TWO GRAMMARS OF A'INGAE GLOTTALIZATION: A CASE FOR COPHONOLOGIES BY PHASE

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ABSTRACT This paper describes and analyzes phonological processes pertinent to the glottal stop in A'ingae (or Cofán, ISO 639-3: `con`). The operations which the glottal stops undergo and trigger reveal an interaction of two morphophonological parameters: stratum and stress dominance. First, verbal suffixes are organized in two morphophonological domains, or strata. Within the inner domain, glottal stops are a facultative feature of the metrical foot and preferably right-aligned with it. In the outer domain, glottal stops do not have any effects on stress. Second, some verbal suffixes delete stress (i. e. they are dominant). Dominance is unpredictable and independent of the suffix's morphophonological domain, but dominance and the phonological domain interact in a non-trivial way: Only inner dominant suffixes delete glottalization. To account for the A'ingae data, I adopt Cophonologies by Phase (Sande, Jenks, and Inkelas, 2020), which (i) models phonological stratification while (ii) allowing for morpheme-specific phonological idiosyncrasies which (iii) interact with the phonological grammar of their stratum. Stress deletion triggered by the dominant suffixes is modeled with ANTIFAITHFULNESS (Alderete, 1999, 2001). Antifaithfulness to a metrical foot entails antifaithfulness to its features (glottalization). This captures the fact that only the inner dominant suffixes delete glottal stops.

1 INTRODUCTION

This paper presents and analyzes data from A'ingae (or Cofán, an Amazonian isolate, ISO 639-3: `con`), whose phonological grammar shows effects specific to (i) morphological domains as well as (ii) idiosyncratic morphemes, which (iii) interact with each other. The organization of the A'ingae morphology-phonology interface considerably restricts the space of viable formalisms. I show that Cophonologies by Phase (e. g. Sande, Jenks, and Inkelas, 2020) has the requisite architectural properties to model the A'ingae patterns.

To support my claim, I focus on the grammar of the A'ingae glottal stop. The glottal stop most often appears in syllabic rimes; onset glottal stops are rare. The presence of the glottal stop is contrastive in roots (1a-b)[1] as well as functional morphemes (1c-d).[2] The position of glottalization is contrastive in morphologically complex forms (1e-f). Stress is marked with the acute accent (´) and **boldface**.

(1) GLOTTAL STOP AS A CONTRASTIVE SEGMENT

a. ***û́***_kha_	b. ***û́ʔ***_kha_	c. ***tsá*** _=ma_	d. ***tsá*** _-ʔma_	e. ***séʔ***_je -pa_	f. ***sé***_je -ʔpa_
break.INTR	break.TR	ANA =ACC	ANA -FRST	cure -SS	cure -N

More narrowly, I focus on the phonological processes pertinent to the glottal stop in A'ingae morphologically complex verbs. In addition to the presence or absence of preglottalization (1c-d), A'ingae suffixes vary along two dimensions. First, there are two morphophonological domains, or strata, which I refer to as *inner* (closer to the root) and *outer* (farther away from the root). Glottal stops in roots and suffixes of the inner domain are associated with stress which falls on the syllable which contains the second mora to the left of the glottal stop. Glottal stops introduced in the outer domain do not have any effect on stress.

Second, A'ingae suffixes can be categorized as *recessive*, which preserve underlying stress, or *dominant*, which delete input stress (Dąbkowski, 2021b). Whether a suffix is recessive (i. e. stress-preserving) or dominant (i. e. stress-deleting) is unpredictable and independent of the morphophonological domain. As a consequence, there are *inner recessive*, *outer recessive*, *inner dominant*, and *outer dominant* suffixes. Notably, the parameter of dominance interacts with the morphological domain in a non-trivial way: If there is an underlying glottal stop, the inner dominant suffixes delete the glottal stop along with stress, but the outer dominant suffixes leave the glottal stop intact.

The main theoretical import of this study resides in the architecture of the A'ingae morphophonological grammar as revealed by the phonological processes related to glottalization: Different phonological grammars within one language may correspond to ordered morphological domains or strata (as is the case with the effect A'ingae glottalization has on stress) but may also be unpredictably associated with individual morphemes (as is the case with A'ingae dominance effects), which further interact with the grammar of their stratum. Thus, a phonological formalism that does justice to the A'ingae data pattern must be able to fulfill the triple desideratum of (i) modeling phonological stratification while (ii) allowing for morpheme-specific phonological idiosyncrasies which (iii) interact with the phonological grammar of their stratum.

To model the A'ingae data, I adopt Cophonologies by Phase (henceforth CbP; Sande, 2017, 2019; Sande and Jenks, 2018; Sande, Jenks, and Inkelas, 2020). CbP allows for associating *cophonologies*, or morphologically-specific phonological grammars, with phase heads as well as individual morphosyntactic features. In my proposal, lower phase heads are associated with a cophonology where glottalization triggers stress assignment and higher phase heads with a cophonology where the glottalization has no effect on stress (i). Morphosyntactic features which are spelled out by dominant suffixes are associated with a cophonology that requires stress deletion (ii). Lastly, the cophonologies of all the features within a phase jointly determine the phonological ranking at each spell-out, so phase head and morpheme-specific cophonologies may interact (iii). Thus, Cophonologies by Phase fulfills the above triple desideratum, whereas alternatives fail to fulfill some or all of its parts. For example, Stratal Optimality Theory (Bermúdez-Otero, 1999, 2012; Jaker and Kiparsky, 2020; Kiparsky, 2000, 2008; others) meets part (i), but does not allow for (ii). Classic Cophonology Theory (Anttila, 1997; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Orgun, 1996; others) and Indexed Constraint Theory (Benua, 1997; Ito and Mester, 1999; Pater, 2009; others) meet part (ii), but miss the generalization

1 Although (1a) and (1b) are obviously related, glottal stop insertion is not a productive way of causativizing inchoatives.

2 The following glossing abbreviations are used: 1 = first person, 2 = second person, 3 = third person, ACC = accusative, ACC2 = accusative 2, ANA = anaphoric, APPR = apprehensional, CAUS = causative, DAT = dative, DIST = distal, DS = different subject, FRST = frustrative, IF = conditional, IF2 = conditional 2, IMP = imperative, IMP2 = imperative 2, IMP3 = imperative 3, INF = infinitive, INTR = intransitive, IPFV = imperfective, IRR = irrealis, MANN = manner, N = nominalizer, NEG = negative, PASS = passive, PAUC = verbal paucal, PL = plural, PLA = pluractional, PLS = plural subject, PRCL = preculminative, PRHB = prohibitive, PROX = proximal, RCPR = reciprocal, RPRT = reportative, SBRD = subordinator, SFX = suffix, SG = singular, SH.DLM = delimited space shape, SMFC = semelfactive, SS = same subject, TR = transitive, VER = veridical, WH = content interrogative, YNQ = polar interrogative.

expressed in part (i). Representational solutions (e. g. Jaker and Kiparsky, 2020; Kushnir, 2019; Rosen, 2016; Smolensky and Goldrick, 2016; Trommer and Zimmermann, 2014; Zimmermann, 2018a,b) struggle with modeling A'ingae stress deletion (Dąbkowski, 2021b).

