

TOWARDS A TYPOLOGY OF COALESCENCE

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This paper argues for the recognition of four distinct types of coalescence, namely, (i) coalescence by assimilation, found in Xhosa, Zulu, Swahili, Owon Afa, Gbe, etc; (ii) coalescence by merger, reported for Tswana and Yatye; (iii) coalescence by polarisation, shown to occur in contemporary Standard Yoruba as well as in Abua; and (iv) coalescence by dissimilation, which has actually not been reported for any human language so far, and therefore remains for now as a theoretical possibility only. The traditional input condition on coalescence is modified in the light of new findings, while some of the issues requiring further work and/or discussion are highlighted. Finally, the paper argues for the continued retention of the term coalescence in linguistics.

La présente étude montre qu'il faudrait reconnaître quatre types différents de coalescence, à savoir: (i) coalescence par assimilation, ce qui est le cas en Xhosa, Zulu, Swahili, Owon Afa, Gbe, etc; (ii) coalescence par fusion, comme on l'a rapporté pour le Tswana et le Yatye; (iii) coalescence par polarisation, comme nous le montrons pour le Yoruba standard contemporain et l'Abua; et (iv) coalescence par dissimilation, ce qui n'a pas encore été documenté et reste donc pour le moment une simple possibilité théorique. A la

lumière des données nouvelles on propose une modification des conditions traditionnelles propices à la coalescence tout en insistant sur les points qui demandent plus de recherche et/ou de discussion. Enfin l'étude plaide pour le maintien du terme coalescence en linguistique.

0. INTRODUCTION

Coalescence¹ (also known as contraction or fusion) occurs when two linguistic units, which may or may not be distinct, end up being replaced in specific contexts by a third distinct unit of the same general kind. The linguistic units most commonly affected by the process are phonological segments, particularly vowels and consonants, and, as a general rule, such segments must be contiguous for the process to apply, as indicated in rule (1)

1. Coalescence:

$\text{Unit}_1 (+) \text{Unit}_2 \rightarrow \text{Unit}_3$

Condition:

(a) + represents word/morpheme boundary

(b) $\text{Unit}_1 / \text{Unit}_2 \neq \text{Unit}_3$

A well known example is the Swahili case shown in:

2. $a + i \rightarrow e$

In this particular example, the two phonological segments that get replaced are vowels, and the new unitary segment that replaces them is itself also a vowel, though of a different quality.

There is controversy in the literature regarding how coalescence is actually brought about in natural language. One school of thought holds, as in Maddieson (1972) and Aoki (1974), that the phenomenon represents no more than the end result of applying the thoroughly familiar and very traditional segmental rules of (partial or reciprocal) assimilation and deletion in that order. Thus, the Swahili case cited above would under that view be considered as having been derived as follows:

3.	Underlying form	$a + i$
	Assimilation	$a + e$
	Deletion	$\emptyset + e$
	Surface form	[e]

The other school of thought for its part maintains, as in Stahlke (1976), that coalescence is brought about by a phonological transformational rule which in effect merges appropriate features of input segments. Under this view, the Swahili output vowel [e] represents the merger of the frontness of /i/ and the non-high feature of /a/, among others.

Given the facts now available on the phenomenon of coalescence, however, it would appear that neither side in the controversy is, strictly speaking, either right or wrong. This is because such facts seem to show clearly that some languages allow for one of the two competing methods or strategies of effecting coalescence, some others allow for the other, while, as will be shown below,

still others allow for neither. The result of this is that there is not just one way of bringing coalescence about in natural language, as the controversy seems to presuppose, but several. Each such way is considered in this paper as portraying a specific type of coalescence and will be discussed and illustrated below.

1. COALESCENCE BY ASSIMILATION

The facts of Xhosa as reported by Aoki (1974) lend very strong and, in the present writer's opinion, unequivocal empirical support to the view that coalescence consists in first assimilating one of two contiguous segments to the other and then deleting one of them. In that language changes like the ones exemplified below regularly occur:

- | | | | | |
|--------|--------------|---------------|------------|------------------------|
| 4. (i) | a + a --> a | /aʔa + akhi/ | [aʔakhi] | 'builders' |
| (ii) | a + e --> e | /aʔa + enzi/ | [aʔenzi] | 'doers' |
| (iii) | a + o --> o | /aʔa + oni/ | [aʔoni] | 'wrong doers' |
| (iv) | i + a --> a | /ndi + akha/ | [ndakha] | 'I build' |
| (v) | i + e --> e | /ni + enza/ | [nenza] | 'you make' |
| (vi) | i + o --> o | /ni + oja/ | [noja] | 'you roast' |
| (vii) | a + i --> e | /wa + inkosi/ | [wenkosi] | 'of the chiefs' |
| (viii) | a + u --> o | /wa + umfazi/ | [womfazi] | 'of the woman' |
| (ix) | u + i --> wi | /umntu + ini/ | [emntwini] | 'person'
(locative) |
| (x) | o + i --> we | /isilo + ini/ | [esilweni] | 'animal'
(locative) |

Examples (4i-vi) illustrate simple vowel deletion. They show that in Xhosa the first of two juxtaposed vowels regularly gets deleted. The next set of examples, (4vii-viii), illustrate coalescence, while (4ix-x) exemplify glide formation.

