbo and Diola Fogny Vowel Harmony (mirror image)

$$V \rightarrow [+ATR] \; / \; \underset{[+ATR]}{V} \; C_o \; \_\_$$

[10] Turkish also has roundness harmony for high vowels. It might appear that the Igbo and Diola-Fogny vowel harmony rules differ from Uralic and Altaic rules in another respect. The latter are bidirectional or mirror image rules whereas the former are not. However, the apparent unidirectional nature of Uralic and Altaic vowel harmony rules is probably a result of the paucity of prefixes in these languages. Indeed, under certain circumstances, vowel harmony in Finnish and Turkish, at least, applies right-to-left as well as left-to-right. See Skousen [1975] for a discussion of Finnish examples.

REFERENCES

Abraham, R.C. 1967. *The Principles of Igbo.* Ibadan: Institute of African Studies, University of Ibadan.

Aoki, H. 1968. "Toward a typology of vowel harmony." *International Journal of American Linguistics* 34:142-145.

Bach, E. 1968. "Two proposals concerning the simplicity metric in phonology." *Glossa* 2:128-149.

Clements, G. 1974. "A wave theory of vowel harmony application." Paper presented at the Winter Meeting of the Linguistic Society of America.

Green, M. and G. Igwe. 1963. *A Descriptive Grammar of Igbo.* Berlin: Akademie-Verlag.

Hall, B.L., R.M.R. Hall, M.P. Pam, A. Myers, S. Antell and G. Cherono. 1974. "African vowel harmony systems from the vantage point of Kalenjin." *Afrika und Übersee* 57:241-267.

Halle, M. and K. Stevens. 1969. "On the feature 'Advanced Tongue Root'." *Quarterly Progress Report No. 94,* Research Lab of Electronics, MIT, pp. 209-215.

Ladefoged, P. 1964. *A Phonetic Study of West African Languages.* West African Language Monographs, 1. Cambridge: The University Press.

Lightner, T. 1972. *Problems in the Theory of Phonology, Volume 1: Russian and Turkish Phonology.* Edmonton: Linguistic Research, Inc.

Lindau, M., L. Jacobson and P. Ladefoged. 1972. "The feature Advanced Tongue Root." In Working Papers in Phonetics, no. 22, pp. 76-94. University of California, Los Angeles.

Lord, C. 1975. "Igbo verb compounds and the lexicon." *Studies in African Linguistics* 6:23-48.

Sapir, J.D. 1965. *A Grammar of Diola-Fogny.* West African Language Monographs No. 3. Cambridge: The University Press.

Skousen, R. 1975. *Substantive Evidence in Phonology.* The Hague: Mouton.

Stewart, J.M. 1967. "Tongue root position in Akan Vowel Harmony." *Phonetica* 16:185-204.

Welmers, Wm. 1970. "The derivation of Igbo verb bases." *Studies in African linguistics* 1:49-59.