Secondary theoretical implications of the study pertain to formal tools for modeling stress deletion and their relation to prosodic features. To capture the behavior of stress-deleting suffixes, I adopt Alderete's (1999, 2001) AntiFaithfulness, whereby stress-deleting suffixes penalize the retention of input stress. To capture the relationship between glottalization and stress, I propose that glottalization is a facultative feature of the metrical foot in the inner, but not the outer, domain. Finally, I propose that antifaithfulness to metrical structure entails antifaithfulness to all of its features. This captures the fact that dominant suffixes delete glottalization only within the inner domain. Thus, the study contributes a new argument in favor of the controversial family of AntiFaithfulness constraints and fleshes out its interaction with features dependent on the deleted node.

By providing a novel case study from A'ingae, the paper contributes to growing research on lexically idiosyncratic dominance effects. Other studies which apply diverse frameworks to complex morphologically-conditioned accentual systems include Vaux's (2008) analysis of Abkhaz (North-West Caucasian) stress, Kushnir's (2019) treatment of Lithuanian pitch accent, Czaykowska-Higgins's (1993) account of Moses-Columbia Salish (Nxa'amxcin) stress, Kawahara's (2015) work on Japanese pitch accent, and analyses of Baltic, Sanskrit, Slavic, and Greek (Kiparsky, 2010).

The rest of the paper is structured as follows. Section 2 gives background on the A'ingae language and its speakers. Section 3 describes the distribution of the A'ingae glottal stop and the morphophonological processes relevant to it. Section 4 presents a formal analysis of the data couched in Cophonologies by Phase (Sande, 2019; Sande, Jenks, and Inkelas, 2020; others). Section 5 considers and rejects alternative analyses. Section 6 concludes.

2 LANGUAGE BACKGROUND

A'ingae (or Cofán, ISO 639-3: `con`) is an Amazonian language isolate spoken by ca. 1,500 Cofán people in the province of Sucumbíos (northeast Ecuador) and the department of Putumayo (southern Colombia). The language is endangered and highly underdocumented. In Ecuador, A'ingae is spoken robustly and transmitted to children. Bilingualism with Spanish is prevalent, especially among younger generations. Despite economic, ecological, and political pressures experienced by the Cofán, their language attitudes towards A'ingae are uniformly positive (Dąbkowski, 2021a).

Previous work on the phonetics and phonology of A'ingae includes Borman's (1962) phonological sketch, Fischer and Hengeveld's (to appear) grammatical sketch, Repetti-Ludlow et al.'s (2019) phonetic study, Sanker and AnderBois's (2021) reconstruction of nasality, and Dąbkowski's (2021b) argument against a representational treatment of stress dominance.

A'ingae syllable structure is (C)V(V)(ʔ). This is to say, there are no codas, possibly other than the glottal stop. This paper adopts the language's practical orthography with one exception: the glottal stop is represented as in the IPA (ʔ), and not with an apostrophe. For the complete set of grapheme-phoneme correspondences, see Fischer and Hengeveld (to appear). Here, only a few issues will be flagged. First, *û* represents the high central vowel /ɨ/; the circumflex is not a tonal diacritic. Second, the orthographic *n* and *m* after a vowel are not codas. Rather, they represent vowel nasality and/or prenasalization on the following stop. For example, the sequence *and* represents [ãⁿd].[3] When it comes to its morphological profile, A'ingae is exclusively suffixing. The language has robust progressive nasalization, which gives rise to extensive nasal allomorphy among its numerous suffixes (see Sanker and AnderBois, 2021).

3 Word initial prenasalization has a shorter duration and lower intensity (Repetti-Ludlow et al., 2019). This is reflected orthographically with word-initial *b* [ᵐ̆b], *d* [ⁿ̆d], *z* [ⁿ̆dz], *dy* [ⁿ̆dʒ], and *g* [ᵑ̆g].

All the data were collected remotely by the author between 2021 and 2022 and reflect the judgments reported by two native speaker consultants (both male, 24 and 36 years old) from the community of Dureno, Sucumbíos, Ecuador.

3 DESCRIPTION

This section describes the interaction of stress, glottalization, and stress deletion. A'ingae is a heavily agglutinating language, with many inflectional categories exponed with suffixes and enclitics on the verbal head. Within a complex verb, two morphophonological domains, or strata, can be distinguished (2): The inner domain includes the root and the exponents of voice, aspect, and associated motion. The inner suffixes may attach only to verbal predicates. The outer domain includes exponents of subject plurality, reality, polarity, subject person, and others. Many of the outer suffixes may attach to verbal as well as nominal predicates. The inner domain is delimited with square brackets [ ].

(2) STRATAL ORGANIZATION OF THE A'INGAE VERB

[***kufi***	***-án***	*-ʔjen*	*-ngi*]	*-ʔfa*	*-ya*	*-mbi*	*=tsû*
play	-CAUS	-IPFV	-PROX	-PLS	-IRR	-NEG	=3

"they$_{\text{3,PLS}}$ will$_{\text{IRR}}$ not$_{\text{NEG}}$ come$_{\text{PROX}}$ to be$_{\text{IPFV}}$ making$_{\text{CAUS}}$ play"

3.1 *Verbal roots*

The inner morphophonological domain consists of the verbal root and, optionally, suffixes exponing voice, aspect, and associated motion. In this section, I will focus on verbal roots, which fall in one of three categories: stressless (3-4), stressed (5-6), and glottalized (7-12).

Underlyingly stressless roots can be monosyllabic (3a-b), disyllabic (3c-d), or trisyllabic (3e-f). On the surface, penultimate stress is assigned to disyllabic and trisyllabic roots. This is the default stress assigned to underlyingly stressless forms, as evidenced by stress shift in the presence of inflectional morphology (4).

(3) STRESSLESS ROOTS

a.	b.	c.	d.	e.	f.
/ *phi* /	/ *tsun* /	/ *panza* /	/ *afe* /	/ *atapa* /	/ *utishi* /
[***phí***]	[***tsún***]	[***pá****nza*]	[***á****fe*]	[*a****tá****pa*]	[*u****tí****shi*]
sit	do	hunt	give	breed	wash

(4) STRESSLESS ROOTS WITH SUFFIXES

a.	b.	c.	d.	e.	f.
/ *phi -ji -mbi* /	/ *tsun -ji -mbi* /	/ *panza -ji* /	/ *afe -ji* /	/ *atapa -ji* /	/ *utishi -ji* /
[*phi* ***-jí*** *-mbi*]	[*tsun* ***-jín*** *-mbi*]	[*pan****zá*** *-ji*]	[*a****fé*** *-ji*]	[*ata****pá*** *-ji*]	[*uti****shí*** *-ji*]
sit -PRCL -NEG	do -PRCL -NEG	hunt -PRCL	give -PRCL	breed -PRCL	wash -PRCL

Underlyingly stressed roots are mostly disyllabic (5a-d); a few are trisyllabic (5e-f). All underlyingly stressed roots have word-initial stress.[4] This lexically-specified first-syllable stress does not shift when most inflectional suffixes are added (6).

