THE MORPHOPHONOLOGY OF A'INGAE VERBAL STRESS

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ABSTRACT

This work treats of the morphophonology of verbal stress in A'ingae (Cofán, ISO 639-3: con), an isolate language of the Amazon. By presenting and generalizing over novel data, it makes contributions to language description, typology, and theory.

At the level of description, it demonstrates the sensitivity of stress to weight in A'ingae, systematizes the template of verbal inflections, and details its intricate patterns of morphophonological alternations.

At the level of typology, it observes a rare, if not unattested, accentual pattern, whereby the primary stress targets the syllable containing the second mora to the left of a glottal stop.

At the level of theory, it provides an account within the framework of Cophonology (Anttila, 1997; Orgun, 1996; others) and lends support to the framework by the dint of its analytical parsimony.

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CONTENTS

1

INTRODUCTION

The subject matter of this work is the rich morphophonology of verbal stress in A'ingae (Cofán, ISO 639-3: `con`), a language isolate of the Amazon. I will present novel data and advance original generalizations, contributing to language description, typology, and theory.

I will systematize the inflectional template the A'ingae verb and detail the morphophonological alternations found within it.

Furthermore, I will demonstrate the sensitivity of A'ingae stress assignment to syllabic weight as well as glottal stops, which cannot be accounted for with a recourse to the notion of syllabic weight.

Finally, I will lend support to the framework of Cophonology Theory (Anttila, 1997; Orgun, 1996; others) by providing a parsimonious Cophonological account of the complex data.

1.1 THE PUZZLE

A'ingae's stress system is highly complex. It presents two interwoven challenges, one morphological and one phonological.

The morphological challenge is posed by the descriptive necessity to posit six different suffix types, each associated with a separate accentual pattern. This can be demonstrated by a minimal six-tuple of pairs of verbs inflected with a suffix of each type and another suffix to its right (1-6). The pattern is here exemplified with the verbs *upathû* 'pick' and *afase* 'insult' and the negative suffix *–mbi* 'NEG.' Stress is marked with the acute accent and an underline.

			a. *upathû ...–mbi*	b. *afase ...–mbi*
			'pick ...–NEG'	'insult ...–NEG'
(1)	*–'chu*	'SBRD'	*upáthû–'chu–mbi*	*áfase–chu–mbi*
(2)	*–'fa*	'PLS'	*upathû́–'fa–mbi*	*áfase–fa–mbi*
(3)	*–ji*	'PRCM'	*upathû–jí–mbi*	*áfase–ji–mbi*
(4)	*–'je*	'IMPV'	*upáthû–'je–mbi*	*afáse–'je–mbi*
(5)	*–'kha*	'DMN'	*upathû́–'kha–mbi*	*afasé–'kha–mbi*
(6)	*–khu*	'RCPR'	*upathû–khú–mbi*	*afase–khú–mbi*

In forms of *upathû* 'pick' (1-6a), the subordinating *–'chu* 'sbrd' and the imperfective *–'je* 'impv' induce stem-penultimate stress (1, 4a). The plural subject *–'fa* 'pls' and the verbal diminutive *–'kha* 'dmn' induce stem-ultimate stress (2, 5a). The precumulative *–ji* 'prcm' and the reciprocal *–khu* 'rcpr' induce post-stem stress (3, 6a).

In forms of *afase* 'offend' (1-6b), only *–'je* 'impv,' *–'kha* 'dmn,' and *–khu* 'rcpr' induce the same patterns (4-6b), while *–'chu* 'sbrd,' *–'fa* 'pls,' and *–ji* 'prcm' occur with stem-initial stress (1-3b). In total, six distinct accentual patterns are observed.

The phonological challenge consists of the peculiar role glottal stops play in stress assignment. A particular pattern of "glottal stress" is revealed in comparing stress induced by suffixes without glottal stops, such as *–ji* 'prcm' (8), and with glottal stops, such as *–'je* 'impv' (9), on roots with syllables of different weights: light-light (7-9a), heavy-light (7-9b), and light-heavy (7-9c).[1]

	V-FINAL STEM	V-FINAL STEM	VV-FINAL STEM
(7)	a. *fétha* 'open'	b. *fû́ite* 'help'	c. *fû́ndûi* 'sweep'
(8)	a. *fethá–ji* 'open–prcm'	b. *fûité–ji* 'help–prcm'	c. *fûndû́i–ji* 'sweep–prcm'
(9)	a. *fétha–'je* 'open–impv'	b. *fû́ite–'je* 'help–impv'	c. *fûndû́i–'je* 'sweep–impv'

In the absence of a glottal stop, stress falls on the penultimate syllable (7-8). When a glottal stop is present, stress falls on the syllable with the second mora before the glottal stop (9). This results in stem-penultimate stress when the ultima is light (9a-b), and stem-ultimate stress when the ultima is heavy (9c). The accentual pattern observed in (7-9) is, to the best of my knowledge, typologically unattested.

1.2 ANALYTICAL PRÉCIS

The analysis of A'ingae morphophonology given in Chapter 4 will be couched in Cophonology Theory (Anttila, 1997; Orgun, 1996; others), a framework which integrates phonology and morphology, providing formal tools for a rigorous and elegant account of complex interactions between the two. The phonological functions proposed as part of the Cophonological analysis will be stated within Optimality Theory (McCarthy and Prince, 1993; Prince and Smolensky, 1993; others),

1 Section A.1 gives the meanings of glossing abbreviations for all the functional morphemes discussed here alongside their corresponding abbreviations in Fischer and Hengeveld (forthcoming, henceforth H&F) and M. Borman and Enrique Criollo (1990, hencheforth B&C).

which analyzes the observed linguistic forms as maximally harmonic with respect to rankings of conflicting constraints. Many of the constraints will be formulated within the McCarthy and Prince (1993)'s framework of Generalized Alignment, which deals with reference to edges in morphology and phonology.

In the course of the analysis, I will distinguish between two classes of verbs, categorize suffixes with respect to two binary parameters, and capture the above glottal pattern with an ALIGNMENT constraint (McCarthy and Prince, 1993). Thus, I will reduce the observed complexity to a much smaller number of theoretical posits. I will further motivate my proposal by its ability to account for other yet-undiscussed morphophonological phenomena, such glottal stop deletion (1-2a).

My thesis is restricted in scope to verbal morphophonology. Although nominal morphophonology is partially dissimilar from verbal (Fischer and Hengeveld, forthcoming, henceforth F&H), verbal morphology is much richer, which compelled me to study it in greater depth.

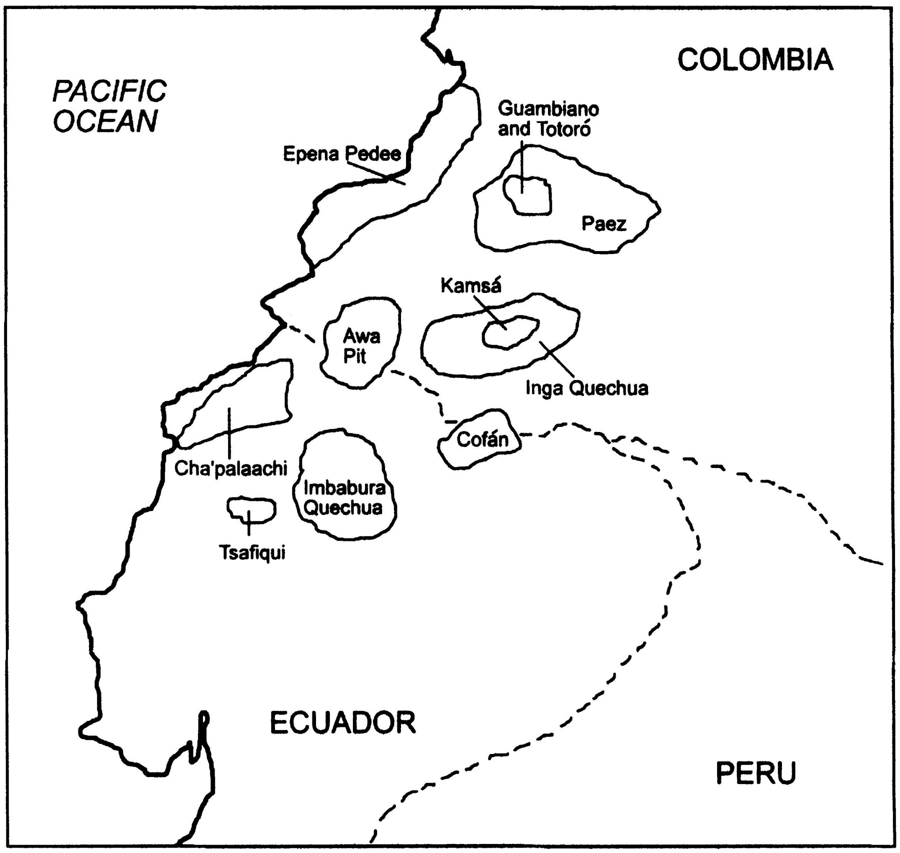
1.3 ROAD MAP

The rest of Chapter 1 provides a road map for the thesis. Chapter 2 gives background on the language, including its geography, history, typology, current status, previous scholarship, segmental phonology, and the phonetics of stress and glottal stops. Chapter 3 introduces the template of verbal inflection, motivates the empirical refinements it proposes, and challenges the enclitic analysis of A'ingae functional morphology. Chapter 4 presents a Cophonological analysis of the A'ingae verb's morphophonology of stress. Chapter 5 concludes.

2

BACKGROUND

The Cofán are an indigenous people of South America, presently inhabiting the northeast Ecuadorian province of Sucumbíos and southern Colombia. Their origin can be traced back to the Andes. Historically, they made use of a large territory as a primarily hunter-gatherer people (Cepek, 2012). The map below gives their current geography (Curnow and Liddicoat, 1998).



Indigenous languages of southern
Colombia and northern Ecuador.

The Cofán people speak *a'ingae*, which is to say: "like (civilized) people." This endonym can be morphologically decomposed into *a'i* '(civilized) person' and the manner case clitic =*ngae* 'MANN.' In current literature, "Cofán" and "A'ingae" are used interchangeably to refer to the language.

A'ingae is an endangered, though robust, and severely underdocumented language isolate (F&H). Issues related to language status are discussed in Section 2.1.

Notable linguistic scholarship is given in Section 2.2, which also summarizes previous research on verbal morphology and lexical stress.

Although A'ingae is often placed in the Amazonian sprachbund, its Andean origin is reflected in the mixture of its prototypically Amazonian and Andean features (AnderBois, Emlen, Lucitante, Sanker, and Silva, 2019). The typological profile of the language is briefly discussed in Section 2.3.

Segmental phonology and a few major phonological processes are introduced in Section 2.4.

Lastly, Section 2.5 outlines the phonetics and stress and the glottal stop, which has a very prominent prosodic role.

Almost all of the data in the present work draw on elicitations conducted by the author with native speakers from three indigenous communities of Ecuador: Zábalo, Dureno, and Sinangoé. Thus, it should only be considered representative of the Ecuadorian language variety. Some of the data in Chapter 3 comes from previously published sources; all of it is cited as such.

2.1 LANGUAGE STATUS

A'ingae has around 1 500 native speakers across Ecuador and Colombia (Repetti-Ludlow, Zhang, Lucitante, AnderBois, and Sanker, 2019). As the Cofán population nearly quintupled since the 1960s, the language is is considered developing (Eberhard, Simons, and Fennig, 2019). In Ecuador, A'ingae is used vigorously. In communities with stronger Kichwa and colonial influences, especially in Colombia, the prominence of Spanish in everyday communication is elevated at the cost of A'ingae. The national borders demarcate a linguistic divide: of the two major dialects, one is spoken along the Aguarico River in Ecuador; the other—on the San Miguel, Guamués, and Putumayo rivers in Colombia (M. Borman, 1962).

First orthography for the language was developed by Marlytte Bub Borman and Roberta Borman, missionary linguists active in the Cofán communities since 1950's. It was recently revised by members of the Cofán communities. Here, the revised orthography is used. For comparisons of the two orthographies, see Fischer and Hengeveld (forthcoming) and Repetti-Ludlow et al. (2019).

An estimated two thirds of A'ingae speakers are literate in A'ingae as well as Spanish, which is the language of instruction in schools (Eberhard, Simons, and Fennig, 2019).

2.2 PREVIOUS SCHOLARSHIP

There is little previous scholarship on the language. Outside of a few brief word lists, first contributions to the systematic study of A'ingae were made by the Bormans, who provide the only substantial dictionary to date (M. Borman, 1976), and a collection of cosmological narratives (M. Borman and Enrique Criollo, 1990, henceforth B&C). Other notable works include a grammatical sketch by F&H, a collection of traditional stories by Blaser and Umenda (2008), and the scholarly output of the A'ingae Language Documentation Project, which consists of, among others, AnderBois, Emlen, et al. (2019), AnderBois and Sanker (2019), AnderBois and Silva (2018), Dąbkowski (2019), Dąbkowski and AnderBois (forthcoming), Pride, Tomlin, and AnderBois (forthcoming), and Repetti-Ludlow et al. (2019).

2.2.1 *verbal morphology*

There have been a few significant treatments of the language's morphology. The first discussion of verbal morphology appears in M. Borman (1976). The first morphological template is given by F&H, who pay closer attention to the ordering and co-occurrence restrictions among the functional morphemes. I further revise the template in Chapter 3. Other work which touches on the verbal morphology, but is not immediately relevant the morphophonological concerns taken up here, includes Fischer (2007)'s treatment of clause linkage.

2.2.2 *stress and prosody*

Stress and prosody are among the lesser studied topics of this already understudied language. M. Borman (1962), F&H, and Repetti-Ludlow et al. (2019) provide phonetic and phonological descriptions of the language, though their treatment of stress is limited. AnderBois and Sanker (2019) focus on the issues of nasality, which have not been found to interact with stress.

M. Borman (1962) observes that stress falls usually on one of the first three syllables and is often penultimate. Furthermore, M. Borman (1976) reports that stress in words with glottal stops falls on the "penultimate syllable before the stop" (p. 3, translation mine), anticipating an important postulate of my analysis. M. Borman (1962) also identifies the existence of alternating secondary stress and recognizes the existence of "perturbations and variations in placement of stress" due to "morphophonemic patters"—an analytical challenge he does not take up. On the whole, M. Borman (1962, 1976)'s generalizations find support in my data.

F&H observe that the attachment of suffixes and clitics (which I reanalyze as suffixes in Chapter 3) does not change the position of stress. Furthermore, they observe that in verbs stress is often ultimate. Thus, they largely contradict M. Borman (1962, 1976). On the whole, F&H generalizations do not find support in my data.

Repetti-Ludlow et al. (2019) observe that stress can be contrastive, and is never ultimate except for monosyllables. On the whole, Repetti-Ludlow et al. (2019)'s generalizations find support in my data.

Previous scholarship does not make systematic attempts to understand the interactions between morphology and phonology, nor does it recognize the role that syllabic weight plays therein. All the generalizations about morphophonology and syllabic weight I provide are novel.

2.3 Typological profile

A'ingae is a head-final language, with SOV as the predominant word order. Subordinate clauses are strictly verb-final, while matrix clauses allow for various permutations, subject to pragmatic factors (F&H). Marking is found consistently on dependents, with verbal arguments carrying case clitics. The morphosyntactic alignment is nominative-accusative.

Verbal morphology is complex and encodes a large number of semantic categories, including valence, aspect, associated motion, subject person and number, polarity, switch-reference, information structure, various modalities, and others. The ordering of suffixes expressing these categories and the co-occurrence restrictions found among them are the subject of Chapter 3.

A'ingae is spoken in a region located between the Andes and the Amazon. Historical and archaeological evidence shows movement of the Cofán people eastward over the course of several centuries. As such, one is not surprised to see a blend of typically Amazonian and Andean grammatical features. On the Andean side, A'ingae boasts a switch-reference system, an evidential morpheme, and extensive case marking. On the Amazonian side, A'ingae is characterized by its use of noun classifiers, a frustrative marker, and a lot of agglutination (AnderBois, Emlen, et al., 2019).

2.4 Segmental phonology

This section will provide an introduction the the segmental phonology of the language. Section 2.4.1 outlines the language's sound inventory and motivates major deviations from previous descriptions, mainly Repetti-Ludlow et al. (2019). The next two sections consider two groups of phonological rules particularly relevant to the data introduced in later chapters: Section 2.4.2 gives an overview of nasality-related processes. Section 2.4.3 details the changes that adjacent vowels undergo in order to form legal diphthongs.

2.4.1 *sound inventory*

A'ingae has a moderately large sound inventory, totalling twenty-seven consonants, ten vowels (split evenly between oral and nasal), and fifteen diphthongs (eight oral and seven nasal). The entire sound inventory is given on the following page, along with the most common graphemes associated with each phoneme. Deviations are due to phonological rules discussed in Section 2.4.2 and 2.4.3, variously reflected in the orthography.

A characteristic feature of A'ingae's is the three-way distinction between plain (voiceless), aspirated, and prenasalized oral occlusives (F&H). Aspiration is common in the Andes, while prenasalization—in the Amazon basin. A'ingae has palatal sonorants, typical of the Andean group, but it has only one liquid consonant, as do languages in the Amazonian sprachbund (AnderBois, Emlen, et al., 2019).

The language's five-vowel inventory with a highcentral vowel is typically Amazonian (Aikhenvald, 2012). The distinction between its two back close vowels can be viewed as based in roundedness, rather than hight. The unrounded back vowel's phonetic realization ranges from central to back, and the rounded one's from high to mid. Each oral vowel has a nasal counterpart.

The diphthong inventory proposed here, with eight oral and seven nasal diphthongs is larger from that of Repetti-Ludlow et al. (2019). In addition to the six oral and six nasal diphthongs they recognize, I include *ia* /i̯a/, *ian* /ĩ̯ã/ and the marginal diphthong *ae* /ae̯/.

The decision to include *ia* /i̯a/ and *ian* /ĩ̯ã/ among diphthongs has phonological motivations: for purposes of stress assignment, they pattern with other diphthongs. For example, the stress shift between (10a) and (10b) is predicted if (10a) is disyllabic, but unexpected if it were trisyllabic. This differs from the proposal of Repetti-Ludlow et al. (2019), who treat *ia, ian* /i̯a, ĩ̯ã/ as realized with an intervening glide [ija, ɪȷ̃ã] and posit an optional deletion of the preconsonantal vowel, resulting in homosyllabic [ja, ȷ̃ã].

(10) a. *<u>úm</u>buen*
'follow'

b. *um<u>buén</u>–mbi*
'follow–NEG'

The decision to consider *ae* /ae̯/ a marginal diphthong is motivated by the phonetics of the manner case clitic *=ngae* 'MANN.' Although

	LABIAL		ALVEOLAR		PALATAL		VELAR		GLOTTAL	
PLAIN STOPS	*p*	p	*t*	t			*k*	k	*ʼ*	ʔ
ASPIRATED STOPS	*ph*	pʰ	*th*	tʰ			*kh*	kʰ		
PRENASAL STOPS	*mb*	ᵐb	*nd*	ⁿd			*ng*	ᵑg		
NASAL SONORANTS	*m*	m	*n*	n	*ñ*	ɲ				
PLAIN FRICATIVES	*f*	f	*s*	s	*sh*	ʃ			*j*	h
PLAIN AFFRICATES			*ts*	ʦ	*ch*	ʧ				
ASPIRATED AFFRICATES			*tsh*	ʦʰ	*chh*	ʧʰ				
PRENASAL AFFRICATES			*nz*	ⁿʣ	*ndy*	ⁿʤ				
ORAL SONORANTS	*v*	ʋ	*r*	ɾ	*y*	j	*g*	ɰ		

	ORAL				NASAL			
	FRONT		BACK		FRONT		BACK	
CLOSE	*i*	i	*û*	ɨ	*in*	ĩ	*ûn*	ɨ̃
ROUNDED			*u*	o			*un*	õ
OPEN	*e*	e	*a*	a	*en*	ẽ	*an*	ã

ORAL	*ua*	oa	*ia*	ia	*ui*	oi	*ue*	oe
	au	ao	*ai*	ai	*ûi*	ɨi	(*ae*	ae)
NASAL	*uan*	õã	*ian*	ɪã	*uin*	õɪ	*uen*	õẽ
	aun	ãõ	*ain*	ãɪ	*ûin*	ɨ̃ɪ		

Sound inventory.

Repetti-Ludlow et al. (2019) correctly observe that the orthographic *ai* and *ae* are both consistently realized as [ai] (more on which in Section 2.4.3), =*ngae* 'MANN' is a curious exception. The orthographic *ae* in =*ngae* 'MANN' has a distinct realization, which I transcribe broadly as /ae/, although its actual realization is unstable and ranges from [əæ] to [ɛ]. The marginal diphthong *ae* /ae/ has not been observed in environments other than =*ngae* 'MANN.'

A'ingae syllable structure is (C)V(V)(ʔ). Monophthongal nuclei make for monomoraic syllables; diphthongal nuclei make for bimoraic syllables. The glottal stop does not contribute to weight at the foot level, but attracts stress to the syllable which contains the second mora to its left. This pattern is discussed in detail in Section 4.5.

2.4.2 *nasal processes*

Nasality-related phonological processes are likely among the most prominent in the language. They are, at the same time, some of the more complex processes to have been identified. They have been discussed extensively in AnderBois and Sanker (2019) and more briefly in F&H and Repetti-Ludlow et al. (2019). Since they affect verbal forms central to Chapters 3 and 4, a short exposition is in order. Four nasality-related processes will be introduced: retronasalization, denasalization, nasal spreading, and prenasalization.

2.4.2.1 *retronasalization*

Prenasalized stops nasalize the preceding vowel, as can be observed root-internally (11a), across morpheme boundaries (11b), and across glottal stops (11c). The process has been first proposed by F&H. In the examples to follow, the first line will give the orthography of the component morphemes along with their underlying phonological form; the second line—the practical orthography which variably reflects or does not reflect the phonological process under discussion along with the surface form of the word.

(11) a. *sumbu* /soᵐbo/ b. *ji–ngi* /hiᵑgi/ c. *i–'ngi* /iʔᵑgi/
sumbu [sõᵐbo] *jingi* [hĩᵑgi] *i'ngi* [ĩʔᵑgi]
'come out' 'come–1' 'bring–VEN'

This process will be referred to as retronasalization. In the rule formulations to follow, T will stand for a plain stop, ᴺD—a prenasalized stop, N—a nasal consonant, V—a vowel, and Ṽ—a nasal vowel.

RETRONASALIZATION
V ⟶ Ṽ / _ (ʔ) ᴺD
A prenasalized stop nasalizes the preceding vowel (across a glottal stop).

Nasality of vowels left-adjacent to prenasalized stops is not separately reflected in the orthography. This convenient convention means that the *n*s and *m*s accompanying prenasalized stops play a double role: they represent the prenasalization of the stop and the nasality of the preceding vowel.

2.4.2.2 *denasalization*

Word-initially, the prenasalization of glottal stops has shorter duration and lower intensity (12), the phonetics of which are reported by Repetti-Ludlow et al. (2019).

(12)	a. *bûthu* /$^{\text{m}}$bɨt$^{\text{h}}$o/	b. *da* /$^{\text{n}}$da/	c. *geñu* /$^{\text{ŋ}}$gẽɲõ/
	bûthu [$^{\breve{\text{m}}}$bɨt$^{\text{h}}$o]	*da* [$^{\breve{\text{n}}}$da]	*geñu* [$^{\breve{\text{ŋ}}}$gẽɲõ]
	'run'	'become'	'plantain'

This process will be referred to as denasalization.

> DENASALIZATION
> $^{\text{N}}$D $\longrightarrow$ $^{\breve{\text{N}}}$D / # _
> *Preasalization is weakened word-initially.*

Denasalization is reflected in the orthography, with *b* [$^{\breve{\text{m}}}$b], *d* [$^{\breve{\text{n}}}$d], *z* [$^{\breve{\text{n}}}$ʣ], *dy* [$^{\breve{\text{n}}}$ʤ], and *g* [$^{\breve{\text{ŋ}}}$g] spelled without *m*s and *n*s.

2.4.2.3 *nasal spreading*

The prominence of nasality in the language is greatly magnified by robust progressive nasalization, whereby nasality of one segment can "trickle down" to further segments and across syllable boundaries (F&H). Nasal segments are observed to spread their nasality onto following vowels (13a-c), sonorant consonants (13a-b), and across glottal consonants (13c).

(13)	a. *na=ve* /naʋe/	b. *jin–ye* /hĩye/	c. *an–'je* /ãʔhe/
	name [nãmẽ]	*jiñe* [hĩɲẽ]	*an'jen* [ãʔhẽ]
	'fruit–ABS'	'be–INF'	'eat–IMPV'

This process will be referred to as nasal spreading.

> NASAL SPREADING, iterative
> [+sonorant] $\longrightarrow$ [+nasal] / [+nasal] [+glottal]$_0$ _
> *A sonorant nasalizes after a nasal phoneme (across glottals); applies iteratively.*

Nasal spreading is partially reflected in the orthography. Segments nasalized in the course of nasal spreading are spelled as such, except vowels adjacent to nasal consonants.

2.4.2.4 *prenasalization*

Lastly, plain stops are often observed to turn into prenasalized stops after nasal vowels. It is evident in patterns of borrowings from Spanish (14a) as well as a number of functional morphemes, which have nasal allomorphs after nasal vowels (14b). Oral and nasal allomorphs for suffixes of interest will be given in Section 3.1.

(14) a. *compadre* /kompaðre/
kumba [kõᵐba]
'godfather'

b. *an–'ta* /ãʔta/
a'nda [ãʔⁿda]
'eat–NEW'

This process will be referred to as prenasalization.

> PRENASALIZATION, non-general
> T ⟶ ᴺD / Ṽ(ʔ) _
> *A plain stop prenasalizes after a nasal vowel (across a glottal stop).*

Prenasalization is reflected in the orthography, with Spanish borrowings and nasal allomorphs spelled with prenasalized stops.

Prenasalization is not exceptionless. Other Spanish borrowings (15a) as well as the preponderance of ṼCṼ forms in the language (15b) suggest that nasal spreading can apply across plain obstruents as well.

(15) a. *cotón* /koton/
kuntun [kõtõ]
'shirt'

b. *sinsin* /sĩsi/
sinsin [sĩsĩ]
'louse'

For a detailed investigation of nasality-related processed in the language and a diachronic discussion of nasal spreading and prenasalization, see AnderBois and Sanker (2019).

2.4.3 *diphthongal mutations*

In addition to nasalization, other processes relevant to the data of Chapters 3 and 4 include changes of vowel quality in diphthongs. These processes will be referred to as diphthongal mutations. The two processes discussed in this section are diphthongal ikavism and diphthongal rounding.