Now consider example (4x) in particular. It very clearly could only have come about as follows:

- | | | | |
|----|---------------------|-------|--|
| 5. | Underlying Form | o + i | |
| | Height Assimilation | o + e | |
| | Glide Formation | w + e | |
| | Surface Form | [we] | |

This derivation suggests that the two cases of coalescence in (4vii - viii) must, for their part, have been brought about as in

- | | | | |
|----|---------------------|-------|-------|
| 6. | Underlying Forms | a + i | a + u |
| | Height Assimilation | a + e | a + o |
| | Vowel Deletion | ə + e | ə + o |
| | Surface Forms | [e] | [o] |

In other words, example (4x) suggests that coalescence is achieved in Xhosa by applying the two independently motivated rules of height assimilation and vowel deletion in that order.

Notice that, as it would seem, the type of coalescence seen in (4vii-viii) cannot be satisfactorily accounted for other than as above. More specifically, it cannot be accounted for by means of

phonological transformational rules. To see this, observe that in any principled account of the Xhosa data in (4), the change from /i/ to /e/, seen in both (4vii) and (4x), must be explained in the same way, as otherwise a significant generalisation would be missed. If, in an attempt to capture that generalisation, one applies a phonological transformational rule of coalescence to (4vii,viii,x), partially reproduced below, respectively, as

7. (i) a + i --> e
 (ii) a + u --> o
 (iii) o + i --> we

the result would actually be as shown in:

8. (i) a + i --> e
 (ii) a + u --> o
 (iii) o + i --> *e

As shown by asterisk, one of the outputs of such a transformational rule would be ill-formed, and there would be no principled way to correct or improve it, as the only segment that could be used to effect the desired correction would have been irretrievably destroyed by the transformation.

Some other languages which appear to display the Xhosa type of coalescence, to be known here as coalescence by assimilation, are Zulu (Jordan, 1967:133; Westermann and Ward, 1957:130), Swahili (Welmers, 1973:45), Owon Afa (Awobuluyi, 1972), Kasem (Chomsky and Halle, 1968:360), Obolo (Faraclas, 1982:72), and Gbe (Capo, 1985:21).

2. COALESCENCE BY MERGER

Compelling as the above Xhosa case may be, however, it in no way constitutes justification for treating every other case of coalescence as involving assimilation followed by deletion². This is because there actually exist natural languages in which coalescence simply cannot be handled in that way, but must instead be accounted for in some other fashion. One particularly clear example of such languages is Tswana, where, as Stahlke (1976) reports, changes like the ones shown below regularly occur:

9. (i) -bopa 'mould' -bopiwa/-botšwa 'be moulded'
 (ii) -tihaba 'stab' -tihabiwa/-tihajwa 'be stabbed'
 (iii) -lefa 'pay' -lefiwa/-lešwa 'be paid'
10. (i) p + i --> tš
 (ii) b + i --> j
 (iii) f + i --> š

Considering that the output segments featured in these examples, as highlighted in (10) for the reader's convenience, are all palatal in quality, the temptation might easily arise to account for all of them by means of a segmental rule of assimilation followed directly by that of deletion, as in the following derivation:

11.	Underlying Form	p + i	b + i	f + i
	Palatalisation	tš + i	j + i	š + i
	Deletion	tš + ø	j + ø	š + ø
	Surface Form	[tš]	[j]	[š]

There would, however, be serious objections to this proposed way of deriving the output segments in question. As Stahlke (1976:47) quite rightly observes:

'...the palatalization rule [involved in (11)] is about as unnatural a rule as can be imagined. Not only can it not involve assimilation, since there is no articulatory resemblance between labial consonants and palatal vowels, but in just those cases where we would most expect to find articulatory assimilation, that is, with alveolars and velars there is no palatalization. Thus, the palatalization rule is exactly the inverse of what one would expect a palatalization rule to be, palatalizing labials but not palatalizing articulatorily adjacent segments.'

The explanation represented by (11) would not merely be highly implausible for Tswana, it would actually be disproved by additional data of the following kind from that same language:

12. (i) kolob + yane--> kolojwane 'piglet'
 (ii) mogop + yana--> mogotšwana 'small bowl'
 (iii) marôph + yaba--> marôtšhwana 'small blisters'
 (iv) gauf + yane--> gautšhwane 'fairly nearby'
13. (i) b + y --> jw
 (ii) p + y --> tšw
 (iii) ph + y --> tšhw
 (iv) f + y --> tšhw

The output segments involved here, which are displayed more clearly in (13), are not consonant clusters but complex unitary segments. Thus, [tšhw], produced from combinations of either /ph + y/ or /f + y/, is an aspirated, labialised, palato-alveolar voiceless affricate. If the palatal quality of the complex segment is explained by the palatal glide /y/, the same thing very clearly cannot be said of its qualities of labialisation and aspiration. The latter appear very clearly to come from /ph/ or /f/, as the case may be. This being so, it can justifiably be said that each of the input segments contributes to the feature complex that makes up the corresponding output segment. In which case, the latter can rightly be considered as representing a merger of the relevant features of the corresponding input segments.