(5) STRESSED ROOTS

a.	b.	c.	d.	e.	f.
/ ***á****fa* /	/ ***á****na* /	/ ***ká****ti* /	/ ***fû́****ndu* /	/ ***á****fase* /	/ ***kú****ndase* /
[***á****fa*]	[***á****na*]	[***ká****ti*]	[***fû́****ndu*]	[***á****fase*]	[***kú****ndase*]
speak	sleep	cast	shout	offend	tell

4 In A'ingae, final stress is strongly avoided. Thus, all disyllabic stressed verbs have word-initial stress. The stress of glottalized verbs results from independently attested interactions of stress and glottalization explored further in Section 3.2. There are only two non-glottalized trisyllabic verbs with underlying stress: ***á****fase* 'offend' and ***kú****ndase* 'tell.' Both are diachronically related to stressed disyllables ***á****fa* 'speak' and ***kú****nda* 'let know.' Thus, their initial stress receives a historical explanation.

(6) STRESSED ROOTS WITH SUFFIXES

	a.	b.	c.	d.	e.	f.
	/ ***á**fa* -*ji* /	/ ***á**na* -*ji* /	/ ***ká**ti* -*ji* /	/ ***fʉ̂**ndu* -*ji* /	/ ***á**fase* -*ji* /	/ ***kú**ndase* -*ji* /
	[***á**fa* -*ji*]	[***á**na* -*jin*]	[***ká**ti* -*ji*]	[***fʉ̂**ndu* -*ji*]	[***á**fase* -*ji*]	[***kú**ndase* -*ji*]
	speak -PRCL	sleep -PRCL	cast -PRCL	shout -PRCL	offend -PRCL	tell -PRCL

Finally, some roots have an underlying glottal stop. All underlyingly glottalized roots have word-initial stress.[5] In disyllabic glottalized roots, the glottal stop surfaces in the rime of the first syllable (7a-c). (I remain agnostic whether the glottal stop is part of the nucleus or a coda.) In trisyllabic glottalized roots, the glottal stop surfaces in the rime of the second syllable (7d-f). This is to say, across di- and trisyllables, the glottal stop shows up in the rime of the penult. Thus, within a glottalized root, the position of the glottal stop, the presence of stress, and the position of stress are entirely predictable. Glottalized roots do not undergo stress shift when most inflectional suffixes are added (8).[6]

(7) GLOTTALIZED ROOTS

	a.	b.	c.	d.	e.	f.
	/ ***séʔ**je* /	/ ***íʔ**na* /	/ ***fíʔ**thi* /	/ ***á**kheʔpa* /	/ ***á**nsaʔnge* /	/ ***á**khuʔsha* /
	[***séʔ**je*]	[***íʔ**na*]	[***fíʔ**thi*]	[***á**kheʔpa*]	[***á**nsaʔnge*]	[***á**khuʔsha*]
	cure	cry	kill	forget	be shy	chop

(8) GLOTTALIZED ROOTS WITH SUFFIXES

	a.	b.	c.	d.	e.	f.
	/ ***séʔ**je* -*ji* /	/ ***íʔ**na* -*ji* /	/ ***fíʔ**thi* -*ji* /	/ ***á**kheʔpa* -*ji* /	/ ***á**nsaʔnge* -*ji* /	/ ***á**khuʔsha* -*ji* /
	[***séʔ**je* -*ji*]	[***íʔ**na* -*jin*]	[***fíʔ**thi* -*ji*]	[***á**kheʔpa* -*ji*]	[***á**nsaʔnge* -*ji*]	[***á**khuʔsha* -*ji*]
	cure -PRCL	cry -PRCL	kill -PRCL	forget -PRCL	be shy -PRCL	chop -PRCL

A few glottalized roots alternate between disyllabic (C)V.ʔV and monosyllabic (C)VVʔ, depending on the morphological context. The dot (.) represents syllable breaks. The disyllabic (C)V.ʔV forms of the alternating glottalized roots are the only cases of onset glottal stops in A'ingae. In most contexts, including uninflected forms (9) and forms with an inflectional suffix (10), these roots surface as disyllabic (C)V.ʔV.[7] When followed by a derivational suffix (11) or the inner causative -*ña* CAUS (12), they surface as monosyllabic (C)VVʔ. In Section 4.3, this alternation will be analyzed in terms of phonological cyclicity.

(9) ALTERNATING GLOTTALIZED ROOTS

	a.	b.	c.	d.	e.
	kʉ̂.ʔi	***tsá**.ʔu*	***á**.ʔi*	***tʉ̂.ʔi***	***já**.ʔi*
	drink	house	person	tomorrow	later

(10) ALTERNATING GLOTTALIZED ROOTS WITH AN INFLECTIONAL SUFFIX

	a.	b.	c.	d.	e.
	kʉ̂.ʔi -*ji*	***tsá**.ʔu* -*mbi*	***á**.ʔi* -*mbi*	***tʉ̂.ʔi*** -*mbi*	***já**.ʔi* -*mbi*
	drink -PRCL	house -NEG	person -NEG	tomorrow -NEG	later -NEG

(11) ALTERNATING GLOTTALIZED ROOTS WITH A DERIVATIONAL SUFFIX

	a.	b.	c.	d.	e.
	***kʉ̂iʔ**.* -*khû*	***tsáu*** -*ʔ.pa*[8]	***ái*** -*ʔ.vu*[8]	***tʉ̂iʔ**.* -*ve*	***jáiʔ**.* -*ngae*
	drink -SH.DLM	house -N	person -?	tomorrow -ACC2	later -MANN
	"chucula"	"nest"	"body"	"overmorrow"[9]	"eventually"

5 In the analysis advanced in Section 4.3, I will propose that only the glottalization is underlying present; stress is predictably assigned in the inner domain and persists upon the addition of most suffixes.

6 There is a paucity of trisyllabic glottalized verbs, with ***á**kheʔpa* 'forget,' ***á**nsaʔnge* 'be shy,' and ***á**khuʔsha* 'chop' possibly being the only three attested morphologically simple examples. However, the insertion of a glottal stop into the verb root productively expones pluractionality. The position of the pluractional glottal stop follows the generalization outlined in this section, i. e. it shows up in the rime of the penult, in disyllables (ia-c) as well as trisyllables (ia-c). While a full discussion of the A'ingae pluractional formation is outside of the scope of this paper, this data further supports the generalization stated in this section.

(i) ROOTS WITH PLURACTIONAL GLOTTAL STOP

	a.	b.	c.	d.	e.	f.
	/ *chava* -*ʔ* /	/ *panza* -*ʔ* /	/ *fetha* -*ʔ* /	/ *atapa* -*ʔ* /	/ *uphathû* -*ʔ* /	/ *undikhû* -*ʔ* /
	[***cháʔ**va*]	[***páʔ**nza*]	[***féʔ**tha*]	[***á**taʔpa*]	[***ú**paʔthû*]	[***ú**ndiʔkhû*]
	buy.PLA	hunt.PLA	open.PLA	breed.PLA	pick.PLA	don.PLA

7 The disyllabic status of (C)V.ʔV can be diagnosed by the fact that in related forms, the second vowel may carry primary stress, e. g. *a.**ʔí**=ndekhû* 'person=PL.'

8 The glottal stops in the surface forms of (11b-c) come from the preglottalized nominalizers -*ʔpa* N and -*ʔvu* ?; root glottalization is deleted. For analogous behavior in the domain of verbal morphology, see preglottalized inner dominant suffixes (26).

