

VOWEL SANDHI AND WORD DIVISION IN IGEDE¹

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Vowel sandhi occurs in many African languages and poses problems for word division in practical orthographies. For example, Rowlands says that in many Yoruba books it is hard to find two consecutive pages where elision (one kind of vowel sandhi) is written consistently (1954, p. 376). The purpose of this paper is to describe the vowel sandhi processes in Igede (section 1) and to suggest some principles for writing word division involving vowel sandhi with some application of these principles to Igede (section 2).

1. VOWEL SANDHI IN IGEDE

Five types of vowel sandhi occur in Igede: elision, coalescence, compensatory lengthening, tone alternation, and consonant alternation. Elision (the loss of a final vowel) and coalescence (the replacement of two juxtaposed vowels by a third vowel) are primary processes, one of which always occurs when vowel sandhi takes place. Compensatory lengthening (the lengthening of a vowel), tone alternation (the replacement of a tone), and consonant alternation (the replacement of a consonant) are secondary processes which can accompany elision or coalescence. There are instances in which more than one secondary process occurs. Final vowel refers to the first of two juxtaposed vowels and initial vowel refers to the second.

In order to show all instances where vowel sandhi processes occur in Igede, a morphophonemic transcription is adopted here with four types of juncture: hyphen juncture (-), space juncture (space), plus juncture (+), and comma juncture (,). Except for specific orthographic examples in section 2, all Igede examples not between diagonals are morphophonemic or isolation forms, i.e. always give the full morphemic and phonemic form before any vowel sandhi processes take place. Diagonals are used only where it is useful

¹ By vowel sandhi is meant the morphophonemic processes which occur when vowels become juxtaposed in morphology or syntax. The Igede (Egede or Egedde) language is a Kwa language spoken by over 70,000 people in Idoma Division, Benue-Plateau State, (Northern) Nigeria. The author's study of the Igede language has been under the auspices of the Institute of Linguistics (Nigeria), a branch of the Summer Institute of Linguistics, in association with the University of Nigeria, and Ahmadu Bello University. Martin Leigh and Nancy Vie Bergman had a part in the actual field work.

This paper is adapted from an M.A. thesis presented to the Hartford Seminary Foundation entitled 'Vowel Sandhi in Igede and Other African Languages'. The thesis is a typological study which suggests several universal hypotheses about vowel sandhi and some practical principles for word division when there is vowel sandhi. Source material on about sixty African languages was used in the study. Using Greenberg's (1963) classification as a point of reference, all the sources for Kwa languages and many sources for Benue-Congo languages describe considerable vowel sandhi, but the sources for other non-Afroasiatic languages describe very little. Appendices to the thesis include additional phonological material, a text, and the Swadesh lexicostatistical word list. Copies of the thesis will be available at the Hartford Seminary Foundation, University of Ghana, University of Ibadan, and Ahmadu Bello University, Zaria.

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to show the phonemic form which occurs as a result of vowel sandhi, e.g. ha-ɔ /hɔɔ/ 'to give it to him'. The only juncture used between diagonals is plus (+), which marks a phonemic juncture where allophones of vowels occur as the result of coalescence.

Hyphen juncture delimits units within the phonological word. It is used to indicate morphemes which have alternate forms depending upon the vowels or tones of a following or preceding morpheme. For example, the quality of the vowel of the third person singular subjective pronoun is determined by the quality of the following vowel, e.g. *ō-kèle* 'he goes there', *-ɔyèkéké* 'he said'. Either elision or coalescence occurs when vowels are juxtaposed at hyphen juncture.

Space, plus, and comma junctures have been posited to delimit the phonological word and indicate where vowel sandhi processes occur. Elision occurs at space juncture, coalescence occurs at plus juncture, and no vowel sandhi occurs at comma juncture (with an optional phonetic pause). Comma juncture is marked where it actually occurs and not where it is possible for it to occur. The relationship of junctures to vowel sandhi processes is summarized in the following outline:

Juncture types	Vowel sandhi types
	(Morpheme junction) ²
Hyphen	Elision or coalescence
	(Word junction)
Space	Elision
Plus	Coalescence
Comma	None, optional pause

Variations in vowel sandhi processes, which are related to different syntactic constructions and performance, are discussed in section 1.7.

1.1. PHONOLOGY

Following is a brief outline of Igede phonology which must be presented as a basis for the description of the vowel sandhi. The thirty-six consonant phonemes are divided into two groups, neutral consonants and labialized and palatalized consonants, because certain neutral consonants are replaced by the others in consonant alternation. The labialized and palatalized consonants have the same distribution and points of articulation as the corresponding neutral consonants, but occur with a secondary articulation of labialization or palatalization.