2.4.3.1 *diphthongal ikavism*

The vowels *e* /e/ and *û* /ɨ/ undergo raising and fronting when adjacent to *a* /a/ in order to create well-formed diphthongs (see Section 2.4.1). This is most easily demonstrated with the causative CAUS suffix, which has three phonologically conditioned allomorphs: *–ña* /ɲã/, *–en* /ẽ/, and *–an* /ã/. The first one surfaces on monosyllables (16a). The second one surfaces on *a-* and *u*-final words (16b-c). The third one surfaces on *e-*, *i-*, and *û*-final words (16d-f).

(16)
a. *khûi–ña* /k^{h}ɨ͠ɪɲã/ *khûiña* [k^{h}ɨ͠ɪɲã]
'lie–CAUS'
"put"

b. *i'na–en* /ĩʔna͠e/ *i'naen* [ĩʔna͠ɪ]
'cry–CAUS'
"make cry"

c. *fiyu–en* /fijo͠e/ *fiyuen* [fijo͠e]
'curl up–CAUS'
"curl up"

d. *dûse–an* /dɨse͠a/ *dûsian* [dɨsɪ͠a]
'hang–CAUS'
"hang"

e. *pûvi–an* /pɨʋɪ͠a/ *pûvian* [pɨʋɪ͠a]
'turn–CAUS'
"turn"

f. *a'jû–an* /aʔhɨ͠a/ *a'jian* [aʔhɪ͠a]
'vomit–CAUS'
"make vomit"

Of the six cases above, three involve underlying vowel sequences which do not constitute legal diphthongs: *aen* /a͠e/ (16b), *ean* /e͠a/ (16d), and *uan* /ɨ͠a/ (16f). These are resolved to [a͠ɪ], [ɪ͠a], and [ɪ͠a], respectively. This process will be referred to as diphthongal ikavism.[1]

DIPHTHONGAL IKAVISM
[–low, –round] ⟶ i / {_ a, a _}
e and ɨ become i when adjacent to a.

Although demonstrated with causative forms above, diphthongal ikavism is a generally productive rule (17).

(17)
a. *ze'nze–a* /$^{\breve{n}}$ʥẽʔ^{n}ʥea/ *ze'nzia* [$^{\breve{n}}$ʥẽʔ^{n}ʥia]
'painted–ADN'

b. *inzû–a* /ĩ^{n}ʥɨa/ *inzia* [ĩ^{n}ʥia]
'green–ADN'

Diphthongal ikavism is partially reflected in orthography: while /a͠e/ [a͠ɪ] is spelled *aen*, reflecting its underlying form, /e͠a/[ɪ͠a] and /ɨ͠a/[ɪ͠a] are both spelled *ian*, reflecting their surface forms.

Diphthongal ikavism provides further support for considering *ia* /ia/ a diphthong (see Section 2.4.1): otherwise the process could not be motivated as a rule ensuring output well-formedness.

1 By analogy with Ukrainian, where *ikavism* refers to the phonologically-conditioned shift of Proto-Slavic *e and *o to modern-day i (Carlton, 1974).

2.4.3.2 *diphthongal rounding*

The vowel *a* /a/ becomes rounded in sequences of *ae* /ae/ and *ai* /ai/ when it is preceded by a labial consonant. The rule applies within one stem (18a-b), across morpheme boundaries (18c-d), in native roots (18a), and in borrowings (18b).

(18)

a. *fae* /fae/
fae [foe]
'one'

b. *bailar* /bailar/
buira [ᵐ̆boira]
'dance'

c. *sema–en* /sema͠e/
semuen [semo͠e]
'work–CAUS'
"make work"

d. *atapa–en* /atapa͠e/
atapaen [atapo͠e]
'breed–CAUS'
"breed"

This process will be referred to as diphthongal rounding. It has not been observed in previous literature.

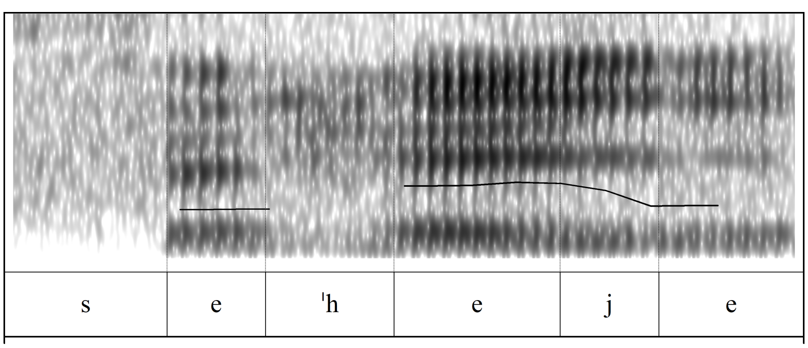
DIPHTHONGAL ROUNDING
a ⟶ o / [+labial] _ [−back]
ae and ai become oe and oi, respectively, after labial consonants.

An additional piece of evidence in favor of the rule comes from the absence of lexical forms in which [ae] follows a labial consonant—despite the presence of the orthographic *ae*, here understood as reflecting the underlying /ae/. On the whole, diphthongal rounding is inconsistently reflected in the orthography. Even morphologically complex forms can be spelled in a way reflecting their surface form (18c) or their underlying form (18d).

2.5 PHONETICS OF STRESS AND THE GLOTTAL STOP

A'ingae stress correlates most robustly with duration and pitch (19). The y-axis represents duration. The black curves represent pitch.

(19)



sej<u>é</u>–ye
'cure–PASS'

The correlation between duration and stress can be partially beclouded by phrase-level effects: although the stressed syllable is commonly the longest in a stress group, the final syllable can characterized by phonetic elongation, too, as well as a lowering of pitch (M. Borman, 1962; Repetti-Ludlow et al., 2019). This does not impede correct identification of the stressed syllable, as stress is almost never ultimate.

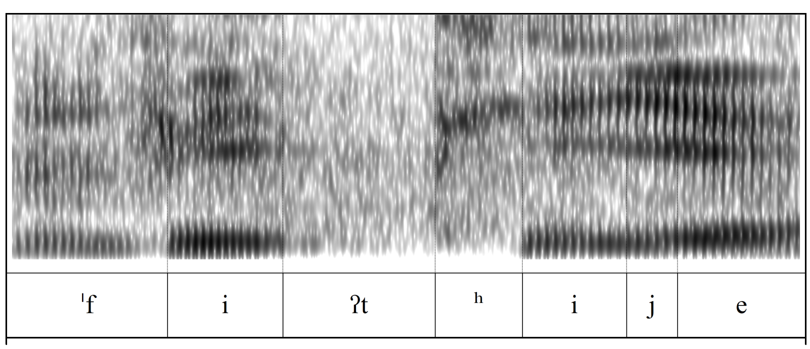
There are bidirectional phonological and phonetic interactions between glottal stops, as the realization of glottal stops depends on the placement of stress and the placement of stress depends on the presence of glottal stops. The phonological conditioning of stress by glottal stops will be discussed in detail in Section 4.5.

The realization of glottal stops ranges from full glottal closure to creaky voice, to complete deletion. The variation between full glottal closure and creaky voice is taken to be a matter of phonetic detail. It will be discussed here only briefly, as it is largely outside of the scope of this study. The complete deletion of glottal stop is given a phonological interpretation. It will be analyzed in Section 4.5.2.

M. Borman (1962) observes that the glottal stop is "fortis when closing a stressed syllable, and lenis, varying to actualization as laryngealization, when closing an unstressed syllable" (p. 51). This is corroborated insofar as the glottal stop can be realized as glottal closure in tonic (i. e. stressed) syllables (20) and with creaky voice in posttonic (i. e. immediately following the tonic) syllables (21).

In (20), the glottal stop is realized as a glottal closure and followed by an aspirated alveolar stop /ʔt^h/. The two together can be seen on the spectrogram as a long pause.

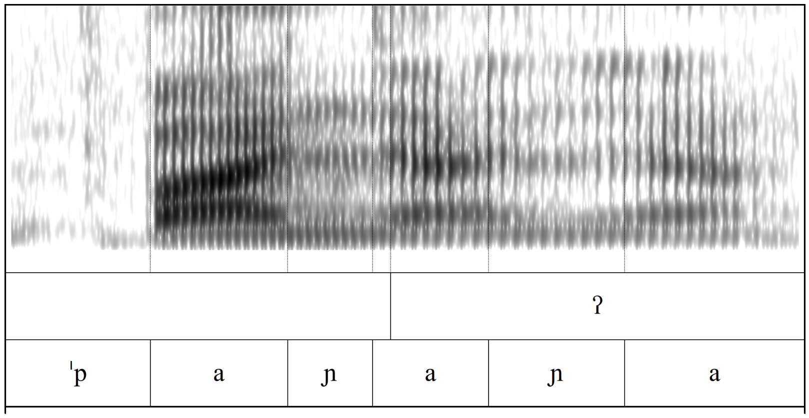
(20)



fi'thi–ye

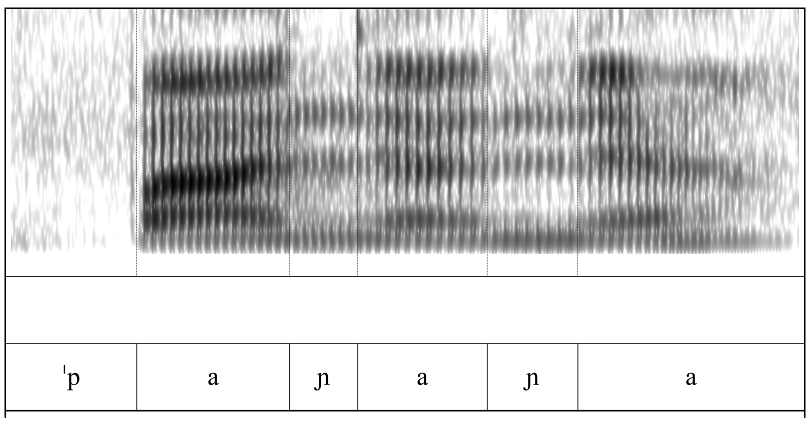
'kill–INF'

In (21), the glottal stop is realized as creak, which is reflected in the spectrogram as broadening striations. For a non-creaky realization, compare (21) to the minimally different (22), where striations near the right word boundary are much narrower.

(21)


páña–’ña

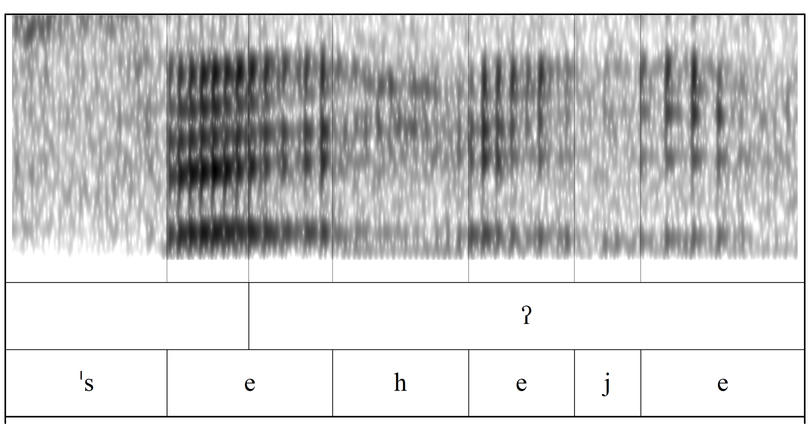
‘hear–VER’

(22)


páña–ña

‘hear–IRR’

M. Borman (1962)’s picture, however, is not exhaustive, as glottal stops can be realized with creaky voice on tonic syllables as well (23). The creaky realization is not restricted to the glottalized syllable and once begun it can extend across the rest of the word (21, 23).

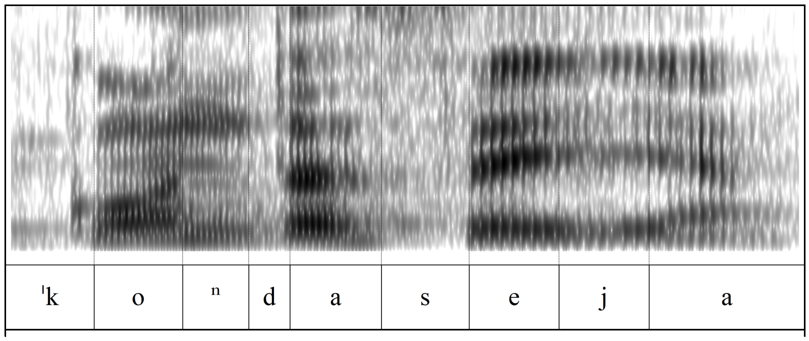
(23)


sé’je–ye

‘cure–INF’

Lastly, the realization of glottal stops in syllables other then the tonic and the posttonic is much weaker, up to the point of deletion. There is no noticeable difference in the breadth of striations anywhere between (24) and (25), despite the glottal stop in (24)'s underlying form. Glottal stop deletion will be understood as a phonological process, which will be given an account in Sections 4.5.2 and 4.5.3.

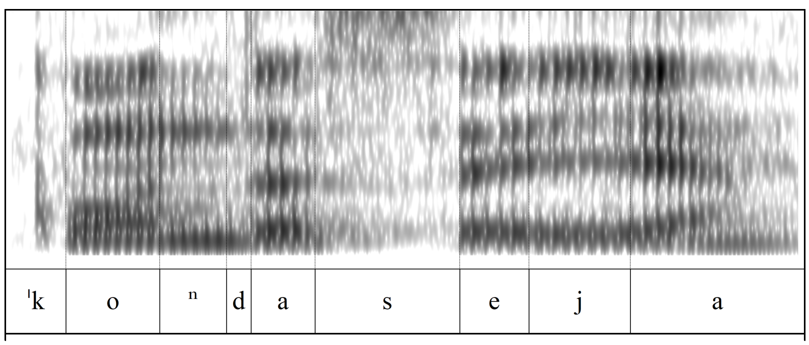
(24)



kúndase–'ya

'tell–VER'

(25)



kúndase–ya

'tell–IRR'

3 CONJUGATION

Verbal morphology is the richest in the language and interacts with stress in complex, interesting ways. The conjunction of these two facts invited the present study.

Section 3.1 presents and describes the inflectional template of the A'ingae verb. Section 3.2 motivates its deviations from F&H's proposal. Finally, Section 3.3 raises the question of A'ingae functional morphology's syntax. It evaluates F&H's claim that A'ingae verbal morphemes are enclitics, rejects it, and proposes to analyze them as suffixes instead.

3.1 TEMPLATE OF VERBAL INFLECTION

Almost all functional morphemes of the language can be found at the right edges of words. Suffixes and enclitics abound; prefixes and proclitics are virtually absent.[1]

The inflectional template of the A'ingae verb encodes multiple semantic and pragmatic categories in a dozen or so slots. Voice-related slots host suffixes that change the valence of the root to which they attach. They are followed by slots for aspect ASP, associated motion MOT, subject number NUM, modality MOD, polarity POL, taxis TAX, information structure, illocution ILL, and subject person PER suffixes. All the slots along with the suffixes which inhabit them are given by the morphological template. Details of the verbal inflections will be momentarily discussed.

The morphological template on the next page captures the ordering of inflectional morphemes as well as the co-occurrence restrictions that obtain among them. As such, it is a visual representation of a generative algorithm for A'ingae conjugation. To generate a legal ver-

1 In some dialects, a glottal stop can be productively infixed to express pluractionality. Reduplication of a part of the stem expresses similar semantics (F&H).
F&H identify morphological vowel lengthening and analyze it as the durative aspect. Sanker, Silva, Lucitante, and AnderBois (2018) identify falsetto and analyze it as a shift in narrative perspective. The lengthening identified by F&H and the falsetto identified by Sanker et al. (2018) might or might not be the same phenomenon, although Sanker et al. (2018) show that falsetto is not only verbal and that its perspectival use does not involve vowel lengthening.
While glottal stop infixation, stem reduplication, and vowel lengthening *alias* falsetto all three have prosodic correlates, they are beyond the scope of this study.

VOICE / VALENCE			ASP	MOT	NUM	MOD	POL	TAX	INFO STRUCTURE			ILL	PER
				–'ngi				*–'ya*					*–tsû*
			–'je	VEN		*–ya*	*–mbi*	VER					3
			IMPV	*–'nga*		IRR	NEG	HYP				*–te*	*–ki*
				AND					*–'yi*	*–'ta*	*–'khe*	RPRT	2
–ña	*–khu*	*–ye*	*–ji*		*–'fa*				EXCL	NEW	ADD	*–ti*	*–ngi*
CAUS	RCPR	PASS	PRCM		PLS			*–ye*				INT	1
			–'ñakha					INF		*–'ja*			
			SMFC							CNTR			
			–'kha					DCV				*–teki*	
			DMN									RPRT.2	

HYP:	*–pa*	*–si*	*–'ma*	*–'ni*	*–sa'ne*
	SS	DS	FRST	LOC	APPR
DCV:	*–ja*	*–kha*	*–'se*	*–jama*	
	IMP	IMP2	IMP3	PRHB	

Morphological template of verbal inflection, 1st iteration.

bal form, go from left to right picking at most one morpheme per column along the way. Do not cross the horizontal lines.

The rest of this section is a brief description of the various morphological slots and suffixes, given here mainly for purposes of documentation. A reader interested strictly in the questions of morphophonology should feel free to skip it.

The three leftmost slots in the inflectional template correspond to the three valence-changing suffixes: the causative voice –*ña* 'CAUS,' whose allomorphs –*en* and –*an* are discussed in Section 2.4.3.1, the reciprocal voice –*khu* 'RCPR,' and the passive voice –*ye* 'PASS', whose nasal allomorph is –*ñe*. The three suffixes can co-occur in the order of introduction.

The voice suffixes are followed by the aspectual ASP suffixes, which include the imperfective –*'je* 'IMPV' (nasal allomorph –*'jen*), the precumulative –*ji* 'PRCM' (nasal allomorph –*jin*), the semelfactive –*'ñakha* 'SMFC', and the verbal diminutive –*'kha* 'DMN.'

The associated motion MOT suffixes include the venitive –*'ngi* 'VEN' and the andative –*'nga* 'AND.' The aspectual and associated motion suffixes are mostly incompatible, except the imperfective –*'je* 'IMPV.'

The only subject number NUM suffix is the plural subject –*'fa* 'PLS.' As indicated by the gloss, it expresses the plurality of subject, not action (F&H). Pluractionality is expressed by glottal stop insertion or reduplication of a part of the stem. Glottal stop insertion and reduplication are beyond the scope of the current study.

The plural subject suffix can be followed by the irrealis –*ya* 'IRR' (nasal allomorph: –*ña*), which is the only morpheme in the slot designated for modal MOD suffixes. While the irrealis is not the only morphologically encoded modal category in the language, others are mixed in with the taxis suffixes, two morphological slots down the road.

Between the modal and the taxis suffixes, there is the negative –*mbi* 'NEG,' which is the sole polarity POL suffix.

The taxis TAX suffixes comprise a large number of heterogeneous morphemes with few semantic commonalities. The rationale for the category of taxis suffixes is syntactic, as they play an important (though not unique) role in determining the (in)dependent status of a clause.

Among suffixes associated chiefly with dependent clausal status, we find the infinitival –*ye* 'INF,' as well as the hypotactic HYP suffixes: the same subject –*pa* 'SS,' the different subject –*si* 'DS,' the frustrative –*'ma* 'FRST,' the locative –*'ni 'loc,'* and the apprehensional –*sa'ne* 'APPR.'

The infinitival –*ye* 'INF' (nasal allomorph: –*ñe*) can head argument clauses or adjunct clauses with purpose-like semantics. The same subject –*pa* 'SS' (nasal allomorph: –*mba*) and the different subject –*si* 'DS' index subject coreference between two clauses.[2] The frustrative *–'ma* 'FRST' marks an unfulfilled expectation. The locative *–'ni 'loc'* relates two clauses with different subjects in a temporal fashion. The apprehensional *–sa'ne* 'APPR' encodes a potential undesirable situation (for more details, see Dąbkowski and AnderBois, forthcoming).

The hypotactic suffixes are listed below the inflectional template and referenced as HYP in the taxis TAX column. Their visual presentation outside the main template is primarily due to the high number of taxis suffixes, although there is a difference between the infinitive and other hypotactic suffixes: the infinitive does not independently express modality or polarity (i. e. does not combine with either of *–ya* 'IRR' or *–mbi* 'NEG'), whereas the suffixes referred to as hypotactic do.

Among suffixes associated chiefly with independent clausal status, we find the veridical *–'ya* 'VER' (nasal allomorph: *–'ña*) of rather elusive semantics (for more, see the discussion of the assertive clitic in F&H), as well as the directive DCV suffixes: the three imperatives *–ja* 'IMP' (nasal allomorph: *–jan*), *–kha* 'IMP2,' *–'se* 'IMP3,' and the prohibitive *–jama* 'PRHB.' The semantic differences among the three imperative morphemes are not well understood. The prohibitive *–jama* 'PRHB' expresses prohibition.

The directive suffixes are listed beneath the inflectional template and referenced as DCV in the taxis TAX column. Here again, the displacement of the directive suffixes is primarily for reasons of visual compactness, although there is obviously a clear split between the veridical and the directive suffixes in their illocutionary force.

The information structure suffixes include the exclusive focus *–'yi* 'EXCL,' the new topic *–'ta* 'NEW,' the contrastive topic *–'ja* 'CNTR,' and the additive focus *–'khe* 'ADD.' The exclusive focus *–'yi* 'EXCL' (nasal allomorph: *–'ñi*) can be approximated by the English *only*. The topic suffixes relate clauses in a conditional fashion. The differences between *–'ta* 'NEW' (nasal allomorph: *–'nda*) and *–'ja* 'CNTR' (nasal allomorph: *–'jan*) are not well understood. The semantics of the additive focus *–'khe* 'ADD' is roughly equivalent to the English particle *too*.

The illocutionary ILL suffixes comprise the reportative *–te* 'RPRT' (nasal allomorph: *–nde*) and the polar interrogative *–ti* 'INT' (nasal allomorph: *–ndi*). If not followed by person suffix, they both entail a third person subject in the main clause.

2 Among hypotactic clauses, Fischer (2007) further distinguishes between subordinate and co-subordinate clauses, and argues that the A'ingae switch-reference markers *–pa* 'SS' and *–si* 'DS' can function in either dependency relation. While this is largely peripheral to questions of morphophonology, some language-internal variation has been observed with respect to the accentual variation of *–pa* 'SS' and *–si* 'DS.' The potential interactions between the syntax and the phonology of the switch-reference markers are to be explored in further research.

The subject person PER suffixes include the first person –*ngi* '1', the second person –*ki* '2,' and the third person –*tsû* '3.' They encode, often redundantly, the subject of the main clause. The directive suffixes can be followed by the composite –*teki* 'RPRT.2', which expresses a reported imperative or a reported prohibition.

3.2 DISCUSSION OF EMPIRICAL REFINEMENTS

The only attempt to date at constructing a comprehensive morphological template of the A'ingae verb has been made by F&H, who refer to it as the "template of the predicate phrase" (p. 30). The template proposed here differs from that of F&H in several ways: it includes some functional morphemes which F&H do not include, excludes others, and thoroughly reorganizes them, making different predictions about their ordering and co-occurrence. Some of the major deviations from F&H's template will be discussed and motivated in this section.[3]

The template I am proposing is restricted to inflectional morphemes, where inflectional morphemes are understood as those which preserve the morphosyntactic category of verbhood. Although derivational morphemes also interact with stress in unpredictable ways, they are largely outside of the scope of this study (except for the nominalizing subordinator –*'chu* 'SBRD' which will be discussed in Section 4.5.2 due to its unique accentual properties, unencountered among inflectional morphemes).

Generally, the template I am proposing is richer than F&H's, as it includes many morphemes recognized in both works, but excluded from the template by F&H. Among the morphemes discussed by F&H, but not included in their template of the predicate phrase, we find the early-attaching valence suffixes, and some of the later-attaching ones: the hypotactic, information structure, illocution, and subject person morphemes.[4] A study of many of these morphemes will be central to understanding the interactions between morphology and prosody in A'ingae.

In addition to the above inclusions, the structure of the template has been reorganized. The reorganization results in different predic-

3 Aside from their organization in a template, the very form of many morphemes assumed here differs from the forms proposed by F&H. Some of the preglottalized morphemes, e. g. the semelfactive –*'ñakha* 'SMFC,' the venitive –*'ngi* 'VEN,' the andative –*'nga* 'AND,' or the apprehensional –*sa'ne* 'APPR,' are transcribed by F&H without glottal stops (although see M. Borman, 1976 for a transcription of these morphemes with glottal stops, corroborating my analysis). A possible explanation for these differences is discussed briefly in a footnote on page 73.

4 Valence suffixes were excluded by F&H from the template of the predicate phrase presumably on the grounds of their derivational status. The late-attaching morphemes were excluded from the template of the predicate phrase presumably on the grounds of their association with the entire clause, not the predicate.

tions about the ordering and co-occurrence of functional morphemes. Three major changes are motivated in what follows.

First, I group the the negative –*mbi* 'NEG' and the frustrative –*'ma* 'FRST' in two consecutive morphological slots, predicting that they can co-occur. I group I the frustrative –*'ma* 'FRST' and the veridical –*'ya* 'VER' in one morphological slot, predicting their mutual exclusivity.

F&H group the negative –*mbi* 'NEG' and the frustrative –*'ma* 'FRST' in one morphological slot, arguably predicting their mutual exclusivity. They locate the veridical –*'ya* 'VER' in a morphological slot following –*'ma* 'FRST,' arguably predicting their co-occurrence.

The negative –*mbi* 'NEG' and the frustrative –*'ma* 'FRST' have been attested to co-occur (26a). The frustrative –*'ma* 'FRST' and the veridical –*'ya* 'VER' cannot co-occur (26b).

(26) a. *indi–mbi–'ma* (Quenamá, 1992, p. 25)
'catch–NEG–FRST'
b. **panza–'ma –'ya*
'hunt–FRST–VER'

Second, I locate the infinitival –*ye* 'INF' in a slot following the plural subject –*'fa* 'PLS,' predicting that –*ye* 'INF' attaches after –*'fa* 'PLS.' I prohibit the co-occurrence of the infinitival –*ye* 'INF' with the negative –*mbi* 'NEG,' the irrealis –*ya* 'IRR,' or the directive suffixes.

F&H locate the infinitival –*ye* 'INF' in a morphological slot followed by the plural subject –*'fa* 'PLS,' the negative –*mbi* 'NEG', the irrealis –*ya* 'IRR,' and the directive suffixes, arguably predicting their co-occurrence in that order.

The plural subject –*'fa* 'PLS' comes before –*ye* 'INF' (27a). The infinitival –*ye* 'INF' does not combine with the negative –*mbi* 'NEG' (27b), the irrealis –*ya* 'IRR' (27c), or directive suffixes (27d-e) in either order.