(12) ALTERNATING GLOTTALIZED ROOTS WITH THE INNER *-ÑA* CAUS

a. ***kʉ̂iʔ***. *-ña*	b. ***tsáuʔ***. *-ña*
drink -CAUS	house -CAUS

3.2 *Inner suffixes*

The inner suffixes expone the categories of voice, aspect, and associated motion. There are three voice suffixes: the causative *-ña/-an/-en* CAUS, the reciprocal *-khu*$^{\emptyset}$ RCPR, and the passive *-ye*$^{\emptyset}$ PASS. The suffix which attaches the closest to the root is the causative. The causative has three phonologically-conditioned allomorphs: *-ña* CAUS attaches to monosyllabic roots (13a); *-an* CAUS attaches to polysyllabic roots which end in *e*, *i*, or *û* (13b-d); *-en* CAUS attaches to polysyllabic roots which end in *a* or *u* (13e-f). The allomorph *-ña* CAUS constitutes a separate syllable; the allomorphs *-an* and *-en* CAUS form a diphthong with the root-final vowel. Root vowel alternations seen in the surface forms of (13b,d) are due to a regular phonological process averting illicit diphthongs. For more on A'ingae diphthongs, see Dąbkowski (subm.).

(13) ALLOMORPHS OF *-ÑA/-AN/-EN* CAUS

a. ***phí***.*ña*	b. ***á***.*thian*	c. ***ká***.*tian*	d. ***áʔ***.*jian*	e. ***pá***.*nzaen*	f. ***bʉ̂***.*thuen*
phí. *-ña*	***á***.*the -an*	***ká***.*ti -an*	***áʔ***.*jû -an*	***pá***.*nza -en*	***bʉ̂***.*thu -en*
sit -CAUS	see -CAUS	cast -CAUS	vomit -CAUS	hunt -CAUS	run -CAUS

The causative suffix is recessive; it does not have any effect on stress (regardless of which allomorph is chosen): If the causative attaches to a stressless root, stress is assigned to the penultimate syllable by default (14). Lexically-listed stress and glottalization are preserved if present (15).

(14) STRESSLESS ROOTS WITH *-ÑA/-AN/-EN* CAUS

a. / *phi. -ña* /	b. / *pa.nza -en* /	c. / *a.ta.pa -en* /	d. / *u.ti.shi -an* /
[***phí***. *-ña*]	[***pá***.*nza -en*]	[*a.**tá**.pa -en*]	[*u.**tí**.shi -an*]
sit -CAUS	hunt -CAUS	breed -CAUS	wash -CAUS

(15) STRESSED AND GLOTTALIZED ROOTS WITH *-ÑA/-AN/-EN* CAUS

a. / ***á***.*fa -en* /	b. / ***kú***.*nda.se -an* /	c. / ***séʔ***.*je -an* /	d. / ***á***.*kheʔ.pa -en* /
[***á***.*fa -en*]	[***kú***.*nda.si -an*]	[***séʔ***.*ji -an*]	[***á***.*kheʔ.pa -en*]
speak -CAUS	tell -CAUS	cure -CAUS	forget -CAUS

The causative is followed by the reciprocal *-khu*$^{\emptyset}$ RCPR and the passive *-ye*$^{\emptyset}$ PASS. These two suffixes are dominant, which means that they delete input stress. Dominance is notated with the superscripted empty set ($^{\emptyset}$). When a dominant suffix attaches to a stressless root, stress deletion triggered by a dominant suffix is vacuous; the output surfaces with the expected default penultimate stress (16-17a). When *-khu*$^{\emptyset}$ RCPR or *-ye*$^{\emptyset}$ PASS attaches to a stressed root, the underlying stress is deleted, feeding penultimate stress assignment (16-17b). Finally, when *-khu*$^{\emptyset}$ RCPR or *-ye*$^{\emptyset}$ PASS attaches to a glottalized root, both stress and glottalization are deleted, again feeding penultimate stress assignment (16-17c-d). The same pattern of deletion of stress and glottalization followed by penultimate stress assignment is seen across the causative *-an* CAUS (18a-b) and with multiple dominant suffixes (18c-d).

(16) VARIOUS ROOTS WITH *-KHU*$^{\emptyset}$ RCPR

a. / *atapa -khu*$^{\emptyset}$ /	b. / ***á****fase -khu*$^{\emptyset}$ /	c. / ***íʔ****na -khu*$^{\emptyset}$ /	d. / ***á****kheʔpa -khu*$^{\emptyset}$ /
[*ata**pá** -khu*]	[*afa**sé** -khu*]	[*i**ná** -khu*]	[*akhe**pá** -khu*]
breed -RCPR	offend -RCPR	cry -RCPR	forget -RCPR

9 "the day after tomorrow"

(17) VARIOUS ROOTS WITH *-YE*$^{\emptyset}$ PASS

a. / *upathû -ye*$^{\emptyset}$ /
[*upa**thû** -ye*]
cut -PASS

b. / ***á**fase -ye*$^{\emptyset}$ /
[*afa**sé** -ye*]
offend -PASS

c. / ***séʔ**je -ye*$^{\emptyset}$ /
[*se**jé** -ye*]
cure -PASS

d. / ***á**kheʔpa -ye*$^{\emptyset}$ /
[*akhe**pá** -ye*]
forget -PASS

(18) STRESSED AND GLOTTALIZED ROOTS WITH COMBINATIONS OF *-AN*/*-EN* CAUS, *-KHU*$^{\emptyset}$ RCPR, AND *-YE*$^{\emptyset}$ PASS

a. / ***á**fase -an -ye*$^{\emptyset}$ /
[*afa**si** **-án** -ñe*]
offend -CAUS -PASS

b. / ***séʔ**je -an -ye*$^{\emptyset}$ /
[*se**ji** **-án** -ñe*]
cure -CAUS -PASS

c. / ***á**fa -khu*$^{\emptyset}$ *-ye*$^{\emptyset}$ /
[*afa **-khú** -ye*]
speak -RCPR -PASS

d. / ***á**kheʔpa -en -khu*$^{\emptyset}$ *-ye*$^{\emptyset}$ /
[*akhepa -en **-khú** -ye*]
forget -CAUS -RCPR -PASS

The voice suffixes are followed by aspectual suffixes. There are four aspectual suffixes: the preculminative *-ji* PRCL, the paucal *-kha*$^{\emptyset}$ PAUC, the imperfective *-ʔje*$^{\emptyset}$ IPFV, and the semelfactive *-ʔñakha*$^{\emptyset}$ SMFC. When the preculminative *-ji* PRCL attaches to a stressless base, default penultimate stress is assigned. (Here, *base* refers to the root plus all the suffixes that precede the suffix under discussion.) Note that a base may be stressless because there is no stress (or glottalization) in the input (19a-c) or because input stress (and glottalization) have been deleted by a preceding dominant suffix (19d-e). If the underlying stress (and glottalization) have not been previously deleted, forms with *-ji* PRCL retain them in the output (20). Thus, the preculminative *-ji* PRCL is a recessive suffix.