Traditional segmental rules of the type used for Xhosa cannot convincingly be employed to effect mergers of the type under consideration; only phonological transformational rules can. Hence, in addition to the variety of coalescence found in Xhosa and many other languages, it is necessary to recognise another variety of the phenomenon which involves the merger of features and can only be accounted for by means of phonological transformational rules. That variety of the phenomenon, here called coalescence by merger, occurs in Tswana and Yatye (a Benue -Congo

language), as data cited and discussed in Stahlke (1976) indicate. Chances are that it occurs in still other languages also on which there is currently no information.

3. COALESCENCE BY POLARISATION

The cases of coalescence reported and discussed in earlier literature up till fairly recently would each appear to fall easily under one or the other of the two varieties of coalescence discussed so far in the present paper. Not so, however, with the case to be considered next.

3.1 THE STANDARD YORUBA CASE

In contemporary Standard Yoruba³ combinations of vowels in lexically governed contexts are observed to get replaced by unitary rounded vowels in a manner reminiscent of vowel coalescence in other languages. Thus consider:

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|---------------------------|-----|------------------------------------|
| 14. (i) <i>ìše kí ìše</i> | --> | <i>ìšekúše</i> ⁴ |
| acting any acting | | 'wayward, unapproved
behaviour' |
| (ii) <i>ibi ìsù</i> | --> | <i>ibùsù</i> |
| place sleeping | | 'bed' |
| (iii) <i>a rí ogbó</i> | --> | <i>arúgbó</i> |
| agent see old-age | | 'an old person' |
| (iv) <i>ò ša ògbó</i> | --> | <i>òšùgbó</i> |
| agent pick ogbo | | 'a member of the
oşugbo cult' |
| (v) <i>dá ɔkpé</i> | --> | <i>dúkpe</i> |
| offer thanks | | 'give thanks' |
| (vi) <i>ogú éjì</i> | --> | <i>ogójì</i> |
| twenty two | | 'forty' |
| (vii) <i>ogú éta</i> | --> | <i>ɔgóta</i> |
| twenty three | | 'sixty' |
| (viii) <i>ogú àrùú</i> | --> | <i>ɔgórùú</i> |
| twenty five | | 'one hundred' |

The vowels believed to be involved in coalescence in the above examples and the results produced are, respectively, as follows:

- | | |
|-------------------------------|------------------------------|
| 15. (i) <i>i + i --> u</i> | (v) <i>a + o --> u</i> |
| (ii) <i>i + i --> u</i> | (vi) <i>ũ + e --> o</i> |
| (iii) <i>i + o --> u</i> | (vii) <i>ũ + ɛ --> ɔ</i> |
| (iv) <i>a + o --> u</i> | (viii) <i>ũ + a --> ɔ</i> |

Now, observe that these phonetic changes cannot be accounted for by means of segmental rules of assimilation and deletion⁵. In particular, that strategy, which was successfully employed for Xhosa earlier, is completely ineffective for:

- | | |
|-------------------------------|----------------------------|
| 15. (i) <i>i + i --> u</i> | (iv) <i>a + o --> u</i> |
| (ii) <i>i + i --> u</i> | (v) <i>a + ɔ --> u</i> |

Thus, since neither of the two input segments involved in (15i-ii) contains the feature [+rounded], there is just no way by which one of the segments could acquire it from the other by assimilation. Similarly for the feature [+high] in the case of the two sets of input segments in (15iv-v).

The strategy involving the merging of features employed for Tswana earlier is similarly ineffective for these same cases. As common sense would suggest, only features which are physically present in input strings can be merged. But since the feature [+rounded] is not physically present anywhere in the two sets of input segments in (15i-ii), it is clear that no amount of merging could ever make it surface, as necessary, in the corresponding output segment. The same thing goes for the feature [+high] in the remaining two examples.

Careful study of the relevant data has now shown that vowel coalescence in contemporary Standard Yoruba seems to require the reversal or polarisation of the specification for the feature [-rounded] or [-high] as it occurs in each second input segment. The rules which appear to accomplish this can be formulated (in transformational format⁶) as follows:

16. Roundness Polarisation

$$\begin{array}{rcl}
 \text{SD [+ syll]} & & \\
 1 & & \begin{bmatrix} + \text{ syll} \\ - \text{ rounded} \\ \propto \text{ high} \end{bmatrix} \\
 & & 2 \\
 \text{SC: } 1 \ 2 \ \rightarrow & \begin{bmatrix} 1 \\ \emptyset \end{bmatrix} & \begin{bmatrix} + \text{ syll} \\ + \text{ rounded} \\ \propto \text{ high} \end{bmatrix}
 \end{array}$$

17. Height Polarisation:

$$\begin{array}{rcl}
 \text{SD [+ syll]} & & \\
 1 & & \begin{bmatrix} + \text{ syll} \\ + \text{ rounded} \\ - \text{ high} \end{bmatrix} \\
 & & 2 \\
 \text{SC: } 1 \ 2 \ \rightarrow & \begin{bmatrix} 1 \\ \emptyset \end{bmatrix} & \begin{bmatrix} + \text{ syll} \\ + \text{ rounded} \\ + \text{ high} \end{bmatrix} \\
 & & 2
 \end{array}$$

The first of these two rules says, among other things, that the feature [-rounded] in second input segments invariably gets converted to [+rounded] for corresponding output segments. The rule thereby accounts for the changes seen in:

- | | | |
|-----|----------------|------------------|
| 15. | (i) i + i → u | (vii) ũ + ɛ → ɔ |
| | (ii) i + i → u | (viii) ũ + a → ɔ |
| | (vi) ũ + e → o | |

Because the vowel /u/ does not occur word initially in contemporary standard Yoruba, the only [+rounded] second input vowels found in the data under consideration are also [-high].

