Chapter 3

Glide-onset formation between vowels in Akan

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This paper examines complex alternations involved in glide-onset formation between vowels in Akan. A glide-onset formed between vowels is realized as either [w] or [j], largely aligning with the place specification of an abutting vowel. I propose that two inviolable phonotactic constraints underlie the [w] and [j] glide-onset formation process – *$V_{1[+High]}V_{2[-High]}$ and *$C^{w}V_{[Labial]}$ – which are sometimes in conflict with one another. To avoid such impermissible structures, glide-onsets are formed that ultimately preserve V_1's contrastive features. It will be shown that, surprisingly, /u/ and /ʊ/ as V_1s behave differently in glide-onset formation.

1 Introduction

In Akan, a Niger-Congo language of the New Kwa sub-branch, forms in which one might expect a $V_{[+High]}V_{[-High]}$ sequence are instead produced with a glide-onset inserted between the vowels. I will henceforth call the process *glide-onset formation*. Data for the current study were gathered through direct data elicitation from 30 native speakers of the language, alongside my intuition as a native speaker of Akan. Written sources such as de Jong & Obeng (2000), Dolphyne (1988), and Ofori (2006, 2008, 2013, 2018, 2019) were also useful in determining the underlying representations of the data that were collected. The following is a brief introduction of the problem.

Dolphyne (1988: 8–14) lists and describes the vowel sequences in Figure 1 as permissible in Akan. Here, and in tables elsewhere throughout this chapter, grey cells show impermissible forms. The sequences under consideration here are bolded (and later presented in Table 10).

Seth Antwi Ofori. 2024. Glide-onset formation between vowels in Akan. In Christopher R. Green & Samson Lotven (eds.), *The Ghanaian linguistics nexus*, 27–52. Berlin: Language Science Press. DOI: 10.5281/zenodo.11091823

				V_2+High				V_2−High				
				−Round		+Round		−Low				+Low
								−Round		+Round		
				i	ɪ	u	ʊ	e	ɛ	o	ɔ	a
V_1+High	−Round		i	ii				**ie**	**iɛ**	**io**	**iɔ**	**ia**
			ɪ		ɪɪ				**ɪɛ**			**ɪa**
	+Round		u	ui		uu		**ue**		**uo**		**ua**
			ʊ		ʊɪ		ʊʊ		**ʊɛ**		**ʊɔ**	**ʊa**
V_1−High	-Low	−Round	e	ei				ee				
			ɛ		ɛɪ				ɛɛ			
		+Round	o	oi						oo		
			ɔ		ɔɪ						ɔɔ	
	+Low		a		aɪ							aa

Figure 1: Vowel sequences in Akan (Dolphyne 1988: 8–14)

Given the possible sequences in Figure 1, the generalizations in (1) can be stated, based on Dolphyne (1988).

(1) a. $[\alpha F][\alpha F]$: identical vowel sequences are allowed
b. [+High][−High]: high followed by non-high is allowed
c. [−High][+High]: non-high followed by high is allowed
d. [+High][+High]: two high vowels (round followed by non-round) are allowed

It is not explicitly stated in Dolphyne's book at what level of representation these vowel sequences are acceptable, and whether the vowel sequences in (1b), in particular, are the same at both the underlying and surface levels of representation in Akan. The current study seeks to bring determinacy to this matter by providing the relevant phonetic evidence that these vowel sequences are only present underlyingly. On the surface, however, there are markedness and sonority-based syllable sequencing constraints coupled with the need to preserve segmental/feature contrasts that militate against a surface $V_{1[+High]}V_{2[-High]}$ sequence. As such, a glide-onset must be formed between the involved vowels to satisfy all these conditions. Therefore, the claim in this paper is that, on the surface, there is glide-onset formation between an underlying $V_{1[+High]}V_{2[-High]}$ sequence. One goal of this paper is to establish the rules leading up to glide-onset formation which achieve phonotactic well-formedness while also preserving underlyingly contrastive distinctions. The interactions that result in glide-onset formation, have implications for markedness theory, perspectives on the sonority

scale, and for syllable theory, including for the Syllable Contact Law (Murray & Vennemann 1983).

For expository purposes, Tables 1 through 5 illustrate instances of glide-onset formation in Akan that will be further explored below. Here and elsewhere, underlying (phonological) forms are given between slashed brackets, and surface (phonetic forms) are not bracketed.

As seen in Table 1, glide-onset formation is realized as [j] when the V_1 is an underlyingly high coronal vowel. It can also be realized as [w], when V_1 is an underlyingly high labial (i.e., round) vowel, as in Tables 2 and 3.

Table 1: [j] glide-onset formation when $V_{1[+High]}$ is /i/ or /ɪ/

a.	/èfíé/	èfíjé	'house'
b.	/àbìèsá/	àbìjèsá	'three'
c.	/èfɪ́é/	èfɪjé	'vomit'
d.	/bìó/	bìjó	'again, furthermore'
e.	/àpíá/	àpíjá	'itchy powdered substance'

Table 2: [w] glide-onset formation when $V_{1[+High]}$ is /ʊ/

a.	/èbʊ́ɔ́/	èbʊ́wɔ́	'stone'
b.	/ètʊ́ɔ́/	ètʊ́wɔ́	'butt'
c.	/èkʊ́ɔ́/	èkʊ́wɔ́	'buffalo'
d.	/kʊ̀á/	kʊ̀wá	'bend over'
e.	/bʊ̀á/	bʊ̀wá	'help'
f.	/tʊ̀á/	tʊ̀wá	'enjoin'

Table 3: [w] glide-onset formation when $V_{1[+High]}$ is /u/

a.	/bùá/	bùwá	'answer'
b.	/pùé/	pùwé	'go out'
c.	/èbúó/	èbúwó	'coop'

Table 4: [j] glide-onset formation in Akuapem when $V_{1[+High]}$ is /ʊ/

a.	/bùá/	bùwá	'answer'
b.	/pùé/	pùwé	'go out'
c.	/èbúó/	èbúwó	'coop'

As will become clear, typical outcomes of glide insertion like those just shown are not realized in all instances. For example, forms in Table 4, which are found only in the Akuapem dialect, involve additional rules of delabialization and labio-palatalization that affect an underlying /ʊ/, yielding unique surface forms.

In addition, there is variation in forms with underlying V_1 /u/. While a [w] is often found after a labial consonant, as in Table 3, other forms with [j] are also attested in Table 5a–b in this context; these further entail vowel delabialization to [i]. After a non-labial consonant, there are alternative forms with delabialization to [ɪ], with subsequent labio-palatalization (Table 5c–h).

Table 5: Alternative glide insertion for V_1 /u/

a.	/bùá/	bìjá	'answer'
b.	/pùé/	pìjé	'go out'
c.	/tùá/	tᵘìjá	'settle debt'
d.	/ètúó/	ètᵘíjó	'gun'
e.	/kúá/	kᵘíjá	'farming'
f.	/èkúó/	èkᵘíjó	'group/association'
g.	/dùé/	dᵘìjé	'bid apologies'
h.	/àdùɔ̀wɔ̀tɕᵘí/	ædᵘìjɔ̀wɔ̀tɕᵘí	'eighty'

The remainder of this paper is organized as follows. §2 defines the relevant phonological background for the analysis introduced above. §3 presents and analyzes the data within rule-based phonology. §4 connects findings in §3 with principles of markedness, sonority and syllable theories, and research on Akan phonology.