NEUTRAL CONSONANTS

Voiceless plosives	p	t	c	k	kp	—
Voiced plosives	b	d	j	g	gb	—
Nasals	m	n	ñ	ŋ	ŋm	—
Lateral	—	l	—	—	—	—
Flap	—	r	—	—	—	—
Semivowels	w	y	—	—	—	h

² Junction is used in this paper to mean simply the juxtaposition of items and is not to be confused with juncture.

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LABIALIZED AND PALATALIZED CONSONANTS

p, c, k, b, j, g, m, ŋ, r, and h occur with labialization as unit phonemes: p^w, c^w, k^w, b^w, j^w, g^w, m^w, ŋ^w, r^w, and h^w, p, b, g, m, r, and h also occur with palatalization as unit phonemes: p^y, b^y, g^y, m^y, r^y, and h^y.

VOWELS

Ten contrastive vowels divide into two vowel harmony sets (see Fig. 1 for a vowel diagram): tense (i, e, ə, o, u) and lax (ɪ, ɛ, a, ɔ, ɔ̃). Any phonological word has all tense vowels or all lax vowels even when the word has more than one morpheme (a small residue of grammatical words have mixed tense and lax vowels, but most of these forms suggest that they have been derived from compound nouns). For example:

Tense		Lax	
okīlēkū	'anteater'	òkulèṭṭ	'chest'
úkpilékù	'door'	ɔhārṭ	'fifth'
ígù	'friendship'	àgà	'hospitality'
òl-ígù	'friend'	òl-àgà	'host'
onjiri	'a vine rope'	ònjuru	'strength'
òkpilṭ	'flint'	òkpìlà	'small wooden basin'
wu	'to catch'	ma	'to bear'
ò-wu-hí	'she-caught-us'	ò-ma-hí	'she-bore-us'
o-wuwu	'catching'	ò-mama	'bearing'

The phonetic difference between the vowel harmony sets in Igede is not only tongue height, but involves a tense/lax³ distinction. This tense/lax distinction has been recently discussed by Ladefoged (1967, p. 43), who says, 'the highest point of the tongue... can be in a given place, but the tongue can be more or less bunched up lengthways (in the anterior [l] posterior dimension)'. When Ladefoged (1964, pp. 39 f.) compares the vowels in Igbo vowel harmony, he says: 'The most striking difference between the vowels in the two sets is that in each case the body of the tongue is more retracted for the vowels of set 2 [lax vowels]'. The crucial difference between tense and lax Igede vowels is similar to what Ladefoged is describing. When observing an Igede informant pronounce **wu** 'to catch' and **wṭ** 'to harvest groundnuts' in sequence, his jaw is noticeably moved back for **wṭ**. Our observations seem to be verified when we imitate the vowel sounds. The tongue is retracted for each of the lax vowels, as compared to the tense vowels. This is especially evident of high vowels in Igede where there does not seem to be any significant difference in tongue height between i and ɪ or u and ɔ̃, but that the difference is only tenseness versus laxness of the tongue. David Sapir has a similar analysis for Dyola and says he is 'unable to detect any significant difference in height' between i and ɪ or u and ɔ̃ (1965, pp. 5, 11 n.).

TONES

Igede has a discrete level tone system with four level tones: high /´/, high-mid /ˊ/, low-mid (unmarked), and low /ˋ/. Each vowel and syllabic nasal occurs with one of these four tones. Over 250 minimal pairs, triplets, quadruplets, and quintuplets have been found,

³ According to Jakobson, Gunnar, Fant and Halle (1963, p. 58), Melville Bell was the first to draw attention to the tense/lax distinction. Ladefoged uses the terms in his discussion of vowel harmony sets in West African languages, but suggests we may need to redefine the terms or return to Sweet's narrow/wide terminology (1964, pp. 36-40).

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involving 30 per cent of the total vocabulary collected (about 2,000 items). The following paradigm illustrates the four contrastive tones.

5-h ^ó lè	'He has washed'
5-h ^ō lè	'He has stayed'
5-h ^ə lè	'He has scattered'
5-h ^ò lè	'It has flown'

SYLLABLES AND WORDS

Phonemes combine to form syllables and phonological words. The syllable consists of V (vowel), CV (consonant, vowel), or N (syllabic nasal), each of which always occurs with a single tone. The word is equated with the vowel harmony unit. N is restricted in its distribution and does not occur preceding V. VV sequences occur within the word, but are always identical vowels.

Nearly all words end with a V or CV syllable and about 50 per cent of the words in a text begin with a V syllable, which means that vowels become juxtaposed at nearly one-half of the word junctions in text material. Of all morpheme and word junctions in a text, vowel sandhi occurs at about 20 per cent of the total junctions.