The second rule above polarises the specification for this latter feature in addition to doing other things, and in that way accounts for:

15. (iii) $i + o \rightarrow u$ (v) $a + o \rightarrow u$
 (iv) $a + o \rightarrow u$

The above two rules between them account without exception for the genuine cases of vowel coalescence that generations of Yoruba scholars have so far identified in the language.⁷

3.2 THE ABUA CASE

As one would expect, the type of coalescence said here to occur in contemporary standard Yoruba is by no means peculiar to that language. It seems to occur in other languages as well. Thus, consider the following phonetic changes reported for Abua⁸ by Pike (1966: 116):

18. (i) $o + i \rightarrow u$
 (ii) $a + i \rightarrow u$

Under the popular view that the vowel /a/ is [+back], one would easily be tempted to account for these changes by invoking backness assimilation followed immediately by deletion, as in the following sample derivation:

- | | | |
|-----------------------|-----------------|-----------------|
| 19. Underlying Form | $o + i$ | $a + i$ |
| Backness Assimilation | $o + u$ | $a + u$ |
| Vowel Deletion | $\emptyset + u$ | $\emptyset + u$ |
| Surface Form | [u] | [u] |

However, there are reasons for doubting the validity of this kind of derivation, particularly as it relates to the combination /a + i/. In the first place, many West African languages featuring five or seven oral vowel systems (like Abua and Yoruba, respectively) and displaying only open syllables typically resyllabify consonant-final loanwords by epenthesis word-final vowel /i/ or /u/ to the consonants concerned. In many cases, the choice between these two vowels depends on the nature of the consonants involved, with labial consonants selecting /u/ and non-labials selecting /i/. In other cases, however, the choice is influenced by the nature of the vowel immediately preceding the consonants, such that [+back] vowels select /u/, while [-back] vowels select /i/.

Thus, in contemporary standard Yoruba, for example, we have the following English loanwords among many others:

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|--|---------------|--|--------|
| 20. $\acute{s}\acute{o}\grave{o}b\grave{u}/\ast\acute{s}\acute{o}\grave{o}b\grave{i}$ | 'shop' | $p\acute{a}\grave{a}s\grave{i}/\ast p\acute{a}\grave{a}s\grave{u}$ | 'pass' |
| $f\acute{a}\grave{a}b\grave{u}/\ast f\acute{a}\grave{a}b\grave{i}$ | 'valve' | $k\acute{a}\grave{a}d\grave{i}/\ast k\acute{a}\grave{a}d\grave{u}$ | 'card' |
| $s\acute{i}k\acute{a}\grave{a}f\grave{u}/\ast s\acute{i}k\acute{a}\grave{a}f\grave{i}$ | 'scarf' | $b\acute{a}\grave{a}t\grave{i}/\ast b\acute{a}\grave{a}t\grave{u}$ | 'bat' |
| $b\acute{u}\grave{u}k\grave{u}/\ast b\acute{u}\grave{u}k\grave{i}$ | 'book' | $f\acute{e}\grave{e}l\grave{i}/\ast f\acute{e}\grave{e}l\grave{u}$ | 'fail' |
| $k\acute{o}\grave{o}t\grave{u}/\ast k\acute{o}\grave{o}t\grave{i}$ | 'coat, court' | $b\acute{e}\grave{e}d\grave{i}/\ast b\acute{e}\grave{e}d\grave{u}$ | 'bed' |
| $r\acute{e}k\acute{o}\grave{o}d\grave{u}/\ast r\acute{e}k\acute{o}\grave{o}d\grave{i}$ | 'record' | | |

As can be observed in these examples, word-final vowel /u/ is never selected when the vowel in the syllable immediately preceding the consonant in the indigenized word is /a/, whereas it is

the consistent choice whenever a [+back, + rounded] vowel occurs preceding the consonant concerned. Facts such as these, which hold true not just for Yoruba alone but for very many other typologically similar West African languages as well, show that having the feature [+back] is simply not sufficient to render the vowel /a/ capable of inducing /i/ to become /u/ in situations calling for assimilation.⁹

Secondly, in those African languages that are known to feature coalescence by assimilation, the sequence /a + i/ never yields /u/. Instead, it always yields either [e], as in Xhosa (Aoki, 1974; Jordan, 1967:133), Zulu (Jordan, 1967:133; Westermann and Ward, 1957:130), Swahili (Welmers, 1973:45), and Obolo (Faraclas, 1982:72); or [ɛ], as in Ọwọ́n Afa (Awobuluyi, 1972) and dialects of Gbe (Capo, 1985:21); or, as the final possibility reported so far in the literature, [æ], as in Kasem (Chomsky and Halle, 1968:360). That Abua does not behave like these other African languages shows that it does not belong in their group, and would therefore constitute a highly visible and obtrusive exception if forced to be there. By contrast, with contemporary Standard Yoruba as described above, it would find nothing but thoroughly congenial company.