2 Phonological background

Table 6 shows features that I assume to be associated with the nine vowel phonemes in Akan. Redundant features appear in parentheses.[1] Certain feature definitions are particularly important for this paper. Notably, I extend place features to vowels. Doing so follows Hume (1992) and provides a unified and more meaningful account of vowel-consonant and consonant-vowel feature interactions in this study. Note that one could alternatively analyze [±Labial] vowels [±Round], but given their interaction with Labial consonants, the former is analytically preferable. A binary ± distinction for [Labial] place for consonants is necessary, as consonant-based phonological processes actively reference these values independently. The same is not the case for vowels, and therefore [Labial] is treated privatively for vowels. Since there is no evidence to suggest its binarity, the [Coronal] feature is also treated privatively. Privative features, when present, are marked with "✓" in Table 6. In general, I assume featural binarity unless there is reason to posit otherwise.

The feature classes defined in Table 7 provide a reference to be used throughout this paper, with V_1 and V_2 indicated for convenience. Phonotactic constraints refer to these classes, and they aid in defining the context and processes that underlie alternations.

[1]There is an additional low vowel represented as [æ], which is underlyingly /a/ but appears allophonically in [+ATR] contexts.

Table 6: The Akan vowel feature matrix

	i	ɪ	e	ɛ	a	u	ʊ	o	ɔ
±High	+	+	–	(–)	+	+	–	–	–
±Low	(–)	(–)	–	–	+	(–)	(–)	–	–
±ATR	+	–	+	–	–	+	–	+	–
Labial						✓	✓	✓	✓
Coronal	✓	✓	✓	✓					

Table 7: Vowel feature classes

V_1		V_2	
i ɪ u ʊ	[+High]	e ɛ a o ɔ	[–High]
u ʊ	[+High, Labial]	o ɔ	[–High, Labial]
i ɪ	[+High, Coronal]	e ɛ	[–High, Coronal]
i u	[+High, +ATR]	a	[+Low]
ɪ ʊ	[+High, –ATR]		

In Akan, there is a constraint forbidding unadvanced [–ATR] and advanced [+ATR] vowels from co-occurring either within words (roots, stems, and compound words) or between words in a phrase. This phonotactic state of affairs is typically resolved by favoring [+ATR] over [–ATR] such that an unadvanced vowel becomes advanced. The process is called "[+ATR] harmony", and is caused by the *[+ATR] harmony rule* (Dolphyne 1988), in recognition of the direction of sound change. Generally speaking, [–ATR] vowels, /ɪ, ʊ, ɛ, ɔ, a/, in a given domain, are pronounced [i, u, e, o, æ], respectively, without a meaning change. For example, there is regressive [+ATR] harmony in which the future marker /bɛ-/ is pronounced [be-] before a [+ATR] vowel (e.g., /bɛ-di/ ⟶ [bedi] 'will eat').

Progressive [+ATR] harmony also occurs in Akan, but strictly between two vowels without an intervening consonant, the second of which is [–Low]. For example, /ɔ-di-ɪ-ɛ/ (3SG-eat-PST-EMP) is realized [odiijɛ] 's/he ate it'. Here, [+ATR] harmony spreads from /i/, the root vowel, to /ɪ/, the past/perfect marker, but does not spread to /ɛ/, the emphatic marker. Such outcomes are relevant to the current paper in that [j] glide-onset formation precedes and blocks the spread of [+ATR] to /ɛ/.[2]

[2]The [+ATR] harmony process will only be discussed in this paper where its application interacts with processes that contribute to glide-onset formation as described above. The interested reader could consult Dolphyne (1988: 14–18) for when and how the [+ATR] harmony rule applies in Akan.

Table 8 is based on Dolphyne (1988: 29, 48) and provides readers with information concerning the consonantal phonemes of Akan. The phonetic realization(s) of each phoneme appear(s) in square brackets, where relevant.

Table 8: Akan consonant system (Dolphyne 1988: 29, 48)

	Labial	Coronal	Dorsal		Glottal
Plosive					
Voiceless	p	t [t, ts]	k [k, kw, tɕ, tɕɥ]		
Voiced	b	d [d, ɾ, l, dz]	g [g, tw, dʑ, dʑɥ]		
			Prepalatal	Velar	
Fricative	f	s	ɕ ɕɥ		h
Nasal	m	n	ɲ ɲɥ	ŋ ŋw	
Lateral		l			
Trill		r			
Glide			j	w [w, ɥ]	

In this paper, I am concerned with only a subset of these consonants. In several instances, the phonemes /t, d, s, k, g/ behave differently from /p, b, f, m, w/ in that they undergo labialization triggered by $V_{1[+High/Labial]}$. An opposing delabialization process also applies in the language, which derives the coronal vowels [i, ɪ] from the labial vowels /u, ʊ/, respectively. I view the latter as a repair that is necessary to ensure that a $C^{w}V_{[Labial]}$ sequence does not occur on the surface.

Depending on the quality of the following vowel, a $C_{[-Labial]}$ may be labialized (i.e., [C^{w}]), or ultimately labio-palatalized ([$C^{ɥ}$]). In both instances, the trigger is $V_{[Labial]}$, though this vowel ultimately loses its labiality by rule to become coronal. The processes taken together displace the vowel's labiality onto the consonant while subsequently satisfying an Obligatory Contour Principle (OCP, Leben 1973) constraint on adjacent segments specified for [Labial]. Vowel delabialization yields an environment which, in turn, sets the stage for labio-palatalization, with the former, in essence, feeding the latter.

Independent evidence for these outcomes is seen in that /u/ is optionally delabialized when preceded by an inherently labial consonant (e.g., /bùá/ ⟶ [bùwá] ~ [bìjá] 'to answer'). As seen in this example, such inputs have two non-contrastive output forms: i) V_1 [u] with a [w] glide-onset, and ii) V_1 [i] with a [j] glide-onset. Employing the feature [Labial] for vowels and consonants allows one to capture both the aforementioned phenomena as instances of [Labial][Labial] dissimilation whereby the second instance of the feature is removed. As discussion of

these outcomes continues, the feature classes in Table 9 will prove important in capturing the outcomes witnessed in Akan. The focus here is on consonants, but some vowels are included to illustrate the classes within which consonants and vowels pattern in the language's phonological processes.

Table 9: Feature classes

[+Labial]	Consonants: p, b, f, m, w	Labial
[+Labial]	Labialized consonants: C^{w}	Labialized
[+Labial]	Labio-palatalized consonants: $C^{ɥ}$	Labio-palatalized
[–Labial]	Consonants: t, d, s, j, k, g	Non-labial
[Coronal]	Consonants: t, d, s, j	Coronal
[Dorsal]	Consonants: k, g	Dorsal
[Labial]	Vowels: u, ʊ, o, ɔ	Labial

With reference to the feature classes in Table 9, the glide-onset [w] patterns with [+Labial] consonants and labial vowels, while the [j] glide-onset patterns with [–Labial] consonants and vowels. In addition, the [j] glide-onset patterns with [Coronal] consonants. Where there is the need to discuss /k, g/ separately, [Dorsal] is used.

