Contributed to DougSchrift: A Collection of Squibs and Puzzles presented to Doug Pulleyblank, 2025.
https://arts-pulleyblank-2024.sites.olt.ubc.ca/

Cross Consonantal Spreading in Yoruba Numerals*

Akinbiyi Akinlabi

In this squib, I take a quick look at vocalic spreading across consonants in Yoruba numerals. The focus of this squib is just on **DORSAL** stops (Dorsal and Labial-Dorsal). The observation is that the spreading is restricted in two ways, unlike in other parts of the grammar. First, it is single feature spread, and secondly, it occurs across **DORSAL** stops. In other parts of the grammar, it is complete vocalic spread (see Akinlabi to appear).

1. Spreading across the DORSAL stop

In Yoruba cardinals indicating multiples of twenty, an interesting process takes place between the form **ogún** [ogű][1] "twenty", and the other cardinals indicating its multiples. More precisely, the process is between the nasalized high back vowel [ũ] ("un") of **ogún**, and the initial vowel [e] or [ɛ] ("ẹ") of the following cardinal. The outputs of the derived cardinals have the dorsal [g] of the input **ogún** between two identical vowels.

(1)	ogún	èjì	→	ogójì	
	twenty	two		'forty'	
	ogún	èje	→	ogóje	
	twenty	seven		'one hundred and forty'	
(2)	ogún	ẹ̀ta	→	ọgọ́ta	
	twenty	three		'sixty'	
	ogún	ẹ̀rin	→	ọgọ́rin	
	twenty	four		'eighty'	
	ogún	ẹ̀fà	→	ọgọ́fà	
	twenty	six		'one hundred twenty'	
	ogún	ẹ̀jọ	→	ọgọ́jọ	[ɔgɔ́ɔ̀jɔ]
	twenty	eight		'one hundred sixty'	
	ogún	ẹ̀sán	→	ọgọ́sàn-án	[ɔgɔ́sɑ̃ɑ̃́]
	twenty	nine		'one hundred eighty'	
	ogún	ẹ̀rún[2]	→	ọgọ́rùn-ún	[ɔgɔ́rʊ̃ʊ̃́]
	twenty	five		'one hundred'	

---

* The examples are transcribed using Yoruba orthography. In the orthography, RTR [-ATR] vowels are transcribed with underdots, and nasal vowels are transcribed with an 'n' after them. [kp] is "p", [gb] is "gb", [ɲ] is "j", [ʃ] is "ṣ", and [j] is "y". All other symbols follow the IPA.

[1] Awobuluyi (2008:97-100) regards the initial vowels of ALL numerals as prefixes **o-gún** 'twenty', **è-jì** 'two', **ẹ̀-ta** 'three'. While this may be historically true (as with all VCV nouns), I will assume here that these initial vowels are not synchronic prefixes.

[2] Awobuluyi 1984 proposes a vowel coalescence analysis for these changes, which could be summarized as follows.

un	+	e	→	o	(1)
un	+	ẹ	→	ọ	(2)

Coalescence is more plausible in these examples than in any other that Awobuluyi proposed because the output vowel appears to be a fusion of the two vowels in the input. However, the coalescence view must be so restricted that it applies only to a class of numerals, the multiples of twenty, and not to all numerals, as I show presently. The form **[ẹ̀rún]** "five" has been employed as input in place of the more common cardinal **[àrún]** because this is the form that is used in other multiples such as **[ẹgbẹ̀rún] (< igba ẹ̀rún 200x5)** "One thousand" (Bamgbose 1986:67). See also Awobuluyi (2008:98).

There are two alternative views of how the outputs in (1) and (2) are derived. Awobuluyi (1988/92) proposes that [ũ] and [e] (in 1) coalesce to **[o]**, while [ũ] and [ɛ] ("ẹ") in (2) coalesce to **[ɔ]** ("ọ"). So, the medial output vowel in these examples do not involve any vocalic spreading, within Awobuluyi's proposals. The ATR value difference (**[o]** vs. **[ɔ]**) of the initial output vowel comes from regular right to left vowel harmony (see Archangeli and Pulleyblank 1989 for a discussion).