Given these considerations, it is here suggested that the facts of Abua presented in (18) above would seem better and more accurately accounted for as a case of coalescence by polarisation; that is, as one in which the feature [-rounded] in first or second input vowels, as the case may,¹⁰ is polarised to [+rounded], exactly as in Standard Yoruba. The derivation here envisaged for the segments concerned could take the following form, depending on details of Abua not available to this writer.

21. Underlying Form	o + i	a + i
Roundness Polarisation	o + u	a + u
Vowel Deletion	ø + u	ø + u
Surface Form	[u]	[u]

If the account of contemporary Standard Yoruba as well as of Abua just given is correct, as all available evidence suggests is the case at least for Yoruba, it follows that yet another variety of coalescence must be recognised as being actually operative in some natural languages, namely, the variety referred to above as coalescence by polarisation. It has so far been found to operate only in the two languages examined in the present section of this paper, and it is left for future research to determine its precise incidence among human languages.

4. COALESCENCE BY DISSIMILATION

Coalescence by assimilation and coalescence by polarisation are actually not as dissimilar as they may at first appear to be. As has already been made clear, coalescence by polarisation is effected largely by changing or reversing the specifications for specific features. Now, this is what actually happens also when coalescence by assimilation takes place, as can be seen from the following reformulation (in segmental format) of the Swahili case cited at the beginning of this paper:

22. Height Assimilation:

$$\begin{bmatrix} + \text{syll} \\ + \text{high} \\ - \text{back} \end{bmatrix} \rightarrow \begin{bmatrix} + \text{syll} \\ - \text{high} \\ - \text{back} \end{bmatrix} \bigg/ \begin{bmatrix} + \text{syll} \\ - \text{high} \end{bmatrix} ___$$

(i $\rightarrow$ e/a $___$)

23. Vowel Deletion:

$$\begin{bmatrix} + \text{syll} \\ - \text{high} \end{bmatrix} \rightarrow \emptyset / ___ \begin{bmatrix} + \text{syll} \\ - \text{high} \\ - \text{back} \end{bmatrix}$$

(a $\rightarrow$ $\emptyset$ / $___$ e)

The practical effect of assimilation, as can be seen in (22), is to alter or reverse the specification for the feature [high] in the segment undergoing change, in much the same way that the specification for features gets reversed when polarisation takes place.

As it turns out, assimilation and polarisation are not the only phonological processes which have the practical effect of reversing the specification for features in segments. Dissimilation has precisely that same effect also. That being the case, one would expect it to be also possible to achieve the effect of coalescence by dissimilating necessarily identical adjoining segments; that is, by reversing the specification for some feature displayed by one of such segments. Thus, assuming a dissimilatory process which affects the feature [round] in a seven-oral-vowel system much like the one found in Standard Yoruba, the following are the changes to be expected:

- | | |
|-------------------------------|-----------------------------|
| 24. (i) i + i $\rightarrow$ u | (v) ɔ + ɔ $\rightarrow$ ɛ |
| (ii) e + e $\rightarrow$ o | (vi) o + o $\rightarrow$ e |
| (iii) ɛ + ɛ $\rightarrow$ ɔ | (vii) u + u $\rightarrow$ i |
| (iv) a + a $\rightarrow$ ɔ | |

Prior to the discovery of the major principle (of feature polarisation) governing coalescence in contemporary Standard Yoruba and Abua, changes of the type set out above would have been completely unthinkable. Now, however, that we seem better informed, they appear easily imaginable. But whether the variety of coalescence concerned, which has been referred to here as coalescence by dissimilation, actually occurs in any natural language is not currently known. For now, therefore, it remains only as a theoretical possibility to be either confirmed or disconfirmed by future research.¹¹

5. INPUT CONDITIONS ON COALESCENCE

Four varieties of coalescence have now been identified, namely, (i) coalescence by assimilation, (ii) coalescence by merger, (iii) coalescence by polarisation, and (iv) coalescence by dissimilation. None of these four varieties of the phenomenon, it should be noted, can be merged with the others in a bid to achieve greater economy in the classification being proposed. This is so

because, as already seen, the rules required for deriving them differ. The input conditions required by those rules, too, differ to some extent.