It is clear that the vowels [i, ɪ] are coronal given their role in [j] glide-onset formation. Also, /e, ɛ/ are coronal, which is supported by the fact that even when they are in V_2 position, they dictate [j] glide-formation when V_1 is /ʊ/, and also when [w] glide-onset formation would be phonotactically and/or semantically costly. It is typically, but not always, in the absence or inability of [j] glide-onset formation to apply that a [w] glide-onset is formed. As will be shown, context is everything.

With the relevant features and feature classes defined, we can now turn to more details of the Akan data. To aid in doing so, Table 10 presents a subset of the vowel sequences that were given in Figure 1 in order to focus strictly on those relevant to the current study. These sequences can be described as $V_{1[+High]}V_{2[-High]}$.

Important to this paper is that a glide is formed between these vowel sequences and comes to serve as an onset to $V_{2[-High]}$: coronal vowels introduce a [j] glide-onset, and labial vowels introduce a [w] glide-onset. The morphological structure of a word plays no role in glide-onset formation or in processes associated with it. As a requirement, a glide-onset must agree with an adjacent surface vowel for place, either [Coronal] or [Labial], with a preference for the former over the latter. This preference is partly based on contrast preservation, but perhaps also

Table 10: Vowel sequences under consideration

			V_2 –High				
			–Low				
			–Round		+Round		+Low
			e	ɛ	o	ɔ	a
V_1 +High	–Round	i	ie	iɛ	io	iɔ	ia
		ɪ		ɪɛ			ɪa
	+Round	u	ue		uo		ua
		ʊ		ʊɛ		ʊɔ	ʊa

in markedness. [j] is coronal, whereas [w] is labial, with the former being less sonorous, and perhaps a better syllable onset in the language. But, although this is the preferred outcome, others are observed that are predicated on several interrelated featural and phonotactic factors. The description and analysis in §3 aims to establish how context affects a given rule's application, and how rule interactions derive output forms.

3 A rule-based analysis of glide-onset formation

This section analyzes data on glide-onset formation in Akan drawing upon concepts and principles of rule-based phonology. Data are sub-divided into two broad categories, namely [j] glide-onset formation (§3.1) and [w] glide-onset formation (§3.2). Rules and their relevant refinements are fully expressed in §3.3.

As elsewhere in this chapter, input forms are given in slashed brackets. The second column of each table shows the output for a given input. As will be shown, for some inputs, onset formation is more complex than simple glide insertion. There are indeed instances in which the onset formation trigger (a $V_{1[+High]}$) is altered by rule before a glide-onset is formed. There are also situations in which a preferred alternation is not phonotactically and/or semantically feasible, leading to another outcome instigated by a non-high, coronal V_2.

3.1 Domains of [j] glide-onset formation

This section focuses on instances when onset-formation is realized as [j] between a $V_{1[+High]}V_{2[-High]}$ vowel sequence. The goal here is to establish requirements

for the formation of the [j] glide-onset and to formulate linear rules to formalize the outcomes.

As shown in Tables 11 and 12, Akan avoids a $V_{1[+High]}V_{2[-High]}$ vowel sequence by introducing [j], the coronal glide.

Table 11: Input /ɪɛ/ and /ɪa/ sequences

a.	/èfiɛ́/	èfijɛ́	'vomit'
b.	/tiɛ́/	tìjɛ́	'discipline'
c.	/àpía/	àpíjá	'itchy powdered substance'
d.	/tiá/	tìjá	'shout at'

Table 12: Input /ie/, /io/, and /ia/ sequences

a.	/èfíé/	èfíjé	'house'
b.	/tìé/	tìjé	'listen'
c.	/bìé/	bìjé	'open'
d.	/pìé/	pìjé	'go out'
e.	/bìó/	bìjó	'again, furthermore'
f.	/àbìèsá/	æ̀bìjèsá	'three'
g.	/ànìèdíń/	æ̀nìjèdíń	'persistence'
h.	/pìá/	pìjá	'push'
i.	/àfiá/	æ̀fijá	'Friday female name'

Prosodically, the augmented [j] comes to form an onset for the syllable containing $V_{2[-High]}$. A common characteristic of the vowel sequences in these tables is that V_1 is both [+High] and [Coronal] – the only notable featural difference between the vowels in V_1 is their [ATR] status, which is [–ATR] in Table 11, but [+ATR] in Table 12. The V_2s, which are all [–High], can be of either [ATR] value.

Though I have not listed them in the table, the forms in Table 12, /bìé/ 'to open' and /pìé/ 'to go out', are sometimes realized as the variants [bùwé] 'to open' and [pùwé] 'to go out', respectively, with a [w] glide onset, with no change in meaning. While each retains its V_2, it is the V_1s that witness variation. This variation, in turn, underlies their difference in glide-onset formation: a labial $V_{1[+High]}$ will select [w], whereas a coronal $V_{1[+High]}$ will select [j]. The latter outcome is relevant in Tables 11 and 12, given that the glide that is inserted and the $V_{1[+High]}$ that precedes it are both coronal.

It is unclear at this point how best to treat this variation. One plausible explanation is that these items have a $V_{1[+High]}$ that is underspecified for place. Coronality might be assigned by default, resulting in the [j] glide-onset, while the [w] glide-onset is derived via V_1 labialization from the preceding consonant. This is a matter to be explored in future research given that their counterparts in Table 12 with V_1 /i/ are always realized with a [j] glide-onset. From the data, it is clear that $V_{2[-High]}$ plays no role in this matter. Rule (2) captures [j]-onset formation in these forms.

(2) j glide-onset formation:
$\emptyset \rightarrow [j] / V_{1[+High,\ Coronal]} \_\_ V_{2[-High]}$

It was mentioned that the presence of a labial V_1 often yields a [w] glide-onset to prevent a $V_{1[+High]}V_{2[-High]}$ sequence, but this is not what obtains in Tables 13 through 16. Although $V_{1[+High]}$ is underlyingly labial (either /u/ or /ʊ/), it loses its labiality to a preceding non-labial consonant, becoming coronal and triggering a [j] glide-onset. /ʊ/ only appears as $V_{1[+High]}$ in Table 16 and is always followed by /ɛ/. /u/ is the $V_{1[+High]}$ for the input forms in Tables 13 through 15, with a non-high V_2.