(27) a. *avûja–'fa–ye* (Blaser and Umenda, 2008, p. 7)
'rejoice–PLS–INF'
b. *panza*(*–*ye*)–*mbi*(*–*ye*)
'hunt(–INF)–NEG(–INF)'
c. *panza*(*–*ye*)–*ya*(*–*ye*)
'hunt(–INF)–IRR(–INF)'
d. *hunt*(*–*ye*)–*ja*(*–*ye*)
'hunt(–INF)–IMP(–INF)'
e. *panza*(*–*ye*)–*jama*(*–*ye*)
'hunt(–INF)–PRHB(–INF)'

Third, I propose one morphological slot for the aspect suffixes: the imperfective –*'je* 'IMPV,' the precumulative –*ji* 'PRCM,' the semelfactive –*'ñakha* 'SMFC,' and the verbal diminutive –*'kha* 'DMN'. I propose another morphological slot for the associated motion suffixes: the ventitive –*'ngi* 'VEN' and the andative –*'nga* 'AND'. I permit only one aspectual morpheme, the imperfective –*'je* 'IMPV,' to combine with the associated motion suffixes.

F&H put aspectual and associated motion suffixes in one morphological slot, arguably predicting their mutual exclusivity.[5]

The precumulative –*ji* 'PRCM,' the semelfactive –*'ñakha* 'SMFC,' and the verbal diminutive –*'kha* 'DMN' are incompatible with the associated motion suffixes (28a-c). The imperfective –*'je* 'IMPV' is compatible with both –*'ngi* 'VEN' and –*'nga* 'AND' (28d).

(28) a. **panza–ji*{*–'ngi, –'nga*}
'hunt–PRCM{–VEN, –AND}'
b. **panza–'ñakha*{*–'ngi, –'nga*}
'hunt–SMFC{–VEN, –AND}'
c. **panza–'kha*{*–'ngi, –'nga*}
'hunt–DMN{–VEN, –AND}'
d. *panza–'je*{*–'ngi, –'nga*}
'hunt–IMPV{–VEN, –AND}'

Finally, on top of including some functional morphemes and reorganizing others, the template I propose eliminates three suffixes: the adjectivizer –*'tshi* 'ADJ,'[6] the prospective –*yi* 'PRSP,' and the movement manner –*in* 'MVM.' In what follows, I will briefly outline reasons for these exclusions.

The adjectivizer –*'tshi* 'ADJ' is glossed by F&H as the "quality marker" and included among aspectual suffixes. There are three reasons for not considering it an aspectual suffix.

First, unlike other aspectual morphemes (the imperfective –*'je* 'IMPV,' the precumulative –*ji* 'PRCM,' the semelfactive –*'ñakha* 'SMFC,' and the verbal diminutive –*'kha* 'DMN'), the adjectivizer –*'tshi* 'ADJ' does not combine with the valence suffixes. It attaches to bare stems only.

Second, the adjectivizer –*'tshi* 'ADJ' is not productive. New forms cannot be freely constructed, and the existing ones often display semantic idiosyncrasies (29-30a) or cannot be related to any independently existing verb (29-30b).[7]

5 To be precise, F&H predict the co-occurrence of the imperfective –*'je* 'IMPV' and the andative –*'nga* 'AND' by associating what I dub the andative with two different morphological slots. The morpheme incompatible with –*'je* 'IMPV' is labeled as "translocative." The morpheme compatible with the imperfective is labeled as "distal" (p. 30). The proposal advanced here avoids this redundancy.

6 The adjectivizer often appears without the glottal stop as well: –*tshi* 'ADJ.' Due to the low productivity of the suffix, it is difficult to tell which form is the underlying one.

7 The root *chhara–* 'shine' does not have independence existence as a verb (29b), but it is attested in derivatives such as *chhara'u* 'sunray' or *chhara'khu* 'crack in the roof' (M. Borman, 1976).

(29) a. *in'jan*
'want'
b. **chhara*
int.: "shine"

(30) a. *injan'tshi*
'many'
b. *chhara'tshi*
'bright'

Third, forms with –*'tshi* 'ADJ' are of a different syntactic category then verbs. Although they can function predicatively (31a), like verbs (31b), they can also combine with the adnominal marker –*a* 'ADN' to modify nouns directly (32a), while verbs cannot (32b).[8]

(31) a. *dû'shû=tsû avûja–tshi*
'child=3 rejoice–ADJ'
"a child is happy"
b. *dû'shû=tsû avûja*
'child=3 rejoice'
"a child is happy"

(32) a. *avûja–tshi–a dû'shû*
'rejoice–ADJ–ADN child'
"a happy child"
b. **avûja–a dû'shû*
'rejoice–ADN child'
int.: "a happy child"

Thus, –*'tshi* 'ADJ' is better understood as a derivational morpheme. Due to its the adjective-like semantics, I gloss it as an adjectivizer.

The movement manner –*in* 'MVM' is analyzed by F&H as a marker of "simultaneity" and included among relative tense morphemes (a category absent from my schema). It is, however, attested exclusively as an argument of verbs of motion where it expresses the manner of motion (33). The movement manner –*in* 'MVM' attaches to bare stems only and does not permit the attachment of any further suffixes.

(33) a. *kha'ya–in ja* (Chica Umenda and R. Borman, 1982, p. 12)
'swim–MVM go'
"swim away"
b. *bûthu–in ji* (Blaser and Umenda, 2008, p. 24)
'run–MVM come'
"come running"

A'ingae is a verb-framed language with a suffix devoted specifically to expressing the manner of motion.

The purpose of motion is expressed with the attributive –*'su* 'ATTR' (34). Although the attributive –*'su* 'ATTR' is highly polysemous, as a purpose of motion marker, its distribution is like that of –*in* 'MVM.'

8 The third person subject morpheme coheres phonologically with verbs, but not with nouns. It is therefore glossed variably as a suffix –*tsû* '3' or a clitic =*tsû* '3'. For a discussion of affixal and enclitic properties, see Section 3.3.

(34) a. *simba–'sû ja* (Blaser and Umenda, 2008, p. 204)
'fish–ATTR go'
"go fishing"

b. *pasia–'sû ji* (R. Borman, 1965, p. 18)
'ride–ATTR come'
"come for a ride"

Lastly, the prospective *–yi* 'PRSP' is included by F&H among the aspectual suffixes. It is, as F&H themselves observe, attested only with one verb, *ja* 'go' (35), which I take to be sufficient grounds for not considering it a proper aspectual morpheme.

(35) a. *ja*
'go'
"go"

b. *jayi*
'go.PRSP'
"be going"

Although the prospective *–yi* 'PRSP' is found only on *ja* 'go,' it has a counterpart *–ña* 'PRSP,' which, in turn, is found only on *ji 'come'* (36). I treat these two as irregular prospective forms of motion verbs.

(36) a. *ji*
'come'
"come"

b. *jiña*
'come.PRSP'
"be coming"

3.3 syntax of functional morphology

The last major deviation of my analysis from F&H's is the syntactic status I assign to A'ingae verbal morphology. While I have referred to all of the verbal morphemes discussed so far as suffixes, F&H take most of them to be clitics. In this section, I will motivate my departure from F&H's analysis.

Suffixes are bound morphemes which attach to syntactically independent words. Clitics are morphemes which have syntactic characteristics of an independent word, but are phonologically dependent on another independent word or phrase.

F&H assign the clitic status to great many morphemes, across many different syntactic and functional categories. In arguing for their clitichood, they invoke the ability of those morphemes to attach to different lexical classes (p. 11). Among many others, F&H analyze as clitics the human plural morpheme *=ndekhû* 'HPL,' the adverbializer *=e* 'ADV,' and the honorific *='ye* 'HONR.'[9]

Importantly, they assign the status of enclitics to all the verbal morphemes other than the valence, aspect, and associated motion suf-

9 The equals sign = is used throughout this paragraph to reflect F&H's analysis.

fixes.[10] This includes the plural subject *='fa* 'PLS,' the irrealis *=ya* 'IRR,' the negative *=mbi* 'NEG,' the imperative *=ja* 'IMP,' the prohibitive *=jama* 'PRHB,' the interrogative *=ti* 'INT,' the reportative *=te* 'RPRT,' the subject persons *=ngi* '1,' *=ki* '2,' and *=tsû* '3,' and others.[9]

Finally, they assign the enclitic status to all the case markers, including the accusative *=ma* 'ACC,' the absentive *=ve* 'ABS,' the dative *=nga* 'DAT,' the locative *=ni* 'LOC,' the ablative *=ne* 'ABL,' and others.

I propose that most of the verbal morphemes, up to the the illocution ILL and person PER slots, should be analyzed as suffixes, rather than clitics. The illocution and person morphemes straddle the line: they are clitics, but with some suffixal properties.

The table below abstracts away from the morphological template information about individual morphemes and shows only their affixal or enclitic status, as proposed by F&H and here.

	VOI	ASP	MOT	NUM	MOD	POL	TAX	STR	ILL	PER
F&H	–	–	–	=	=	=	=	=	=	=
HERE	–	–	–	–	–	–	–	–	≈	≈

Morphological template of verbal inflection, schematized.

The hyphen – is used for affixes. The equals sign = is used for clitics. The approximately equals sign ≈ is used for ambiguous clitics with some affixal properties. As the ambiguous clitics exhibit phonological properties more characteristic of suffixes than clitics when attached to verbs (and which is of relevance to verbal morphophonology), they have been glossed with hyphens in the inflectional template and will be glossed as such in Chapter 4.

Although my analysis deviates from F&H's in treating most verbal morphemes as suffixes, it is continuous with it in treating case markers as clitics. Thus, while non-verbal morphology is not the focus of this work, it will be instructive to contrast verbal morphemes with the case markers. To motivate my partial departure from F&H's analysis, I will demonstrate that most of the verbal morphemes differ from the case markers in their syntactic status. To bring out their differences, I invoke the first three of the six criteria for distinguishing suffixes from clitics proposed by Zwicky and Pullum (1983, henceforth Z&P, p. 503–504).

10 The distinction F&H make between clitics and suffixes maps roughly onto a distinction between between level 0 and level 1 inflectional suffixes I will make in Section 4.3. I assign valence suffixes, associated motion suffixes, and a majority of the aspectual suffixes to level 0, and all other verbal morphemes to level 1. Thus, the distinction F&H made between suffixes and clitics has a real correlate in the morphophonology of A'ingae. Nevertheless, it is neither necessary nor sufficient to account for it and, as will be shown in this section, there are reasons not to adopt it.

The data I will now present is representative of the number NUM, modality MOD, polarity POL, taxis TAX, and information structure morphemes, i. e. where my analysis diverges from that of F&H's. Subsequently, I will consider how the illocution ILL and person PER morphemes fair against Z&P's criteria.

The first of Z&P's criteria pertains to freedom of host selection.

> Criterion A
> Clitics can exhibit a low degree of selection with respect to their hosts, while affixes exhibit a high degree of selection with respect to their stems.

The word order in A'ingae matrix clauses is free. The nominal and verbal dependents can come either before or after the head. This allows us to observe that while case markers attach at the level of the phrase (37), verbal morphemes attach at the level of the head (38-39). Brackets are used to indicate the constituent to which the functional morpheme attaches.

(37) a. [*rande kini'khu*]=*ma*
'[large tree]=ACC'
"a large tree.ACC"

b. [*kini'khu rande*]=*ma*
'[tree large]=ACC'
"a large tree.ACC"

(38) a. *kini'khu=ma* [*thûthû*]–*'fa*
'tree=ACC [fell]–PLS'
"they felled a tree"

b. *[*thûthû kini'khu=ma*]–*'fa*
'[fell tree=ACC]–PLS'
int.: "they felled a tree"

(39) a. *ja'ñu* [*thûthû*]–*'fa*
'today [fell]–PLS'
"they felled it today"

b. *[*thûthû ja'ñu*]–*'fa*
'[fell today]–PLS'
int.: "they felled it today"

The case markers are associated with the noun phrase. They can attach to the head of the phrase (37a), but also to its modifier if it comes second (37b). Thus, case markers exhibit freedom of host selection. The same cannot be said of verbal morphemes, as they cannot attach to an argument (38b) or a modifier (39b) of the predicate. Verbal morphemes do not exhibit a freedom of host selection.

The second of Z&P's criteria pertains to arbitrary gaps.

> Criterion B
> Arbitrary gaps in the set of combinations are more characteristic of affixed words than of clitic groups.

There are arbitrary gaps found among the verbal morphemes. As was shown in Section 3.1, the infinitival –*ye* 'INF' does not combine with the negative –*mbi* 'NEG' (27b), the irrealis –*ya* 'IRR' (27c), or directive suffixes (27d-e). No analogous morphological gaps have been observed with case markers.

The third criterion pertains to morphophonological idiosyncrasies.

> Criterion C
> Morphophonological idiosyncrasies are more characteristic of affixed words than of clitic groups.

Before case markers and verbal morphemes are evaluated with respect to Criterion C *sensu stricto*, observe that case markers do not form a part of the phonological word with their host, whereas verbal morphemes do. This is to say, stress can shift when a verbal morpheme is attached to a verb (40-41b), but not when a case marker is attached to a noun (40-41a). This shows that there is a closer phonological connection between the verb and the verbal morphemes—as is expected of affixes—than there is between the noun and the case markers—as is expected of clitics.

(40) a. *khúvi* b. *pánza*
'tapir' 'hunt'

(41) a. *khúvi=ma* b. *panzá–mbi*
'tapir=ACC' 'panza–NEG'

The close phonological connection between the verb and the verbal morphemes allows for morphophonological idiosyncrasies, which are indeed attested. There is variation among verbal morphemes with respect to the stress they assign to one class of verbal roots (for an introduction to verbal classes, see Section 4.2). Thus, depending on the morpheme, the observed inflected form can have initial (42a) or stem-final (42b) stress. Case markers have not been observed to exhibit analogous morphophonological idiosyncrasies.

(42) a. *áfa–sa'ne* b. *afá–jama*
'speak–APPR' 'speak–PRHB'

In an interim conclusion, the evaluation of case markers and verbal morphemes with respect to Z&P's Criteria A, B, and C supports F&H's analysis of case markers as clitics. The evaluation does not support F&H's analysis of verbal morphemes as clitics—the verbal morphemes located in the slots for number NUM through information structure are instead demonstrated to be affixes.

Now I will consider the illocution ILL morphemes—the interrogative *≈ti* 'INT' and the reportative *≈te* 'RPRT'—and the subject person PER morphemes—the first person *≈ngi* '1,' the second person *≈ki* '2,' and third person *≈tsû* '3.'

All the five morphemes surface in the second position in the clause (F&H; Dąbkowski and AnderBois, forthcoming). They are Wackernagel clitics (Wackernagel, 1892). This is to say, they attach to the right edge of the first phase in the clause (43).[11]

(43) a. *kanse≈te tayupi*
'live≈RPRT formerly'
"used to live.RPRT"

b. *tayupi≈te kanse*
'formerly≈RPRT live
"used to live.RPRT"

Attaching to verbs (43a), adverbs (43b), or nouns (31), the five morphemes exhibit a complete freedom of host selection. Thus, they are clitics according to Z&P's CRITERION A.

Evaluating the illocution and subject person morphemes against the other two of Z&P's criteria complicates the picture.

There are arbitrary gaps found among the illocution and subject person morphemes. While the interrogative ≈*ti* 'INT' and the reportative ≈*te* 'RPRT' can co-occur with the first person ≈*ngi* '1,' and second person ≈*ki* '2' subject morphemes (44a), they cannot co-occur with the third person subject morpheme (44b). Thus, they are affix-like according to Z&P's CRITERION B.

(44) a. *panza{≈te, ≈ti}{≈ngi, ≈ki}*
'hunt{≈RPRT, ≈INT}{≈1, ≈2}'

b. **panza{≈te, ≈ti}≈tsû*
'hunt{≈RPRT, ≈INT}≈3'

The illocution and subject person morphemes cohere stress-wise with verbs, but not with other lexical classes. Thus, they can shift the stress of a verb (45-46a), but not, for example, an adverb (45-46b).

(45) a. *p<u>á</u>nza*
'hunt'

b. *tay<u>ú</u>pi*
'formerly'

(46) a. *panz<u>á</u>≈ki tayupi*
'hunt≈2 formerly'
"you used to hunt"

b. *tay<u>ú</u>pi≈ki panza*
'formerly≈2 hunt'
"you used to hunt"

Lastly, the illocution and subject person morphemes exhibit morphophonological idiosyncrasies with respect to nasalization. The interrogative ≈*ti* 'INT' and the reportative ≈*te* 'RPRT' (47a) have nasal allomorphs ≈*ndi* 'INT' and ≈*nde* 'RPRT' which surface after nasal vowels (48a). The forms of the person subject morphemes ≈*ngi* '1,' ≈*ki* '2,' and ≈*tsû* '3' (47b) are constant; they do not undergo prenasalization (48b). Thus, the illocution and subject person morphemes are affix-like according to Z&P's CRITERION C.

11 Exceptions to this generalization are analyzed by F&H as pragmatically-driven constituent fronting.

(47) a. *panza≈ti*
**panza≈ndi*
'hunt≈INT'

b. *panza≈tsû*
**panza≈nzû*
'hunt≈3'

(48) a. **paña≈ti*
paña≈ndi
'hear≈INT'

b. *paña≈tsû*
**paña≈nzû*
'hear≈3'

In conclusion, various verbal morphemes have been compared with case markers and evaluated with respect to the first three of Z&P's criteria to determine their syntactic status.[12] The investigation revealed that while case markers are independent syntactic words, i. e. clitics, most verbal morphemes are suffixes dependent on the predicate.

The illocution and the subject person morphemes fall somewhere in between. While their syntactic distribution points clearly to their Wackernagel clitic status, the presence of gaps in their combinations and their phonological properties are characteristic of affixes.[13]

	CASE MARKERS	MOST VERBAL MORPHEMES	ILL & PER MORPHEMES
Criterion A	clitic	affix	clitic
Criterion B	clitic	affix	affix
Criterion C	clitic	affix	affix

Functional morphemes by Z&P's criteria.

12 The latter three of Z&P's criteria pertain to semantics, syntax, and the relative ordering of affixes and clitics. They have generally not been found informative.

Criterion D
Semantic idiosyncrasies are more characteristic of affixed words than of clitic groups.

Criterion E
Syntactic rules can affect affixed words, but cannot affect clitic groups.

Criterion F
Clitics can attach to material already containing clitics, but affixes cannot.

Semantic idiosyncrasies have not been observed among either verbal morphemes or case markers, which renders Criterion D mute. Syntactic rules relevant to Criterion E have not been identified. Lastly, the informativity of Criterion F depends on facts about the linear ordering of morphemes given independent evidence of affixhood or clitichood. Criterion F cannot tell between two analyses which treat a group of morphemes uniformly as all affixes or all clitics.

13 For a formal account which wrestles with a similar suffix-clitic duality, see Crysmann (2006)'s treatment of Polish person agreement "floating affixes," strikingly parallel in their syntax and morphophonology to A'ingae's subject person morphemes.

4 ANALYSIS

A'ingae exhibits a complex morphophonology, where morphological idiosyncrasies interweave with an unusual phonology of stress assignment. The richness of the system can be gleaned from a minimal six-tuple of verb pairs, showing distinct stress behaviors of six suffix types (1-6). Here, a formal analysis of this complex data pattern will be undertaken.

			a. *upathû ...–mbi*	b. *afase ...–mbi*
			'pick ...–NEG'	'insult ...–NEG'
(1)	*–'chu*	'SBRD'	*upáthû–'chu–mbi*	*áfase–chu–mbi*
(2)	*–'fa*	'PLS'	*upathû́–'fa–mbi*	*áfase–fa–mbi*
(3)	*–ji*	'PRCM'	*upathû–jí–mbi*	*áfase–ji–mbi*
(4)	*–'je*	'IMPV'	*upáthû–'je–mbi*	*afáse–'je–mbi*
(5)	*–'kha*	'DMN'	*upathû́–'kha–mbi*	*afasé–'kha–mbi*
(6)	*–khu*	'RCPR'	*upathû–khú–mbi*	*afase–khú–mbi*

Section 4.1 will introduce the frameworks of Optimality Theory (McCarthy and Prince, 1993; Prince and Smolensky, 1993; others) and Cophonology Theory (Anttila, 1997; Orgun, 1996; others).

Section 4.2 will distinguishing between two classes of verbs—the regular and irregular ones—in a step towards an account of the differences between (1-6a) and (1-6b).

Section 4.3 will present evidence for the existence of two phonological levels—level 0 and level 1—explaining the differences between (2a) and (5), on one hand, and (3a) and (6), on the other.

Section 4.4 will categorize suffixes with respect to their faithfulness to stem stress—as either recessive or dominant—thus accounting for the differences between (1-3b) and (4-6b).

Section 4.5 will further complicate the pattern by considering the role glottal stops play in stress assignment. It will introduce a language-particular prosodic rule, deriving the forms of (1a) and (4).

Section 4.6 will present basic facts of the phonological, morphologically unconditioned, assignment of secondary stress.

Section 4.7 will make a tentative observation about the phonological status of the glottal stop in A'ingae, anticipating future research.

4.1 FRAMEWORKS

The two frameworks I will employ in a formal account of A'ingae morphophonology of stress are Cophonology Theory (Anttila, 1997; Orgun, 1996; others) and Optimality Theory (McCarthy and Prince, 1993; Prince and Smolensky, 1993; others).

Section 4.1.1 will give an outline of Optimality Theory, a framework in which underlying forms proposed by linguistic analysis are related to the observed surface forms via a mechanism of optimal constraint satisfaction. The phonological functions of Cophonology Theory will be formalized as Optimality Theoretic rankings.

Section 4.1.2 will be devoted to Cophonology Theory (Anttila, 1997; Orgun, 1996; others), a framework which provides formal tools for integrating phonology and morphology. Cophonology Theory particularizes Optimality Theoretic constraint rankings to morphological constructions, splitting one language's grammar into multiple phonological subgrammars.

4.1.1 *optimality theory*

Optimality Theory is a formal framework which proposes that the observed linguistic forms emerge as a consequence of optimal satisfaction of conflicting constraints (McCarthy and Prince, 1993, 1995; Prince and Smolensky, 1993; others).

The three basic components of the theory are the GENERATOR (GEN), the CONSTRAINT component (CON), and the EVALUATOR (EVAL).

The GENERATOR (GEN) takes an input and generates a set of all candidates (possible outputs) evaluated by EVAL based on CON.

The CONSTRAINT component (CON) is the set of all criteria for choosing among the possible outputs generated by GEN. The criteria are phrased as violable constraints; they are the criteria which EVAL uses to decide between candidates.

The EVALUATOR (EVAL) chooses one optimal candidate from the list generated by GEN based on the ranking of CON.

GEN, the CON and EVAL are assumed by the theory to be universal. Different grammars are the result of different rankings of constraints present in the universal constraint set CON. Cophonology Theory, discussed in Section 4.1.2, extends this idea to language-internal variation, proposing that different morphological constructions can be associated with different phonological subgrammars.

Particular input-output mappings selected by EVAL are commonly represented in form of tableaux, where the constraints of CON are ranked on the x-axis and the candidates generated by GEN are plotted on the y-axis. Consider an example tableau to observe the principles by which constraint evaluation operates.

	input:	A »	B »	C,	D
i.	output_{i}	∗!	———	———	———
ii.	output_{ii}		∗∗	∗!∗	∗
☞ iii.	output_{iii}		∗∗	∗	∗

Tableau, an example.

A constraint to the left of the dominates symbol » is ranked above the constraints to its right. A comma , between two constraints indicates that their relative ranking cannot be determined. The violation mark ∗ symbolizes the violation of a constraint by a candidate. The exclamation mark ! to the right of the violation mark additionally indicates that the violation is fatal, i. e. it ultimately eliminates the candidate from the race for optimality. Horizontal rules ——— strike out constraint when their evaluation is no longer relevant, i. e. past a fatal violation or after all other candidates have been eliminated. The hand ☞ points to the most optimal candidate.

Constraint evaluation is a step-wise process. First, the highest ranking constraints are evaluated, which means that the violation of a higher-ranking constraint cannot be compensates by the satisfaction of a lower-ranking one (Kager, 1999). Constraint A ranks above constraint B and eliminates candidate i, even though candidates ii and iii incur twice as many constraint B violations. Constraints past A are stricken out for candidate i, as their evaluation is irrelevant.

When all considered candidates are assigned the same number of violation marks by a constraint, that constraint does not play a decisive role in selecting the winner. Thus, candidates ii and iii which both fair equally poorly with respect to constraint B are further evaluated by the criteria of constraints C and D.

When candidates violate a constraint to different degrees, the candidate with the least number of violations wins. In the example tableau, candidate ii incurs more constraint C violations than candidate iii, so EVAL maps the input to output_{iii}. Observe that although constraint C plays the decisive role in picking the winning candidate, constraint D is evaluated as well, as the relative ranking of constraints C and D has not been determined.

Optimality Theory proposes that the set of constraints CON is universal. There are two main families of constraints: FAITHFULNESS constraints and MARKEDNESS constraints. FAITHFULNESS constraints ensure the identity between aspects of the input and the output (McCarthy and Prince, 1995).

FAITHFULNESS
Input and output are identical.

MARKEDNESS constraints ensure that the output is well-formed, i. e. it conforms with particular demands of the language's grammar. The two classes of constraints are usually particularized to elements of linguistic structure.

MARKEDNESS
Output structure is well-formed.

FAITHFULNESS and MARKEDNESS constraints are inherently in tension: FAITHFULNESS constraints work to prevent deviations from the input while MARKEDNESS constraints tweak it in conformity with the language's grammar. Variation in the relative importance of particular constraints yields variation among grammars.

The two major constraint families can be further subdivided. In the analysis to follow, two subclasses of FAITHFULNESS will be employed: MAXIMALITY and DEPENDENCE. MAXIMALITY constraints prevent the deletion of linguistic structure (e. g. phonological segments or stress); they ensure the what is found in the input is also found in the output.

MAXIMALITY
Input structure is present in the output.

DEPENDENCE constraints prevent the insertion of linguistic structure; their role is converse to that of MAXIMALITY, as they ensure that segments absent from the input are not epenthesized and novel metrical structure is not constructed.

DEPENDENCE
Output structure is present in the input.

MARKEDNESS constraints ensure that the output conforms with the language-particular grammatical principles. As such, there is less uniformity among MARKEDNESS constraints; their taxonomy is a matter of empirical investigation.

One subfamily of MARKEDNESS constraints prominent in the forthcoming analysis are the ALIGNMENT constraints, as proposed in McCarthy and Prince (1993)'s framework of Generalized Alignment. The ALIGNMENT constraints handle reference to edges of constituents.

ALIGN(x, $e(x)$, y, $e(y)$)
$\forall x \exists y [e(x)$ coincides with $e(y)]$.