(19) STRESSLESS BASES WITH *-JI* PRCL

a. / *panza -ji* /
[*pan**zá** -ji*]
hunt -PRCL

b. / *atapa -ji* /
[*ata**pá** -ji*]
breed -PRCL

c. / *phi -ña -ji* /
[*phi **-ñá** -jin*]
sit -CAUS -PRCL

d. / ***ká**ti -ye*$^{\emptyset}$ *-ji* /
[*kati **-yé** -ji*]
cast -PASS -PRCL

e. / ***séʔ**je -ye*$^{\emptyset}$ *-ji* /
[*seje **-yé** -ji*]
cure -PASS -PRCL

(20) STRESSED AND GLOTTALIZED BASES WITH *-JI* PRCL

a. / ***ká**ti -ji* /
[***ká**ti -ji*]
cast -PRCL

b. / ***á**fase -ji* /
[***á**fase -ji*]
offend -PRCL

c. / ***séʔ**je -ji* /
[***séʔ**je -ji*]
cure -PRCL

d. / ***á**kheʔpa -ji* /
[***á**kheʔpa -ji*]
forget -PRCL

e. / ***á**kheʔpa -en -ji* /
[***á**kheʔpa -en -jin*]
forget -CAUS -PRCL

The paucal *-kha*$^{\emptyset}$ PAUC is dominant, so it deletes stress and glottalization from the base. The output surfaces with the default penultimate stress, regardless of whether the base is a stressless root (21a), a stressed root (21b), a glottalized root (21c-d), contains a recessive suffix (21e), or another dominant suffix (21f).

(21) VARIOUS BASES WITH *-KHA*$^{\emptyset}$ PAUC

a. / *atapa -kha*$^{\emptyset}$ /
[*ata**pá** -kha*]
breed -PAUC

b. / ***á**fase -kha*$^{\emptyset}$ /
[*afa**sé** -kha*]
offend -PAUC

c. / ***séʔ**je -kha*$^{\emptyset}$ /
[*se**jé** -kha*]
cure -PAUC

d. / ***á**kheʔpa -kha*$^{\emptyset}$ /
[*akhe**pá** -kha*]
forget -PAUC

e. / ***á**kheʔpa -en -kha*$^{\emptyset}$ /
[*akhe**pá** **-en** -kha*]
forget -CAUS -PAUC

f. / ***á**kheʔpa -ye*$^{\emptyset}$ *-kha*$^{\emptyset}$ /
[*akhepa **-yé** -kha*]
forget -PASS -PAUC

The aspectual suffixes are followed by associated motion suffixes: the proximal *-ʔngi*$^{\emptyset}$ PROX and the distal *-ʔnga*$^{\emptyset}$ DIST. The aspectual suffixes *-ʔje*$^{\emptyset}$ IPFV and *-ʔñakha*$^{\emptyset}$ SMFC and the associated motion suffixes *-ʔngi*$^{\emptyset}$ PROX and *-ʔnga*$^{\emptyset}$ DIST begin with glottal stops (i.e. they are preglottalized). The preglottalized suffixes trigger special stress assignment: If the base to which they attach ends with a light syllable (a monophthong), stress falls two syllables to the left of the preglottalized suffix (22-25a-b). If the base ends with a heavy syllable (a diphthong), stress falls on the syllable which immediately precedes the preglottalized suffix (22-25c). This shows that in the presence of glottalization, stress assignment is weight-sensitive. Specifically, stress falls on the syllable which contains the second mora to the left of the glottal stop.[10]

10 When a preglottalized suffix attaches to a monosyllabic verb root, stress falls on the root syllable (ii).

WEIGHT-SENSITIVE STRESS ASSIGNMENT WITH PREGLOTTALIZED SUFFIXES

		fetha 'open'	*fûite* 'help'	*fûndûi* 'sweep'
(22)	*-ʔje*$^{\emptyset}$ IPFV	a. ***fé****tha-ʔje*	b. ***fû̂i****te-ʔje*	c. *fûn****dû̂i****-ʔje*
(23)	*-ʔñakha*$^{\emptyset}$ SMFC	a. ***fé****tha-ʔñakha*	b. ***fû̂i****te-ʔñakha*	c. *fûn****dû̂i****-ʔñakha*
(24)	*-ʔngi*$^{\emptyset}$ PROX	a. ***fé****tha-ʔngi*	b. ***fû̂i****te-ʔngi*	c. *fûn****dû̂i****-ʔngi*
(25)	*-ʔnga*$^{\emptyset}$ DIST	a. ***fé****tha-ʔnga*	b. ***fû̂i****te-ʔnga*	c. *fûn****dû̂i****-ʔnga*

The preglottalized suffixes are dominant, which means that they delete input stress and glottalization. In the output, only the glottal stop introduced by the preglottalized suffix is retained. Stress is assigned to the syllable which contains the second mora to the left of that glottal stop, regardless of whether the base is a stressless root (26a), a stressed root (26b), a glottalized root (26c-d), contains a recessive suffix (26e), or another dominant suffix (26f).

(26) VARIOUS BASES WITH *-ʔJE*$^{\emptyset}$ IPFV, *-ʔÑAKHA*$^{\emptyset}$ SMFC, *-ʔNGI*$^{\emptyset}$ PROX, OR *-ʔNGA*$^{\emptyset}$ DIST

a. / *atapa -ʔje*$^{\emptyset}$ /
[*a****tá****pa -ʔje*]
breed -IPFV

b. / ***á****fase -ʔñakha*$^{\emptyset}$ /
[*a****fá****se -ʔñakha*]
offend -SMFC

c. / ***séʔ****je -ʔngi*$^{\emptyset}$ /
[***sé****je -ʔngi*]
cure -PROX

d. / ***á****kheʔpa -ʔnga*$^{\emptyset}$ /
[*a****khé****pa -ʔnga*]
forget -DIST

e. / ***á****kheʔpa -en -ʔje*$^{\emptyset}$ /
[*akhe****pá*** ***-en*** *-ʔjen*]
forget -CAUS -IPFV

f. / ***á****kheʔpa -ye*$^{\emptyset}$ *-ʔñakha*$^{\emptyset}$ /
[*akhe****pá*** *-ye -ʔñakha*]
forget -PASS -SMFC

The imperfective suffix *-ʔje*$^{\emptyset}$ IPFV may be followed by an associated motion suffix *-ʔngi*$^{\emptyset}$ PROX or *-ʔnga*$^{\emptyset}$ DIST. Notably, in this configuration, the associated motion suffix optionally loses its preglottalization and stress falls on the syllable which contains the second mora before the imperfective *-ʔje*$^{\emptyset}$ IPFV (27). Here, an earlier dominant suffix wins over a latter one, contradicting strictly cyclic theories of dominance (Alderete, 1999; Inkelas and Zoll, 2007; Rolle, 2018). A morphological template of the A'ingae verb listing all of the suffixes, their domain, and their dominance status is given in Table 2 (Section 4.2).