There are correlations between syntactic classes and the syllable patterns of phonological words. For example, all nouns, numerals, and demonstratives have V as the initial syllable, while all verbs and ideophones have CV as the initial syllable.

1.2. ELISION

A final vowel elides when vowels from the same vowel harmony set become juxtaposed at hyphen juncture, or any vowels become juxtaposed at space juncture, as in the following examples. Compensatory lengthening (see 1.4) always occurs when vowels are juxtaposed at hyphen juncture.

kpa ijū	/kpijū/	'take yams'
dā ēñī	/dēñī/	'to (do) rain'
óbè ɔh ^ō h ^ō	/óbòh ^ō h ^ō /	'thanks for doing'
àka ɔ́wà	/àkɔ́wà/	'that time'
ñā ij ^w ò	/ñij ^w ò/	'of the leopard'
gbè òbí	/gbòbí/	'until evening'
ha-ɔ	/hɔɔ/	'to give to him'
yē-ā	/yāā/	'to see them'

1.3. COALESCENCE

Coalescence occurs when (a) the vowels preceding and following hyphen or plus juncture are from different vowel harmony sets and (b) the preceding phonological unit is monosyllabic. The vowel which results from coalescence has the same tense or lax quality as the final vowel, but the same basic tongue position (high front, high back, mid front, mid back, or central) as the following initial vowel. Two types of coalescence are posited: complete coalescence, where the vowel which results is a high or central vowel phoneme; and partial coalescence, where the vowel which results is an allophone of a mid vowel. The allophones which occur with partial coalescence are shown in square brackets in Fig. 1 and are marked by a dot subscript.

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Complete and partial coalescence are posited because only the mid vowels have allophones which result from coalescence. The high vowels do not have allophones because of the phonetic characteristics of vowel harmony which we have described in section 1.1. The difference between the high vowels *i* and *ɪ* or *u* and *ʊ* is primarily tenseness versus laxness and not tongue height, while the difference between the mid vowels *e* and *ɛ* or *o* and *ɔ* is tenseness versus laxness AND tongue height. Each of the four mid vowels has an allophone of the same tongue height. The central vowels also differ in tongue height but no allophones have been found of either *ə* or *a*. *ə* has a very low frequency and has not been found following hyphen or plus juncture, which may help to explain why allophones of *a* and *ə* do not occur.

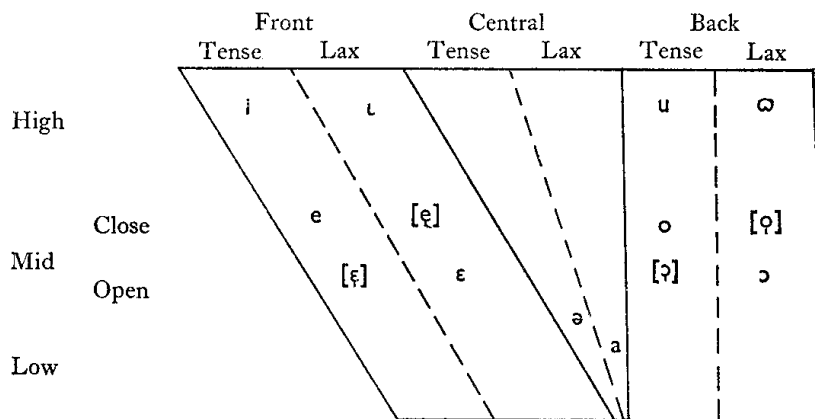


Fig. 1

COMPLETE COALESCENCE

Complete coalescence occurs when a high or central vowel (*i*, *ɪ*, *u*, *ʊ*, *a*) follows hyphen or plus juncture. For example:

- rì + ɔ̄wɛ /rūwɛ/* 'to eat fufu' (tense V plus lax high back V > tense high back V);
- yē + idə /yɪdə/* 'to see oil' (lax V plus tense high front V > lax high front V);
- wú-ā /wáā/* 'to catch them' (tense V plus lax central V > tense central V)

PARTIAL COALESCENCE

Partial coalescence occurs when a mid vowel (*e*, *ɛ*, *o*, *ɔ*) follows hyphen or plus juncture. The vowel which results is an allophone which occurs only with partial coalescence, but nevertheless has the same tense or lax quality as the final vowel and the basic tongue position as the initial vowel. For example, *gbe-ɔ* 'to watch for him' occurs as /*gb + ɔ*/ [gbɔ]. The tense vowel *e* coalesces with the lax vowel *ɔ* and they are replaced by [ɔ], a 'tense' *ɔ*. In contrast to the preceding example, *gba-ɔ* 'to draw it out' (where the vowels are from the same vowel harmony set) occurs as /*gbɔ*/ [gbɔ] with the expected lax quality. Both *gbe-ɔ* and *gba-ɔ* contrast with *gbo*/*gbo*/ 'clearly' so the vowels of [gbɔ] could not be phonemicized as /oo/. In terms of the strictly phonemic transcription between diagonals, the allophones [ɔ], [ɔ], [ɛ] and [ɛ] only occur following plus juncture.⁴

Coalescence occurs only when the phonological unit preceding hyphen or plus juncture

⁴ A similar coalescence process seems to be reported for Telugu, a Dravidian language, where the loss of conditioning vowels through the operation of sandhi processes has created contrasts between [i] and [ɪ] (Bright, 1966, p. 318).