Table 13: Input /ue/ sequences with non-Labial C

a.	/tùé/	tᵘijé	‘pierce’
b.	/dùé/	dᵘìjé	‘sorry’

Table 14: Input /uo/ sequences with non-Labial C

a.	/ètúó/	ètᵘíjó	‘gun’
b.	/ènsúó/	ènsᵘíjó	‘water’
c.	/èkúó/	èkᵘíjó	‘group’
d.	/àdùɔ̀wɔ̀tɕʯí/	æ̀dᵘìjɔ̀wɔ̀tɕʯí	‘80’

Table 15: Input /ua/ sequences with non-Labial C

a.	/tùá/	tᵘìjá	‘settle debt’
b.	/dùá/	dᵘìjá	‘plant’
c.	/sùá/	sᵘìjá	‘imitate’
d.	/kúá/	kᵘíjá	‘farming’

Table 16: Input /ʊɛ/ sequences with non-Labial C

a.	/tʊ̀ɛ́/	tᵘijɛ́	‘remove from fire’
b.	/sʊ̀ɛ́/	sᵘijɛ́	‘offload’

The following are shared characteristics of forms in Tables 13 through 16, aside from their shared $V_{1[+High,\ Labial]}V_{2[-High]}$ vowel sequences: i) the consonant after which the glide-onset is added is underlyingly non-labial, ii) the underlying

consonants become labio-palatalized, iii) the underlying $V_{1[+High, Labial]}$ becomes coronal, and iv) onset-formation yields [j], triggered by a derived coronal V_1. Given the place alternation of labial V_1s to coronal, and the context in which Rule (2) applies, the rule responsible for the labial-to-coronal alternation must apply before the glide formation rule. I call this the V_1 delabialization rule.

There are other instances in which the consonant preceding $V_{1[+High]}$ becomes labio-palatalized, and this can only apply after V_1 delabialization. In Akan, a labial vowel can only labialize, but not labio-palatalize a consonant. For example, the stems *àkɔ́* 'has gone' and *àbá* 'has come' merge to derive the expression: *àkwáábá* [àkʷáábá] 'welcome'. Here, /ɔ/ would labialize /k/ to derive the intermediate output |akʷɔaba|. To avoid the *kʷɔ sequence, /ɔ/ is deleted, and the low vowel that follows it lengthens to compensate for this deletion to ultimately yield [àkʷáábá]. The [w] that is superimposed on /k/ in [àkʷáábá] does not become labio-palatalized because the succeeding vowel is not (or does not become) a high coronal. In Akan, it is only a labial glide that can become labio-palatalized before a coronal vowel. The word /wɪ/ 'to chew' is pronounced [ɥɪ] – that is, /w/ (labio)palatalizes to [ɥ] before the coronal vowel /ɪ/.

From the examples above, it can be argued that there are three rules that apply consecutively (in a feeding relation) to render labio-palatalized a non-labial consonant preceding $V_{1[+Hi]}$. The three rules are (ii) consonant labialization, (ii) V_1 delabialization, and (iii) labio-palatalization. According to the consonant labialization rule, a non-labial consonant followed by the vowel-sequence, $V_{1[+Hi, Lab]}$ $V_{2[-Hi]}$ becomes labialized (i.e., C^w).

For the current study, one must formulate two separate consonant labialization rules, one for when /u/ is V_1, with V_2 specified broadly as $V_{2[-Hi]}$ (see 3a), and a second consonant labialization rule for when V_1 is /ʊ/, with a V_2 that is strictly /ɛ/ as in (see 3b). This is necessary because forms with /ʊ/ as V_1, as in Table 16, opt out of [j] glide-onset formation when V_2 is /a/ or /ɔ/. Forms with V_1 /u/ do not.

A consonant labialization rule focusing strictly on the /ʊɛ/ vowel sequence (Rule 3b) ensures that output forms with /ʊa/ and /ʊɔ/ sequences are not wrongly predicted to have a [j] glide-onset. That is, Rule (3a) has diverse V_2s and, therefore, is more productive than Rule (3b) whose application is restricted to when the sequence following the underlyingly non-labial consonant is /ʊɛ/.

(3) a. Consonant labialization:
$C_{[-Labial]} \rightarrow C_{[-Labial]}{}^{w} / \_\_ V_{1[+High, Labial, +ATR]} V_{2[-High]}$

b. Consonant labialization:
$C_{[-Labial]} \rightarrow C_{[-Labial]}{}^{w} / \_\_ V_{1[+High, Labial, +ATR]} V_{2[-High, Coronal]}$

c. V_1 delabialization (avoidance of $C^wV_{[Labial]}$):
$V_{[Labial]} \longrightarrow V_{[Coronal]} / C_{[-Labial]}{}^w\_\_$
d. Labio-palatalization:
$C^w \longrightarrow C^q / C \_\_ V_{1[Coronal]}$
e. j glide-onset formation:
$\emptyset \longrightarrow [j] / V_{1[+High, Coronal]} \_\_ V_{2[-High]}$

The two rules of consonant labialization, in effect, derive an impermissible consonant-vowel sequence, $C^wV_{[+High, Labial]}$. This, in turn, motivates the application of the V_1 delabialization (Rule 3c) to derive the intermediate output, $C^wV_{[+High, Coronal]}$. This sequence then motivates labio-palatalization of the labialized consonant (Rule 3d) and [j] glide-onset formation (Rule 3e). The labio-palatalization and [j] glide-onset rules must apply after the V_1 delabialization rule; labio-palatalization and the [j] onset-formation rules need not be ordered crucially.

In Table 16, it was shown that a non-labial consonant preceding /ʊ/ is realized with labialization as a secondary articulation: $C_{[-Labial]} \longrightarrow C_{[-Labial]}{}^w$. In these instances, V_1 /ʊ/ delabializes to [ɪ], and consequently, a [j] glide is formed to avoid the [+High][−High] vowel-sequence, in that order.

A different procedure occurs in words like those in Table 17, however. Consonant labialization and V_1 delabialization do not apply to yield [j] onset-formation, and yet a [j]-onset is formed nonetheless. The consonants preceding /ʊ/ in Table 17 are underlyingly labial, which is the only way that these forms differ from those in Table 16.

Table 17: Input /ʊɛ/ sequences with a preceding labial consonant

a.	/bʊ̀ɛ́/	bʊ̀jɛ́	‘be crunchy’
b.	/fʊ̀ɛ́/	fʊ̀jɛ́	‘be ill’

Comparing Tables 16 and 17, one can see that consonant labialization, with its associated V_1 delabialization, does not apply when the consonant preceding /ʊ/ is underlyingly labial. It is expected, in the absence of consonant labialization and resultant V_1 delabialization, that [w] will be formed (i.e., to derive: *[bʊ̀wɛ́] and *[fʊ̀wɛ́]) given that V_1 remains /ʊ/ and labial, yet this does not happen. Rather, the V_2 /ɛ/ dictates onset formation. Hence, these output forms emerge with the [j] onset. Note that *[wɛ] is not a permissible phonetic sequence/syllable in Akan, and any attempt to avoid this structure by extending labiality further to /ɛ/ would

therefore yield attested Akan words: [bɔ̀wɔ́] ‘stone’ and [fɔ̀ɔ́] ‘buffalo’. To avoid such an outcome, a [j]-onset, triggered by /ɛ/, is the preferred option. Rule (4) shows insertion of [j] after $C_{[+Labial]}V_{[Labial]}$ and before V_2 /ɛ/.

(4) V_2/ɛ/, [j] onset-glide formation:
$\emptyset \longrightarrow$ [j] / $C_{[+Labial]}V_{1[+High, Labial, -ATR]}$ __ $V_{2[-High, Coronal]}$

The data in Table 17 suggest that consonant labialization with V_1 delabialization fails to apply when the consonant preceding /ʊ/ is underlyingly labial. It will also be shown in Tables 22 and 27 that onset-formation between a /ʊa/ sequence, irrespective of the place of articulation of the preceding consonant, is typically [w]. The output forms in Table 18, observed in the Akuapem dialect of Akan, might seem to contradict these two positions. However, this is not entirely true, as these forms are simply variants of those seen elsewhere, which are observed for all dialects of Akan. In other words, the underlyingly /ʊa/ word-forms in Akuapem optionally involve consonant labialization, which triggers the processes that derive the forms in Table 18.