(27) VARIOUS ROOTS WITH *-ʔJE*$^{\emptyset}$ IPFV AND *-ʔNGI*$^{\emptyset}$ PROX OR *-ʔNGA*$^{\emptyset}$ DIST

a. / *atapa -ʔje*$^{\emptyset}$ *-ʔngi*$^{\emptyset}$ /
[*a****tá****pa -ʔje -ngi*]
breed -IPFV -PROX

b. / ***á****fase -ʔje*$^{\emptyset}$ *-ʔnga*$^{\emptyset}$ /
[*a****fá****se -ʔje -nga*]
offend -IPFV -DIST

c. / ***séʔ****je -ʔje*$^{\emptyset}$ *-ʔngi*$^{\emptyset}$ /
[***sé****je -ʔje -ngi*]
cure -IPFV -PROX

d. / ***á****kheʔpa -ʔje*$^{\emptyset}$ *-ʔnga*$^{\emptyset}$ /
[*a****khé****pa -ʔje -nga*]
forget -IPFV -DIST

3.3 *Outer suffixes*

The outer suffixes (and clitics) expone proposition- (TP) and clause-level (CP) categories. Proposition-level categories include subject number (*-ʔfa* PLS), reality status (*-ya* IRR), polarity (*-mbi* NEG), and finiteness (*-ye* INF). Clause-level categories include clause type (subordinate: *-ʔta* IF.SS, *-ʔja* IF2.SS, *-ʔni* IF.DS, *-ʔma* FRST, *-saʔne* APPR; cosubordinate: *-pa* SS, *-si* DS; and matrix: *-ja* IMP, *-kha*$^{\emptyset}$ IMP2, *-ʔse* IMP3, *-jama*$^{\emptyset}$ PRHB, *-ʔya* VER), evidentiality (*=te* RPRT),[11] polar questions (*=ti* YNQ), and subject person agreement (*=ngi* 1, *=ki* 2, *=tsû* 3).

If stress has not been fixed within the inner domain (either as lexical or glottal-assigned stress), and there is at least one outer recessive suffix, stress is assigned to the last syllable of the inner domain. The inner domain is delimited with square brackets [ ] in the underlying form. (The surface form is enclosed by another

(ii) MONOSYLLABIC ROOTS WITH PREGLOTTALIZED SUFFIXES

a. ***kû̂i*** *-ʔje*$^{\emptyset}$
drink -IPFV

b. ***tû̂i*** *-ʔñakha*$^{\emptyset}$
rain -SMFC

c. ***án*** *-ʔngi*$^{\emptyset}$
eat -PROX

d. ***pá*** *-ʔnga*$^{\emptyset}$
die -DIST

11 The morphemes introduce with the equals sign (=) are matrix-clausal second-position clitics (Dąbkowski, to appear). As such, they can attach to constituents of any category. However, when encliticized to verbs, their phonological behavior is like that of regular outer suffixes. Thus, I group and discuss outer suffixes and second-position clitics together.

set of square brackets.) This stress might be confused for the default penultimate stress if there is only one monosyllabic outer suffix (28-29), but it is not penultimate if the outer suffix is polysyllabic (30a) or if there are multiple outer suffixes (30b-f). Crucially, unlike the stress assignment in the inner domain, this stress assignment is completely insensitive to the presence or absence of preglottalization on the outer suffix.

(28) STRESSLESS BASES WITH PLAIN OUTER SUFFIXES

a. / [*atapa*] *-ja* /
[*ata**pá*** *-ja*]
breed -IMP

b. / [*phi -ña*] *-si* /
[*phi **-ñá*** *-si*]
sit -CAUS -DS

c. / [*afe -ji*] *=ngi* /
[*afe **-jí*** *=ngi*]
give -PRCL =1

(29) STRESSLESS BASES WITH PREGLOTTALIZED OUTER SUFFIXES

a. / [*atapa*] *-ʔfa* /
[*ata**pá*** *-ʔfa*]
breed -PLS

b. / [*phi -ña*] *-ʔse* /
[*phi **-ñá*** *-ʔse*]
sit -CAUS -IMP3

c. / [*afe -ji*] *-ʔya* /
[*afe **-jí*** *-ʔya*]
give -PRCL -VER

(30) STRESSLESS BASES WITH PLAIN AND PREGLOTTALIZED OUTER SUFFIXES

a. / [*atapa*] *-saʔne* /
[*ata**pá*** *-saʔne*]
breed -APPR

b. / [*phi -ña*] *-ya =tsû* /
[*phi **-ñá*** *-ña =tsû*]
sit -CAUS -IRR =3

c. / [*afe -ji*] *-mbi -ʔma* /
[*afe **-jí*** *-mbi -ʔma*]
give -PRCL -NEG -FRST

d. / [*atapa*] *-ʔni =te* /
[*ata**pá*** *-ʔni =nde*]
breed -IF.DS =RPRT

e. / [*phi -ña*] *-ʔfa -ʔta* /
[*phi **-ñá*** *-ʔfa -ʔta*]
sit -CAUS -PLS -IF.SS

f. / [*afe -ji*] *-ʔfa -ya -mbi* /
[*afe **-jí*** *-ʔfa -ya -mbi*]
give -PRCL -PLS -IRR -NEG

Stress is assigned to the last syllable of the inner domain when the outer suffixes immediately follow the root (28-30a) as well as when inner suffixes intervene between the root and the outer suffixes (28-30b-c). Crucially, stress is assigned to the last syllable of the inner domain when the outer suffix is plain (i. e. non-preglottalized) (28), preglottalized (29), internally glottalized (30a), and with any combination of plain and (pre)glottalized suffixes (30b-f). To recapitulate, stress assignment in the outer domain is insensitive to glottalization.

Preexisting inner domain stress is retained. This is to say, if the verbal root has lexically specified glottalization and/or stress (31), or if stress has been assigned due to the presence of a preglottalized suffix within the inner domain (32), that stress (and glottalization) are preserved; stress is not reassigned to the last syllable of the inner domain.

(31) STRESSED ROOTS WITH OUTER SUFFIXES

a. / [***ká**ti*] *-ʔya* /
[***ká**ti* *-ʔya*]
cast -VER

b. / [***séʔ**je -an*] *-mbi* /
[***séʔ**ji -an* *-mbi*]
cure -CAUS -NEG

c. / [***á**kheʔpa -ji*] *-ye* /
[***á**kheʔpa -ji* *-ye*]
forget -PRCL -INF

d. / [***ká**ti*] *-ya -mbi* /
[***ká**ti* *-ya -mbi*]
cast -IRR -NEG

e. / [***séʔ**je -ji*] *-ʔfa -ye* /
[***séʔ**je -ji* *-ʔfa -ye*]
cure -PRCL -PLS -INF

f. / [***á**kheʔpa -en*] *-ya -ʔya* /
[***á**kheʔpa -en* *-ña -ʔña*]
forget -CAUS -IRR -VER

(32) INNER PREGLOTTALIZED SUFFIXES WITH OUTER SUFFIXES

a. / [*atapa -ʔngi*$^{\emptyset}$] *-ʔya* /
[*a**tá**pa -ʔngi* *-ʔya*]
breed -PROX -VER

b. / [***séʔ**je -ʔñakha*$^{\emptyset}$] *-mbi* /
[***sé**je -ʔñakha* *-mbi*]
cure -SMFC -NEG

c. / [***á**kheʔpa -ʔnga*$^{\emptyset}$] *-ye* /
[*a**khé**pa -ʔnga* *-ye*]
forget -DIST -INF

d. / [***á**fase -ʔje*$^{\emptyset}$] *-ya -mbi* /
[*a**fá**se -ʔje* *-ya -mbi*]
offend -IPFV -IRR -NEG

e. / [***séʔ**je -khu*$^{\emptyset}$ *-ʔje*$^{\emptyset}$] *-ʔfa* /
[*se**jé** -khu -ʔje* *-ʔfa*]
cast -RCPR -IPFV -PLS

f. / [***á**kheʔpa -en -ʔje*$^{\emptyset}$] *=tsû* /
[*akhe**pá** **-en** -ʔjen* *=tsû*]
forget -CAUS -IPFV =3

However, if stress (and glottalization) were deleted by a plain (i. e. non-preglottalized) dominant suffix within the inner domain, stress is assigned to the last syllable of the inner domain (33).