Bamgbose (1986:26, 1990) advances an alternative analysis proposed by Ajolore (1972). Ajolore's intuition is that a combination of three processes is involved in the derivation of the forms in (1-2): vowel deletion, vowel harmony and vowel assimilation, in that order (see also Owolabi 2011). In a serial (rule based) approach, the derivations of the numerals are given as in (3).

(3)	Input			V. Deletion		V. Harmony		V. Assimilation
	ogún	èjì	→	ogéji	→	ogéji	→	ogójì
	ogún	èje	→	ogéje	→	ogéje	→	ogóje
	ogún	ẹ̀ta	→	ogẹ́ta	→	ọgẹ́ta	→	ọgọ́ta
	ogún	ẹ̀rún	→	ogẹ́rùn-ún	→	ọgẹ́rùn-ún	→	ọgọ́rùn-ún

For our purposes, the two features spreading in the above numerals are [ATR], and [LABIAL]. [ATR] spreads in a Right to Left direction, from the final vowels of the numerals [èje] 'seven', [ẹ̀ta] 'three', etc., as seen in (3). [LABIAL] spreads from Left to Right; that is, from the initial vowel of the compounded numeral to the medial vowel. The spreading from two different directions is not surprising because this is not a prefix-stem relationship in which spreading is usually from the stem; it is a stem-stem relationship. In fusing this way, these numeral compounds exhibit characteristics not found in other Yoruba compounds. First, they form a domain of vowel harmony, whereas other compounds violate vowel harmony constraints (see Akinlabi to appear). Secondly, this Left to Right [LABIAL] spread is not found in any other compounds in the language. But more formally, the two features spreading through the DORSAL consonant, [ATR] and [LABIAL], are not DORSAL, and they are not sisters on any node. Therefore, we do not expect the DORSAL consonant to block the spread[3].

2 Spreading Across the voiced LABIAL-DORSAL

The second case of vocalic spreading across consonants in numeral compounds takes place in numerals for multiples of two-hundred. Here, it appears the entire vocalic feature set propagates across the labial-velar stop, as the following examples show.

[3] This assumes that Yoruba vowels do not contrast DORSAL, since there are no front rounded or back unrounded vowels. Otherwise, DORSAL consonants should block vowel to vowel spreading of back vowels (see Casali 1995).

(4)	igba	èjì	→	egbèjì (= irinwó)
	two hundred	two		'four hundred'
	igba	èje	→	egbèje
	two hundred	seven		'one thousand four hundred'

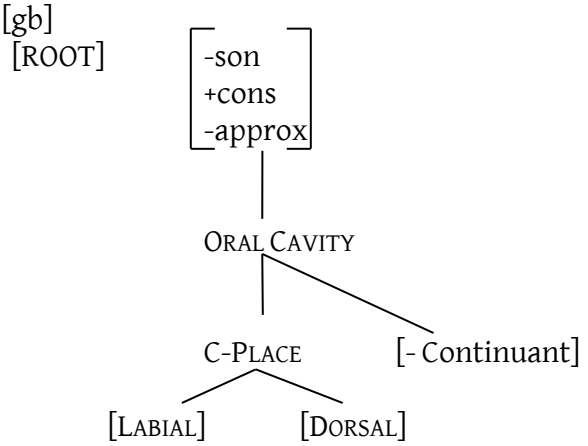
(5)	igba	ẹ̀ta	→	ẹgbẹ̀ta
	two hundred	three		'six hundred'
	igba	ẹ̀rin	→	ẹgbẹ̀rin
	two hundred	four		'eight hundred'
	igba	ẹ̀rún	→	ẹgbẹ̀rún
	two hundred	five		'one thousand'
	igba	ẹ̀fà	→	ẹgbẹ̀fà
	two hundred	six		'one thousand two hundred'
	igba	ẹ̀jọ	→	ẹgbẹ̀jọ
	two hundred	eight		'one thousand six hundred'
	igba	ẹ̀sán	→	ẹgbẹ̀sán
	two hundred	nine		'one thousand eight hundred'

There is one crucial similarity between these cases and the ones we just examined in the previous section, which involve multiples of "twenty". Just as in the numerals for multiples of twenty where the output vowels surrounding the DORSAL [g] of **ogún** "twenty" are identical, the output vowels surrounding the LABIAL-DORSAL [gb] of **igba** "two hundred" are also identical (4-5). However, there is one difference. While the surface vocalic identity of the forms in (2-3) seem to arise from spreading labiality from the initial vowel (progressive spread), the surface vocalic identity of the cases in (4-5) appears to arise from spreading the medial vowel [e] or [ɛ] ("ẹ") backwards to the initial vowel (regressive spread), just as in Yoruba vowel harmony.