Table 18: Input /ʊa/ sequences in Akuapem Twi

a.	/bɔ̀á/	b^{ɥ}ìjá	‘help’
b.	/fɔ̀á/	f^{ɥ}ìjá	‘agree with’
c.	/tɔ̀á/	t^{ɥ}ìjá	‘enjoin’
d.	/sɔ̀á/	s^{ɥ}ìjá	‘carry over head’
e.	/kɔ̀á/	k^{ɥ}ì.já	‘bend over’

Given these facts, I propose the optional consonant-labialization rule in (5), which applies only in the Akuapem dialect of Akan.

(5) Consonant labialization (in Akuapem):
C $\longrightarrow$ [C^{w}] / __ $V_{1[+High, Labial, -ATR]}V_{2[+Low]}$

With this optional consonant labialization rule now added, the V_1 delabialization rule proposed above in (3c) must be refined to accommodate the instances of V_1 delabialization seen in Table 18. The only way to do this is to remove the feature [–Labial], as in the amended Rule (6), so that the V_1 delabialization rule applies regardless of whether a labialized consonant is underlyingly labial or non-labial.

(6) $V_{[Labial]} \longrightarrow V_{[Coronal]}$ / C^{w} __

I have illustrated thus far that there are three contexts triggering [j] onset formation: i) a $V_{1[+High]}$ that is underlyingly coronal (Tables 11 and 12), ii) a derived coronal vowel from an underlyingly high labial vowel (Tables 13 through 16), and iii) a coronal $V_{2[-High]}$ preceded by $C_{[+Labial]}V_{[+High, Labial, -ATR]}$ (Table 17). Thus, a derived coronal-trigger of the [j]-onset emerges after consonant labialization and V_1 delabialization.

In addition, I have proposed three consonant labialization rules. In two of them, the consonant preceding a labial V_1 is underlyingly non-labial. The third is an optional consonant labialization rule found only in Akuapem that affects any consonant before a V_1/ʊ/V_2/a/ sequence. To these, one can also add a V_1 delabialization rule which targets either /u/ or /ʊ/ when preceded by a labialized consonant.

The rule relationships identified here are of the feeding type, which holds among consonant labialization, V_1 delabialization, and [j] onset-formation and labio-palatalization, in that order. The V_1 delabialization rule applies to avoid a [Labialized][Labial] (consonant-vowel) sequence, and the [j]-onset is formed to prevent a [+High][–High] vowel-sequence.

The vowel /u/ triggers consonant labialization and also undergoes V_1 delabialization to condition the [j] glide-onset more than /ʊ/. Cross-dialectally, V_1 delabialization involving /ʊ/ applies when the surrounding sounds (both consonants and vowels) are underlyingly coronal.

3.2 Domains of [w] glide-onset formation

This subsection discusses input vowel sequences that result in [w] glide-onset formation. The first portion focuses on data in Tables 19 through 23 which involve vowel sequences preceded by a labial consonant. In most instances, the expected [w] glide-onset emerges. However, Table 24 is given for comparison as it contains data discussed earlier where the language distinctly but unexpectedly opts out of [w] onset-formation.

Data from Tables 19 through 22, and also Table 23 below, exhibit the following shared properties: i) $V_{1[+High]}$ is underlyingly high and labial, ii) the consonant preceding V_1 is labial, and iii) V_2 is [–High]. Rule (7) accounts for [w] glide-onset formation in these instances and is not restricted to V_1 being only /ʊ/ or /u/.

(7) w glide-onset formation:
$\emptyset \longrightarrow$ [w] /$C_{[+Labial]}V_{1[+High, Labial]}$ ___ $V_{2[-High]}$

This rule applies broadly, when C is underlyingly labial, V_1 is high and labial, and V_2 is [–High]. Exceptions to it contain inputs with V_2/ɛ/ (as in Table 24)

Table 19: Input /uo/ sequences

a.	/èbúó/	èbúwó	‘coop’
b.	/àfúó/	æfúwó	‘farm’

Table 20: Input /ʊɔ/ sequences

a.	/ɛ̀bʊ́ɔ́/	ɛ̀bʊ̀wɔ́	‘stone’
b.	/ɛ̀fʊ́ɔ́/	ɛ̀fʊ́wɔ́	‘buffalo’

Table 21: Input /ua/ sequences

a.	/bùá/	bùwá	‘answer’
b.	/fúá/	fúwá	‘single’

Table 22: Input /ʊa/ sequences

a.	/bʊ̀á/	bʊ̀wá	‘help’
b.	/fʊ́á/	fʊ́wá	‘agree with’

Table 23: Input /ue/ sequences

a.	/pùé/	pùwé	‘go out’
b.	/bùé/	bùwé	‘open’

Table 24: Input /ʊɛ/ sequences

a.	/bʊ̀ɛ́/	bʊ̀jɛ́	‘be crunchy’
b.	/fʊ́ɛ́/	fʊ́jɛ́	‘be ill’

which seem immune to it. To account for such outcomes, Rule (4), proposed above, must be ordered before Rule (7). In these instances involving /ɛ/, the grammar prioritizes [j] onset-formation rule over [w] onset-formation. The derivations in Table 25 illustrates this outcome.

Table 25: Effect of V_2 /ɛ/

	/bʊ̀ɛ́/	/bùé/
Rule 4	bʊ̀jɛ́	–
Rule 7	–	bùwé
	[bʊ̀jɛ́]	[bùwé]
	‘be crunchy’	‘open’

In Table 25, the /ɛ/-specific [j]-onset rule bleeds the [w]-onset rule, yielding /bʊ̀ɛ́/ → [bʊ̀jɛ́]. Reversing the rules would derive unattested *[bʊ̀wɛ́]. The [j]-onset rule does not apply to /bùé/ whose V_2 is [+ATR], resulting instead in [bùwé].

The last of the [w]-onset cases to be analyzed involve the forms in Tables 26 and 27. The vowel sequences are underlyingly /ʊɔ/ and /ʊa/, just like those in Tables 21 and 22, but they differ in that they are preceded by non-labial consonants.

Table 26: Input /ʊɔ/ sequences

a.	/ɛ̀tʊ́ɔ́/	ɛ̀tʊ̀wɔ́	'butt'
b.	/ɛ̀kʊ́ɔ́/	ɛ̀kʊ̀wɔ́	'buffalo'

Table 27: Input /ʊa/ sequences

a.	/tʊ̀á/	tʊ̀wá	'enjoin'
b.	/sʊ̀á/	sʊ̀wá	'carry over head'
c.	/kʊ̀á/	kʊ̀wá	'bend over'

Rule (8) captures [w] onset-formation as it applies to forms in Tables 26 and 27.