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is monosyllabic. For example, the CV verb *bé* followed by *-a* occurs as /bǎǎ/ 'to chop them' but the CVCV verb *milé* followed by *-a* occurs as /milǎǎ/ 'to swallow them'. Coalescence contrasts with elision and reduces ambiguity with CV verbs in the following examples.

Coalescence:		Elision:	
rì + ǎwε	/rǎwε/	rà ǎwε	/rǎwε/
	'to eat fufu'		'to buy fufu'
yē-ǎ	/yǎǎ/	yē-ǎ	/yǎǎ/
	'to receive it'		'to see it'
wú-ǎ	/wǎǎ/	wǎ-ǎ	/wǎǎ/
	'to catch them'		'to boil them'

In comparison, all the transitive CVCV verbs which we have collected (about 40), include only one pair of verbs which could be ambiguous when occurring with elision. Coalescence is not necessary to reduce ambiguity with CVCV verbs (and any other multisyllabic words) as it is with CV verbs.

1.4. COMPENSATORY LENGTHENING⁵

The rules for the occurrence of compensatory lengthening, which is determined by the tones of the final and initial vowels, are outlined in Table 1. The only exception is that compensatory lengthening always occurs when vowels are juxtaposed at hyphen juncture.

Table 1
Tone of the following initial vowel:

Tone of the final vowel	Tone of the following initial vowel:			
	High	High-mid	Low-mid	Low
High	V̂	V̄V̄	V̂V	V̂V̂
High-mid	V̄	V̄	V	V̂
Low-mid	V	V̄	V	V̂
Low	V̂	V̄	V̂	V̂

When the final vowel has high tone and the initial vowel does not have high tone, elision or coalescence is accompanied by compensatory lengthening, which always consists of a doubling of the initial vowel (see Fig. 2 and the second, third, and fourth examples below); the tones of the final and initial vowels occur with the double vowel. Final vowels with high-mid, low-mid, and low tones are lost along with their tones (the fifth and following examples below), except when a final vowel with low tone precedes a vowel with low-mid tone (the next to the last example, see also section 1.5).

gá ápǎ	/gǎpǎ/	'to sew cloth'
dú ijū	/díijū/	'to harvest yams'
pá omótò	/pǎomótò/	'to drive a vehicle'
bé èkǎ	/béèkǎ/	'to chop a shout (to shout)'
yē éǎmé	/yéǎmé/	'to see kola'
yē ǎbá	/yǎǎbá/	'to see a mat'
yē ǎkpílǎ	/yǎǎkpílǎ/	'to see a female sheep'
yē àkpà	/yǎkpà/	'to see a box'

⁵ Compensatory lengthening is often described as assimilation. We have chosen to use the term compensatory lengthening to describe the process which occurs with either elision or coalescence.

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ha íṭē	/hítē/	‘to give pepper’
ha ɔ́bá	/hɔ́bá/	‘to give a mat’
ha odo	/hodo/	‘to give a yam digger’
ha àkpà	/hàkpà/	‘to give a box’
kà ígēdē	/kígēdē/	‘to go to Igede’
gbà ijū	/gbijū/	‘to take out yam’
tà ɪp̣ʷ	/tìp̣ʷ/	‘to lack sweetness’
kà ùbè	/kùbè/	‘to go into a room’

When a final syllabic nasal is juxtaposed to a vowel, the nasal loses its syllabicity and the vowel can occur with compensatory lengthening according to the same rules, e.g. aṅ ɔ́lɛ ‘this thing’ occurs as /aṅɔ́lɛ/.

1.5. TONE ALTERNATION

Tone alternation occurs at space or plus juncture only when the final vowel has low tone and the initial vowel has low-mid tone, e.g. tà ɪp̣ʷ /tìp̣ʷ/ ‘to lack sweetness’. The low-mid tone is replaced by the low tone.

Some verbs and objective pronouns have alternating tones depending upon whether they are contiguous to hyphen juncture or certain tones. Tone alternation includes instances where vowels and nasals are juxtaposed and vowel sandhi does not occur, but the same rules apply.