In the formulation above, x and y stand for phonological, morphological, or syntactic categories, and e stands for the left or right edge of the corresponding category. Thus, ALIGNMENT constraints all have the general form of "the left/right edge of every x coincides with the left/right edge of some y."

Lastly, the analysis to come will also avail itself of an ANTIFAITHFULNESS constraint, as proposed in Alderete (1999)'s framework of Transderivational Antifaithfulness. ANTIFAITHFULNESS constraints work in the direction opposite to FAITHFULNESS, ensuring that input and output differ in some particular way.

> ANTIFAITHFULNESS
> Input and output are different.

Alderete (1999)'s Transderivational Antifaithfulness proposes that all MAXIMALITY and DEPENDENCE constraints have their negative counterparts. My analysis will make use of an ANTIMAXIMALITY constraint to formalize phenomena of stress deletion.

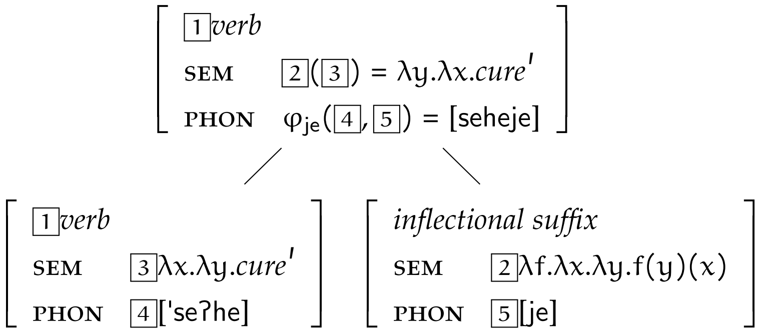
4.1.2 *cophonology theory*

Cophonology Theory (Anttila, 1997; Orgun, 1996; others) is a formal framework of phonology-morphology interface in the tradition of unification-based grammar (HPSG: Pollard and Sag, 1994; CG: Fillmore and Kay, 1996; LFG: Kaplan and Bresnan, 1982; others). It builds on the advances made by Lexical Phonology and Morphology (Kiparsky, 1982; Mohanan, 1982; others).

Cophonology Theory models morphologically conditioned phonological variation by associating morphological processes with phonological subgrammars, known as *cophonologies*. The phonological subgrammars are themselves morphologically blind, which predicts that the phonology of a word depends on the phonologies of its constituent parts and their hierarchical organization (Caballero, 2011; Inkelas and Zoll, 2007).

Cophonology Theory models morphemes (such as stems and affixes) as signs and morphological processes as constructions which combine these signs. Each construction is associated with a syntactic SYN category, as well as a meaning SEM and a form PHON function (a cophonology). The rules or constraints which make up the cophonology are general; they themselves do not refer to morphological categories. When these phonological functions differ across morphological constructions, morphology yields language-internal phonological variation (Caballero, 2011; Inkelas and Zoll, 2005, 2007).

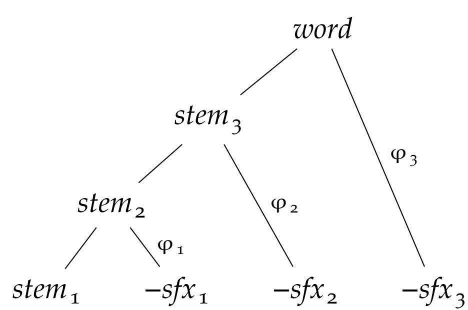
The verb *se'je* 'cure' and the passive suffix –*ye* 'PASS' below are used to exemplify an affixation construction in A'ingae. Boxed indices mark those values whose identity is imposed by the construction.



An inflectional construction, *sejeye* ‘cure–PASS.’

The left daughter’s category is a *verb*, while the right daughter’s category is an *inflectional suffix*. Since the construction is inflectional, the mother node’s category is identified with the category of its left daughter. The mother node’s SEMANTICS is the output of applying the meaning function of –*ye* ‘PASS’ to *se’je* ‘cure.’ Finally, its PHONOLOGY is the output of a construction-specific cophonological function whose two arguments are the phonologies of its two daughters. Observe the deletion of stress and the glottal stop in the mother node’s form [seheje], a consequence of applying the cophonological function associated with the passive suffix –*ye* ‘PASS’ to [ˈseʔhe] and [je]. The analysis of stress deletion and glottal stop deletion will be given in Sections 4.4 and 4.5.3.

The dependence of a word’s phonology on the phonologies of its constituent parts and their hierarchical organization is derived by the very architecture of Cophonology Theory. Since the morphological constructions apply sequentially, complex words have branching structures (Caballero, 2011; Inkelas and Zoll, 2007).



Morphological constituency, an example.

This hierarchical structure has a direct phonological correlate: the phonologies of branching nodes depend exclusively on the phonologies of their daughters. For example, the phonology of the *word* node is the output of the function $\varphi_3(stem_3, -sfx_3)$, blind to the fact that the $stem_3$ node is itself a morphological complex of $stem_2$ and sfx_2. Likewise, the function φ_2 as applied to its two arguments, $stem_2$ and $-sfx_2$, does not have access to information about the nodes which come subsequent to it (*sfx*$_3$ and *word*). In this way, the branching structure of morphologically complex words derives the domains of applicability for particular cophonologies (Caballero, 2011; Inkelas and Zoll, 2007).

Although in principle there is no upper limit on how disparate particular cophonologies within a language can be, Cophonology Theory employs grammar lattices to capture their commonalities, with mother nodes abstracting away phonological patterns shared by their daughters. Language-general phonological patterns are captured in the root node. Construction-particular phonological patterns are captured in its inferior nodes.

If cophonologies are implemented with Optimality Theoretic constraint rankings, terminal nodes correspond to the cophonologies associated with particular morphological constructions, while their superior nodes correspond to partial constraint rankings capturing the commonalities found among those cophonologies. In particular, the root node corresponds to the constraint rankings of the language's overall phonology—it defines the *master* ranking which holds true of all the constructions in the language.

Consider a hypothetical language with three operative constraints A, B, and C, and two cophonologies: *cophonology a* associated with the ranking A » B » C and *cophonology b* associated with the ranking B » » A » C. Both cophonologies share in common the ranking of A and B above C, while the relative ranking of A and B differs between them.

	RANKING
cophonology a	A » B » C
cophonology b	B » A » C

Terminal nodes of a lattice, an example.

The observed commonality can be captured in the *master* ranking as { A, B } » C. Is it then only necessary to say that *cophonology a* ranks A above B and that *cophonology b* ranks B above A; the ranking of A and B relative to C is determined by their mother node.

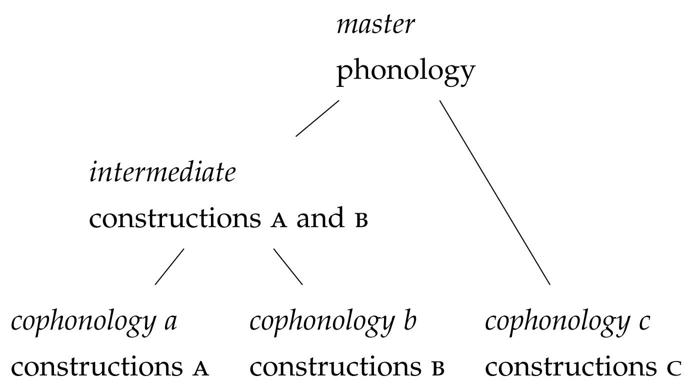
master

{ A, B } » C

cophonology a	*cophonology b*
A » B	B » A

Grammar lattice, an example.

Distinct cophonologies correspond to terminal nodes and capture patterns specific to morphological constructions. The *master* ranking corresponds to the root node and captures the language's overarching phonology. Commonalities found among morphological constructions which do not generalize to the overarching phonology of the language can be captured with intermediate-level rankings.



Grammar lattice, a schema.

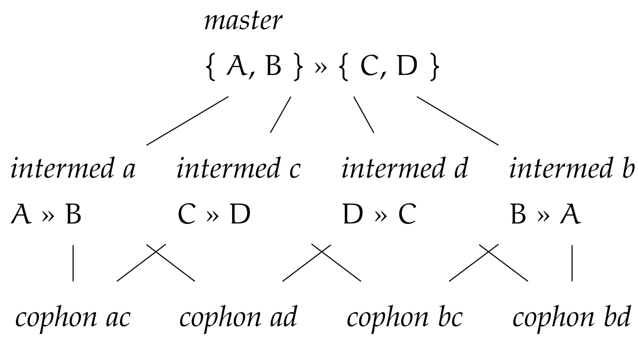
To fully capture the generalizations of A'ingae functional morphology, I will employ a multiple inheritance hierarchy. To see the utility of multiple inheritance hierarchies, consider a hypothetical language with four operative constraints A, B, C, and D, and four cophonologies, which have the following property: all four cophonologies rank A and B above C and D, but across the four cophonologies, all combinations of relative rankings of A with respect to B and C with respect to D are attested. This is to say, the four cophonologies form a 2×2 matrix whose one dimension specifies the relative rankings of A and B while the other specifies the relative rankings of C and D.

	A » B	B » A
C » D	*cophonology ac* A » B » C » D	*cophonology bc* B » A » C » D
D » C	*cophonology ad* A » B » D » C	*cophonology bd* B » A » D » C

Terminal nodes of a multiple inheritance lattice, an example.

The relative rankings of A with respect to B and C with respect to D can be conceptualized as two language-internal phonological parameters which vary independently. A parametric variation of this sort characterizes A'ingae, which will be motivated in the following sections of this chapter.

A multiple inheritance hierarchy can formally capture this pattern of intersecting commonalities, as terminal nodes are allowed to inherit from multiple intermediate nodes. All nodes ultimately inherit from the root node, which specifies the *master* ranking.



Multiple inheritance lattice, an example.

Although multiple-inheritance matrices are proposed in some unification-based grammars (e.g. SBCG: Boas and Sag, 2012)—a tradition from which Cophonology Theory inherits, their employment in a Cophonological analysis is—to the best of my knowledge—novel.

4.2 Verbal classes

Most A'ingae verbal stems are are di- or trisyllabic. Due to their sheer number, they are very informative about the language's prosodic processes. Some verbal stems are monosyllabic; from them, little can be gleaned about the stress system, so they will be referred to only in passing. The occasional quadrisyllabic oddballs are lexicalizations of morphologically complex forms and are all irregularly stressed.

In bare disyllables, stress is uniformly penultimate (49).

	uniform penultimate stress			
(49)	a. *pánza* 'hunt'	b. *fétha* 'open'	c. *áfa* 'speak'	d. *páña* 'hear'

In bare forms of trisyllabic verbs, stress falls predominantly on the penultimate syllable (50a-b), but there is a small number of verbs with word-initial stress (50c-d).

	penultimate stress		word-initial stress	
(50)	a. *upáthû* 'pick'	b. *agáthu* 'count'	c. *áfase* 'insult'	d. *kúndase* 'tell'

Disyllabic verbs further subdivide with respect to stress in morphologically complex forms. Most of the language's suffixes shift the stress of disyllabic verbs rightwards (49a-b), yielding penultimate stress on morphologically simplex and suffixed forms alike, as demonstrated with the precumulative *–ji* 'PRCM' (51a-b) and the irrealis *–ya* 'IRR' (52a-b). Some verbs, however (49c-d), resist the shift, retaining word-initial stress (51-52c-d).

	PENULTIMATE STRESS		WORD-INITIAL STRESS	
(49)	a. *pánza* 'hunt'	b. *fétha* 'open'	c. *áfa* 'speak'	d. *páña* 'hear'
(51)	a. *panzá–ji* 'hunt–PRCM'	b. *fethá–ji* 'open–PRCM'	c. *áfa–ji* 'speak–PRCM'	d. *páña–jin* 'hear–PRCM'
(52)	a. *panzá–ya* 'hunt–IRR'	b. *fethá–ya* 'open–IRR'	c. *áfa–ya* 'speak–IRR'	d. *páña–ña* 'hear–IRR'

The above difference between stress-shifting (49a-b) and rigid-stress (49c-d) disyllabic verbs is paralleled among trisyllabic verbs, whereby penultimate stress (50a-b) shifts down to the penultimate syllable when the verb is suffixed (53-54a-b), but word-initial stress (50c-d) remains word-initial under those same circumstances (53-54c-d).

	PENULTIMATE STRESS		WORD-INITIAL STRESS	
(50)	a. *upáthû* 'pick'	b. *agáthu* 'count'	c. *áfase* 'insult'	d. *kúndase* 'tell'
(53)	a. *upatû́–ji* 'pick–PRCM'	b. *agathú–ji* 'count–PRCM'	c. *áfase–ji* 'insult–PRCM'	d. *kúndase–ji* 'tell–PRCM'
(54)	a. *upatû́–ya* 'pick–IRR'	b. *agathú–ya* 'count–IRR'	c. *áfase–ya* 'insult–IRR'	d. *kúndase–ya* 'tell–IRR'

Thus, the language's verbs can be divided in two classes with respect to patterns of stress shift, irrespective of the number of syllables: one with a pattern of penultimate stress (49-50a-b), the other with a pattern of initial stress (49-50c-d).

The difference between penultimate-patterning verbs (49-50a-b) and initial-patterning verbs (49-50c-d), I propose, can be attributed to a difference in the mechanism of stress assignment. Initial stress is lexical; penultimate stress is supplied by the language's phonology in the absence of lexical stress. In short, initial-patterning verbs have stress at the underlying level (49′-50′c-d), which the penultimate-patterning verbs lack (49′-50′a-b).[1]

1 Section A.4 provides a short list of underlying verbal forms, classified as transitive *vtr* or intransitive *vin*, along with their English translations.

		PHONOLOGICAL STRESS		LEXICAL STRESS	
(49′)		a. */panza/* [*pánza*] 'hunt'	b. */fetha/* [*fétha*] 'open'	c. */áfa/* [*áfa*] 'speak'	d. */páña/* [*páña*] 'hear'
(50′)		a. */upathû/* [*upáthû*] 'pick'	b. */agathu/* [*agáthu*] 'count'	c. */áfase/* [*áfase*] 'insult'	d. */kúndase/* [*kúndase*] 'tell'

Penultimate stress is the language's default assigned to verbs without lexical stress. I will therefore refer to the lexically stressless verbs (49-50a-b) as *regular*. Initial stress needs to be separately specified. I will refer to the lexically stressed verbs (49-50c-d) as *irregular*.

Regular verbs (49′-50′a-b) surface with penultimate stress as a consequence of *culminativity*, which requires that one syllable within a word must carry the primary stress and at most one can. Accentual culminativity is overwhelmingly common in the world's languages (Alderete, 1999; Hayes, 1995; Liberman and Prince, 1977).

An immediate alternative to the above penultimate-as-default analysis would be one of the opposite markedness profile: take the initial-patterning verbs as regular, or representative of the language's accentual default, and the penultimate-patterning verbs as irregular, or carrying some form of lexical specification. There are four principal reasons why such an initial-as-default analysis is dispreferred.

First, while initial-patterning disyllabic verbs are fairly common, only a few initial-patterning trisyllabic verbs have been identified.[2] This suggests that initial stress is more marked than penultimate stress.

Second, many of the initial-patterning trisyllables seems to have been historically derived from initial-patterning disyllables,[2] sometimes via semantically opaque morphology (55-56). This suggests that the initial stress pattern can be attributed at least in part to its diachrony.

(55) a. *áfa*
'speak'
b. *kúnda*
'let know'

(56) a. *áfa–se*
'speak–SE'
"insult"
b. *kúnda–se*
'let know–SE'
"tell"

Third, taking penultimate stress as the language's default leads to a more parsimonious analysis. With default penultimate stress, initial stress can be analyzed as a simple matter of faithfulness to the input

2 Trisyllables with glottal stops are excluded here, as their consistent initial stress is accounted for independently in Section 4.5.3. Disyllables and trisyllables with glottal stops will be later referred to as *glottal verbs*.

(to be developed in this section). If word-initial stress were taken as the default, though, accounting for the shifting penultimate stress would require more intricate mechanisms.

Fourth, all monosyllables are penultimate-patterning; no monosyllables are initial-patterning. This can be demonstrated only with multiply-suffixes verbal forms whose analysis will be given in Section 4.3. Nevertheless, a preanalytical illustration is still possible.

	PENULTIMATE	PENULTIMATE	WORD-INITIAL
(57)	a. *an–jín–ña*	b. *panza–jí–ya*	c. *áfa–ji–ya*
	'eat–PRCM–IRR'	'hunt–PRCM–IRR'	'speak–PRCM–IRR'

Monosyllables, such as *an* 'eat,' surface with penultimate stress when suffixed with both *–ji* 'PRCM' and *–ya* 'IRR' (57a). In doing so, they show affinity to the regular *panza* 'hunt,' which likewise surfaces with penultimate stress (57b), and a dissimilitude from the irregular *áfa* 'speak,' whose word-initial lexical stress surfaces untrammeled (57c). This again suggests that initial stress is more marked than penultimate stress.

The penultimate stress default will be derived as an interaction of two Optimality Theoretic constraints. Those constraints will be motivated in Section 4.3, with reference to data of greater morphological complexity. For now, penultimate stress will be captured with a temporary constraint aptly dubbed PENULTIMATESTRESS.

> PENULTIMATESTRESS, or σ́σ#, temporary
> The penultimate syllable is the prosodic head of the word.

Glyphs introduced along the constraints names, such as σ́σ# above, will be used in the tableaux for shorthand. For meanings of the individual symbols used in the glyphs, see Section A.2.

PENULTSTRESS (σ́σ#) is not a serious theoretical proposal. The constraint is a placeholder used before penultimate stress is derived from the interaction of more fundamental principles in Section 4.3.

Faithfulness to the lexical specification of the initial-stress verbs is guaranteed by a MAXIMALITY constraint which prohibits the deletion of stress (McCarthy and Prince, 1995).

> MAXIMALITY(STRESS), or Mxφ
> Stress is not deleted.

The Greek letter φ used in the constraint's glyph symbolizes metrical feet, of which stress is a property.

The data pattern of (49-54) is derived by ranking MAXSTRESS (Mxφ) over PENULTSTRESS (σ́σ#), thus preserving exceptional word-initial accentuation, but allowing for penultimate stress to emerge when no lexical stress is present. The ranking of MaxStress (Mxφ) over PenultStress (σ́σ#) is captured in the following grammar lattice.

master
MaxStress (Mxφ) » PenultStress (σ́σ#)

Grammar lattice, 1st iteration.

Since no constructions-specific cophonologies have been proposed yet, the constraint ranking is listed under the *master* node. The ranking is thus predicted to operate in every nook and cranny of the language's phonology, although this will soon be revised. Since only two constraints and one ranking have been introduced so far, the current lattice is understandably minimalist. As refinements to the constraint rankings are being motivated, new iterations of the grammar lattice will be constructed.

Penultimate-stress verbs do not have accentual specification in the input. MaxStress (Mxφ) is not violated by any candidate, so the responsibility of picking the winning one rests on PenultStress (σ́σ#), as can be seen in (50′a) and (53′a) alike.

(50′)	a. *upathû* :	Mxφ »	σ́σ#
	i. *upathû*		∗!
	ii. *úpathû*		∗!
☞	iii. *upáthû*		
	iv. *upathû́*		∗!
	'pick'		

(53′)	a. *upathûji* :	Mxφ »	σ́σ#
	i. *upathûji*		∗!
	ii. *úpathûji*		∗!
	iii. *upáthûji*		∗!
☞	iv. *upathû́ji*		
	v. *upathûjí*		∗!
	'pick–PRCM'		

Initial-stress verbs, on the other hand, have accentual specification in the input. A mismatch between the input and the output violates Max Stress (Mxφ), which ends up picking the unique winning candidate every time (50′, 53′c).

(50′) c. *áfase* :	Mxφ »	όσ#
i. *afase*	∗!	———
☞ ii. *áfase*		∗
iii. *afáse*	∗!	———
iv. *afasé*	∗!	———

'insult'

(53′) c. *áfaseji* :	Mxφ »	όσ#
i. *afaseji*	∗!	———
☞ ii. *áfaseji*		∗
iii. *afáseji*	∗!	———
iv. *afaséji*	∗!	———
v. *afasejí*	∗!	———

'insult–PRCM'

In summary, two stress-wise verbal classes have been observed: penultimate-patterning verbs and initial-patterning verbs. Penultimate-patterning verbs have been analyzed as regular, or lexically stressless. Initial-patterning verbs—as irregular, or lexically stressed. PENULT STRESS (όσ#) has been tentatively proposed to account for the default penultimate stress. It is dominated by MAXSTRESS (Mxφ), which ensures faithfulness to the word-initial stress of irregular verbs.

4.3 PHONOLOGICAL LEVELS

As demonstrated in Chapter 3, the inflection of the A'ingae verb is extraordinarily rich, with a dozen or so morphological slots, many of which can be occupied at the same time. This section will consider two complications involving morphologically complex verbs and polysyllabic suffixes. In consequence, the analysis of Section 4.2 will be revised.

Section 4.2 showed that accentually unmarked verbs, such as *panza* 'hunt,' surface with penultimate stress when unsuffixed and suffixed alike. Forms with the precumulative –*ji* 'PRCM' and the irrealis –*ya* 'IRR' are reiterated below (58). Multiply-suffixed verbs present the first complication to this picture: when a second suffix is attached, here the negative –*mbi* 'NEG,' forms with –*ji* 'PRCM' and –*ya* 'IRR' differ in the placement of stress (59). Forms suffixed with –*ji* 'PRCM' undergo a rightward stress shift and surface with penultimate stress again (59a), whereas forms suffixed with –*ya* 'IRR' retain the stem-final stress, i. e. they surface with antepenultimate stress (59b).

		PENULTIMATE STRESS		STEM-FINAL STRESS
(58)	a.	*panzá–ji* 'hunt–PRCM'	b.	*panzá–ya* 'hunt–IRR'
(59)	a.	*panza–jí–mbi* 'hunt–PRCM–NEG'	b.	*panzá–ya–mbi* 'hunt–IRR–NEG'

Lexically stressed verbs, such as *áfa* 'speak,' behave in a less unexpected way, with stress initial across the board (60-61). These lexically stressed verbs will play a secondary role in the analysis developed throughout this section; interactions of lexical stress specification with diacritic properties of the language's functional morphemes will be taken up again in Section 4.4.

		UNIFORM WORD-INITIAL STRESS		
(60)	a.	*áfa–ji* 'speak–PRCM'	b.	*áfa–ya* 'speak–IRR'
(61)	a.	*áfa–ji–mbi* 'speak–PRCM–NEG'	b.	*áfa–ya–mbi* 'speak–IRR–NEG'

The second complication involves polysyllabic suffixes. There are two disyllabic inflectional morphemes: the apprehensional *–sa'ne* 'APPR' and the prohibitive *–jama* 'PRHB.' Both suffixes trigger antepenultimate stress on regular verbs (62).

		ANTEPENULTIMATE STRESS		
(62)	a.	*panzá–sa'ne* 'hunt–APPR'	a.	*panzá–jama* 'hunt–PRHB'

The two complications outlined above require a refinement to the analysis proposed in Section 4.2. The refined analysis can be informally summarized as follows. First, penultimate stress is the prosodic default. Second, two major groups of functional morphemes are distinguished with respect to their accentual properties.

As before, stress is assigned to the penultimate syllable by default. This default pattern emerges whenever a verb is not assigned stress at an earlier stage via morphological means.

Unlike before, suffixes are divided in two groups depending on their accentual properties. One group is *nonstressing*—these suffixes do not contribute any stress, but they do form part of the accentual domain and are taken into account when the default penultimate stress is assigned to lexically stressless verbs. The other group is *prestressing*—these suffixes place stress on the right edge of the stem to which they attach (on the syllable immediately to their left), effectively contributing lexical stress. Prestressing is blocked if the stem has lexical stress as an irregular verb or due to having previously undergone prestressing suffixation.

The precumulative *–ji* 'PRCM' is a nonstressing suffix, whereas all the other functional morphemes introduced so far: the negative *–mbi* 'NEG,' the irrealis *–ya* 'IRR,' the apprehensional *–sa'ne* 'APPR,' as well as the prohibitive *–jama* 'PRHB,' are prestressing.

The nonstressing suffix *–ji* 'PRCM' attaches before the prestressing suffixes. An empirical investigation reveals that the nonstressing suffixes all attach before the prestressing suffixes. As such, the two groups of suffixes can be thought of as reflecting two phonological levels (Kiparsky, 1982). I will therefore say that the nonstressing suffixes attach at level 0, and label their corresponding cophonology as *level 0* or φ_0.[3] I will say that the prestressing suffixes attach at level 1, and label their corresponding cophonology as *level 1* or φ_1.[4]

The updated morphological template on the following page uses subscripts for each suffix to indicate its phonological level as 0 or 1. A dashed line separates the two levels, further highlighting their linear order.[5]

The outputs of level 0 and level 1 suffixal constructions are *lexical words*. A lexical word can be stressed by virtue of having a lexically stressed (irregular) root, or by having a prestressing (level 1) suffix. If neither obtains, the word is lexically stressless. A *prosodic word* is required to have exactly one accent (see the discussion of culminativity in Section 4.2). If a lexical word is stressless, it is supplied with penultimate stress to comply with the language's prosodic requirements.

Penultimate stress will be formalized with the level 1 cophonology. This is to say, the prestressing of level 1 suffixes and the default penultimate stress will be unified and captured with one constraint ranking. The constraint ranking will have the effect of deriving stem-final

3 The Greek letter φ is used for cophonological functions as it stands for the word *phonology*. It bears no direct relation to the φ which symbolizes feet or metrical structure in constraint glyphs.

4 Phonological layering is not imposed by the architecture of the Cophonology Theory. This predicts the existence of languages without phonological levels. The predication is borne out by, for example, Turkish (Orgun, 1996). Nevertheless, in languages where phonological levels are a reality, the Cophonology Theory allows for capturing it with a LEVEL feature, whose value is appropriately restricted in lower-level constructions. For details of the implementation, see Orgun (1996).

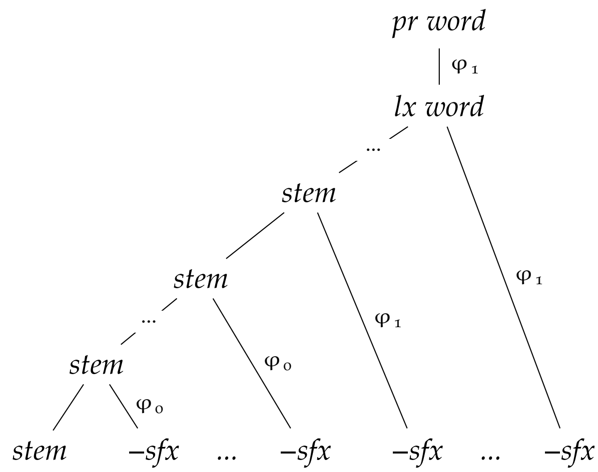
5 The verbal diminutive *–'kha* 'DMN' is somewhat of an outlier—the only level 1 morpheme in a slot of level 0 suffixes. Nevertheless, its aspectual semantics cements its position in the template.
On one hand, the verbal diminutive *–'kha* 'DMN' does not violate the proposed morphological layering, as no level 0 suffix attaches past it. On the other, its realization is somewhat variable: it has a glottalless variant *–kha* 'DMN' which is realized as a level 0 suffix, possibly by analogy with other aspectual morphemes.