On this latter criterion of the kinds of input segments they permit, the four varieties of coalescence under consideration subdivide into two, namely, coalescence by assimilation and coalescence by merger on the one hand, and coalescence by polarisation and coalescence by dissimilation on the other. Coalescence by assimilation and coalescence by merger each require input segments that are phonetically distinct. Being the only varieties known hitherto in the literature, as observed earlier, it comes as no surprise that they directly inspired the traditional view, as in (Crystal, 1980:65), that the inputs of coalescence necessarily must be distinct, as in the following rule, which should be compared with rule (1) above:

25. Coalescence (Traditional Formulation):

Unit₁ (+) Unit₂ --> Unit₃

Conditions:

(a) + represents word/morpheme boundary;

(b) Unit₁ ≠ Unit₂ ≠ Unit₃

What has to be borne in mind concerning condition (b) in the above rule, however, is that the condition is no more than a function of the specific processes employed for bringing about the particular varieties of coalescence concerned. In other words, the condition is necessary only because the derivational strategies that work for the types of coalescence concerned require it. And they require it for practical rather than theoretical reasons. Specifically, the two input segments required for coalescence by assimilation just have to be phonetically distinct, as otherwise there would be no role at all for assimilation to play in any effect or influence such segments might exert on each other. Similarly, in the case of coalescence by merger, the required input segments have to be phonetically distinct for their features to be combined to form a third distinct segment. In other words, if the two segments are non-distinct, there is no way in which their individual features can be shuffled and merged to produce a new phonetically distinct segment.

This finding suggests the possibility that some hitherto unknown types of coalescence which are not produced as in the case of the two types just considered may for that reason require input conditions that are different from those required by the latter. As will be seen directly below, this is not a mere possibility but a reality.

Unlike the two types of coalescence considered above, coalescence by polarisation and coalescence by dissimilation do not require distinct input segments. There is nevertheless a clear difference between them in this regard; for while the input segments required for coalescence by dissimilation cannot be distinct (cf.(24) above), the ones required for coalescence by polarisation can, but need not, be distinct (cf.(15) above).

Once again, as in the case of two varieties looked at earlier, the specific condition that must be imposed on input segments for coalescence by dissimilation and coalescence by polarisation is a direct function of the type of rules needed for producing them. Thus, take the case of coalescence by dissimilation. It is clear that if its inputs were distinct to start with, there would be nothing for the rule of dissimilation to do to make such distinct segments dissimilar. In the case of coalescence by polarisation, the relevant rule always operates directly on only one of the two input segments fed into it, and its operation on that particular segment is never in any way constrained by anything present in the other input segment. Proof of this is that, in the Abua case considered earlier, for instance, the desired output segment would be produced regardless of how vowel deletion is ordered in relation to polarisation, as seen in (26-27):

26.	Underlying Form	a + i
	Roundness Polarisation	a + u
	Vowel Deletion	∅ + u
	Surface Form	[u]
27.	Underlying Form	a + i
	Vowel Deletion	∅ + i
	Roundness Polarisation	∅ + u
	Surface Form	[u]

Compare the above derivations with the following for Swahili:

3.	Underlying Form	a + i
	Assimilation	a + e
	Deletion	∅ + e
	Surface Form	[e]
28.	Underlying Form	a + i
	Deletion	∅ + i
	Assimilation	---
	Surface Form	[*i]

It seems clear from these two contrasting sets of examples that, whereas the relationship between the input vowels of Swahili, a language featuring coalescence by assimilation, can be characterised as conjunctive, the one between Abua input vowels is disjunctive. This latter type of relationship, which characterises input segments for coalescence by polarisation, obviously explains why such input segments may or may not be distinct.

Given, as we can now see, that input segments for the rule of coalescence may or may not be distinct depending on the particular variety of the phenomenon involved, it is clear that the traditional view that such segments necessarily must be distinct is, in fact, erroneous. This being the case, the condition imposed on input segments for the traditional rule of coalescence, namely, $Unit_1 \neq Unit_2 \neq Unit_3$, must be dropped from that rule in favour of the one attached to rule(1) repeated below for ease of reference:

1 Coalescence:Unit₁ (+) Unit₂ --> Unit₃Condition:

(a) + represents word/morpheme boundary

(b) Unit₁/Unit₂ ≠ Unit₃

The substitute condition proposed here to reflect the facts of coalescence in all the languages examined requires only that input segments be distinct from corresponding output segments. It says nothing about the relationship that must obtain between the former, as that depends entirely on the variety of coalescence involved.

6. CONCLUSION

Very many questions need to be answered in further work on coalescence. Among them are the following: (1) What (additional) natural languages display the varieties of coalescence identified above? (2) can a language display more than one variety of the phenomenon? (3) Is four the maximum possible number of types of coalescence in human language? (4) Is it possible for coalescence to produce output segments that do not otherwise occur as segments in the language concerned? (5) Must the outputs of coalescence by polarisation always be rounded as in the two cases encountered so far? why, if so? (6) How many features can get polarised or altered at a time? Is it only one, as in the cases encountered so far, or can the number exceed one? (7) Is it only the negative specification for features that gets polarised as in Yoruba and Abua, or can a positive specification be polarised as well? (8) Can output segments produced by merger display features that were not present in corresponding input segments? if so, under what condition or conditions?

Regardless of how these and other questions of similar nature are answered, it is clear from available data that coalescence is a reality in human language. Some observers like Aoki (1974) seem to feel that, just because coalescence as they know it can quite easily as well as validly be viewed in terms of sequences of time-honoured discrete phonological processes, there is no need at all for the term in linguistics. One noteworthy thing about coalescence, however, is that no matter how it is actually effected or brought about, whether by means of segmental rules or by phonological transformational rules, whether through assimilation, dissimilation, polarisation, or merger, the effect is always the same from one language to another in different parts of the world. It would seem that this recurrent effect of a distinct unitary segment substituting for two earlier segments, rather than the process or processes by which the effect itself came into being, is what the term coalescence actually names. That being the case, the science of linguistics would very definitely be the poorer should it be denied the use of the term.