TONE ALTERNATION WITH VERBS

(a) All CV̇ verbs become CV preceding hyphen juncture. For example:

kp̣ẉ	>	kp̣ẉ-ɔ	/kp̣ẉ/	‘to satisfy him’
wà	>	wa-a	/waa/	‘to count them’
gbè	>	gbe-m	/gbem/	‘to watch for me’
bì	>	bi-hí	/bihí/	‘to tell us’

(b) Some CV verbs become CV̇ preceding hyphen juncture. For example:

wɔ	>	wɔ́-ā	/wáā/	‘to harvest them’
do	>	dó-ɔ	/d + ɔ́/	‘to abuse him’
yɛ	>	yé-ɔ	/yɔ́/	‘to turn it’
ba	>	bá-m̄	/bám̄/	‘to follow me’

Other CV verbs do not become CV̇. For example:

gba-a	/gbaa/	‘to draw them out’
ɔ-ɔ	/ɔɔ/	‘to cut it’
ha-m	/ham/	‘to give to me’
tɔ-hí	/tɔhí/	‘to meet us’
kpa-ɔ	/kpɔɔ/	‘to carry it’

(c) All CVCV and CV̇CV̇ verbs become CVCV̇ and CV̇CV̇, respectively, preceding hyphen juncture. For example:

burɪ	>	burí-ɔ	/burɔ́/	‘to spoil it’
mile	>	milé-ɔ	/milɔ́/	‘to swallow it’
kórɔ	>	kórɔ́-ɔ	/kórɔ́/	‘to cover it’
mílā	>	mílá-ɔ	/mílɔ́/	‘to hit it’

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TONE ALTERNATION WITH OBJECTIVE PRONOUNS

All objective pronouns (excluding reported speech pronouns) have alternate forms depending upon the tone of the final vowel of a preceding verb. The alternations are outlined in Table 2. \bar{V} is the same as the preceding verb vowel, e.g. há-āhí 'to please us',

Table 2

	Preceding vowel tone		
	/'/	/-/'	//
First singular	-m̄	-m	-m
Second singular	-ŋ̄	-ŋ	-ŋ
Third singular	-ɔ̄	-ɔ	-ɔ
Third plural	-ā	-a	-a
First plural	\bar{V} - hÍ	-hÍ	—
Second plural	\bar{V} - nÚ	-nÚ	—

kórw-āhí 'to conquer us'. I and U are morphophonemes whose phonemic realizations are determined by the vowel harmony set of the preceding vowel, e.g. há-āhí 'to please us', hú-ūhí 'to take us'. The following examples illustrate all the tone alternations outlined in Table 2.

bá-m̄	/bám̄/	'to follow me'
hɔ̄-m̄	/hɔ̄m̄/	'to affect me'
ha-m	/ham/	'to give to me'
bá-ɔ̄	/báɔ̄/	'to follow him'
hɔ̄-ɔ̄	/hɔ̄ɔ̄/	'to affect him'
ha-ɔ	/hɔɔ/	'to give to him'
bá-āhí	/báāhí/	'to follow us'
hɔ̄-hí	/hɔ̄hí/	'to affect us'
ha-hí	/hahí/	'to give to us'

1.6. CONSONANT ALTERNATION

When elision or coalescence occurs, a neutral consonant preceding the final vowel is replaced by a labialized or palatalized consonant as follows: p, c, k, b, j, g, m, ŋ, r, or h is replaced by the corresponding labialized phoneme, e.g. p > p^w, if the final vowel is u or ɔ and the initial vowel is any other vowel; p, b, m, r, or h is replaced by the corresponding palatalized phoneme if the final vowel is i or ɪ and the initial vowel is any other vowel. Consonant alternation occurs with most syntactic constructions and the following examples from verb-nominal and verb-pronominal constructions illustrate where labialization and palatalization occur.

pó ēp ^w ā	/p ^w ēēp ^w ā/	'to reach home'
cō ilā	/c ^w ílā/	'to take (choose) fire'
kó ám̄	/k ^w ám̄/	'to dwell here'
bu ígēdē	/b ^w ígēdē/	'to be from Igede'
jó-ɔ̄	/j ^w ɔ̄ɔ̄/	'to pain him'

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gu ɔ́bá	/g ^w ɔ́bá/	‘to weave a mat’
má ɛ̀kpé	/m ^w ɛ̀ɛkpé/	‘to return back’
ḡḡ ɔ́ḡíńí	/ḡ ^w ɔ́ḡíńí/	‘to kill a person’
rà ámē	/r ^w ámē/	‘to burn grass’
há ápò	/h ^w ápò/	‘to wash clothes’
pí úgbōjì	/p ^y úgbōjì/	‘to squeeze an orange’
bì-ɔ	/b ^y +ɔ/	‘to tell him’
mī ɔ́nó	/m ^y ɔ́nó/	‘to agree-mouth (promise)’
rì·ań	/r ^y àń/	‘to eat something’
hí ókór ^w ó	/h ^y ókór ^w ó/	‘to leave the work’

In the first and seventh examples, consonant alternation can occur at the same place as compensatory lengthening. *bì-ɔ* (*bì* plus *-ɔ*) /b^y+ɔ/ is an example where compensatory lengthening, tone alternation, and consonant alternation occur with coalescence.