(33) Inner plain dominant suffixes with outer suffixes

a. / [***ká**ti -an -ye$^{\emptyset}$*] *=ki* /
[*kati -an* ***-ñé*** *=ki*]
cast -CAUS -PASS =2

b. / [***séʔ**je -khu$^{\emptyset}$ -ji*] *-ʔfa* /
[*seje -khu* ***-jí*** *-ʔfa*]
cure -RCPR -PRCL -PLS

c. / [***á**kheʔpa -ye$^{\emptyset}$*] *-ye* /
[*akhepa* ***-yé*** *-ye*]
forget -PASS -INF

d. / [***ká**ti -khu$^{\emptyset}$*] *-pa =ti* /
[*kati* ***-khú*** *-pa =ti*]
cast -RCPR -SS =YNQ

e. / [***séʔ**je -khu$^{\emptyset}$*] *-ʔfa -ya* /
[*seje* ***-khú*** *-ʔfa -ya*]
cure -RCPR -PLS -IRR

f. / [***á**kheʔpa -ye$^{\emptyset}$ -ji*] *-ʔfa -saʔne* /
[*akhepa -ye* ***-jí*** *-ʔfa -saʔne*]
forget -PASS -PRCL -PLS -APPR

Lastly, there are two dominant clause-level suffixes in the outer domain: the prohibitive *-jama*$^{\emptyset}$ PRHB and the imperative 2 *-kha*$^{\emptyset}$ IMP2. The outer dominant suffixes delete preexisting stress (if any) and reassign it to the syllable which immediately precedes them (34). Crucially, the stress deletion triggered by these two suffixes does not affect glottalization. Thus, despite the stress shift, glottal stops introduced by glottalized roots (35, 37), inner preglottalized suffixes (36, 38), and outer preglottalized suffixes (37-38) are retained. Observe that stress is reassigned to the syllable which immediately precedes the suffix and need not fall within the inner domain (37-38). A morphological template of the A'ingae verb listing all of the suffixes, their domain, and their dominance status is given in Table 2 (Section 4.2).

(34) Stressless and stressed bases with *-jama*$^{\emptyset}$ PRHB or *-kha*$^{\emptyset}$ IMP2

a. / [*atapa*] *-jama*$^{\emptyset}$ /
[*ata**pá*** *-jama*]
breed -PRHB

b. / [***á**fase*] *-kha*$^{\emptyset}$ /
[*afa**sé*** *-kha*]
offend -IMP2

c. / [***á**fase -an*] *-jama*$^{\emptyset}$ /
[*afa**si*** ***-án*** *-jama*]
offend -CAUS -PRHB

(35) Glottalized roots with *-jama*$^{\emptyset}$ PRHB or *-kha*$^{\emptyset}$ IMP2

a. / [***séʔ**je*] *-kha*$^{\emptyset}$ /
[*se**ʔjé*** *-kha*]
cure -IMP2

b. / [***á**kheʔpa*] *-jama*$^{\emptyset}$ /
[*akhe**ʔpá*** *-jama*]
forget -PRHB

c. / [***á**kheʔpa -en*] *-kha*$^{\emptyset}$ /
[*akhe**ʔpá -en*** *-kha*]
forget -CAUS -IMP2

(36) Inner preglottalized suffixes with *-jama*$^{\emptyset}$ PRHB or *-kha*$^{\emptyset}$ IMP2

a. / [***á**fase -ʔje$^{\emptyset}$*] *-jama*$^{\emptyset}$ /
[*afase* ***-ʔjé*** *-jama*]
offend -IPFV -PRHB

b. / [***séʔ**je -ʔje$^{\emptyset}$*] *-kha*$^{\emptyset}$ /
[*seje* ***-ʔjé*** *-kha*]
cure -IPFV -IMP2

c. / [***á**kheʔpa -ʔje$^{\emptyset}$*] *-jama*$^{\emptyset}$ /
[*akhepa* ***-ʔjé*** *-jama*]
forget -IPFV -PRHB

(37) (Glottalized roots and) outer preglottalized suffixes with *-jama*$^{\emptyset}$ PRHB or *-kha*$^{\emptyset}$ IMP2

a. / [***á**fase*] *-ʔfa -kha*$^{\emptyset}$ /
[*afase* ***-ʔfá*** *-kha*]
offend -PLS -IMP2

b. / [***séʔ**je*] *-ʔfa -jama*$^{\emptyset}$ /
[*seʔje* ***-ʔfá*** *-jama*]
cure -PLS -PRHB

c. / [***á**kheʔpa*] *-ʔfa -kha*$^{\emptyset}$ /
[*akheʔpa* ***-ʔfá*** *-kha*]
forget -PLS -IMP2

(38) Inner and outer preglottalized suffixes with *-jama*$^{\emptyset}$ PRHB or *-kha*$^{\emptyset}$ IMP2

a. / [***á**fase -ʔje$^{\emptyset}$*] *-ʔfa -jama*$^{\emptyset}$ /
[*afase -ʔje* ***-ʔfá*** *-jama*]
offend -IPFV -PLS -PRHB

b. / [***séʔ**je -ʔje$^{\emptyset}$*] *-ʔfa -kha*$^{\emptyset}$ /
[*seje -ʔje* ***-ʔfá*** *-kha*]
cure -IPFV -PLS -IMP2

c. / [***á**kheʔpa -ʔje$^{\emptyset}$*] *-ʔfa -jama*$^{\emptyset}$ /
[*akhepa -ʔje* ***-ʔfá*** *-jama*]
forget -IPFV -PLS -PRHB

As a final comment, secondary stress in A'ingae falls on every other syllable counting from the primary stress (39a). Secondary stress is marked with the grave accent (`) and **boldface**. If there is an odd number of posttonic syllables, stress clash is avoided in favor of a disyllabic immediately posttonic lapse (39b). If primary stress is later in the word, there is alternating secondary stress to the left as well (39c).

(39) Secondary stress

a. (***á**fa*) (*-**yà**-mbi*) (*=**tì**=ki*)
speak -IRR-NEG =YNQ=2

b. (***á**fa-ʔ*)*fa* (*-**yà**=mbi*)
speak-PLS -IRR=NEG

c. (***à**kheʔ*) (***pà**-ʔje*) (*-**ʔfá**-ja*)*ma*
forget -IPFV -PLS-PRHB

I assume that secondary stress is assigned at the very end of the derivation of morphologically complex verbs. Since secondary stress is entirely predictable and does not interact with the factors responsible for primary stress assignment, the distribution of glottal stops, or anything else discussed in this paper, it will not be transcribed in the following examples.

3.4 *Central generalizations*

From the data presented above emerge two central generalizations which need to be captured by any successful account of A'ingae glottalization. In the following section, I argue that the architecture of Cophonologies by Phase (Sande, Jenks, and Inkelas, 2020) rises to the task. A summary table of all the A'ingae suffixes, their morphophonological domain, and their dominance status is given in Table 2 (Section 4.2).