VOICE / VALENCE			ASP	MOT	NUM	MOD	POL	TAX	INFO STRUCTURE			ILL	PER
				–'ngi$_0$				*–'ya*$_1$					*–tsû*$_1$
			–'je$_0$	VEN		*–ya*$_1$	*–mbi*$_1$	VER					3
			IMPV	*–'nga*$_0$		IRR	NEG	HYP				*–te*$_1$	*–ki*$_1$
				AND					*–'yi*$_1$	*–'ta*$_1$	*–'khe*$_1$	RPRT	2
–ña$_0$	*–khu*$_0$	*–ye*$_0$	*–ji*$_0$		*–'fa*$_1$				EXCL	NEW	ADD	*–ti*$_1$	*–ngi*$_1$
CAUS	RCPR	PASS	PRCM		PLS			*–ye*$_1$				INT	1
			–'ñakha$_0$					INF		*–'ja*$_1$			
			SMFC							CNTR			
			–'kha$_1$					DCV				*–teki*$_1$	
			DMN									RPRT.2	

HYP:	*–pa*$_1$	*–si*$_1$	*–'ma*$_1$	*–'ni*$_1$	*–sa'ne*$_1$
	SS	DS	FRST	LOC	APPR
DCV:	*–ja*$_1$	*–kha*$_1$	*–'se*$_1$	*–jama*$_1$	
	IMP	IMP2	IMP3	PRHB	

Morphological template of layered verbal inflection, 2nd iteration.

stress in binary constructions involving a stem and a level 1 suffix, and penultimate stress in unary constructions involving only a stem (a prosodic word). The morphological constituency below schematizes the claims made in preceding paragraphs.



Morphological constituency, 1_{st} iteration.

Levels 0 and 1 will be formalized as two Optimality Theoretic constraint rankings. Level 0 suffixes do not insert stress. To capture this, a Dependence constraint is introduced (McCarthy and Prince, 1995).

> Dependence(Stress), or Dpφ
> Stress is not epenthesized.

To ensure faithful mappings of stressless input to stressless output, DepStress (Dpφ) is ranked in the level 0 cophonology above constraints which supply stress at level 1 (to be discussed momentarily).

Level 1 suffixes stress the final syllable of the domain to which they attach. This can be straightforwardly captured with an Alignment constraint of McCarthy and Prince (1993)'s Generalized Alignment framework. The constraint aligns stress with the right edge of the stem, effectively deriving the prestressing of level 1 suffixes.

> Align(Stem, R, Stress, R), or σ́]
> The stem-final syllable is the prosodic head of the word.

AlignStem (σ́]) ranks above DepStress (Dpφ), because it supplies stress to stressless stems. AlignStem (σ́]) ranks below MaxStress (Mxφ), introduced in Section 4.2, because it does not do so when stress is already present.

Primary stress is placed on the penultimate syllable when no other stress is present. This is captured in one ranking along with the level 1 prestressing, by letting AlignStem (σ́]) be dominated by a NonFinality constraint (Prince and Smolensky, 1993). The NonFinality constraint prevents the placement of stress on the word-final syllable.

This ranking predicts stem-final stress with level 1 suffixes as well as penultimate stress on lexically stressless words.

> NonFinality, or *σ́#
> The final syllable of a word is not its prosodic head.

NonFinality (*σ́#) is inactive with level 1 suffixes, as prestressing means that stress does not surface on the word-final syllable either way. When applied to a fully inflected yet lexically stressless word, though, it makes all the difference: in a unary construction with no suffixation, the domains of word and stem coincide. As a result, AlignStem (σ́]) targets the entire word. AlignStem (σ́]) is interpreted in a gradient fashion: one violation mark is assigned for each syllable between stress and the right edge of the word, so the constraint pushes for word-final stress. Dominated by NonFinality (*σ́#), however, it settles for the second best, which is penultimacy.[6]

Finally, LexicalWord≈ProsodicWord operative at level 1 ensures that every lexical word corresponds to a prosodic word (Prince and Smolensky, 1993).

> LexicalWord≈ProsodicWord, or #ω#
> Every lexical word corresponds to a prosodic word.

LxWd≈PrWd (#ω#) forces every word to have at least one foot. In practice, this boils down to eliminating stressless candidates. LxWd≈PrWd (#ω#) ranks above NonFinality (*σ́#), ensuring that monosyllabic words (whose all syllables are word-final) can be parsed as well. A revised grammar lattice graphs the refinements discussed in the preceding paragraphs.

master

Mxφ » *σ́# » Dpφ

φ_0: *level 0* — Dpφ » { σ́], #ω# }

φ_1: *level 1* — #ω# » *σ́# » σ́] » Dpφ

Grammar lattice, 2nd iteration.

6 Alternatively, one could capture the penultimate stress of the prosodic word by constructing metrical structure bottom-up. In this approach, syllables are parsed into trochees from right to left, which can be formalized with ParseSyllables and Align(Foot, R, PrWd, R) (see Section 4.6), and primary stress is assigned via some Optimality Theoretic equivalent of the EndRuleRight (Hayes, 1995), e. g. another Alignment constraint (McCarthy and Prince, 1993).
This alternative is viable, but it would not buy us any simplicity, as it does not reduce the number of invoked constraints. AlignStem (σ́]) is independently necessitated by level 1 suffixes, and NonFinality (*σ́#) would have to be invoked any way to explain why heavy-final words do not receive ultimate stress (see the footnote on page 71).

The *master* cophonology ranks the faithfulness constrains and NonFinality (*ό#) generally operative in the language. The ranking of MaxStress (Mxφ) above NonFinality (*ό#) will be briefly motivated towards the end of this section. The *level 0* cophonology ranks DepStress (Dpφ) above constraints which favor prosodic structure, reflecting the fact that level 0 suffixes are nonstressing. The *level 1* cophonology ranks AlignStem (ό]) below NonFinality (*ό#) and above DepStress (Dpφ), which captures the level 1 prestressing and the prosodic word penultimate stress.

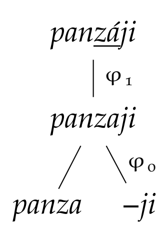
Technically, each node in a grammar lattice has the exact same set of constraints, with subordinate nodes resolving ranking indeterminacies of the superordinate nodes. The constraints not listed under the *master* node, i. e. AlignStem (ό]) and LxWd≈PrWd (#ω#), are still understood to be present there. They are skipped to visually declutter the lattice. The ranking Mxφ » *ό# » Dpφ can therefore be understood to stand for Mxφ » *ό# » Dpφ, *ό#, #ω#, with the latter two constrains unranked with respect to the former three. Due to the ultimate resolution of *master* into *level 0* or *level 1*, the notational convention I am adopting does not result in a loss of formal precision.

The two constraint rankings *level 0* and *level 1* suffice to account for the data so far. The penultimate stress identified in Section 4.2 is the output of the *level 1* cophonology applied at the stage of suffixation or prosodic default stress suppliance.

In verbal forms suffixed at level 0, lexical stress is absent, so penultimate stress is supplied to the prosodic word in a unary level 1 construction (58′a).

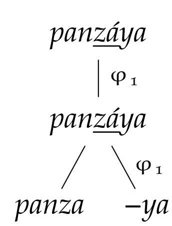
In verbal forms suffixed at level 1, on other other hand, stress is lexical, as level 1 suffixes stress the syllable immediately to their left. A subsequent reapplication of the level 1 cophonology in a unary construction simply preserves that stress, since level 1's prestressing prestressing is blocked by preexisting metrics (58′b). For monosyllabic suffixes, this coincides with penultimacy.

(58′) a.



‘hunt–PRCM’

b.



‘hunt–IRR’

The tableaux below demonstrate the evaluation of four candidates each against two constraint rankings applied sequentially (58″a-b). Brackets [ ] delimit input stems. The cophonology active in any construction is given by the subscript to the right of the input. The constraint ranking associated with the active cophonology is additionally labeled as such in the top row. The succeeds operator ≻ relates the output of one cophonology to the input of the next one.

With faithfulness constraints dominating LxWd≈PrWd (#ω#), a level 0 construction's output is stressless given stressless input. That output then becomes input to a level 1 construction, where it is assigned penultimate stress in a contest between the gradient AlignStem (σ́]) pushing for stem-final stress (here word-final as well) and the absolute NonFinality (*σ́#) penalizing word-final stress (58″a).

			level 0				
(58″)	a.	[*panza*]*ji*$_0$:	Mxφ »	*σ́# »	Dpφ »	#ω#,	σ́]
☞	i.	*panzaji*				*	
	ii.	*pánzaji*			*!		
	iii.	*panzáji*			*!		
	iv.	*panzají*		*!			

			level 1				
≻		[*panzaji*]$_1$:	Mxφ,	#ω# »	*σ́# »	σ́] »	Dpφ
	i.	*panzaji*		*!			
	ii.	*pánzaji*				*!*	
☞	iii.	*panzáji*				*	
	iv.	*panzají*			*!		

'hunt–PRCM'

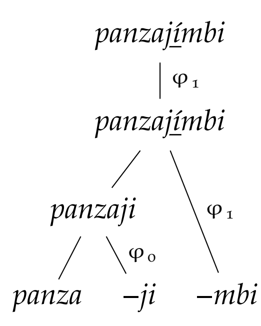
Ranking ALIGNSTEM (ó]) above DEPSTRESS (Dpφ) models the prestressing behaviour of level 1 suffixes. The repeated application of level 1 cophonology to the output simply preserves the lexical stress from the previous construction (58″b).

		level 1				
(58″) b.	[*panza*]*ya*$_1$:	Mxφ,	#ω# »	*ó# »	ó] »	Dpφ
i.	*panzaya*		*!			
ii.	*pánzaya*				*!	
☞ iii.	*panzáya*					*
iv.	*panzayá*			*!		

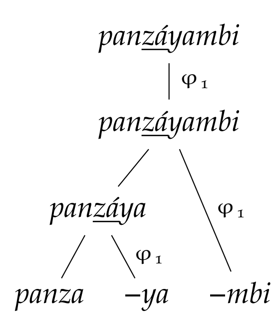
		level 1				
≻	[*panzáya*]$_1$:	Mxφ,	#ω# »	*ó# »	ó] »	Dpφ
i.	*panzaya*	*!	*!			
ii.	*pánzaya*	*!				
☞ iii.	*panzáya*				*	
iv.	*panzayá*	*!				

'hunt–IRR'

Default stress assignment and level 1-induced prestressing both yield penultimate stress when only one monosyllabic suffix is attached to a bare verb. In multiply-suffixed forms, the two can be told apart: an early attachment of a level 0 suffix does not block the prestressing of a later-attaching level 1 suffix (59′a), whereas stress once induced by a level 1 suffix blocks the prestressing of latter level 1 suffixes (59′b).

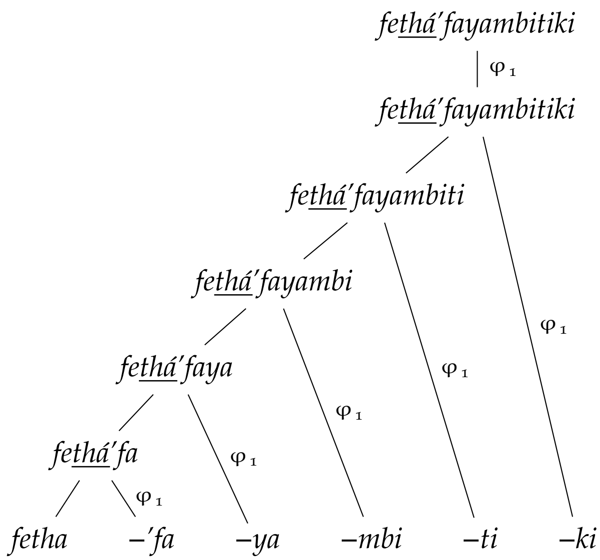
(59′) a. 

'hunt–PRCM–NEG'

b. 

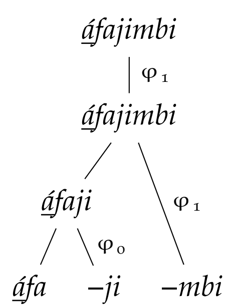
'hunt–IRR–NEG'

The blocking of prestressing for all level 1 suffixes other than the first one is most conspicuous when many level 1 suffixes are attached, as stress falls reliably on the syllable immediately preceding the first level 1 suffix (63).

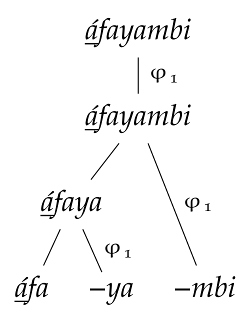
(63) 

'open–PLS–IRR–NEG–INT–2'
"will you not open?"

The blocking of prestressing seen in (59'b, 63), where the stress triggered by the first suffix blocks the stress associated with latter suffixes, is not particular to a configuration of multiple level 1 suffixes. The same exact mechanism operates when a level 1 suffix attaches to a verb with lexical word-initial stress (61') as when the level 1 cophonology applies to words that already underwent it (58'b, 59', 63, 62'). To put it differently, prestressing associated with level 1 suffixes is blocked when the stem to which they attach is already accented, regardless of the accent's provenance.

(61') a. 

'speak–PRCM–NEG'

b. 

'speak–IRR–NEG'

The tableau below demonstrates the blocking of prestressing in *áfaya* ‘speak–IRR’ (60′b), the first step in the derivation of (61′b).

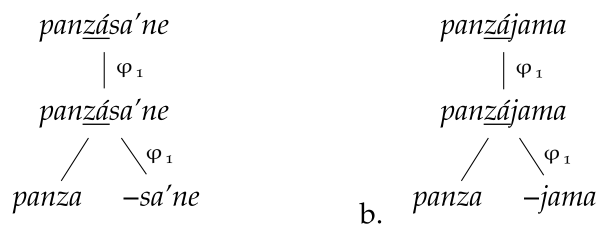
		level 1				
(60′)	b. [*áfa*]*ya* $_1$:	Mxφ,	#ω# »	*σ́# »	σ́] »	Dpφ
	i. *afaya*	∗!	∗!			
☞	ii. *áfaya*				∗	
	iii. *afáya*	∗!				
	iv. *afayá*	∗!				

‘speak–IRR’

Indeed, no other pattern could be observed. The architecture of Cophonology Theory necessitates that the cophonologies be morphologically blind (see Section 4.1.2). This is to say, morphological constructions have no access to the morphological makeup of the stem: if the stem retains its accent, it will do so regardless of how it got there.

Finally, the refined analysis also accounts for the antepenultimate stress of the disyllabic suffixes –*sa’ne* ‘APPR’ and –*jama* ‘PRHB’ (62′).

(62′) a. b.



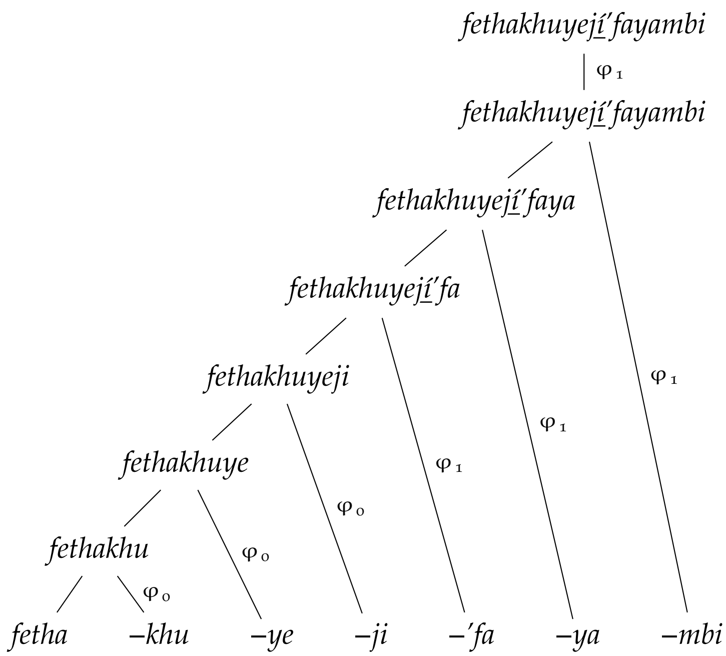
a. ‘hunt–APPR’ b. ‘hunt–PRHB’

Both –*sa’ne* ‘APPR’ and –*jama* ‘PRHB’ are prestressing level 1 morphemes. Since prestressing is defined as stress placement on the last syllable of the stem, immediately to the left of the suffix, antepenultimacy follows straightforwardly (62″a).

		level 1				
(62″)	a. [*panza*]*sa’ne* $_1$:	Mxφ,	#ω# »	*σ́# »	σ́] »	Dpφ
	i. *panzasa’ne*		∗!			
	ii. *pánzasa’ne*				∗!	
☞	iii. *panzása’ne*					∗
	iv. *panzasá’ne*				∗!	
	iv. *panzasa’né*			∗!		

‘hunt–APPR’

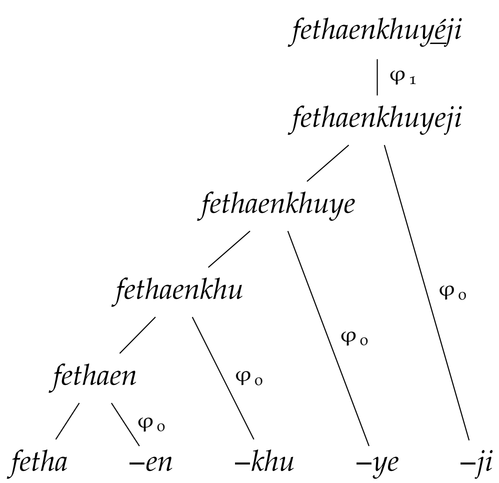
The principles demonstrated above generalize fully to forms of any morphological complexity. They are most conspicuous in verbs with many level 0 and level 1 suffixes, where the nonstressing behavior of the former and the blockable prestressing of the latter collaborate to mark the left boundary between the two phonological levels (64).



(64)

'open–RCPR–PASS–PRCM–PLS–IRR–NEG'
"will not be about to be opened by each other"

This can be contrasted with a simpler morphological form, composed only of a stressless stem with level 0 suffixes, where stress is supplied by the language's phonology to the penultimate syllable of the prosodic word (65).



(65)

'open–CAUS–RCPR–PASS–PRCM'
"about to be made open by each other"

Finally, two closing remarks about the ranking of NonFinality (*σ́#). The constraint is high-ranked to reflect the language's general dispreference for word-final stress. There are no verbs with final stress (*pace* F&H) and all the reported final-stress nouns, which can be counted on one hand, are borrowings or onomatopoeiae.

MaxStress (Mxφ) ranks above NonFinality (*σ́#) in recognition of those few rare ultimate-stress borrowings or onomatopoeiae. Such a ranking correctly predicts that word-final stress, however marked it be, is preserved and can surface (66).

(66)	*tûn<u>tű̂n</u>*:	Mxφ »	*σ́# »	Dpφ
i.	*tûntûn*	∗!		
ii.	*<u>tű̂n</u>tûn*	∗!		
☞ iii.	*tûn<u>tű̂n</u>*		∗	

'trumpeter finch'

In summary, two phonological levels have been proposed, each associated with a cophonology: *level 0* and *level 1*. Level 0 corresponds to early-attaching suffixes. Level 1 corresponds to late-attaching suffixes and the penultimate stress supplied to stressless verbs by default.

The *level 0* cophonology ranks stem faithfulness above LxWd≈PrWd (#ω#), preventing stress epenthesis. The *level 1* cophonology ranks NonFinality (*σ́#) above AlignStem (σ́]) and DepStress (Dpφ), yielding stem-final stress in binary constructions (suffixation) and penultimate stress in unary constructions (prosodic default).

4.4 STEM FAITHFULNESS

Section 4.3 demonstrated the phonological layering of A'ingae functional morphology by contrasting the accentual properties of two levels of suffixes: level 0 and level 1. The verbal stems used in that exposition have largely come from the regular, lexically stressless class. The irregular, lexically stressed verbs will be used to introduce further morphological splits: first among level 0 suffixes, and later among level 1 suffixes.

Level 0 suffixes do not supply stress to regular, lexically stressless stems (67a-b). As consequence, verbs suffixed at level 0 and bare stems alike surface with the default penultimate stress (67-69a-b).

When applied to inherently stressed verbs (67c-d), level 0 suffixes fork: some suffixes, such as the precumulative *–ji* 'PRCM,' remain faithful to the stem's stress (68c-d), while others, such as the passive *–ye* 'PASS,' disregard it. They allow for the penultimate stress to surface on irregular verbs (69c-d), equalizing them with the regulars (69a-b).

	STRESSLESS STEM		STRESSED STEM	
(67)	a. *<u>pán</u>za* 'hunt'	b. *a<u>gá</u>thu* 'count'	c. *<u>á</u>fa* 'speak'	d. *<u>kún</u>dase* 'tell'
(68)	a. *pan<u>zá</u>–ji* 'hunt–PRCM'	b. *aga<u>thú</u>–ji* 'count–PRCM'	c. *<u>á</u>fa–ji* 'speak–PRCM'	d. *<u>kún</u>dase–ji* 'tell–PRCM'
(69)	a. *pan<u>zá</u>–ye* 'hunt–PASS'	b. *aga<u>thú</u>–ye* 'count–PASS'	c. *a<u>fá</u>–ye* 'speak–PASS'	d. *kunda<u>sé</u>–ye* 'tell–PASS'

Attaching another suffix, here the negative *–mbi* 'NEG,' to the passivized *–ye* 'PASS'-verbs further demonstrates the equalization of the two verb classes, as both irregular stressed (70a-b) and regular stressless (70c-d) stems surface with penultimate stress.

	UNIFORM PENULTIMATE STRESS	
(70)	a. *panza–<u>yé</u>–mbi* 'open–PASS–NEG'	b. *agathu–<u>yé</u>–mbi* 'count–PASS–NEG'
	c. *afa–<u>yé</u>–mbi* 'speak–PASS–NEG'	d. *kundase–<u>yé</u>–mbi* 'tell–PASS–NEG'

The passive *–ye* 'PASS' not only abstains from supplying its own lexical stress—it deletes the stress of the stem to which it attaches.

In the typological literature, suffixes which impose their accentual demands over faithfulness to the stem have gone under the name of *dominant*. Suffixes which prioritize faithfulness to the stem over their own accentual specification have been referred to as *recessive* (Alderete, 1999; Halle and Vergnaud, 1987; others).

In A'ingae, recessiveness is exemplified by *–ji* 'PRCM;' dominance—by *–ye* 'PASS.' Thus, two further subtypes of *level 0* suffixes are distinguished: recessive and dominant. I will refer to the cophonology of the former as *level 0 recessive* or φ_0 and to the cophonology of the latter *level 0 dominant* or $\varphi_0^{\times}$. The cross × symbolizes the deletion of stress associated with dominance.

For purposes of concreteness, I will capture the pattern of primary stress deletion with a constraint of Alderete (1999)'s Transderivational Antifaithfulness framework. In particular, I adopt an ANTIMAXIMALITY constraint which requires a violation of its positive counterpart MAXSTRESS (Mxφ), whenever stress is present.

> ANTIMAXIMALITY(STRESS), or ¬Mxφ
> Stress is deleted.

When ANTIMAXSTRESS (¬Mxφ) is operative, i. e. with dominant suffixes, it ranks above MAXSTRESS (Mxφ). For a cross-linguistic argument motivating the class of AntiFaithfulness constraints and a formalization thereof, see Alderete (1999).

The ranking of AntiMaxStress (¬Mxφ) above MaxStress (Mxφ) for level 0 dominant suffixes is captured in the revised grammar lattice below. For visual perspicuity, the ranking of ¬Mxφ is not given in the lattice when the constraint ranks too low to be operative (i. e. below Mxφ for *level 0 recessive* and *level 1*). This convention will be adopted in the coming revisions to the grammar lattice as well: inoperative constraints will not be overtly spelled out.

master
Mxφ » *σ́# » Dpφ

level 0
Dpφ » { σ́], #ω# }

φ_0: *level 0 recessive*

$\varphi_0^{\times}$: *level 0 dominant*
¬Mxφ » Mxφ

φ_1: *level 1*
#ω# » *σ́# » » σ́] » Dpφ

Grammar lattice, 3nd iteration.

Also observe that MaxStress (Mxφ) is not operative at *level 0 dominant*. In every ranking at most one of MaxStress (Mxφ) and Anti MaxStress (¬Mxφ) is operative. In the absence of stress, neither constraint is. In the presence of stress, it is either preserved (and ¬Mxφ is inoperative) or deleted (and Mxφ is inoperative).

The tableaux below demonstrate how dominance works with stressless and stressed stems. The former have no stress to delete (69′a). The latter have their stress deleted by AntiMaxStress (¬Mxφ) (69′c). In either case, penultimate stress is supplied at level 1.[7]

			level 0 dominant		
(69′)	a.	[*panza*]*ye*$_0^{\times}$:	¬Mxφ »	*σ́# »	Dpφ
	☞ i.	*panzaye*			
	ii.	*pánzaye*			∗!
	iii.	*panzáye*			∗!
	iv.	*panzayé*		∗!	———

7 To simplify presentation, violations of constraints peripheral to the discussion and of constraints ranking below operativeness in any given cophonology, e. g. Align Stem (σ́]) and LxWd≈PrWd (#ω#) at *level 0*, MaxStress (Mxφ) at *level 0 dominant*, and DepStress (Dpφ) at *level 1*, will not be explicitly spelled out.

		level 1			
≻	[*panzaye*]$_1$:	Mxφ,	#ω# »	*σ́# »	σ́]
i.	*panzaye*		∗!		
ii.	*pánzaye*				∗∗!
☞ iii.	*panzáye*				∗
iv.	*panzayé*			∗!	

'hunt–PASS'

		level 0 dominant		
(69′) c.	[*áfa*]*ye*$^{\times}_{0}$:	¬Mxφ »	*σ́# »	Dpφ
☞ i.	*afaye*			
ii.	*áfaye*	∗!		
iii.	*afáye*			∗!
iv.	*afayé*		∗!	

		level 1			
≻	[*afaye*]$_1$:	Mxφ,	#ω# »	*σ́# »	σ́]
i.	*afaye*		∗!		
ii.	*áfaye*				∗∗!
☞ iii.	*afáye*				∗
iv.	*afayé*			∗!	