(8) w glide-onset formation for $C_{[-\text{Labial}]}V_1$/ʊ/:
$\emptyset \longrightarrow$ [w] /$C_{[-\text{Labial}]}V_{1[+\text{High, Labial, -ATR}]}$ __ $V_{2[-\text{High}]}$

We can see that this rule is restricted to applying to V_1 /ʊ/ because vowel-sequences /uo/ and /ua/, when preceded by non-labial consonants, submit instead to the [j]-onset rule. The outcomes in Table 28 illustrate key differences that extend from these differing vocalic environments, which are captured by rule ordering.

Table 28: Effect of V_1 /ʊ/ vs. /u/ and C labiality

	/(ɛ)tʊ̀ɔ́/	/tʊ̀á/	/bʊ̀á/	/bʊ̀ɛ́/	/bùá/	/bùé/
Rule 4	–	–	–	bʊ̀jɛ́	–	–
Rule 7	–	–	bʊ̀wá	–	bùwá	bùwé
Rule 8	tʊ̀wɔ́	tʊ̀wá	–	–	–	–
	[tʊ̀wɔ́] 'butt'	[tʊ̀wá] 'join'	[bʊ̀wá] 'help'	[bʊ̀jɛ́] 'be crunchy'	[bùwá] 'help'	[bùwé] 'open'

3.3 Rules and their refinements

Table 29 presents, in no particular order, a summary of the rules proposed thus far to be responsible for [j] and [w] onset-formation between high and non-high vowel-sequences in Akan; any ordering relationships that hold between rules are discussed below. In the interest of space, feature names are abbreviated. Taken together, these repair strategies in Akan prevent *$V_{1[+High]}V_{2[-High]}$ vowel sequences and *[Labialized][Labial] consonant-vowel sequences in CVV words. For ease of reference, rules are numbered here according where they were first discussed earlier in this chapter. Rules contributing to [j] onset-formation are Rules (2) and (4), and those responsible for [w] onset-formation are Rules (7) and (8). Thus, there are two rules directly responsible for forming each onset; one occurs in a very specific vocalic environment, and one that applies more broadly.

Table 29: Rule summary

Rule	Name	Context
4	V_2 /ɛ/-conditioned [j]-onset	$\emptyset \longrightarrow$ [j] / $C_{[+Lab]}V_{1[+Hi, Lab, -ATR]}$ __ $V_{2[-Hi, Cor]}$
2	$V_{1[+Hi, Cor]}$ [j]-onset	$\emptyset \longrightarrow$ [j] / $V_{1[+Hi, Cor]}$ __ $V_{2[-Hi]}$
8	[w]-onset, non-Labial C, V_1/ʊ/	$\emptyset \longrightarrow$ [w]/$C_{[-Lab]}V_{1[+Hi, Lab, -ATR]}$ __ $V_{2[-Hi]}$
7	[w]-onset, Labial C	$\emptyset \longrightarrow$ [w]/$C_{[+Lab]}V_{1[+Hi, Lab]}$ __ $V_{2[-Hi]}$
3a	Consonant labialization 1	$C_{[-Lab]} \longrightarrow C_{[-Lab]}{}^{w}/\_\_V_{1[+Hi, Lab, +ATR]}V_{2[-Hi]}$
3b	Consonant labialization 2	$C_{[-Lab]} \longrightarrow C_{[-Lab]}{}^{w}/\_\_V_{1[+Hi, Lab, -ATR]}V_{2[-Hi, Cor]}$
5	C-Labialization (Akuapem), /ʊa/	$C \longrightarrow [C^{w}]/\_\_ V_{1[+Hi, Lab, -ATR]}V_{2[+Low]}$
6	V_1 delabialization	$V_{[Lab]} \longrightarrow$ [Cor]/C^{w} __
3d	Labio-palatalization	$C^{w} \longrightarrow C^{ɥ}/\_\_ V_{1[+Hi, Cor]}$

In the remainder of this section, I illustrate various interactions that arise between rules in Table 29. It has been shown thus far that rule ordering is critical in a number of instances. For example it was shown in Table 25 that Rule (4) must crucially precede Rule (7). I also discussed that Rule (5), which applies only in the Akuapem dialect, sets the stage for V_1 delabialization via Rule (6), and thereafter [j] glide-onset formation (Rule 2) and labio-palatalization (Rule 3d).

In Rule (4), [j] onset-formation is conditioned by a non-high coronal V_2 when the preceding CV sequence is /$C_{[+Labial]}$ʊ/. Given what occurs elsewhere in Akan, other potential outcomes could have been: i) for V_1 /ʊ/ to delabialize to [ɪ] and then for [ɪ] to have conditioned the [j]-onset (i.e., fʊ̀é ⟶ fìjé 'vomit'), or ii) for V_1 /ʊ/ to have conditioned a [w]-onset, which would thereafter trigger an alternation of /ɛ/ to [ɔ] as in: bʊ̀é ⟶ bʊ̀wé ⟶ bʊ̀wɔ́). Both outcomes would have been

semantically costly, however. That is, [j] onset-formation conditioned by V_2 /ɛ/ blocks a $V_{1[Labial]}$ delabialization rule and also a [w] onset-formation rule, which I have demonstrated above disrupts the semantic identity of $C_{[+Labial]}$ /ʊ̀é/ inputs. As such, /ʊ/ as V_1 must retain its labiality and must not be allowed to trigger the [w] glide-onset.

The [j] glide-formation rule (Rule 2) applies in contexts where such semantic issues are not relevant. That is, the rule applies when $V_{1[+High, Labial]}$ delabialization (via Rule 6) has applied to V_1 /ʊ/ or /u/, changing them to a coronal, [ɪ] or [i], respectively, or when V_1 is inherently coronal. Note that the consonant labialization rules in (3a) and (3b) create the context required for the application of Rule (6); these labialization rules apply when the initial consonant of the word is [–Labial].

A third consonant labialization rule (Rule 5) applies only in the Akuapem dialect and affects both labial and non-labial consonants before the vowel sequence /ʊa/. This rule is just like the labialization rules (3a) and (3b) in that it feeds $V_{1[+High, +Labial]}$ delabialization. It can therefore be said that $C_{[–Labial]}$ labialization, via whichever of the three labialization rules applies in a given environment, is a process that feeds $V_{1[Labial]}$ delabialization which, in turn, feeds [j] glide-onset formation triggered by $V_{1[+High, Coronal]}$.

In sum, consonant labialization applies to preserve V_1 labiality, V_1 delabialization prevents an impermissible $C^wV_{1[Labial]}$ sequence, and [j] glide-onset formation prevents $^*V_{1[+High]}V_{2[–High]}$ sequence. As shown, the vowel /u/ is more susceptible to these processes than /ʊ/.

Concerning the two [w] onset-formation rules, Rules (7) and (8), a [w] glide-onset is formed when $V_{1[+High]}$ is underlyingly labial and remains so on the surface. Rule (8) is restricted to applying when $V_{[+High]}$ is /ʊ/ and the consonant preceding it is non-labial. In Rule (3b), the environment conditioning consonant labialization is similar to that of [w] glide-onset formation. For both, the initial consonant is non-labial, and V_1 is /ʊ/. The only difference between them is the content of V_2 which is broadly [–High] in Rule (7), while narrowly [–High, -Coronal] in Rule (3b). As such, the narrower rule must precede the broader rule, as shown in Table 30, so that /tʊ̀é/ 'to remove from fire' can be spared of [w] glide-onset formation. Even reversing the order of the two rules in Table 30 would yield an unattested form for /tʊ̀é/ ⟶ *[tʊ̀wé], illustrating that other factors must be at play.