One exception to the rules stated above is that *r* followed by *i* or *ɪ* is not replaced by *r^y* preceding high back vowels, or when the *r* is the second consonant of a phonological unit. For example:

rì ùbè	/rùbè/	(it) ‘is a room’
rì + òwε	/rūwε/	‘to eat fufu’
hiri eji	/hireji/	‘to come down on the ground’
turɪ ɔ́nó	/tɪrɔ́nó/	‘to narrate’

One other exception is that *g* is replaced by *g^y* when the verb *gò* ‘to carry many things’ is followed by hyphen or plus juncture, e.g. *gò + ań* /g^yəń/ ‘to carry things’.

1.7. VARIATIONS

The process rules described in the preceding sections apply to most instances when vowels are juxtaposed, but there are variations in the occurrence of vowel sandhi. Variations are correlated with (1) structure, i.e. different morphological and syntactic constructions, and (2) performance, i.e. a speaker’s adherence to the vowel sandhi rules.

The following outline of structural and performance variations is based on seven tape-recorded texts from three adult male informants. A distinction is made between four different morphological and syntactic constructions where vowels become juxtaposed: (a) morpheme followed by another morpheme in the phonological word; (b) verb or particle followed by a noun; (c) words in the noun phrase (including noun plus pronoun and pronoun plus noun); and (d) peripheral clause phrases (introductory, locational, time, manner) preceded or followed by other phrases. All instances where vowels are juxtaposed in the selected texts are counted, and the percentages listed in Table 3 tell how often vowel sandhi does not occur. For example, the texts from Informant B show that

Table 3

	Informant A	Informant B	Informant C
(a) Morpheme plus morpheme	0%	0%	0%
(b) Verb/particle plus noun	3%	4%	3%
(c) Words in noun phrase	12%	7%	19%
(d) Peripheral phrases	81%	78%	77%

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vowel sandhi does not occur at the junction of a verb or particle and a noun 4 per cent of the time. The percentages are not meant to suggest that these are deviations from a norm, but are a means of measuring where and how often vowel sandhi does not occur in a particular corpus.

STRUCTURAL VARIATIONS

The differences in the percentages between (a), (b), (c), and (d) illustrate that there is a difference in variation with different morphological and syntactic constructions. For example, no instances were found where vowel sandhi did not occur at the junction of morpheme plus morpheme within the word. A distinction between internal and external sandhi is useful at this point because vowel sandhi variations do not occur within the phonological word, but do occur between words.

Vowel sandhi almost always occurs at the junction of verbs or particles (including words such as *fi* 'of', *ká* 'that', *balà* 'and') and nouns, but not as consistently at the junction of words in the noun phrase. Moreover, most of the percentages in (b) are the result of instances where a noun follows *balà* 'and'. The high percentages in (d) indicate that the vowel sandhi processes usually do not occur where vowels are juxtaposed preceding or following introductory, locational, manner, or time phrases. For example:

Introductory phrase

ǎka ɔ́wàlè, i-hu ɔ̀tá ɔ́lɛ /ǎkɔ́wàlè/ /ih*ɔ̀táɔ́lɛ/
time then they-took pot this

Locational phrase

ɔ́cɪ rà ijū, í-ihí /ɔ́cɪrijūíihí/
Ochi bought yams in-market

Time phrase

ɛ́nɔ́ mɪ ɛ́nɔ́, ij*ò jì + òwà tó àhà /ɛ́nɔ́m'ɛ́ɛ́nɔ́/ /ij*òjùwàtáàhà/
day finish day, leopard be there sweep travelling

Manner phrase

èhì-jì + òwà jē òjē, íńńíń /èhìjùwàjōjēńńíń/
we-be there telling story similarly

One minor variation which we have not counted in figuring the percentages is that compensatory lengthening, a secondary process, always occurs with (a) and (b) according to the rules we have stated in section 1.4, but sometimes occurs with (c) and (d) regardless of the tones of the juxtaposed vowels. For example:

éjā ɔ̀pì	/éjɔ̀pì/	'clay bowl'
ɛ̀p*ā ɔ̀ñɛñɛ	/ɛ̀p*āɔ̀ñɛñɛ/	'compound exchanging (taxation)'
odo ɔ́lɛ	/odɔ́lɛ/	'this yam digger'
émā ɔ̀tókà	/émɔ̀tókà/	'large knife'
òjè òòkópókó	/òjèòòkópókó/	'one bicycle'
m*ɔ́ ɛ́lā ówà	/m*ɛ́lāówà/	'to argue there'

PERFORMANCE VARIATIONS

The difference in percentages between columns A, B, and C illustrate that there is a difference in variation with different texts or speakers. For example, the junction of words in the noun phrase did not occur with vowel sandhi 7 per cent of the time in the

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texts by informant B, but 19 per cent of the time in the texts by informant C. This variation could be due to factors such as a difference in text material, the context when they were spoken, and the speakers' ability or style. Texts were chosen to control the former two so that the latter would be the main variable. All texts are narratives of fairy tales, history, or personal experience and all were given in the same context of a group of people leisurely sitting around in the evening with different people telling stories.

Performance variations could be stated by positing distinctions between different styles of speech, such as deliberate, normal, and rapid. A frequency statement has been chosen here so that tape-recorded texts could be checked as a basis for statements about variation.

2. PRINCIPLES FOR WORD DIVISION AND WRITING IGEDE⁶

Linguists have suggested useful principles for word divisions based on phonology, morphology, and syntax. The following principles are suggested as supplementary principles which apply where vowel sandhi is involved. We must keep in mind that the final test for writing word divisions is how well the system actually works. Gudschinsky (1958) and Voorhoeve (1962) have reported on practical tests for the writing of tone sandhi in Mazatec (Mexico) and Saramaccan (Surinam), but we do not know of any good experiments on writing word division in a language with extensive vowel sandhi. The rules for Igede suggested here have not been thoroughly tested, but should be of help to those involved in writing languages which have vowel sandhi.

2.1. The most basic choice in writing word divisions where vowel sandhi is involved is how the primary processes of elision and coalescence should be written, i.e. whether to write the elided or full form. In this paper, 'elided form' refers to the spoken phonemic form, e.g. /kpijū/ 'to take yam' and the 'full form' refers to the morphophonemic or etymological form, e.g. kpa ijū.

Some have advocated writing the full form of words every time. Jones (1950, p. 227) says that variants should not be written, but that every word should have a 'definite and easily recognizable visual form'. Others have had the feeling that such a solution is not always the best answer for languages that have considerable vowel sandhi. Vowel sandhi process rules are often extensive and complicated. It does not necessarily follow that all the rules should be reduced to one rule that the full form should always be written. Tucker (1940, p. 321) took this view for Moru-Madi and said, 'It is obvious that some sort of compromise is called for.' Nida emphasizes that there are distinct advantages in preserving the basic form of a word rather than writing it in different ways, but that this is no reason for always adding lost vowels (1954, p. 38). He sets up two requirements for

⁶ For an Igede orthography, we have chosen to write all words with the five vowels of the national language (English) and indicate words with tense vowels by a final h (the only consonant phonemes occurring in final position in words are m and ŋ). Only 16 per cent of the words in text material have tense vowels. The consonants c, ñ and ŋm are written as ch, ny, and nm respectively. The problem of marking tone has not been settled. Orthographic examples in this paper have the same diacritic marks for tone as the phonemic transcription. The following examples illustrate the orthography.

Phonemic:	Orthographic:	
/ɔ̀kílètɔ̀/	òkílètu	'chest'
/okilèkū/	okilèkūh	'ant eater'
/ʃhā/	ōhū	'air'
/ōhū/	ōhūh	'cold'

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writing elided vowels: (a) that their automatic loss is in easily definable positions and (b) that the speakers of the language insist that such vowels should be added. The latter criterion is one that demands careful testing and evaluation, and to our knowledge, no one has ever done this.

After working two years on Igede with literate and illiterate informants, we came to the conclusion that the full form of words usually needs to be written, but that to write the full form always is not the best answer. For example, *kà ɛp^wā/kèp^wā/* 'to go home' is an extremely common collocation and the elided form is much preferred by informants. Other common collocations which informants prefer to write together include *yē āhō /yāhō/* 'to get a wife (marry)', *kpa ólō /kpólō/* 'to carry a load', *turɛ ěkpé /turĕkpé/* 'to return back', *wule eji /wuleji/* 'to stand up', *āñū adūdā/āñadūdā/* 'paternal sibling', and *òhè òlùh^yè /òhòlùh^yè/* 'god above'. We have tentatively written these *kèpwā*, *yāhū*, *kpólōh*, *tirĕkpé*, *ānyadidā*, and *òhòlùhyèh*.