'speak–PASS'

Now, consider the concept of dominance as applied to level 1 suffixes. Given the definition of dominant suffixes as those which prioritize faithfulness to the stem over their own accentual specification, all the level 1 suffixes considered so far are recessive: although they stress the last syllable of the stem, this is blocked by preexisting stress. The prestressing of a level 1 dominant suffix would not be blocked by the stem's stress: regular and irregular verbs alike would surface with stem-final stress.

This data pattern is in fact attested, which testifies to the exsitence of level 1 dominant suffixes. The two level 1 dominant suffixes are the verbal diminutive –*'kha* 'DMN' (72) and the prohibitive –*jama* 'PRHB' (73). Unlike recessives (71), level 1 dominant suffixes place stress on the syllable to their left with both lexically stressless (72-73a-b) and lexically stressed verbs (72-73c-d).

		STRESSLESS STEM		STRESSED STEM	
(71)		a. *panzá–ya* 'hunt–IRR'	b. *agathú–ya* 'count–IRR'	c. *áfa–ya* 'speak–IRR'	d. *kúndase–ya* 'tell–IRR'
(72)		a. *panzá–'kha* 'hunt–DMN'	b. *agathú–'kha* 'count–DMN'	c. *afá–'kha* 'speak–DMN'	d. *kundasé–'kha* 'tell–DMN'
(73)		a. *panzá–jama* 'hunt–PRHB'	b. *agathú–jama* 'count–PRHB'	c. *afá–jama* 'speak–PRHB'	d. *kundasé–jama* 'tell–PRHB'

Thus, two further subtypes of *level 1* suffixes are distinguished: recessive and dominant. I will refer to the cophonologies which govern them as *level 1 recessive* or φ_1, and *level 1 dominant* or $\varphi_1^{\times}$.

In formulating an alternative hypothesis to the one of level 1 dominant suffixes, one could propose that *–'kha* 'DMN' is a level 0 dominant suffix, deriving the penultimate stress of (72) in the same fashion as that of (69). This hypothesis is disconfirmed by forms with subsequent level 1 suffixes, e. g. *–mbi* 'NEG,' whose antepenultimate root-final stress (74) contrasts with the penultimate stress seen with level 0 dominant suffixes (70).

UNIFORM PRESTRESSING OF *–'kha* 'DMN'

(74)	a. *panzá–'kha–mbi* 'hunt–DMN–NEG'	b. *agathú–'kha–mbi* 'count–DMN–NEG'
	c. *afá–'kha–mbi* 'speak–DMN–NEG'	d. *kundasé–'kha–mbi* 'tell–DMN–NEG'

The dominance of the level 1 prohibitive *–jama* 'PRHB' is, on the other hand, further confirmed by the fact it enforces stem-final stress despite earlier-attaching level 1 suffixes, such as the plural subject *–'fa* 'PLS' (75). This is possible as preexisting stress associated with the level 1 suffix is deleted.

UNIFORM PRESTRESSING OF *–jama* 'PRHB'

(75)	a. *panza–'fá–jama* 'open–PLS–PRHB'	b. *agathu–'fá–jama* 'count–PLS–PRHB'
	c. *afa–'fá–jama* 'speak–PLS–PRHB'	d. *kundase–'fá–jama* 'tell–PLS–PRHB'

Formally, the accentual properties of *level 1 dominant* suffixes can be captured by the same mechanism as the one just proposed for level 0 dominant suffixes. Ranking AntiMaxStress ($\neg$Mxφ) above Max Stress (Mxφ) ensures stress deletion and makes MaxStress (Mxφ)

inoperative. The ranking of all other constraints is the same as that of *level 1 recessive*.

The tableaux below demonstrate how the proposed constraint rankings make correct predictions with level 1 dominant and recessive suffixes in either order.

When a level 1 dominant suffix attaches first, stress shifts to its left-adjacent syllable. A subsequent attachment of a recessive suffix does not shift stress (74′c).

		level 1 dominant			
(74′)	c. [*áfa*]'*kha*$_1^{\times}$:	¬Mxφ »	#ω# »	*σ́# »	σ́]
	i. *afa'kha*		∗!		
	ii. *áfa'kha*	∗!			
☞	iii. *afá'kha*				
	iv. *afa'khá*			∗!	

		level 1 recessive			
≻	[*afá'kha*]*mbi*$_1$:	Mxφ,	#ω# »	*σ́# »	σ́]
	i. *afa'khambi*	∗!	∗!		
	ii. *áfa'khambi*	∗!			
☞	iii. *afá'khambi*				∗
	iv. *afa'khámbi*	∗!			
	v. *afa'khambí*	∗!			

'speak–DMN–NEG'

When a level 1 dominant suffix attaches second, it deletes the preceding stress and prestresses (75′c). In either case, stress surfaces on the syllable left-adjacent to the level 1 dominant suffix.

		level 1 recessive			
(75′)	c. [*áfa*]'*fa*$_1$:	Mxφ,	#ω# »	*σ́# »	σ́]
	i. *afa'fa*	∗!	∗!		
☞	ii. *áfa'fa*				
	iii. *afá'fa*	∗!			
	iv. *afa'fá*	∗!			

≻	*[áfa'fa]jama*$^{\times}_{1}$:	*level 1 dominant* ¬Mxφ »	#ω# »	*σ́# »	σ́]
i.	*afa'fajama*		∗!		
ii.	*áfa'fajama*	∗!			
iii.	*afá'fajama*				∗!
☞ iv.	*afa'fájama*				
v.	*afa'fajáma*				∗!
vi.	*afa'fajamá*			∗!	

'speak–PLS–PRHB'

The template on the next page gives the complete morphophonology of verbal inflection, including information about phonological levels as well as recessiveness and dominance. Unlike level 0 and level 1, recessive and dominant suffixes are not linearly ordered.

The four cophonologies: *level 0 recessive*, *level 0 dominant*, *level 1 recessive*, and *level 1 dominant*, exhaust the language-internal morphological variation. Properties of each suffix lie at an intersection of its phonological level (0 or 1) and its stem faithfulness (recessive or dominant). This systematicity can be captured in Cophonology Theory by associating each of *level 0*, *level 1*, *recessiveness*, and *dominance* with a partial ranking, and letting the each of the four cophonologies inherit from them appropriately. A multiple-inheritance hierarchy capturing this idea is given below.

master
Mxφ » *σ́# » Dpφ

dominant
¬Mxφ » Mxφ

level 1
#ω# » *σ́# » σ́] » Dpφ

φ_0: *lvl 0 recessive*

$\varphi^{\times}_{0}$: *lvl 0 dominant*

φ_1: *lvl 1 rcess, prosodic word*

$\varphi^{\times}_{1}$: *lvl 1 dominant*

Grammar lattice, 4$^{\text{th}}$ iteration.

For ease of presentation, partial rankings associated with *level 0* and *recessive* cophonologies are not overtly spelled out in the grammar lattice. ALIGNSTEM (σ́]) and LXWD≈PRWD (#ω#) have no effect on how candidates are evaluated at *level 0*; they rank below DEPSTRESS (Dpφ) and are inoperative as a consequence. Likewise, in the *recessive* cophonologies, ANTIMAXSTRESS (¬Mxφ) is inoperative as it ranks below MAXSTRESS (Mxφ). Lastly, φ_1 serves the double duty of ensuring

VOICE / VALENCE			ASP	MOT	NUM	MOD	POL	TAX	INFO STRUCTURE			ILL	PER
				$-'ngi^{\times}_{0}$				$-'ya_{1}$					$-ts\hat{u}_{1}$
			$-'je^{\times}_{0}$	VEN		$-ya_{1}$	$-mbi_{1}$	VER					3
			IMPV	$-'nga^{\times}_{0}$		IRR	NEG	HYP				$-te_{1}$	$-ki_{1}$
				AND					$-'yi_{1}$	$-'ta_{1}$	$-'khe_{1}$	RPRT	2
$-\tilde{n}a_{0}$	$-khu^{\times}_{0}$	$-ye^{\times}_{0}$	$-ji_{0}$		$-'fa_{1}$				EXCL	NEW	ADD	$-ti_{1}$	$-ngi_{1}$
CAUS	RCPR	PASS	PRCM		PLS			$-ye_{1}$				INT	1
			$-'\tilde{n}akha^{\times}_{0}$					INF		$-'ja_{1}$			
			SMFC							CNTR			
			$-'kha^{\times}_{1}$					DCV				$-teki_{1}$	
			DMN									RPRT.2	

HYP:	$-pa_{1}$	$-si_{1}$	$-'ma_{1}$	$-'ni_{1}$	$-sa'ne_{1}$
	SS	DS	FRST	LOC	APPR
DCV:	$-ja_{1}$	$-kha_{1}$	$-'se_{1}$	$-jama^{\times}_{1}$	
	IMP	IMP2	IMP3	PRHB	

Morphophonological template of verbal inflection, final iteration.

the prestressing of *level 1 recessive* suffixes as well as enforcing stress culminativity on the *prosodic word*.

The minimal six-tuple (1-6) given at the onset of Chapter 4 demonstrated six different accentual patterns. The analysis so far accounts for four out of the six members of the tuple (2-3, 5-6).

			a. *upathû ...–mbi*	b. *áfase ...–mbi*
			'pick ...–NEG'	'insult ...–NEG'
(2)	*–'fa*	'PLS'	*upathû́–'fa–mbi*	*áfase–fa–mbi*
(3)	*–ji*	'PRCM'	*upathû–jí–mbi*	*áfase–ji–mbi*
(5)	*–'kha*	'DMN'	*upathû́–'kha–mbi*	*afasé–'kha–mbi*
(6)	*–khu*	'RCPR'	*upathû–khú–mbi*	*afase–khú–mbi*

The plural subject *–'fa* 'PLS' is a level 1 recessive suffix. It places stress on the last syllable of the stem if no lexical stress is present (2a). If preexisting stress is present in stem stem, the plural subject *–'fa* 'PLS' preserves it (2b).

The precumulative *–ji* 'PRCM' is a level 0 recessive suffix. When attached to a regular stem without stress (3a), it allows stress to be decided by other mechanisms. Here, it is assigned by the negative *–mbi* 'NEG.' Since the negative *–mbi* 'NEG' is prestressing, stress surfaces on the precumulative *–ji* 'PRCM,' which immediately precedes it. The precumulative *–ji* 'PRCM' does not remove preexisting stress, so when it is attached to an irregular stem, stress stays the same as in the bare form (3b).

The verbal diminutive *–'kha* 'DMN' is a level 1 dominant suffix. It deletes the preexisting stress on the verb, if any, and stresses the syllable immediately to its left. Thus, the accent surfaces on the syllable preceding the diminutive *–'kha* 'DMN' whether or not lexical stress is present on the stem (5a-b).

The reciprocal *–khu* 'RCPR' is a level 0 dominant suffix. It deletes the stress of the stem and allows external means to decide it. Here again, stress is assigned by the prestressing negative *–mbi* 'NEG.' As stem stress has been removed by *–khu* 'RCPR', it can be assigned to the syllable preceding *–mbi* 'NEG' regardless of the verbal class (6a-b).

In summary, a distinction between *recessive* and *dominant* suffixes was made. Recessive suffixes are faithful to preexisting lexical stress at the cost of their own accentual specification. Dominant suffixes delete preexisting lexical stress (if any), so their accentual properties manifest on regular and irregular verbs alike.

Cophonologies which inherit from the *dominant* node rank ANTIMAX STRESS (¬Mxφ) above MAXSTRESS (Mxφ), ensuring stress deletion. In the *recessive* cophonologies, MaxStress (Mxφ) is ranked above Anti MaxStress (¬Mxφ), ensuring faithfulness to preexisting stress.

The recessive–dominant distinction interacts with the two phonological levels proposed in Section 4.3, yielding four suffix types in total: *level 0 recessive*, *level 0 dominant*, *level 1 recessive*, and *level 1 dominant*.

Level 0 recessive suffixes are counted as part of the prosodic word for the default penultimate assignment, but do not otherwise affect stress. Level 0 dominant suffixes delete the lexical stress of the domain to which they attach. Level 1 recessive suffixes place stress on the syllable immediately preceding them, unless lexical stress is present. Level 1 dominant place stress on the syllable immediately preceding them without exceptions.

4.5 GLOTTAL STRESS

Sections 4.3 and 4.4 dealt with the intralinguistic morphophonological variation of A'ingae—those properties of stress assignment which differ from suffix to suffix. The analysis I proposed distinguishes between four accentual types of suffixes, which is captured in Cophonology Theory by associating each accentual type with a separate cophonology—a phonological function particular to a subset of morphological constructions.

This morphology-oriented analysis captured four (2-3, 5-6) out of the six stress patterns of the initial minimal six-tuple (see the previous page). The other two (1, 4) will be captured in a phonology-oriented analysis, which assigns a unique prosodic role to the glottal stop.

			a. *upathû ...–mbi*	b. *áfase ...–mbi*
			'pick ...–NEG'	'insult ...–NEG'
(1)	*–'chu*	'SBRD'	*upáthû–'chu–mbi*	*áfase–chu–mbi*
(4)	*–'je*	'IMPV'	*upáthû–'je–mbi*	*afáse–'je–mbi*

The contrast I am making between morphology- and phonology-oriented parts of the analysis corresponds to how general the phonological rules are. All the principles discussed so far have been sensitive to the morphological composition of the word and have had little phonological systematicity to them. The ʔ-related stress mechanisms to be introduced in this section, on the other hand, are language-general, although they will interact with the morphological distinctions in important ways.

In terms of Cophonology Theory's formalism, this distinction maps onto the geometry of the language's grammar lattice. The morphological analysis proposed four distinct cophonologies, which captured accentual properties of particular morphemes and corresponded to the terminal nodes of the lattice. The phonological analysis will enrich only the *master* ranking, which captures the language's overarching phonology and corresponds to the root node of the lattice. For a discussion of grammar lattices, see Section 4.1.2.

Section 4.5.1 summarizes previous literature on the A'ingae glottal stop, motivates weight distinctions, defines the proper foot, motivates the basic stress pattern induced by the glottal stop (referred to as *glottal stess*), formalizes an Alignment constraint capturing glottal stress (McCarthy and Prince, 1993), and motivates its ranking with respect to other constraints in the *master* ranking.

Section 4.5.2 categorizes the ʔ-initial morphemes. The ʔ-initial suffixes which manifest glottal stress are shown to be (mostly dominant) level 0 suffixes. The ʔ-initial suffixes which do not manifest glottal stress are shown to be level 1 suffixes. The deletion of glottal stops in ʔ-initial suffixes is explained.

Section 4.5.3 motivates the analysis by pointing to its two additional purchases: its ability to explain the lack of stressless verbs with glottal stops as well as the deletion of glottal stops in verbal stems induced by dominant suffixes. Lastly, a complication involving the simultaneous presence of the imperfective –*'je* 'impv' and an associated motion suffix is considered and resolved.

4.5.1 *glottal phonology*

Previous scholarship on the language does not generally recognize the relevance of glottal stops to stress assignment. F&H observe that the segment is contrastive, as evidenced by minimal pairs (76-77), but do not assign it a prosodic role.

(76)	a. *chiga* 'god'	b. *an–mba* 'eat–ss'	c. *umba* 'up'	d. *tsa=ma* 'that–acc'
(77)	a. *chi'ga* 'not want' "not want"	b. *an–'mba* 'eat–n' "yuca"	c. *u'mba* 'fill up' "fill up"	d. *tsa–'ma* 'that–frst' "but"

Repetti-Ludlow et al. (2019) recognize several interesting properties of the glottal stop, which sets it apart from other segments. First, glottal stops are the only licensed coda. Furthermore, glottal stops are licensed almost exclusively in codas.[8] Lastly, glottal stops are very often initial in functional morphemes. Indeed, most of the language's

8 The name of the language, *a'i=ngae* 'person=mann,' is an obvious exception to this generalization. Repetti-Ludlow et al. (2019) analyze such cases as metathesis of the glottal stop out of a word-final position. Thus, the proposed underlying form of *a'i* 'person' is /aiʔ/, realized as [aʔi]. The manner clitic =*ngae* 'mann' attaches subsequent to the metathesis, yielding [aʔĩ^{n}gəæ].

glottal minimal pairs are due to pairs of functional morphemes differing only in the presence of the glottal stop (76-77b, d).

M. Borman (1976) is a notable exception, observing that stress in words with glottal stops falls on the "penultimate syllable before the stop" (p. 3, translation mine). M. Borman (1976)'s observation is partially correct, as penultimate syllable before the glottal stop is stressed as long as the glottalized syllable is not a diphthong.

The prosodic significance of the glottal stop is most directly revealed in a comparison of stress induced by suffixes without glottal stops, such as *–ji* 'PRCM' (8), and with glottal stops, such as *–'je* 'IMPV' (9), on roots ending in monophthongs and diphthongs (7-9).

	V-FINAL STEM	V-FINAL STEM	VV-FINAL STEM
(7)	a. *f<u>é</u>tha* 'open'	b. *f<u>û́i</u>te* 'help'	c. *f<u>û́n</u>dûi* 'sweep'
(8)	a. *fe<u>thá</u>–ji* 'open–PRCM'	b. *fûi<u>té</u>–ji* 'help–PRCM'	c. *fûn<u>dû́i</u>–ji* 'sweep–PRCM'
(9)	a. *f<u>é</u>tha–'je* 'open–IMPV'	b. *f<u>û́i</u>te–'je* 'help–IMPV'	c. *fûn<u>dû́i</u>–'je* 'sweep–IMPV'

All the three verbs are regular, so penultimate stress is observed on bare forms (7) as well as forms suffixed with the level 0 recessive *–ji* 'PRCM' (8). When suffixed with the ʔ-initial imperfective *–'je* 'IMPV,' stress usually falls on the penultimate syllable before the glottal stop (9a-b), in accordance with M. Borman (1976). When the syllable left-adjacent to the glottal stops is a diphthong, however, stress is attracted to it (9c). Thus, M. Borman (1976)'s generalization must be refined: in words with glottal stops stress falls not on the penultimate syllable before the stop, but rather on the syllable with the penultimate mora before the glottal stop. This accentual pattern will be referred to as *glottal stress*.

To formulate an Optimality Theoretic account of the pattern, I will rephrase the generalization in terms of metrical structure. In particular, I will propose a language-particular principle which requires that glottal stops be located in the head foot, preferably at its right edge. The head foot is understood to be the foot which contains the stressed syllable. To comply with the requirement, metrical feet are constructed early in the derivation. They are right-aligned with the glottal stop as long as they are proper, but right-alignment is abandoned in avoidance of improper foot construction.

The proposed explanation hinges on (*f<u>é</u>tha'*) and (*f<u>û́i</u>te'*) constituting proper feet (9′a-b), to the exclusion of *(*f<u>û́n</u>dûi'*), which is unattested

(9′c*). Instead, the proper (<u>dû́i</u>'je) is constructed and the glottal stop appears in a dispreferred foot-medial position (9′c).

		V-FINAL STEM	V-FINAL STEM	VV-FINAL STEM
(9′)		a. *(<u>fé</u>tha–')je*	b. *(<u>fû́i</u>te–')je*	c. **(<u>fû́n</u>dûi–')je* *fûn(<u>dû́i</u>–'je)*
		'open–IMPV'	'help–IMPV'	'sweep–IMPV'

The observed foot structure is sensitive to diphthongs, which is commonly understood in terms of syllabic weight. In particular, I propose, A'ingae monophthongs count as light and diphthongs as heavy. The foot constructed in (9′a), therefore, has two light syllables (⏑⏑), and the feet in (9′b-c) have a heavy and a light syllable (–⏑). The foot avoided in (9′c*) has a light syllable followed by a heavy one (⏑–).

The relevance of syllabic weight to the prosody of A'ingae has not been reported in previous scholarship, which either denies its existence or remains agnostic about it (M. Borman, 1962; F&H; Repetti-Ludlow et al., 2019). This oversight can be attributed to the language's very untypical profile.

First, diphthongs are the only heavy nuclei. There are no long vowels, and the language's only coda, the glottal stop, does not contribute weight in the typologically expected way. Since weight is cross-linguistically known to attract stress, heavy glottal stops would predict stress on the glottalized syllables across the board, not on the syllables which precede them (9a-b).

Second, diphthongs do not attract stress word-finally (3c). This can be seen as an additional metrical motivation for NonFinality (*σ́#).

Third, diphthongs are rare in the language. Moreover, most diphthongs are root-final which, in conjunction with NonFinality (*σ́#) and the preponderance of morphologically conditioned stress, makes their contribution to weight even harder to detect.

The shape of the A'ingae proper foot is captured by three uncontroversial Optimality Theoretic constraints: FootBinarity, RhythmicType: Trochaic, and Stress→WeightPrinciple.

FootBinarity ensures that feet comprise two units, be they syllables or morae (McCarthy and Prince, 1986; Prince, 1980; Prince and Smolensky, 1993). It is violated by light monosyllabic feet (⏑) and all feet larger than two heavy syllables (––).

> FootBinarity
> Feet are binary under syllabic or moraic analysis.

RHYTHMICTYPE: TROCHAIC favors the left-prominent trochee over the right-prominent iamb (Hayes, 1985, 1995).

> RHYTHMICTYPE: TROCHAIC, or TROCHEE
> Feet are left-prominent.

STRESS→WEIGHTPRINCIPLE assigns violations for heavy syllables in unstressed positions (Prince, 1990). In a trochaic language, left foot branches are stressed (strong) and right foot branches are unstressed (weak). Thus, the constraint prevents heavy right branches.

> STRESS→WEIGHTPRINCIPLE, or WSP
> Heavy syllables are prosodic heads.

FOOTBINARITY eliminates all feet other then the mora-level binary (–), and the syllable-level binary (⌣⌣), (⌣–), (–⌣), and (––). TROCHEE ensures left-prominence of feet and WSP eliminates those whose right branches are heavy. This leaves us with a set of three shapes: (–), (⌣⌣), and (–⌣), which define the language's proper foot.

Since FOOTBINARITY, TROCHEE, and WSP will largely remain unranked with respect to one another in the analysis to follow, I will subsume the three constraints under one FOOTSHAPE constraint violated whenever one of FOOTBINARITY, TROCHEE, or WSP is violated.

> FOOTSHAPE, or ($\times\mu$)
> Feet are trochees with monomoraic right branches.

The requirement that glottal stops be located in the head foot can be captured with an ALIGNMENT constraint of McCarthy and Prince (1993)'s Generalized Alignment framework. In particular, the constraint states that every glottal stop coincides with the right edge of a prosodic head of the word.

> ALIGN(ʔ, R, WDHD, R), or HDʔ
> Glottal stops are final in a prosodic head of the word.

The informal generalization before stated that glottal stops must be located in the head foot. Since feat are strictly binary and glottal stops occur only in codas, this is tantamount to being located in the coda of either of the two syllables which comprise the head foot.

ALIGNGLOTTAL (HDʔ) requires that every glottal stop be aligned with a word head. The head of the word is the head foot (i. e. the foot with the stressed syllable) but also, by transitivity of headship, the head syllable (i. e. the stressed syllable).

Therefore, alignment with a word head is tantamount to a head foot location. For the account which inspired this word-head-based formulation of ALIGNGLOTTAL (HDʔ), see Prince and Smolensky (1993)'s implementation of Latin extrametricality.

I will assume that the head of a prosodic word cannot license two glottal stops by being counted as both the head syllable and the head foot at once. In other words, ($\underline{\acute{\sigma}ʔ}\sigma ʔ$) is not a legal structure. This effectively enforces that there is at most one glottal stop per word. I will invoke this assumption by the end of the this chapter in accounting for some empirical intricacies.

AlignGlottal (Hdʔ) is a surface-true generalization, which means that it is high-ranked. In the absence of a word head right-aligned with the glottal stop in the input, there are two in-principle ways of satisfying the constraint: glottal stop deletion and construction of metrical structure. Empirically, the latter is attested (9′), which means that faithfulness to glottal stops ranks above DepStress (Dpφ). Faithfulness to glottal stops is captured with a Maximality constraint (McCarthy and Prince, 1995).

> Maximality(ʔ), or Mxʔ
> Glottal stops are not deleted.

The rankings introduced in this section hold true of the language as a whole, i. e. they are not particularized to cophonologies associated with specific suffixes. They are therefore captured in the *master* ranking, from which all other rankings inherit.[9]

master
Mxφ » { *σ́#, Hdʔ » Mxʔ } » (×μ) » Dpφ

dominant — ¬Mxφ » Mxφ
level 1 — #ω# » *σ́# » σ́] » Dpφ

φ_0: *lvl 0 recessive* | $\varphi_0^{\times}$: *lvl 0 dominant* | φ_1: *lvl 1 rcess, prosodic word* | $\varphi_1^{\times}$: *lvl 1 dominant*

Grammar lattice, 5th iteration.

MaxGlottal (Mxʔ) ranks below AlignGlottal (Hdʔ). The reason for this ranking will become apparent in Section 4.5.2.

Our account so far correctly predicts stress with heavy-final stems (9″), but it is insufficient to pick a unique candidate when light-final stems are considered (9″*a-b). AlignGlottal (Hdʔ) aligns the glottal stop with the right edge of a head foot syllable, correctly eliminating

9 In the previous iteration of the grammar lattice, AlignStem (σ́]) was ranked above DepStress (Dpφ), which allowed for supplying stem-final stress with level 1 suffixes and penultimate stress by prosodic default. With the introduction of Foot Shape (×μ), AlignStem (σ́]) is now ranked above it. This is necessary to account for penultimate stress in heavy-final words, e. g. *f̲ú̲n̲dûi* 'sweep' (7c), where a non-proper light-heavy foot (⏑–) must presumably be created.

candidates (9″*a-b.ii). MAXGLOTTAL (MXʔ) prevents the deletion of glottal stops, correctly eliminating candidates (9″*a-b.i). Yet, there are two syllables in the head foot, and nothing as of now discriminates between (9″*a-b.iii) and (9″*a-b.iv).[10]

(9″*)	a. [*fetha*]'*je* :	HDʔ »	MXʔ »	(×μ) »	DPφ
	i. *fethaje*		∗!		
	ii. *fetha'je*	∗!			
☞	iii. (*fétha'*)*je*				∗
☞	iv. *fe*(*thá'je*)				∗

'open–IMPV'

(9″*)	b. [*fûite*]'*je* :	HDʔ »	MXʔ »	(×μ) »	DPφ
	i. *fûiteje*		∗!		
	ii. *fûite'je*	∗!			
☞	iii. (*fû́ite'*)*je*				∗
☞	iv. *fûi*(*té'je*)				∗

'help–IMPV'

(9″)	c. [*fûndûi*]'*je* :	HDʔ »	MXʔ »	(×μ) »	DPφ
	i. *fûndûije*		∗!		
	ii. *fûndûi'je*	∗!			
	iii. (*fû́ndûi'*)*je*			∗!	
☞	iv. *fûn*(*dû́i'je*)				∗

'sweep–IMPV'

An ALIGNMENT constraint will be used to overcome this impasse. In particular, the constraint will require that the left edge of the prosodic word coincide with a foot. ALIGNWORD (#σ́) will be further motivated in Section 4.6, as it is independently needed to account for secondary stress.