There are two issues to address. First, is this complete assimilation of the initial vowel [i] of **igba**, through [gb]? Secondly, why don't the PLACE features of the initial vowel **[i]** of **igba** spread rightwards, just like **[o]** of **ogún**?

Before answering either of these questions, it is important to examine the structure of [gb], so that we know what is allowed or not allowed to spread through it.

(6) Structure: [gb]



It is important to note that [gb] is a complex consonant with two simultaneous places: [LABIAL] and [DORSAL]. Therefore, the only features that can spread through it are plain [CORONAL], and those features below C-PLACE. These are [VOCALIC] and features below it.

We can now answer the first question: is this a case of spreading ALL the features of the medial vowel backwards? The answer is no. First, [ATR] spread occurs independently of all other features of the vowel, as seen in section (1). The vocalic spreading here distinguishes [e] and [ɛ] ("ẹ"). Therefore, harmony is a separate process. But what about the [CORONAL] feature of these vowels? Since the intervening consonant is [LABIAL-DORSAL], it cannot block the propagation of [CORONAL]. Therefore, we propose that the vocalic feature [CORONAL] of the vowel spreads backwards, and so this is a single feature assimilation.

The second question is more difficult. Why doesn't the initial [i] of **igba** spread rightwards? If the [CORONAL] vowels [e] and [ɛ] can spread through [gb], so should [i], since it is also a [CORONAL] vowel. There are at least two ways to answer this question. First, we can follow Pulleyblank (1988) and assume that Yoruba [i] is underspecified for vocalic features, and therefore there is nothing to spread (but see Akinlabi 1993).

An alternative approach, which does not assume underspecification, is to restrict the rightward spread to the feature [LABIAL] (Labial harmony? Awobuluyi 1967). And since [i] lacks [LABIAL]; there is nothing to spread. However, what we expect with this scenario is that nothing spreads, and we end up with forms like (7):

(7) *igbèjì
*igbèje
*igbẹ̀ta
*igbẹ̀rún
*igbẹ̀fà

Instead, the vowel of the second syllable spreads. So, why is this the case? I now provide an sketchy OT analysis of these data.

It is a well-known fact that high vowels are the least sonorous vowels. Let us assume that the simple sonority hierarchy for Yoruba vowels is (non-High ≻ High)[4] as follows:

(8) aɛɔeo ≻ iu

That is, the non-high vowels are more sonorous than the high vowels. As Pulleyblank (1988) demonstrates, high vowels are deleted in deletion contexts, they are assimilated in assimilation contexts, and they are the preferred epenthetic vowels. In short, they are the least preferred nuclei in the language. Therefore, Faithfulness to them is low in terms of outright deletion or

[4] The more ideal picture is (Low ≻ Mid ≻ High) or (a ≻ ɛɔeo ≻ iu), but there is no evidence here that the Low vowel is more sonorous than the Mid vowels.

assimilation. In (9), **M** stands for a "markedness" constraint, and **F** stands for a "faithfulness" constraint.

(9) Constraints for Assimilation
M:AGREE-V: Assign a violation for each occurrence of non-agreeing vowels in the first two syllables of a numeral compound.

F:IO-IDENT$_{NONHIGH-V}$: Assign a violation for each occurrence of a non-identical non-high vowel in the Input and Output.

F:IO-IDENT$_{HIGH-V}$: Assign a violation for each occurrence of a non-identical high vowel in the Input and Output.

If we assume that a markedness constraint like **M:AGREE-V** forces assimilation, the ranking **F:IO-IDENT$_{NONHIGH-V}$ ≫ F:IO-IDENT$_{HIGH-V}$** will force the high vowel to be assimilated:

(10) The constraint interaction that derives assimilation:
M:AGREE-V, F:IO-IDENT$_{NONHIGH-V}$ ≫ F:IO-IDENT$_{HIGH-V}$

The final question however is, what if the initial vowel of **igba** were labial, say **[ɔ]** ("ọ")? The prediction of this analysis is that the [LABIAL] spread would have been blocked, because the intervening consonant **[gb]** is [LABIAL]. This question is, however, untestable.