NOTES

¹Adapted from Awobuluyi (forthcoming). This paper as well as the much bigger work on which it is based has benefited a great deal from discussions and consultations held with Professor B.S. Chumbow, formerly of the University of Ilorin, Ilorin, Nigeria. It has also benefited from critical comments by Professor A. Bamgbose, Mr. M. Aikhionbare, Dr. Y. Awoyale, Mr. F. Oyeade, etc. on earlier versions presented at the Departmental Seminar Series, Department of Linguistics and Nigerian Languages, University of Ilorin, Ilorin, Nigeria, on February 20, 1986, and at the Seventeenth West African Languages Congress, held at the University of Ibadan, Nigeria, March 17-21, 1986. Responsibility for all the shortcomings of the present version of the paper, however, rests with the writer alone.

²Schane (1973:56), to his credit, anticipated this finding when he observed that '... there is not sufficient evidence to suggest that all types of coalescence should be treated as assimilation followed by deletion.'

³Crowther (1852:5-6) appears to have been the first writer to note the occurrence of coalescence in Yoruba. Other writers who have since that time made the same observation are Bowen (1858:7), Le Bouche (1880:20-21), de Gaye and Beecroft (1922:7), Abraham (1958:xxv), and Awobuluyi (1964:64). This writer's only contribution to the discussion of the phenomenon as it manifests itself in Yoruba has been, both here and elsewhere (Awobuluyi 1983, 1985, and forthcoming), merely to (i) identify some additional expressions in the language that appear to exhibit the phenomenon, (ii) indicate the principles that appear to govern its operation, and (iii) show that it is not restricted to the Yoruba language only.

⁴For lack of space, only a very small fraction of the relevant data can be displayed in the present paper. Pending the appearance of Awobuluyi (forthcoming), interested readers will find some additional data in Awobuluyi (1983, 1985).

⁵It may be useful to point out, particularly for the benefit of readers who are not otherwise familiar with the facts of Yoruba, that the consonants adjoining input vowels in these examples have nothing at all to do with the shape of corresponding output vowels. Proof of this is that alongside of

ibi	isù	-->	ibūsù	
place	sleeping		'bed'	
a	bi	iké	-->	abuké
agent	having	jump		'a hunchback'

which feature coalescence, the language has

ibi	išǎ́	-->	ibisǎ́	
place	work		'place of work'	
a	bi	ikù	-->	abikù
agent	having	stomach		'a person having a particular type of belly'

which do not display coalescence.

In a way, it says all that needs to be said about the above suggested solution that Bamgboṣe (1986), who has given considerable thought and attention to how to account for the Yoruba data under discussion without invoking coalescence, did not consider it at all. He did not have to do so as he, like every other Yoruba scholar, knows that the desired or hoped for explanation simply does not lie there.

⁶The rules can alternatively be formulated in segmental format, as follows, for roundness polarisation:

(i) Roundness Polarisation.

$$\begin{array}{c} \text{[+syll } \quad] \\ \text{[-rounded] } \end{array} \rightarrow \begin{array}{c} \text{[+syll } \quad] \\ \text{[+rounded] } \end{array} \quad \text{[+syll](+) } \rightarrow$$

(e.g. i → u/i (+) --)

(ii) Vowel Deletion:

$$\text{[+syll] } \rightarrow \text{ } \emptyset \text{ / --- (+) } \quad \begin{array}{c} \text{[+syll } \quad] \\ \text{[+rounded] } \end{array}$$

(e.g. i → ∅ / -(+)u)

The segmental approach requires a vowel deletion rule which very consistently deletes the first of two juxtaposed vowels. As is well known, however, vowel deletion in the language actually does not behave that way. Quite the contrary; its typical erratic mode of application is such that the first of any set of two juxtaposed vowels is as likely to be deleted as the second, particularly within verb phrases. The preference shown for the transformational format in this paper is dictated largely by a desire to avoid being committed to the unwarranted claim that must be made for vowel deletion under the segmental approach.

This discussion presupposes the following feature specifications for Standard Yoruba oral vowels:

	i	e	ɛ	a	ɔ	o	u
Syllabic	+	+	+	+	+	+	+
High	+	-	-	-	-	-	+
Low	-	-	+	+	+	-	-
Front	+	+	+	-	-	-	-
Back	-	-	-	-	+	+	+
Rounded	-	-	-	-	+	+	+

Rounded vowels are redundantly [+back] and vice versa.

⁷Bamgboṣe feels dissatisfied with the account of contemporary Standard Yoruba given here and has accordingly proposed in (Bamgboṣe, 1965) what seems to him to be a much better alternative to it. That alternative account would, by and large, trace each of the so-called outputs of vowel coalescence to a word or morpheme that, in effect, now constitutes a relic or 'historical residue' in the language.