> ALIGN(PRWD, L, FOOT, L), or #σ́
> A foot is word-initial.

ALIGNWORD (#σ́) is dominated by DEPSTRESS (DPφ), which means that it does not construct new metrical feet by itself. Yet—the con-

10 In contrast to what the grammar lattice and the tableaux intimate, the ranking of FOOTSHAPE (×μ) above ALIGNGLOTTAL (HDʔ) would yield the same outputs. The chosen raking of ALIGNGLOTTAL (HDʔ) above FOOTSHAPE (×μ) will be motivated on page 80.

straint does, through the emergence of the unmarked, push for left-aligned feet when feet are being constructed to comply with higher-ranked constraints (9″a-b).

(9″)	a. [*fetha*]'*je* :	Hdʔ »	Mxʔ »	(×μ) »	Dpφ »	#σ́
	i. *fethaje*		∗!			
	ii. *fetha'je*	∗!				
☞	iii. (*fétha'*)*je*				∗	
	iv. *fe*(*thá'je*)				∗	∗!
	'open–impv'					

(9″)	b. [*fûite*]'*je* :	Hdʔ »	Mxʔ »	(×μ) »	Dpφ »	#σ́
	i. *fûiteje*		∗!			
	ii. *fûite'je*	∗!				
☞	iii. (*fû́ite'*)*je*				∗	
	iv. *fûi*(*té'je*)				∗	∗!
	'help–impv'					

4.5.2 *glottal morphology*

The preceding subsection showed that in the absence of a word head right-aligned with the glottal stop in the input, AlignGlottal (Hdʔ) is satisfied by constructing new metrical structure. This is captured by raking MaxGlottal (Mxʔ) above DepStress (Dpφ).

Another question arises when a metrical foot is present in the input, but it is not aligned with the glottal stop. Due to culminativity, there cannot be two primary stresses in a word. The two conceivable outcomes therefore are: the erasure of preexisting metrical structure (and the construction of a new adequately-aligned metrical foot) and the deletion of the glottal stop.

The actual outcome is, conceivably, morpheme-dependent. All the ʔ-initial level 0 suffixes listed in the template of verbal inflections, i. e. the imperfective –'*je* 'impv,' the semelfactive –'*ñakha* 'smfc,' the venitive –'*ngi* 'ven,' and the andative –'*nga* 'and,' stress the syllable containing the penultimate mora before the glottal stop with all stems, including lexically stressed verbs.[11] This gives us a reason to

11 The level 0 dominant semelfactive –'*ñakha* 'smfc,' venitive –'*ngi* 'ven,' and andative –'*nga* 'and' are transcribed by F&H without glottal stops. This is plausibly explained as a morphophonology-phonetics interaction. Since most verbs end in light syllables and all three of –'*je* 'impv,' –'*ñakha* 'smfc,' and –'*ngi* 'ven' place stress reliably on the syllable with the penultimate mora before the glottal stop, the three suffixes are

classify them as dominant suffixes with the high-ranking AntiMax Stress (¬Mxφ) ensuring deletion of metrical structure.

Lexically stressed verbs arguably come with a lexically specified left-aligned foot (although details of the implementation are immaterial to the point at hand). Due to the high ranking of both AntiMax Stress (¬Mxφ) and AlignGlottal (Hdʔ), their stress is deleted and a new foot right-aligned with the glottal stop is constructed (78).

		level 0 dominant				
(78)	[(*áfa*)*se*]*'je*$^{\times}_{0}$:	¬Mxφ »	Hdʔ »	Mxʔ »	Dpφ »	#σ́
i.	*afaseje*			*!		
ii.	*afase'je*		*!			
iii.	(*áfa*)*seje*	*!				
☞ iv.	*a*(*fáse'*)*je*				*	*
v.	*afa*(*sé'je*)				*	**!

'insult–IMPV'

It is not clear if there are any level 0 recessive ʔ-initial suffixes. A possible candidate is the nominalizing subordinator –*'chu* 'SBRD,' which in some idiolects behaves as one. It stresses the syllable containing the second mora to the left of the glottal stop (79a-b) unless another stress is lexically present (79c). This can be modeled by high-ranking MaxStress (Mxφ), which provides a reason to class –*'chu* 'SBRD' with level 0 recessive suffixes.[12]

almost always realized with creaky voice and almost never with a full glottal closure (for a discussion of the phonetics of glottal stops, see Section 2.5). Thus, when facts about stress are neglected, it is easy to miss the underlying glottal stops.
The level 1 recessive apprehensional –*sa'ne* 'APPR' is also transcribed by F&H without the glottal stop. Due its morpheme-internal position, the glottal stop in –*sa'ne* 'APPR' is also at best final in the posttonic syllable—in which case it is realized with creaky voice—or further away from stress still—in which case it is not realized at all. Thus, a similar reasoning applies.
For a transcription of the imperfective –*'je* 'IMPV,' the semelfactive –*'ñakha* 'SMFC,' the venitive –*'ngi* 'VEN,' the andative –*'nga* 'AND,' and the apprehensional –*sa'ne* 'APPR' with glottal stops, corroborating my analysis, see M. Borman (1976).

12 Classing the nominalizing subordinator –*'chu* 'SBRD' with level 0 recessive suffixes poses a challenge to the previously established strict phonological layering of the A'ingae verb, as –*'chu* 'SBRD' can attach to verbs inflected with level 1 suffixes as well. Yet, since there is considerable variation in the realization of stress with –*'chu* 'SBRD,' there are many lexicalized –*'chu* 'SBRD'-final nouns, and the subordinate clauses it forms are nominal rather than verbal, testifying to its derivational properties and at the same time excluding it from the template of verbal inflections altogether, it is ultimately not obvious what light –*'chu* 'SBRD' sheds on the hypothesis of strict phonological layering in A'ingae.

	V-FINAL STEM	VV-FINAL STEM	STRESSED STEM
(79)	a. *pánza–'chu*	b. *fûndû́i–'chu*	c. *áfase–chu*
	'hunt–SBRD'	'sweep–SBRD'	'insult–SBRD'

The high-ranking AlignGlottal (Hdʔ) supplies stress when no lexical stress is present on the stem (79'a-b).

		level 0 recessive					
(79')	a.	[*panza*]'*chu*$_0$:	Mxφ »	Hdʔ »	Mxʔ »	Dpφ »	#σ́
	i.	*panzachu*			*!		
	ii.	*panza'chu*		*!			
☞	iii.	(*pánza'*)*chu*				*	
	iv.	*pan*(*zá'chu*)				*	*!
		'hunt–SBRD'					

		level 0 recessive					
(79')	b.	[*fûndûi*]'*chu*$_0$:	Mxφ »	Hdʔ »	Mxʔ »	Dpφ »	#σ́
	i.	*fûndûichu*			*!		
	ii.	*fûndûi'chu*		*!			
☞	iii.	(*fû́ndûi'*)*chu*				*	
	iv.	*fûn*(*dû́i'chu*)				*	*!
		'sweep–SBRD'					

When lexical stress is present, the even-higher-ranking MaxStress (Mxφ) prevents its deletion (79'c).

		level 0 recessive					
(79')	c.	[(*áfa*)*se*]'*chu*$_0$:	Mxφ »	Hdʔ »	Mxʔ »	Dpφ »	#σ́
☞	i.	(*áfa*)*sechu*			*		
	ii.	(*áfa*)*se'chu*		*!			
	iii.	*a*(*fáse'*)*chu*	*!				
		'insult–SBRD'					

The winner (79'c.i) remains faithful to input stress. It manages to avoid the violation of AlignGlottal (Hdʔ) at the the cost violating the lower-ranking MaxGlottal (Mxʔ). As a consequence, the input stress is present in the output, but the glottal stop—not so. This interaction of Mxφ, Hdʔ, and Mxʔ explains the glottal stop erasure phenomena first brought up with (1-2b).

			a. *upathû ...–mbi*	b. *áfase ...–mbi*
			'pick ...–NEG'	'insult ...–NEG'
(1)	*–'chu*	'SBRD'	*upáthû–'chu–mbi*	*áfase–chu–mbi*
(2)	*–'fa*	'PLS'	*upathû́–'fa–mbi*	*áfase–fa–mbi*
(3)	*–ji*	'PRCM'	*upathû–jí–mbi*	*áfase–ji–mbi*
(4)	*–'je*	'IMPV'	*upáthû–'je–mbi*	*afáse–'je–mbi*
(5)	*–'kha*	'DMN'	*upathû́–'kha–mbi*	*afasé–'kha–mbi*
(6)	*–khu*	'RCPR'	*upathû–khú–mbi*	*afase–khú–mbi*

Hereby, the last two verb pairs of the minimal six-tuple (1-6) have been accounted for. The accentual difference between the subordinating *–'chu* 'SBRD' (1) and the precumulative *–ji* 'PRCM' (3) and between the imperfective *–'je* 'IMPV' (4) and the reciprocal *–khu* 'RCPR' (6) is explained in terms of phonological properties of the glottal stop which are not particular to the suffixes themselves. Morphophonology-wise, both *–'chu* 'SBRD' (1) and *–ji* 'PRCM' (3) are level 0 recessive. Both *–'je* 'IMPV' (4) and *–khu* 'RCPR' (6) are level 0 dominant.

Morpheme-initial glottal stops do not result in a comparable split among level 1 suffixes. This is because at level 1, stress is assigned stem-finally. Stem-final stress induced by level 1 suffixes does not incur ALIGNGLOTTAL (Hdʔ) violations, as the formulation of ALIGN GLOTTAL (Hdʔ) is consistent with syllable-wise alignment, but the characteristic pattern of stress on the syllable containing the mora penultimate before the glottal stop is absent (80).

		level 1 recessive				
(80)	*[panza]'fa*$_1$:	Mxφ »	Hdʔ »	Mxʔ,	σ́] »	Dpφ
i.	*(pánza')fa*				*!	———
☞ ii.	*pan(zá'fa)*					*
	'hunt–PLS'					

Level 1 recessive suffixes lose their initial glottal stops if outside the lexically specified head foot (81). This is to say, the deletion of glottal stops initial in level 1 recessive suffixes takes place under conditions identical to those discussed above with *–'chu* 'SBRD' (79'c).

		level 1 recessive				
(81)	[(áfa)se]'fa$_1$:	Mxφ »	Hdʔ »	Mxʔ,	σ́] »	Dpφ
☞ i.	(áfa)sefa			*	**	—
ii.	(áfa)se'fa		*!		**	—
iii.	a(fáse')fa	*!	—	—	—	—
iv.	afa(sé'fa)	*!	—	—	—	—
	'insult–PLS'					

4.5.3 *additional purchases*

AlignGlottal (Hdʔ) has so far been motivated through an account of the second-mora-before-the-glottal-stop stress with ʔ-initial suffixes, and the occasional glottal stop deletion at morpheme boundaries. AlignGlottal (Hdʔ), however, is a generally operative principle in the grammar of A'ingae. Two additional phenomena it explains at little to no additional theoretical cost are the lack of stressless verbs with glottal stops, which I will dub *glottal verbs*, and the root-internal glottal stop deletion induced by dominant suffixes.

First, there are no verbal roots with glottal stops but without stress. This is to say, while glottalless verbs are split between lexically stressless (82-84a) and stressed (82-84b), all the verbs with glottal stops pattern with the lexically stressed (irregular) verbs (82-84c). There are no stressless verbs with glottal stops.[13]

	STRESSLESS	STRESSED	GLOTTAL
(82)	a. *panza* 'hunt'	b. *áfa* 'speak'	c. *sé'je* 'cure'
(83)	a. *fetha* 'open'	b. *páña* 'hear'	c. *fí'thi* 'kill'
(84)	a. *upathu* 'pick'	b. *áfase* 'offend'	c. *ákhe'pa* 'forget'

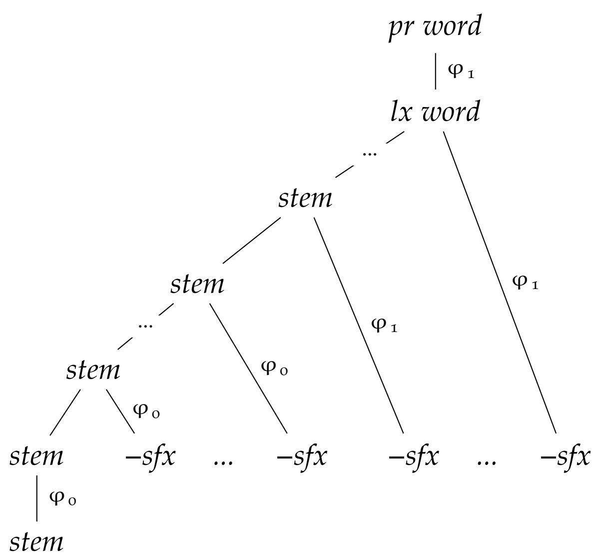
13 Glottal stops are not allowed in a word-final position (for a brief discussion of a related phenomenon of glottal metathesis, see the footnote on page 67). Thus, all bisyllabic glottal roots have the form [(σ́ʔσ)]. Curiously, all trisyllabic glottal roots have the form [(σ́σʔ)σ]. No morphologically simplex verbs of the form [(σ́ʔσ)σ] have been attested. This is to say, in trisyllabic verbs, always the penultimate syllable is closed by the glottal stop; never the antepenultimate. One might want to relate this to the glottal stops' preference for the head-final position, heretofore formalized with AlignWord (#σ́), but—strictly speaking—nothing in the analysis as of now predicts it. For a possible refinement of the current proposal, capturing the distribution of glottal stops in roots, see Section 4.7.

The asymmetry is made fully explicit in the table below, which categorizes verbs along the dimensions of stressedness/stresslessness and the presence of glottal stops.

	−STRESS	+STRESS
−ʔ	attested (82-84a)	attested (82-84b)
+ʔ	unattested	attested (82-84c)

Verbs by stress and glottal stops.

Although all verbs with glottal stops pattern with the irregulars, their initial stress need not be lexically listed. Instead, it is accounted for by having roots undergo the level 0 cophonology.[14] The morphophonological structure of the A'ingae verb is hereby revised to include a unary application of the level 0 cophonology before suffixation.



Word tree, phonological layering, 2nd iteration.

In the level 0 cophonology, stressless verbs remain stressless (82′a), lexically stressed verbs remain stressed (82′b), and AlignGlottal (Hdʔ) supplies stress to glottal verbs (82′c), thus deriving the asymmetry of the table above.[15]

14 The level 0 cophonology applies to pluractional glottalized verbs as well, mentioned in Section 3.1 and in a footnote on page 18. As a consequence, pluractional glottalized verbs are always stressed.

15 Since the stress of glottal verbs is fully predicted by the application of the level 0 cophonology, it need not be stipulated as lexically specified. A.4 reflects this analysis by listing glottal verbs without accentual specification.

			root			
(82′)	a.	[*panza*]$_0$:	Mxφ »	Hdʔ »	Mxʔ »	Dpφ
☞	i.	*panza*				
	ii.	(*pánza*)				∗!

'hunt'

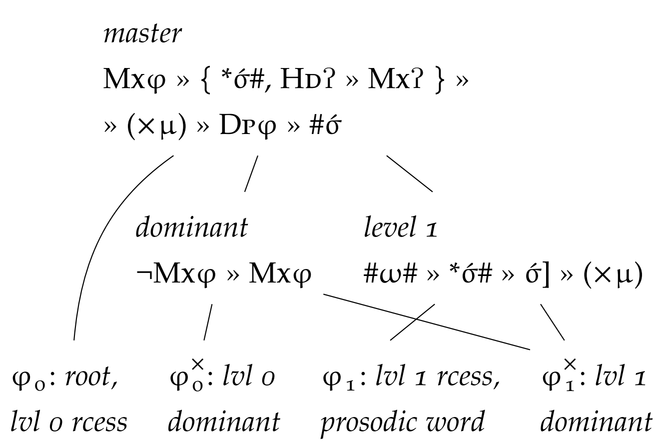
			root			
(82′)	b.	[*áfa*]$_0$:	Mxφ »	Hdʔ »	Mxʔ »	Dpφ
	i.	*afa*	∗!			
☞	ii.	(*áfa*)				

'speak'

			root			
(82′)	c.	[*se'je*]$_0$:	Mxφ »	Hdʔ »	Mxʔ »	Dpφ
	i.	*seje*			∗!	
	ii.	*se'je*		∗!		
☞	iii.	(*sé'je*)				∗

'cure'

Thus, φ_0 plays a double role: it is the cophonology of *level 0 recessive* suffixes, as well as the *root* cophonology of verbal stems before affixation. (Analogously, φ_1 is the cophonology of *level 1 recessive* suffixes as well as the *prosodic word* cophonology assigning penultimate stress to lexically stressless words.) The grammar lattice below captures all the ranking details discussed so far.



Grammar lattice, 6th iteration.

ALIGNGLOTTAL (HDʔ) is ranked above FOOTSHAPE (×μ). This is motivated by heavy-final glottal disyllables where the satisfaction of ALIGNGLOTTAL (HDʔ) requires an improper foot (85).

		root		
(85)	[*am'bian*]$_0$:	HDʔ »	MXʔ »	(×μ)
i.	*ambian*		∗!	
ii.	*am'bian*	∗!		
☞ iii.	(*<u>ám</u>'bian*)			∗
	'have'			

Second, dominant suffixes are observed to delete root-internal glottal stops along with stress. This is most conspicuous in a juxtaposition of forms with the infinitival –*ye* 'INF' and the passive –*ye* 'PASS,' as the former is recessive and the latter dominant, while the two are segmentally identical (86a-b). Glottal stops are removed even if stress is assigned to the syllable stressed in the root (86c). These patterns follow straightforwardly from the satisfaction of ALIGNGLOTTAL (HDʔ).

	ʔ RETAINED	ʔ DELETED	ʔ DELETED
(86)	a. *<u>sé</u>'je–ye*	b. *se<u>jé</u>–ye*	c. *<u>se</u>je–'je*
	'cure–INF'	'cure–PASS'	'cure–IMPV'

In a passive –*ye* 'PASS'-construction, the winning (82′c.iii) becomes an input to (86′b). Candidate (86′b.ii) complies with ANTIMAXSTRESS (¬Mxφ), but violates ALIGNGLOTTAL (HDʔ). Thus, candidate (86′b.i) which violates the lower-ranking MAXGLOTTAL (MXʔ) wins. The winner is then assigned the default penultimate stress (86′b.i ≻ ii).

		level 0 dominant			
(86′) b.	[(*<u>sé</u>'je*)]*ye*$^{\times}_{0}$:	¬Mxφ »	HDʔ »	MXʔ »	DPφ
☞ i.	*sejeye*			∗	
ii.	*se'jeye*		∗!		
iii.	(*<u>sé</u>'je*)*ye*	∗!			

		prosodic word			
≻	[*sejeye*]$_1$:	Mxφ,	#ω# »	*σ́# »	σ́]
i.	*sejeye*		∗!		
☞ ii.	*se*(*<u>jé</u>ye*)				∗
	'cure–PASS'				

Glottal stop deletion takes place even if stress ends up surfacing on the same syllable as the one stressed in the input. This happens in constructions where the input suffix is dominant and ʔ-initial (86′c).

			level 0 dominant			
(86′)	c.	[(*sé′je*)]′*je*$^{\times}_{0}$:	¬Mxφ »	Hdʔ »	Mxʔ »	Drφ
	i.	*seje′je*		∗!		
	ii.	*se′je′je*		∗!∗		
	iii.	(*sé′je*)*je*	∗!			
☞	iv.	(*séje′*)*je*			∗	
	v.	(*sé′je′*)*je*	∗!			
		‘cure–IMPV’				

Stressing of the same syllable in the input and output of (86′c) is, in a sense, a coincidence. The input stress is a consequence of the stem's glottal stop, whereas the output stress is a consequence of the suffix's glottal stop. To satisfy ANTIMAXSTRESS (¬Mxφ), the output stress must be considered as formally distinct from the input stress. As the input stress is deleted, the glottal stop is banished with it.

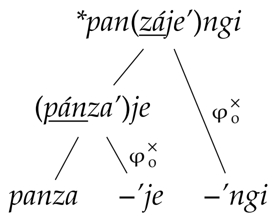
Data such as the above strongly support the analytical choices made so far: the glottal stop deletion in (86′c) would be very difficult to understand without a conjunction of a stress-deleting mechanism, such as ANTIMAXSTRESS (¬Mxφ), and a principle tightly linking glottal stops with stress, such as ALIGNGLOTTAL (Hdʔ).

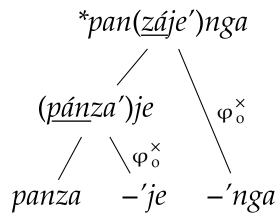
Finally, a minor complication to the picture will be considered. The imperfective –*′je* ‘IMPV’ can be succeeded by either of the two associated motion suffixes, the venitive –*′ngi* ‘VEN’ or the andative –*′nga* ‘AND.’ Stress falls on the penultimate syllable before –*′je* ‘IMPV’ (87).

ROOT-PENULTIMATE STRESS

(87)	a.	*pánza–′je–ngi*	b.	*pánza–′je–nga*
		‘hunt–IMPV–VEN’		‘hunt–IMPV–AND’

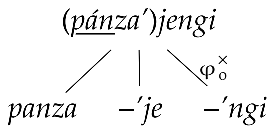
Yet, since the imperfective –*′je* ‘IMPV’ and the associated motion –*′ngi* ‘VEN’ and –*′nga* ‘AND’ suffixes are all dominant and ʔ-initial, the null hypothesis predicts glottal stress in the imperfective construction, followed by stress deletion and stress reassignment in an associated motion construction (87′*). The current analysis, as it stands, seems to be making wrong predictions.

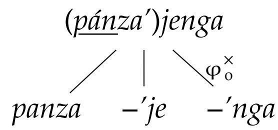
(87′*) a. 

b. 

a. ‘hunt–IMPV–VEN’ b. ‘hunt–IMPV–AND’

One way to resolve the conflict between the data and the analysis is to attach the imperfective and the associated motion suffixes to the verb in a ternary branching structure (87′).[16] For ternary branching to be possible, the cophonologies of individual suffixes must match (Orgun, 1996). This prerequisite is satisfied, as –′*je* ‘IMPV,’ –′*ngi* ‘VEN,’ and –′*nga* ‘AND’ are all level 0 dominant.

(87′) a. 

b. 

a. ‘hunt–IMPV–VEN’ b. ‘hunt–IMPV–AND’

The intermediate (*pánza′*)*je* ‘hunt–IMPV’ is present when the branching is binary (87′*), but not when it is ternary (87′). In the flat structure, *panza* ‘hunt’ is the only stem, which correctly predicts the winning candidate (87″a.iii).[17]

(87″)		*level 0 dominant*				
	a.	[*panza*]′*je*′*ngi*$^{\times}_{o}$:	HDʔ »	MXʔ »	DPφ »	#σ́
	i.	*panzajengi*		∗∗!		
	ii.	*panza*′*jengi*	∗!			
☞	iii.	(*pánza*′)*jengi*		∗	∗	
	iv.	(*pánza*′)*je*′*ngi*	∗!			
	v.	*pan*(*záje*′)*ngi*		∗	∗	∗!
	vi.	*pan*(*zá*′*je*′)*ngi*	∗!			

‘hunt–IMPV–VEN’

16 An additional motivation for attaching the imperfective and the associated motion suffixes in a ternary branching structure comes from co-occurrence restrictions. The imperfective –′*je* ‘IMPV’ is the only aspectual suffix which can occur with either –′*ngi* ‘VEN’ or –′*nga* ‘AND,’ which testifies to their closer morphological relation. For a cross-linguistic motivation of n-ary branching, see Orgun (1996).

17 Candidate (87″a.vi) is ruled out by ALIGNSTEM (σ́]) because one word head cannot be counted as right-aligned with two glottal stops. For an exposition of this restriction, see page 70.

In summary, syllabic weight has been shown to play a role in stress assignment. Glottal stops have been shown to induce stress on the syllable containing the second mora to the left of the glottal stop.

This pattern, referred to as *glottal stress*, has been captured with the AlignGlottal (Hdʔ) constraint, which requires that glottal stops be final in a prosodic head of the word, and a lower ranking AlignWord (#σ́), which pushes for word-initial feet.

AlignGlottal (Hdʔ) explains why level 0 suffixes exhibit two types of accentual behavior—glottalless suffixes do not contribute stress, while ʔ-initial suffixes manifest glottal stress. A similar ʔ-based split is not observed among level 1 suffixes, as their prestressing obscures the operation of AlignGlottal (Hdʔ).

The ranking of MaxGlottal (Mxʔ) below AlignGlottal (Hdʔ) and relative to (Anti)MaxStress explains the phenomena of glottal stop deletion in ʔ-initial suffixes and in glottal roots.

Glottal stops are deleted from recessive ʔ-initial suffixes when extant prosodic structure conflicts with glottal stress. In recessive cophonologies, MaxStress (Mxφ) outranks MaxGlottal (Mxʔ), so the conflict is resolved by removing the glottal stop.

Additionally, glottal stops are deleted from roots upon the attachment of dominant suffixes. Dominant suffixes delete stress and glottal stops in one fell swoop, as glottal stops without stress would incur violations of AlignGlottal (Hdʔ).

Lastly, AlignGlottal (Hdʔ) explains the absence of a class of otherwise expected verbal roots, specifically: stressless roots with glottal stops. This is understood as a consequence of the *level 0* cophonology applying to roots in a unary construction before affixation.

4.6 secondary stress

Secondary stress is predictable given primary stress. No morphophonological conditioning has been observed. Therefore, secondary stress is purely phonological. It is marked with the grave accent and an underline.

If primary stress is abstracted away, and weight distinctions momentarily neglected, secondary stress is observed to fall on even syllables counting from the right as well as the first syllable of a word. It does not fall on two adjacent syllables. Assuming trochaic parsing (see Section 4.5.1), A'ingae secondary stress can be schematized as follows: #(σ̲̀σ)σ(σ̲̀σ)(σ̲̀σ)#. This pattern, dubbed the *initial dactyl effect* by Prince (1983), has been observed in Garawa, English, Polish, Spanish, and others (Furby, 1974; Hayes, 1980, 1995; Prince, 1983; others).

First, consider secondary stress as assigned to even syllables counting from the right edge the word. As the verb becomes progressively more complex, the primary morphologically conditioned (here, lexically listed) stress can remain fixed (88a-f), but secondary stress realigns with respect to the right edge (88c-f). The yields a pattern where verbs with an even number of syllable are fully parsed (88a, c, e), but verbs with an odd number of syllables have an unfooted syllable following the head foot (88b, d, f).