Table 31 shows the attested outcome [tᶣijé] is created owing to the downstream effects of V_1 delabialization, consonant labio-palatalization, and [j] glide-onset formation, which must consecutively apply and act upon the output of Rule (3b).

Table 30: Consonant labialization precedes [w] glide-onset

	/tʊ̀ɛ́/	/(è)tʊ́ɔ́/	/tʊ̀á/
Rule 3b	tʷʊ̀ɛ́	–	–
Rule 8	–	(è)tʊ́wɔ́	tʊ̀wá
	*[tʷʊ̀ɛ́] ‘remove from fire’	[(è)tʊ́wɔ́] ‘butt’	[tʊ̀wá] ‘enjoin’

The input forms /(è)tʊ́ɔ́/ ‘butt’ and /tʊ̀á/ ‘to enjoin’ are not subject to V_1 delabialization, consonant labio-palatalization, and [j] glide-onset formation, as they have not undergone consonant labialization, on which these rules depend.

Table 31: Feeding effects

	/tʊ̀ɛ́/	/(è)tʊ́ɔ́/	/tʊ̀á/
Rule 3b	tʷʊ̀ɛ́	–	–
Rule 8	–	(è)tʊ́wɔ́	tʊ̀wá
Rule 6	tʷɪ̀ɛ́	–	–
Rule 3d	tᵘɪ̀ɛ́	–	–
Rule 2	tᵘɪ̀jɛ́	–	–
	*[tᵘɪ̀jɛ́] ‘remove from fire’	[(è)tʊ́wɔ́] ‘butt’	[tʊ̀wá] ‘enjoin’

The broader [w] glide-onset rule, Rule (7), applies in instances where $V_{1[+High]}$ and the consonant preceding it are [+Labial]. Notably, V_2 must be a non-high vowel. The context of the narrower [j] onset formation rule triggered by V_2 /ɛ/, Rule (4), is similar, illustrating that the latter must be ordered before the former in order for it to have any visible effect. This ordering, yielding [bʊ̀jɛ́] ‘to be crunchy’ from input /bʊ̀ɛ́/ illustrates the necessity of this ordering in Table 32. Other inputs whose V_2 differs are not affected by the more stringent rule.

What I hope is clear is that V_1 is the primary conditioner of glide-onset formation. V_2 has a limited, but nonetheless significant, role to play. Concerning the two high labial V_1s, /ʊ/ generally conditions [w] glide-onset formation. It only conditions consonant labialization (with accompanying V_1 delabialization, consonant labio-palatalization, and [j] glide-onset formation rules) when the preceding consonant is non-labial and the succeeding vowel is /ɛ/. There are cases

Table 32: Ordering [j] glide-onset before [w] glide-onset

	/bʊ̀ɛ́/	/(è)bʊ́ɔ́/	/bùá/	/bùé/	/(è)búó/	/bùá/
Rule 4	bʊ̀jɛ́	–	–	–	–	–
Rule 7	–	(è)bʊ̀wɔ́	bʊ̀wá	bùwé	(è)búwó	bùwá
	[bʊ̀jɛ́] 'be crunchy'	[(è)bʊ̀wɔ́] 'stone'	[bʊ̀wá] 'help'	[bùwé] 'open'	[(è)búwó] 'coop'	[bùwá] 'answer'

where /ɛ/ is the V_2 (i.e., in $C_{+Labial]}$/ʊɛ/ words), and therefore V_2 steps in to trigger a [j] glide-onset when V_1 cannot act in either of the ways described above (i.e., when neither consonant labialization nor the [w] glide-onset formation rule could apply). V_1 /u/ generally conditions consonant labialization, followed by V_1 delabialization, consonant labio-palatalization, and [j] glide-onset formation. It only conditions [w] glide-onset formation when the preceding consonant is labial.

In Akuapem, consonant labialization and its accompanying rules, on the one hand, and the rule of [w] glide-onset formation, on the other, apply independently (irrespective on the place of articulation of the initial consonant) to derive variant output realizations in /Cʊ̀á/ input cases. That is, these forms undergo either [j] glide-onset formation with the initial consonant becoming labio-palatalized, or [w] glide-onset formation with the initial consonant being intact.[3]

4 Conclusion

In this section, I situate the findings presented above within phonological theory to shed more light on the motivations for the observed vowel and consonant behaviors as well as the prosodic aspects of the glide-onset formations under consideration in this paper.

The following is a brief overview of some essential principles of markedness theory and sonority theory to which the findings relate. The theory of markedness (de Lacy 2002, 2006, Lombardi 2002) posits that "not all elements in a phonological system are of equal status" (Rice 2007). The unmarked/marked distinction between any two segments often dictates which phonological processes they can

[3]The approach taken here has been rule-based. In non-linear phonological terms, consonant labialization and both [j] and [w] glide-onset formation, could be conceived of and represented by place feature spreading – not a complete spreading of a vowel as one reviewer suggested – either regressively or progressively.

be subject to. The tendency is to preserve marked units over unmarked ones in situations where one of them must be deleted in a given phonological domain. In terms of height (from marked to unmarked) the following relationships can be proposed for Akan vowels: [–High] ≫ [+High] and [+Low] ≫ [–Low]. Taken together, high vowels are the least marked, and so forth, as vowel height moves to mid and low: *a* ≫ *o, ɔ, ɛ, e* ≫ *ʊ, u, i, ɪ*). For consonant place, coronal is unmarked.

As noted by Zec (2007: 178–179), "[s]onority … steers the crucial aspects of syllable internal segment sequencing" [and that] "[t]he second mode of constraining sonority is syntagmatic in nature." Argued to underlie intra- and inter-syllabic organization of segments, the sonority scale/hierarchy has been represented as follows (from the most to least sonorous): V (low ≫ mid ≫ high) > L (rhotics ≫ laterals) > N (nasals) > O (voiced fricatives ≫ voiced stops ≫ voiceless fricatives ≫ voiceless stops) (Zec 2007: 178). As reiterated by Zec, "[b]y taking into account the ordering [as given above], the arrangement of segments within the syllable follows a clear pattern: the most sonorous segment occupies the nucleus, while the less sonorous ones occur towards the margins. [Syntagmatically], [c]onstraints on sonority distance have the task to optimize the sonority slope between margins and peaks, both within and across syllables". I would argue that Syllable Contact Law (SCL, Murray & Vennemann 1983), focusing on vowel sequences between syllables, motivates onset formation in Akan.

Prosodically, what begins as a /CV.V/ syllable sequence (with the second onsetless syllable being marked) undergoes glide-onset formation to become [CV.CV]. The outcome is two unmarked CV syllables. What is fascinating is how the language employs an unmarked prosodic strategy to obviate the phonotactically ill-formed *[+High][–High] vowel sequence. In achieving this objective, templates have to be modified (e.g., a C has to be inserted on the CV-tier) to allow for the onset and glide formations (i.e., the prosodic and segmental/featural remedies, respectively) which apply concurrently to right this phonotactic blunder. To meet this objective, there is alignment (i.e., association), re-alignment (i.e., re-association), and de-association of units of the different levels of input representation, which could easily be illustrated in a non-linear representational model.