Underlying representations featuring such relics only need, under this account, to be subjected to ordinary vowel deletion to obtain the desired surface expressions in the present-day form of the language. Thus, the following alleged cases of coalescence (cf. 14 i-ii)

iṣe	kí	iṣe	→	iṣekúṣe
action	any	action		'unapproved behaviour'

ibi	isù	-->	ibùsù
place	sleeping		'bed'

are considered under that account to have actually been derived by vowel deletion, as in

iše	kí	ùše	-->	išekúše
action	any	action		'unapproved action'
ibi	ùsù	-->	ibùsù	
place	sleeping		'bed'	

Limitations of space preclude a full discussion here of the many shortcomings of this alternative account. Suffice it to point out that this account, which may be referred to as the deletion account in contradistinction to the coalescence account urged in this paper, is simply not adequate to the task.

Thus, even by Bamgbose's (1986: 25,67, note 24) own (albeit indirect) admission, the verb phrase

dā	ɔkpé	-->	dúkpé
give	thanks		'give thanks'

as, for example, in the traditional expression

A dúkpé, a tú ɔkpé dā (Delano, 1969:138)
 we give-thanks, we again thanks give
 'Thanks a million!'

cannot be explained under the deletion account. In other words, the verb phrase constitutes an exception there, whereas it constitutes an example (cf.(14v)) under the coalescence account.

Going by the views of the writer's language helpers, to whom he must defer because of their superior knowledge of the particular aspect of Yoruba culture involved, the following noun, too, cannot be explained under the deletion account:

ò	ša	ògbó	-->	òšùgbó
agent	pick	'ogbo'		'a member of the Osugbo cult'

Under the account urged in this paper, the noun is not an exception but an example (cf.(14iv)). Similarly for

dā	èbá	ilè	-->	dòbálé
become	vicinity	ground		'prostrate oneself'

Finally, Bamišile (1986:137-38) and several Ekiti dialect language helpers report the occurrence of the following numerals in the speech of members of the older generation in parts of Ekiti-land:

òkà	lè	èwá	-->	òkàlòwá
one	be-added-to	ten		'eleven'
èjì	lè	èwá	-->	èjìlòwá
two	be-added-to	ten		'twelve'
ètà	lè	èwá	-->	ètàlòwá
three	be-added-to	ten		'thirteen'
èrì	lè	èwá	-->	èrìlòwá
four	be-added-to	ten		'fourteen'

The coalescence formula for all these examples is:

$$e + \epsilon \rightarrow \text{ɔ}$$

None of the examples can be explained under the deletion account. By contrast, they fall perfectly in line with the other examples that are uniformly explained under the account advocated here.

These Ekiti dialect examples are of further significance for the position taken in this paper. The body of the paper was written more than a year before their existence became known to the writer. That being the case, they could not have influenced or motivated the account urged here. But since the account fully explains all of them, it is clear that they constitute independent confirmation of it.

⁸Abua is a Benue-Congo language spoken in the Rivers State of Nigeria.

⁹Interested readers are referred to Awobuluyi (1967) for more data of the kind cited here. One would today account for all such data by postulating an underlying epenthetic vowel /i/ which assimilates as appropriate to preceding segments, as in

Underlying Form:	ʃ́ɔ́ɔ́bì	kóòtì	káàdì	bé'èdì
Assimilation:	ʃ́ɔ́ɔ́bù	kóòtù	---	---
Surface Form:	[ʃ́ɔ́ɔ́bù]	[kóòtù]	[káàdì]	[bé'èdì]
	'shop'	'coat/ court'	'card'	'bed'

¹⁰Notice that, according to Pike (1966:116), Abua also has:

$$i + o \rightarrow u \quad i + a \rightarrow u$$

¹¹It is tempting to see coalescence by dissimilation as being not a mere theoretical possibility but an empirical reality, since contemporary standard Yoruba as seen above has:

$$i + i \rightarrow u$$

But such a temptation must be resisted, as it would otherwise lead to employing two rules of coalescence (by dissimilation and by polarisation) where only one (namely, the latter) would do, to account for:

$$\begin{array}{llll} i + i \rightarrow u & \text{ũ} + e \rightarrow o & e + \epsilon \rightarrow \text{ɔ} & \text{ũ} + a \rightarrow \text{ɔ} \\ i + e \rightarrow o & \text{ũ} + \epsilon \rightarrow \text{ɔ} & a + \epsilon \rightarrow \text{ɔ} & \end{array}$$

Much the same considerations (of economy) operate against Bamgbose's (1986:10) objection that $i + i \rightarrow u$ could not be a genuine case of coalescence, since the relevant input vowels are not distinct, as required by the input condition traditionally imposed on coalescence. Notice in this connection that the rule which produces $i + i \rightarrow u$ is independently required in the language. More specifically, it is independently required for the last six of the set of coalescence formulae given above. In other words, whether or not one accepts $i + i \rightarrow u$ as illustrating coalescence, the rule that is thought to have produced it will continue to be needed in the language. That being the case, it is clear that economy requires that $i + i \rightarrow u$ be brought under the ambit of that rule and thereby be treated as a bonafide case of coalescence. And once that is done, the traditional view that input segments for coalescence necessarily must be distinct ceases to be tenable, as indicated in section 5 below.

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