3 Conclusions

In vowel assimilations through **[DORSAL] [g]** and **[LABIAL-DORSAL] [gb]** consonants in numeral compounds, we have proposed single feature spreading at a time, rather than spreading all features at once, though the trigger and target of assimilation end up surface-identical. If we assume an "all feature spread" at one go, it predicts that spreading will be possible through any consonant, which means that all Yoruba consonants will be transparent to spreading. This prediction is not true.

There is some sort of conspiracy in vocalic spreading in numeral compounds. The feature [LABIAL] spreads through the **[DORSAL]** consonant **[g]**, while the feature [CORONAL] spreads through the **[LABIAL-DORSAL]** consonant **[gb]**. In each case, the feature that spreads through the consonant is the one that the consonant lacks, and so the feature escapes being blocked! Can this be an accident?

References

Ajolore, A. 1972. When vowel clusters occur in Yoruba. Ms.

Akinlabi, A. 1993. "Underspecification and the phonology of Yoruba /r/," Linguistic Inquiry 24/1, 139-160.

Akinlabi, A. 2003. "Sonorant Nasalization in Yoruba Deverbal Nouns", Actes du 3e Congrès Mondial de Linguistique Africaine, Lome 2000. Ed. by Kezie K. Lebikaza. Ruediger Koeppe Verlag, Cologne, pp. 3-19.

Akinlabi, A. To appear. Yoruba: A phonological grammar. The W.E. B. Du Bois Series of African

Language Grammars. Series editor: John Mugane. Center for African Studies, Harvard University.
Archangeli, D. & D. Pulleyblank. 1989. Yoruba Vowel Harmony. Linguistic Inquiry. 20/2; 173-217.
Awobuluyi, O. 1967. Vowel and consonant harmony in Yoruba. Journal of African Languages 6/1: 1-8.
Awobuluyi, O. 1988/92. 'Aspects of Contemporary Standard Yoruba in Dialectological Perspective,' in Akínwùmí Ìṣòlá (ed.). 1992. *New Findings in Yoruba Studies.* Lagos: J. F. Ọdunjọ Memorial Lectures Organising Committee, pp. 1-79.
Awobuluyi, O. 2008. Eko Iseda-Oro Yoruba. Akure, Montem Paperbacks.
Awobuluyi O. & F.O. Oyebade. 1995. "Denasalization in Yoruba: A Non-Linear Approach", in K. Owolabi (ed.) Language in Nigeria, Ibadan: Group Publishers, pp. 16-21.
Baković, Eric. 2000. Harmony, Dominance and Control. PhD dissertation, Rutgers University, New Brunswick.
Bamgbose, A. 1986. Yoruba: A language in transition. J.F. Odunjo memorial lectures series 1.
Bamgbose, A. 1990. Fonoloji ati Girama Yorùbá. Ibadan: University Press Limited.
Casali, R. 1995. Labial Opacity and Roundness Harmony in Nawuri. Natural Language and Linguistic Theory 13/4, pp. 649-666.
Clements, G.N. & E. Hume. 1995. The Internal Organization of Speech Sounds. In John Goldsmith (ed.), Handbook of Phonological Theory. Oxford, Blackwell. Pp. 245-306.
Halle, M. 1995. Feature Geometry and Feature Spreading. Linguistic Inquiry 26/1: 1-46.
McCarthy, J. 1988. Feature Geometry and Dependency: A review. Phonetica 43: 84-108.
Owolabi, K. 2011. Ijinle Itupale ede Yoruba I: Fonetiiki ati Fonoloji. Ibadan: Akada Press.
Prince, A. & P. Smolensky. 1993/2004. Optimality Theory: Constraint Interaction in Generative Grammar. Oxford: Basil Blackwell.
Pulleyblank, D. 1988. Vocalic Underspecification in Yoruba. Linguistic Inquiry 19/2, 233-270.
Sagey, E. 1986. The representation of features and relations in nonlinear Phonology. MIT, PhD. Dissertation.
Taiwo, O. 2009. Headedness and the structure of Yoruba compound words. Taiwan Journal of Linguistics. 7/1: 27-52.