This re-organization of features and prosodic units is required to prevent a marked [+High][–High] phonotactic sequence, in a context where the feature [+High] (i.e., the unmarked value) is lexically significant and must be preserved. The unmarked status of [+High] is established based on how sounds with this feature respond when adjacent to those with the feature [–High]. The word, *paɪ*'split', when reduplicated to *paɪpaɪ*, is pronounced [paapaɪ]. That is, /ɪ/ (being unmarked in Akan) is lost in pronunciation, and /a/ (being marked in Akan) is doubled to compensate for the loss.

Also contributing to the observed outcomes is that, historically, the sounds [tɕ, dʑ, ɥ, ɕ] are said to have been originally /k, g, w, h/, respectively, word-initially before $V_{1[+High,\ Coronal,\ +ATR]}V_{2[-High]}$. The V_1 /i/ was deleted alongside the coronalization of the two plosives /k, g/ to [tɕ, dʑ], respectively. Thus, what was once a disyllabic root became monosyllabic. Interestingly, the [+ATR] feature of the deleted /i/ still triggers regressive [+ATR] harmony in the language. The so-called historical reduction was made possible by the fact that the high vowel was not contrastive in said domain. Words in the language that are argued to have been subjected to the two processes are: *agya* [ædʑa] 'father', *gya* [dʑa] 'leave', and *egya* [edʑa] 'fire', as well as, *twa* [tɕɥa], 'to cut', and *dwa* [dʑɥa] 'to peel off'. De Jong & Obeng (2000) (also, see de Jong 2024 [this volume]) use the term *palatalization* to refer to the above historical process in Akan.

Via this process, an unmarked [+High] vowel was deleted, and a marked [–High] vowel preserved, illustrating another instance of faithfulness to the marked, masking of the unmarked, submergence of the unmarked (de Lacy 2002, 2006, Rice 1999, 2002). The impermissible [+High][–High] vowel sequence cannot be prevented by deleting the unmarked high vowel in the data under consideration in the current paper. This is because the unmarked high vowel is lexically significant – i.e., its deletion would create another attested word. The formation of a glide-onset, therefore, precludes the unmarked [+High] vowel from deletion.

Based on the current study, I would argue that glide-onset formation is a strategy for preservation of the unmarked. The unmarked high vowel is under threat of deletion by a succeeding non-high vowel. The argument in this paper is that principles of sonority underlie the determination of what is marked and unmarked in Akan grammar and that the two factors combined are significant in the construction of syllable-sequences in Akan grammar. Glide-onset formation applies to prevent an unmarked/less-sonorous vowel from the encroachment of, and subsequent deletion by, a marked/more-sonorous vowel in sequence. With $V_{1[+High]}$ being less sonorous than V_2, the [j] or [w] glide is inserted to create a syllable onset for the second vowel.

My analytical position is that sonority is not only significant in the organization of segments within syllables (Bybee 1976, Clements 1990, Jespersen 1904, Selkirk 1984, Steriade 1982, Vennemann 1972, Zec 1988), and in constraining syllable contact sequences via the Syllable Contact Law (Murray & Vennemann 1983), but it is also equally relevant in the sequencing of vowels at the syllable-boundary in open syllable languages like Akan. Thus, it would appear that Syllable Contact Law motivates glide-onset formation. Glide-onset formation is necessitated by the fact that V_1, which ends the first syllable, is less sonorous than a following V_2. The argument, therefore, is that glide formation applies to ensure that the left edge of the second syllable is lower in sonority than the right edge of

the first syllable. Glides are well-suited for this because they are lower on the sonority scale than the high vowels which end the first syllable, but it should also be noted that liquids, nasals, obstruents are also lower on the sonority scale than high vowels, and, on that basis, one might consider them equally plausible candidates for the V_2 onset slot. So, this leads to a question of why glides are preferred over non-glides preceding V_2.

The answer would appear to rest in the fact that glide-onset formation must be pursued in ways that preserve meaning, and the grammar meets this objective by employing more predictable, meaning-preserving processes, which the [w] and [j] glide-onset formation can achieve. That is, the transition from a less sonorous vocalic unit to the more sonorous vocalic unit of abutting syllables must be avoided, and is so achieved through glide-onset formation conditioned by an abutting vowel in the sequence in this preference order: [i, ɪ] ≫ [ɛ, e] ≫ [u, ʊ]. The conditioning vowel must be preserved, to the extent possible, to maintain the root's lexical identity.

This (re)syllabification effort is significant for achieving both phonotactic and functional/semantic well-formedness. In the end, contrastive units/features are preserved, and conditions regulating the sequencing of phonological (segmental and featural) units (which are markedness- and sonority-based) under the umbrella term, phonotactics, are observed.

That $V_{2[-\text{High}]}$ is more sonorous than $V_{1[+\text{High}]}$, and the outcomes surrounding them as presented here, is conceived as a fortitioning strategy aimed at preserving an unmarked but contrastive feature. This occurs predictably in all instances. It is guaranteed by the extension a vowel's place feature – either [Coronal] or [Labial] – to the newly created onset slot. We see the tendency of /u/ (but not /ʊ/) to lose its labiality, and, therefore, for the [j] glide-onset to be generated often for forms with underlying /u/. This trend can be viewed as principled if one bears in mind that /u/ is higher than /ʊ/, and therefore less marked based on the reasoning above. The vowel trapezium in Dolphyne (1988: 7) supports these findings. Indeed, what the current study has done is to have offered the relevant empirical phonological support for Dolphyne's Akan vowel chart.

Lastly, on the semantic/functional side of the argument, glide-onset formation applies when the repair of phonotactically impermissible vowel sequences via loss of one of the two segments would be functionally/semantically costly. Therefore, glide-onset formation comes across as the more convenient, alternative repair strategy that significantly preserves essential elements of the two vowels without the output resulting in any meaning difference. Thus, Akan's grammar appears to restrict the application of phonological to specific units and domains, and demands that certain rules be ordered, so preserve both meaning and phonotactic well-formedness.

Abbreviations

ATR	Advanced Tongue Root	Lab	Labial
C	Consonant	Lo	Low
Cor	Coronal	PST	Past
Dor	Dorsal	Rd	Round
EMP	Emphatic	SG	Singular
Hi	High	V	Vowel

Acknowledgements

When I was growing up in Ghana in the 80s, there was a program on national radio called "The Everyday English" on which Dr. Samuel Gyasi Obeng was the radio teacher. We were always glued to our radios each morning to learn from him about the intricacies of the English language and how to use it. We so admired him, and little did some of us know that we would someday meet him and that we would become colleagues in Linguistics. Prof. Obeng is a great teacher and colossus in matters of general and African linguistics, and it is befitting that his contributions to our field be recognized. May God continue to bless this fine scholar and gentleman with good health and in all his endeavors.

I am also very thankful to the editorial team and the two anonymous reviewers for their comments and suggestions on the drafts that have finally developed into the current paper. Chris and Samson, I really appreciate your attention to detail and clarity, your patience and hard work in putting this volume together.

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