	EVEN SYLLABLES	ODD SYLLABLES
(88)	a. (*ắfa*)	b. (*ắfa*)–*ji*
	c. (*ắfa*)–(*jḭ̀*–*ya*)	d. (*ắfa*)–*ji*–(*yà̱*–*mbi*)
	e. (*ắfa*)–(*jḭ̀*–*ya*)–(*mbḭ̀*–*ti*)	f. (*ắfa*)–*ji*–(*yà̱*–*mbi*)–(*tḭ̀*–*ki*)

‘speak–PRCM–IRR–NEG–INT–2’
“will you not be about to speak?”

Heretofore, the prestressing of late-attaching level 1 suffixes and the penultimate stress supplied to prosodic words by default have been associated with *level 1*. Since both patterns were captured with one constraint ranking, there was no need to posit separate cophonologies. This will now be revised.

Secondary stress, unlike primary, is purely phonological. It is assigned only once at the level of the prosodic word. This will be formalized by separating the cophonology associated with the prosodic with from level 1 cophonologies. I will refer to the new cophonology as *prosodic word* or φ^{ω}_{1}. The omega ω symbolizes the prosodic word. The following skeletal grammar lattice illustrates this revision.

master
Mxφ » { *σ́#, HDʔ » Mxʔ } »
» (×μ) » DPφ » #σ́

dominant
¬Mxφ » Mxφ

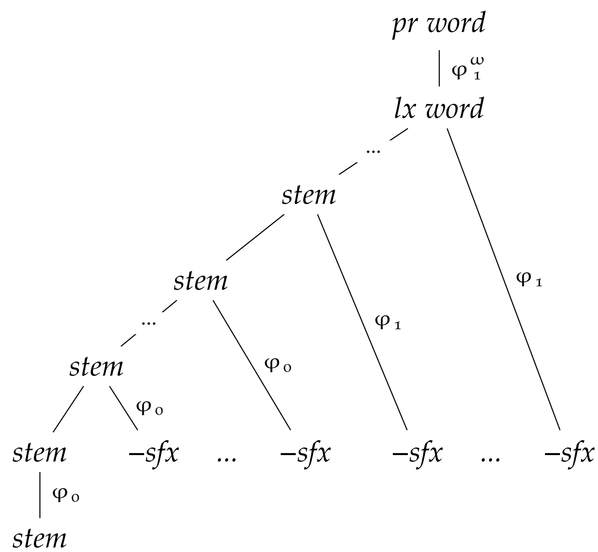
level 1
#ω# » *σ́# » σ́] » (×μ)

φ_0: *root, lvl 0 rcess* | $\varphi^{\times}_{0}$: *lvl 0 dominant* | φ_1: *lvl 1 recessive* | $\varphi^{\times}_{1}$: *lvl 1 dominant* | φ^{ω}_{1}: *pr word* . . .

Grammar lattice, 7th iteration.

Previous iterations of the grammar lattice parsimoniously captured the prestressing of level 1 suffixes and the penultimate default of the prosodic word with one constraint ranking. This parsimony is retained as all cophonologies associated with level 1, including *prosodic word*, inherit from the *level 1* node.

This revision of the grammar lattice necessitates a further revision of the morphophonological structure of the A'ingae verb. The revision of the morphophonological structure reflects the newly made distinction between the cophonologies φ_1 and φ_1^ω.



Word tree, phonological layering, final iteration.

All syllables are parsed by feet. This requirement, known in the metrical theories of stress as the exhaustivity of foot parsing, is captured by ParseSyllables (Halle and Vergnaud, 1987; Hayes, 1987; Liberman and Prince, 1977; McCarthy and Prince, 1993; Prince, 1980; others).

> ParseSyllables, or *⟨σ⟩
> All syllables are parsed by feet.

ParseSyll *⟨σ⟩ incurs a violation for each unparsed syllable. Foot Shape (×μ) dominates ParseSyll *⟨σ⟩, ensuring that footing is binary. Binary footing entails that ParseSyll *⟨σ⟩ always incurs at least one violation when the number of syllables is odd (88b, d, f).

Whether foot-parsing takes place depends on the relative ranking of ParseSyll *⟨σ⟩ and DepStress (Dpφ), introduced in Section 4.3.

> Dependence(Stress), or Dpφ
> Stress is not epenthesized.

At *lexical* levels, secondary stress is not assigned, i. e. DepStress (Dpφ) dominates ParseSyll *⟨σ⟩. At the *prosodic word* level, the ranking of the two constraints is reversed, yielding secondary stress.

Observe that since secondary stress is assigned only once at the level of the prosodic word, ParseSyll *⟨σ⟩ and DepStress (Dpφ) are perfectly antagonistic: the former assigns violations for unparsed syllables whereas the latter—for parsing into metrical structure. Thus, the lower ranking of the two constraints is always inoperative.

The directionality of parsing is captured by a gradient Alignment constraint, which states that every foot coincides with the right edge of the prosodic word (McCarthy and Prince, 1993). It incurs a violation for each foot and each syllable away from the right word edge.

> Align(Foot, R, PrWd, R), or φ#
> Feet are word-final.

Since foot parsing is exhaustive, AlignFeet (φ#) is ranked below ParseSyll *⟨σ⟩.[18] Given that polysyllabic words have multiple feet and only one right prosodic edge, even the winning candidate will often incur plenty of AlignFeet (φ#) violations (88′f).

In the tableaux below, violations of ParseSyll *⟨σ⟩ will be counted for each foot separately. Constraint violations too copious for violation marks ∗ will be represented with numerals. Candidates unfaithful to the primary will not be considered; they are ruled out by the high-ranking MaxStress (Mxφ).

			prosodic word		
(88′)	f.	[(*áfa*)*jiyambitiki*]$^{\omega}_{1}$:	(×μ) »	*⟨σ⟩ »	φ#
	i.	(*áfa*)*jiyambi*(*tìki*)		∗∗!∗	—
	ii.	(*áfa*)(*jìya*)(*mbìti*)*ki*		∗	5, 3, 1!
	iii.	(*áfa*)(*jìya*)*mbi*(*tìki*)		∗	5, 3!, 0
☞	iv.	(*áfa*)*ji*(*yàmbi*)(*tìki*)		∗	5, 2, 0
	v.	(*áfa*)(*jì*)(*yàmbi*)(*tìki*)	∗!	—	—

‘speak–PRCM–IRR–NEG–INT–2’
“will you not be about to speak?”

In addition to right-aligned footing, secondary stress is also assigned to the first syllable of the word, deviating from the pattern captured with AlignFeet (φ#). This can be observed when three syllables precede the word head (90a-b). Secondary stress is found on the first syllable of the word regardless of whether the base form is lexically stressless (89a) or stressed (89b).

18 For a factorial typology of stress, see McCarthy and Prince (1993).

		STRESSLESS STEM		STRESSED STEM
(89)	a.	*kasara*	b.	(*á̲fa*)*se*
		'marry'		'insult'
(90)	a.	(*kà̲sa*)*ra*–(*khú̲*–'*fa*)	b.	(*à̲fa*)*se*–(*khú̲*–'*fa*)
		'marry–RCPR–PLS'		'insult–RCPR–PLS'

The constraint used to capture the above pattern is AlignWord (#σ́), introduced in Section 4.5.1.

> Align(PrWd, L, Foot, L), or #σ́
> A foot is word-initial.

AlignWord (#σ́) ranks above AlignFeet (φ#), correctly predicting word-initial secondary stress (90′a).

(90′)	a. [*kasara*(*khú̲*'*fa*)]$^{\omega}_{1}$:	*prosodic word* *⟨σ⟩ »	#σ́ »	φ#
	i. *kasara*(*khú̲*'*fa*)	∗∗!∗	———	———
☞	ii. (*kà̲sa*)*ra*(*khú̲*'*fa*)	∗		3, 0
	iii. *ka*(*sà̲ra*)(*khú̲*'*fa*)	∗	∗!	———
	'marry–RCPR–PLS'			

AlignWord (#σ́) states that the left edge of the prosodic word coincides with a foot. AlignFeet (φ#) states that every foot coincides with the right edge of the prosodic word.

Formally, the difference between the two constraints lies in the order of arguments. The first argument is quantified over universally, while the second argument—existentially. Thus, AlignFeet (φ#) demands of every foot that it be next to a right word edge, while AlignWord (#σ́)—of every left word edge that it be next to a foot. Simply put, AlignWord (#σ́) is content with just one foot by the left word edge, while AlignFeet (φ#) pushes all feet to the right.

This interaction of AlignWord (#σ́) and AlignFeet (φ#) derives the initial dactyl system in which one foot is aligned with the left edge of the word while all others are pushed rightward: #(σ̲̀σ)σ(σ̲̀σ)(σ̲̀σ)#. For an identical account of the Garawa stress pattern and for details of the formalism, see McCarthy and Prince (1993).

The initial-dactyl stress pattern is attested in morphologically complex verbs with three syllables preceding the head foot (91).

		prosodic word		
(91)	[*kasara(khú'fa)yatiki*]$^{\omega}_{1}$:	*⟨σ⟩ »	#σ́ »	φ#
i.	*kasara(khú'fa)yatiki*	6!	———	———
ii.	*(kàsa)ra(khú'fa)yatiki*	4!	———	———
iii.	*kasara(khú'fa)ya(tìki)*	4!	———	———
iv.	*(kàsa)ra(khú'fa)(yàti)ki*	2		6, 3, 1!
☞ v.	*(kàsa)ra(khú'fa)ya(tìki)*	2		6, 3, 0
vi.	*ka(sàra)(khú'fa)ya(tìki)*	2	*!	———
vii.	*ka(sàra)(khú'fa)(yàti)ki*	2	*!	———

'marry–RCPR–PLS–IRR–INT–2'
"will you marry each other?"

Finally, a word on weight sensitivity in secondary stress. Generally, the predictions made by ranking FootShape (×μ) above AlignWord (#σ́) and AlignFeet (φ#) have been corroborated. Only proper feet are constructed, which can be discerned in the avoidance of word-initial stress when the second syllable is heavy (92).

		prosodic word	
(92)	[*fûndûi(yémbi)*]$^{\omega}_{1}$:	(×μ) »	*⟨σ⟩
i.	*fûndûi(yémbi)*		**!
☞ ii.	*fûn(dȕi)(yémbi)*		*
iii.	*(fȕndûi)(yémbi)*	*!	———

'sweep–PASS–NEG'

If syllabic weight has further significance for the assignment of secondary stress, it is difficult to discern. Diphthongs are rare in the language, and almost all are found at the right edges of bare verbs, where primary stress is a typical outcome of morphological constructions. In addition, all functional morphemes consist of light syllables (although –*-en* and –*-an*, the two vocalic allomorphs of the causative –*ña* 'CAUS' productively yield diphthong-final verbs).

Finally, the complete grammar lattice is given, with all the constraint rankings necessary to account for the phenomena discussed throughout this chapter.

master
Mxφ » { *σ́#, Hdʔ » Mxʔ } »
» (×μ) » Dpφ » #σ́ » φ#

dominant
¬Mxφ » Mxφ

level 1
#ω# » *σ́# » σ́] » (×μ)

φ_0: *root*, *lvl 0 rcess*

$\varphi_0^{\times}$: *lvl 0 dominant*

φ_1: *lvl 1 recessive*

$\varphi_1^{\times}$: *lvl 1 dominant*

φ_1^{ω}: *prosodic word* (×μ) » *⟨σ⟩ » Dpφ

Grammar lattice, final iteration.

In summary, A'ingae secondary stress is purely phonological and assigned after the morphologically-governed primary stress.

A'ingae secondary stress exhibits the initial dactyl pattern, schematized as $\#(\underline{\grave{\sigma}}\sigma)\sigma(\underline{\grave{\sigma}}\sigma)(\underline{\grave{\sigma}}\sigma)\#$. Initial dactyl stress is formalized as an interaction of AlignWord (#σ́) and AlignFeet (φ#).

Like primary stress, secondary stress is sensitive to syllabic weight, which results in the avoidance of heavy-final feet.

4.7 FURTHER RESEARCH

In this section, a tentative observation will be made about the phonological status of the glottal stop in A'ingae. Namely, it is possible to analyze the glottal stop as a suprasegmental feature, rather than a segmental phoneme. Motivations for this analysis are listed below, but its potential implications are left to future research.

Many of the features of glottal stops discussed in the preceding chapters point to their suprasegmental status in the language.

First, glottal stops can be, and often are, realized as creaky voice. When the glottal stop is realized as creak, the creakiness can extend across multiple syllables. This is in accord with what could be expected of a non-segmental feature (see Section 2.5).

Second, glottal stops show a very close affinity to stress (see Section 4.5.1). They appear only in the head constituent, attract stress, and are essentially culminative, since there can be at most one glottal stop per word (see page 70). These features suggest an analogy with systems of pitch accent, many of which have the same properties.

Third, a great number of the language's functional morphemes begin with glottal stops, giving rise to most of the language's glottal minimal pairs (see Sections 3.1 and 4.5.1). This brings to mind the category of floating tones known from morphologically-rich tonal languages.

Fourth, glottal stops appear in the coda position, although A'ingae otherwise prohibits codas (see Section 2.4). This suggests that the glottal stop is not a proper coda, and might be better analyzed as a feature of the nucleus, analogous to other suprasegmentals.

Fifth, the position in which the glottal stop can surface is greatly restricted. At the level of the syllable, the glottal stop appears only in codas (see Section 4.5) and between two vowels of a diphthong (see a footnote on page 67). At the level of a verbal root, the glottal stop is restricted to the penultimate syllable (see a footnote on page 77).

Combining the two limitations on the glottal stop's syllable-wise and stem-wise distribution, it can be seen that in any verbal root of the shape [σσ] or [σσσ], the position of the glottal stop is fully predictable: [σʔσ] and [σσʔσ]. This is to say: in a verbal root, the glottal stop always surfaces right before the last syllable. This suggests that its position is underspecified and points to its suprasegmental character. For another analysis of glottal stops as suprasegmental with respect to the verbal root, see Silva (2016)'s work on Desano (ISO 639-3: `des`).

Although nothing in the current proposal openly conflicts with a reanalysis of glottal stops as a suprasegmental feature and some aspects of it, such as ALIGNGLOTTAL (HDʔ), actually invite it, full implications of this idea are to be explored in future research.

5 CONCLUSIONS

The subject matter of this thesis was the morphophonology of verbal stress in A'ingae, an Amazonian isolate. Novel data were presented and original generalizations were formulated, bearing on questions of language description, linguistic typology, and formal theory.

Chapter 3 was provided the most detailed description of A'ingae verbal morphology to date. Section 3.1 proposed an inflectional template of the A'ingae verb, capturing restriction on morpheme ordering and co-occurrence. Section 3.2 empirically motivated its deviations from a previous proposal by F&H. Section 3.3 evaluated and rejected F&H's claim as to the largely enclitic status of verbal morphology.

Chapter 4 formalized an analysis of the morphophonology of A'ingae verbal stress. Section 4.2 motivated a distinction between lexically stressless (regular) verbs and lexically stressed (irregular) verbs.

Section 4.3 motivated a morphological distinction based on phonological levels. Level 0 suffixes do not independently assign stress. Level 1 suffixes assign stress to the last syllable of the stem.

Section 4.4 motivated a further morphological distinction based on faithfulness to the stem's stress. Recessive suffixes retain preexisting stress. Dominant suffixes delete preexisting stress.

The entirety of A'ingae's morphologically-conditioned phonological variation was captured with four cophonologies inheriting their properties from a phonological level and a stem-faithfulness class.

Section 4.5 analyzed the prosodic import of glottal stops. Section 4.5.1 observed the relevance of syllabic weight to A'ingae stress assignment and argued for a typologically unencountered glottal stress principle, whereby stress is assigned to the syllable with the mora penultimate of the glottal stop. Section 4.5.2 explained apparent morphological variation with recourse to glottal stress. Section 4.5.3 demonstrated the ability of glottal stress to account for phonological properties of the A'ingae lexicon and phenomena of glottal stop deletion.

Section 4.6 discussed A'ingae's phonologically-assigned secondary stress and accounted for its initial dactyl pattern.

Finally, Section 4.7 sketched a potential direction for future research by observing that the A'ingae glottal stop can be reanalyzed as suprasegmental feature of the nucleus.

APPENDIX

A

A.1 GLOSSING ABBREVIATIONS

	MEANING	F&H	B&C
1	first person subject	1	1PE
2	second person subject	2	2PE
3	third person subject	3	3PE
ABL	ablative case	ABL, SO	PP
ABS	absentive case	ACC2	GL
ACC	accusative case	ACC1	DO
ADD	additive focus	ADD	AV, Cnd
ADJ	adjectivizer	QUAL	AJz
ADN	adnominal marker	ADJR	AJz, Jct, Nz
ADV	adverbializer	ADVR	AVz
AND	andative motion	TRANS	Dr)
APPR	apprehensional marker	NEGPURP	Adm, Wrn
ATTR	attributive marker	ATTR	Agnt, Grn, Nz
CAUS	causative voice	CAUS	Cau
CNTR	contrastive topic	CONTR	1E, Cnd
DAT	dative case	DAT	IO
DMN	diminutive aspect	DIM	Mn
DS	different subject	DS	CA
EXCL	exclusive focus	EXCL	Lim, Lm
FRST	frustrative marker	CNTR	Fr
HONR	honorific marker	NPST	Hon
HPL	human plurality	HUM.PL	PL-Nz
IMP	imperative mood	IMP	Imp
IMP2	imperative mood 2	MIT	
IMP3	imperative mood 3		Hor
IMPV	imperfective aspect	IMPF, IMPV	Cnt
INF	infinitival marker	POST	Inf
INT	polar interrogative	INT	Int, S/N, Y/N
IRR	irrealis mood	IRR	F, fut

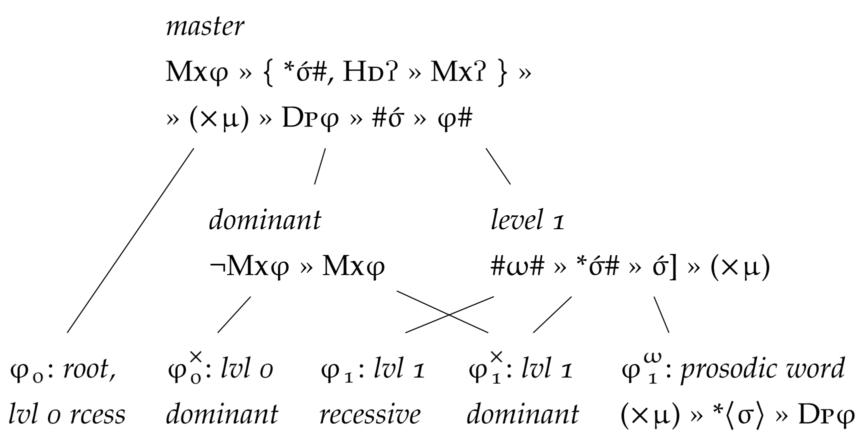
	meaning	F & H	B & C
loc	locative case	loc	CA, Cnd, PP, Tmp
mann	manner case	mann	AVz
mvm	movement manner	sim	Inst
n	nominalizer	nr	Ncl
neg	negative polarity	neg	Ng
new	new topic	new	2E, Cnd
pass	passive voice	pass	Pas
pls	plural subject	pl, pls	PL, Pl
prcm	precumulative aspect	precul	Prg
prhb	prohibitive mood	proh	Imp-Fr
prsp	prospective form	prosp	Cau, Lim, Lm
rcpr	reciprocal voice	recp	Rcp
rprt	reportative evidentiality	rpt	Rp, Qt
sbrd	nominal subordinator	nr, sr, sub	Ncl
smfc	semelfactive aspect	rep	Rep-Mn
ss	same subject	ss	SA
ven	venitive motion	cis	Dr(
ver	veridical marker	ass	Ppf

A.2 miscellaneous symbols

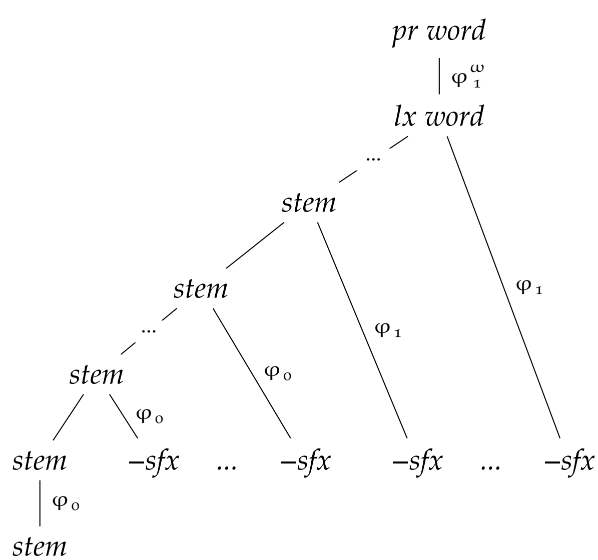
	meaning
( )	optionality
[ ]	constituency
{ }	set
,	alternative
*	markedness
–	affix boundary
=	clitic boundary
≈	ambiguous clitic boundary
/ /	underlying form
[ ]	surface form
ʔ	glottal stop
–	heavy syllable
⌣	light syllable

	MEANING
μ	mora
σ	syllable
φ	foot, metrical structure
ω	prosodic word
( )	metrical foot boundaries
[ ]	morphological stem boundaries
# #	(lexical) word boundaries
$\langle$ $\rangle$	unparsed constituent boundaries
HD	head constituent
$\acute{\sigma}$	syllabic head of a word
$\grave{\sigma}$	syllabic head of a foot
$\times$	strong beat
.	weak beat
DP	dependence
MX	maximality
$\neg$	antifaithfulness
»	constraint domination
,	undetermined ranking
$*$	constraint violation
!	fatal violation
———	constraint irrelevance
☞	optimal candidate
φ	cophonological function
0	phonological level 0
1	phonological level 1
$\times$	suffix dominance
:	construction-specific ranking
$\succ$	construction succession

A.3 GRAMMAR SIGNATURE



Grammar lattice.



Word tree, phonological layering.

Maximality(Stress), or Mxφ
Stress is not deleted.

NonFinality, or *σ́#
The final syllable of a word is not its prosodic head.

Align(ʔ, R, WdHd, R), or Hdʔ
Glottal stops are final in a prosodic head of the word.

Maximality(ʔ), or Mxʔ
Glottal stops are not deleted.

FootShape, or (×μ)
Feet are trochees with monomoraic right branches.

Dependence(Stress), or Dpφ
Stress is not epenthesized.

Align(PrWd, L, Foot, L), or #σ́
A foot is word-initial.

Align(Foot, R, PrWd, R), or φ#
Feet are word-final.

AntiMaximality(Stress), or ¬Mxφ
Stress is deleted.

Align(Stem, R, Stress, R), or σ́]
The stem-final syllable is the prosodic head of the word.

LexicalWord≈ProsodicWord, or #ω#
Every lexical word corresponds to a prosodic word.

ParseSyllables, or *⟨σ⟩
All syllables are parsed by feet.

Operative constraints.

VOICE / VALENCE			ASP	MOT	NUM	MOD	POL	TAX	INFO STRUCTURE			ILL	PER
				$-'ngi^{\times}_{0}$				$-'ya_1$					$-ts\hat{u}_1$
			$-'je^{\times}_{0}$	VEN		$-ya_1$	$-mbi_1$	VER					3
			IMPV	$-'nga^{\times}_{0}$		IRR	NEG	HYP				$-te_1$	$-ki_1$
				AND					$-'yi_1$	$-'ta_1$	$-'khe_1$	RPRT	2
$-\tilde{n}a_0$	$-khu^{\times}_{0}$	$-ye^{\times}_{0}$	$-ji_0$		$-'fa_1$				EXCL	NEW	ADD	$-ti_1$	$-ngi_1$
CAUS	RCPR	PASS	PRCM		PLS			$-ye_1$				INT	1
			$-'\tilde{n}akha^{\times}_{0}$					INF		$-'ja_1$			
			SMFC							CNTR			
			$-'kha^{\times}_{1}$					DCV				$-teki_1$	
			DMN									RPRT.2	

HYP:	$-pa_1$	$-si_1$	$-'ma_1$	$-'ni_1$	$-sa'ne_1$
	SS	DS	FRST	LOC	APPR
DCV:	$-ja_1$	$-kha_1$	$-'se_1$	$-jama^{\times}_{1}$	
	IMP	IMP2	IMP3	PRHB	

Morphophonological template of verbal inflection.

A.4 VERBAL DICTIONARY

a'jû vtr vomit
áfa vin speak
áfase vtr insult
afe vtr give
áfupuen vtr 1) lie 2) cheat
am'bian vtr have
amphi vin fall
an vtr eat
ána vin sleep
ande vin land
ansûnde vin go up
asi'thaen vtr 1) think 2) worry
atapa vin breed
atesû vtr know
áthe vtr see
avûja vin rejoice
bu vin get together
buira vin dance
bûthu vin run
chape vin soften
chava vtr buy
chhuvi vin urinate (of women)
chi'ga vtr 1) hate 2) not want
da vin become
eyephû vtr stir
féña vtr 1) laugh 2) smile
fetha vtr open
fi'thi vtr kill
fûite vtr help
fûndu vin shout
fûndûi vtr sweep
gana vtr earn
giya vin clean up
i vtr bring
i'na vin cry
in'jan vtr 1) want 2) like 3) think
iñakha vin get hurt
iñajan vtr 1) ask 2) pray
ítsa vtr take over
ituye vin spin
ja vin go
jákan vin travel
ji vin come
jin vin be
jû'rû vin 1) burn 2) warm up
ka'ni vin enter
kachûi vtr meet
kan vtr look
kánse vin live
kasara vtr marry
kha'ya vin swim
khûi vin lie
khûcha vtr wipe
khûsha vin 1) heal 2) survive
khûsi vin 1) get drunk 2) get poisoned
khûya vin flee
ku'fe vin play
kúnda vtr let know
kúndase vtr tell
kûndyi vin urinate (of men)
nepi vin arrive
népi vin disappear
ñu'fa vin rest
manda vin 1) send 2) command
panza vtr hunt
páña vtr 1) hear 2) understand
phi vin sit down
rúnda vin wait
se'je vtr cure
sema vtr work
setha'puen vtr sing
shagathû vin go through puberty
shu'khaen vtr cook
shukendi vin bend
simba vtr fish
sumbu vin come out
tshipa vin get wet
tsun vtr 1) do 2) make
u'ru vin smolder
um'ba vin fill up
umbuen vtr follow
undikhû vtr wear
untengû vin tilt
upathû vtr pick (fruit)
uperi vin get chipped
usha vin be able
utishi vtr wash (hands)
û'kha vtr break
ûkha vin break

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colophon

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