Some verb plus object collocations form a new phonological word. For example, the vowel of the third singular pronoun, *ō-/ō-*, occurring with *yē āhō* 'to get a wife', does not harmonize with *yē* but with *āhō* as */ōyāhō/*.

2.2. Secondary vowel sandhi processes should be indicated in a writing system. For example, the compensatory lengthening in Igede should be indicated by writing the full form or by writing vowel length in the elided form to avoid ambiguity with forms which do not occur with compensatory lengthening. If *kpó ijū /kpíijū/* 'to boil yam' is written in the elided form, it should be written as *kpíijūh* and not as *kpíjūh*.

This principle has been applied to Igede in the following rules. (a) Vowels in final position with high tone result in compensatory lengthening, so all words ending with a high tone are written in the full form, e.g. *há unāñ /húnāñ/* 'to please my mother' is written as *há ināñ*. (b) High vowels in final position result in consonant alternation, so all words ending in a high vowel are written in the full form, e.g. *mī ōnó /m'ōnó/* 'to agree-mouth (promise)' is written as *mī ōnú*.

2.3. Internal and external sandhi differences must be considered and a similar difference may need to be reflected in the writing system. For example, we find in Igede that vowel sandhi within the word is different from vowel sandhi between words in the noun phrase. Within words (at hyphen juncture), compensatory lengthening always occurs when vowels are juxtaposed (section 1.4), certain tone alternations are different (section 1.5), and vowel sandhi processes do not vary (section 1.7).

In Igede, we write the elided form when a verb is followed by an objective pronoun. The internal vowel sandhi and the fact that objective pronouns are phonologically dependent upon the verb in other ways support this decision. For example, *ha-ɔ* 'to give it to him' is written as *hoo*. A compromise has been made when the verb form has a final high vowel which results in consonant alternation. *mɔ-ɔ* /m'ɔɔ/ 'to be sufficient for him' has been written as *mio* rather than *myoo* to preserve the free form of the verb *mɔ*. This compromise may well be a mistake because it is inconsistent with how we write all other internal sandhi, and informants find it difficult to learn.

2.4. Where vowel sandhi does not usually occur, the full form should always be written. For example, in Igede the junction of the peripheral phrase with another phrase may occur with elision, but usually does not (section 1.7), giving evidence that the full form should always be written.

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2.5. The whole orthographic system must be considered when decisions on word division are made. For example, if tone is not marked in an orthography, it may be best to write the full form in many more instances. In Igede, *wo* ɔ́táàkōm̄ 'to peel cassava' occurs as /wɔ́táàkōm̄/ and *wù* ɔ́táàkōm̄ 'to dig cassava' occurs as /wòtáàkōm̄/. If tone is not marked in Igede, the elided forms would be ambiguous.

The problem of whether to write the elided or full form is complicated by various orthographic deficiencies. Tone and vowel length have been frequently omitted in African orthographies.

REFERENCES

- Bright, William (1966). 'Dravidian metaphony', *LANGUAGE*, vol. XLII, pp. 311-22.
- Greenberg, Joseph H. (1963). *THE LANGUAGES OF AFRICA*. IJAL, Vol. 29, no. 1, Part II.
- Gudschinsky, Sarah C. (1958). 'Native reaction to tones and words in Mazatec', *WORD*, vol. XIV, pp. 338-45.
- Jakobson, Roman, Fant, Gunnar C. and Halle, Morris (1963). *PRELIMINARIES TO SPEECH ANALYSIS*, 4th ed. Cambridge, Massachusetts: M.I.T. Press.
- Jones, Daniel (1950). *THE PHONEME: ITS NATURE AND USE*. Cambridge: Heffer.
- Ladefoged, Peter (1964). *A PHONETIC STUDY OF WEST AFRICAN LANGUAGES*. West African Language Monographs, no. 1. Cambridge University Press.
- Ladefoged, Peter (1967). *LINGUISTIC PHONETICS*. Working Papers in Phonetics, no. 6. Los Angeles: Phonetics Laboratory, University of California. (Preliminary version for comment and criticism.)
- Nida, Eugene A. (1954). 'Practical limitations to a phonemic alphabet', *THE BIBLE TRANSLATOR*, vol. v, pp. 35-9, 58-62.
- Rowlands, E. C. (1954). 'Word junction in Yoruba', *BSOAS*, vol. XVI, pp. 376-88.
- Sapir, David J. (1965). *A GRAMMAR OF DIOLA-FOGNY*. West African Language Monographs no. 3., Cambridge University Press.
- Tucker, A. N. (1940). *THE EASTERN SUDANIC LANGUAGES*, vol. 1. Oxford University Press.
- Voorhoeve, J. (1962). 'Some problems in writing tone', *THE BIBLE TRANSLATOR*, vol. XIII, pp. 34-8.