First, whether glottalization triggers stress assignment correlates with whether stress-deleting suffixes also delete glottalization. Within the inner domain, glottalization has an effect on stress, i. e. stress is assigned to the syllable containing the second mora to the left of the glottal stop (7-8d-f, 22-27), and stress-deleting suffixes introduced within the inner domain also delete glottalization (16-18, 21). In the outer domain, glottalization has no effect on stress (28-33)—and neither does stress deletion have any effect on glottalization (34-38). This generalization is restated in (40).

(40) STRESS ASSIGNMENT/DELETION × GLOTTALIZATION INTERACTION
For a given morphophonological domain, glottalization introduced in that domain interacts with stress (i. e. assigns stress to the syllable which contains the second mora to the left of the glottal stop) if and only if stress deletion interacts with glottalization (i. e. also causes the deletion of glottalization).

Thus, we see that glottalization depends on stress within the inner domain (it requires metrical structure and is deleted whenever metrical structure is deleted), but not in the outer domain. Since primary stress is *culminative*, i. e. there can be only one primary stress, and glottalization depends on primary stress within the inner domain, glottalization within the inner domain is also culminative (i. e. there can be at most one glottal stop in the inner domain). In the outer domain, glottalization is not culminative because at that stage of the derivation, it is no longer dependent on main stress.

Second, upon controlling for preglottalization and the morphophonological domain, the variation among the phonological processes triggered by particular suffixes reduces to the parameter of dominance (i. e. whether a suffix is stress-preserving or stress-deleting). This is to say, despite the fact that the inner plain dominant suffixes, the inner preglottalized dominant suffixes, and the outer dominant suffixes all have different effects on stress and glottalization, only one property is needed to fully characterize their behavior: they delete stress. The deletion of stress may be accompanied by the deletion of glottalization and stress reassignment to the syllable which contains the second mora to the left of the suffix (if the stress-deleting suffix is inner and preglottalized), by stress reassignment to the last syllable of the previously spelled-out domain (if the stress-deleting suffix is outer), or by the deletion of glottalization and no stress reassignment (if the stress-deleting suffix is inner and plain, i. e. not preglottalized). However, the differences in the impact a suffix has on glottalization and stress assignment (or lack thereof) follow from independent factors (i. e. preglottalization and their morphophonological domain). This generalization is restated in (41).

(41) DOMINANCE AS THE ONLY LEXICAL PARAMETER
Upon controlling for preglottalization and the morphophonological domain, dominance is the only parameter needed to account for differences in the phonological processes triggered by particular suffixes.

If stress (and glottalization) are deleted by a plain dominant suffix introduced in the inner domain, the output form is stressless. Later, stress is assigned in accordance with a generalization independently attested in that domain, i. e. to the right edge of the inner domain if there are outer suffixes (33), or to the penultimate syllable of the word if there are no outer suffixes (16-18, 21). (In other words, stress is rightmost within the inner domain, but not final in the word.)

If stress (and glottalization) are deleted by a preglottalized dominant suffix introduced in the inner domain, stress is reassigned in accordance with a generalization independently attested in that domain, i. e. to the syllable which contains the second mora to the left of the glottal stop (in this case, of the preglottalized dominant suffix) (26-27).

If stress is deleted by a dominant suffix introduced in the outer domain, stress is reassigned in accordance with a generalization independently attested in that domain, i. e. to the immediate left of the outer domain suffix (34-38).

Thus, the only morpheme-specific property of dominant suffixes is that they delete stress. Whether glottalization also undergoes deletion and whether and where stress is reassigned after it is deleted depends on the phonological grammar of their domain and the presence or absence of preglottalization.

Table 1 summarizes the outputs for each combination of a major root and suffix type.[12] The bracketed schemata are outputs of a given suffix's cycle, not surface forms. As such, some of them remain stressless. Metrical feet are shown only when they are constructed due to the presence of a glottal stop.

SUFFIX \ ROOT	STRESSLESS	STRESSED	GLOTTALIZED
N/A	/σσσ/ → [σσσ]	/**σ́**σσ/ → [**σ́**σσ]	/(**σ́**σʔ)σ/ → [(**σ́**σʔ)σ]
INNER RECESSIVE	/σσσ -σ/ → [σσσσ]	/**σ́**σσ -σ/ → [**σ́**σσσ]	/(**σ́**σʔ)σ -σ/ → [(**σ́**σʔ)σσ]
INNER DOMINANT	/σσσ -σ$^{\emptyset}$/ → [σσσσ]	/**σ́**σσ -σ$^{\emptyset}$/ → [σσσσ]	/(**σ́**σʔ)σ -σ$^{\emptyset}$/ → [σσσσ]
PREʔ INNER DOM	/σσσ -ʔσ$^{\emptyset}$/ → [σ(**σ́**σʔ)σ]	/**σ́**σσ -ʔσ$^{\emptyset}$/ → [σ(**σ́**σʔ)σ]	/(**σ́**σʔ)σ -ʔσ$^{\emptyset}$/ → [σ(**σ́**σʔ)σ]
OUTER RECESSIVE	/σσσ -σ/ → [σσ**σ́**σ]	/**σ́**σσ -σ/ → [**σ́**σσσ]	/(**σ́**σʔ)σ -σ/ → [(**σ́**σʔ)σσ]
PREʔ OUTER REC	/σσσ -ʔσ/ → [σσ**σ́ʔ**σ]	/**σ́**σσ -ʔσ/ → [**σ́**σσʔσ]	/(**σ́**σʔ)σ -ʔσ/ → [(**σ́**σʔ)σʔσ]
OUTER DOMINANT	/σσσ -σ$^{\emptyset}$/ → [σσ**σ́**σ]	/**σ́**σσ -σ$^{\emptyset}$/ → [σσ**σ́**σ]	/(**σ́**σʔ)σ -σ$^{\emptyset}$/ → [σσʔ**σ́**σ]

Table 1: Summary table of root-suffix interaction.

4 ANALYSIS

In this section, I analyze the A'ingae data in Cophonologies by Phase (henceforth CbP; Sande, 2017, 2019; Sande and Jenks, 2018; Sande, Jenks, and Inkelas, 2020), a generative model of the phonology-syntax interface. Section 4.1 introduces the framework. Section 4.2 lays out the morphophonological structure of the A'ingae verb. Section 4.3 presents an analysis of the *inner* cophonology, which captures the phonological grammar of the A'ingae verbal roots and recessive suffixes in the inner morphological domain. Section 4.4 presents an analysis of the *dominant* cophonology and its interactions with the *inner* cophonology, which captures the phonological operations triggered by inner dominant suffixes, including the preglottalized ones. Section 4.5 presents an analysis of the *outer* cophonology and its interactions with the *dominant* cophonology, which captures the phonological grammar of the outer suffixes, both recessive and dominant.

4.1 *Cophonologies by Phase*

Cophonologies by Phase (Sande, 2017, 2019; Sande and Jenks, 2018; Sande, Jenks, and Inkelas, 2020) is a model of the phonology-syntax interface which combines *cophonologies*, or morpheme-specific phonological grammars (Anttila, 1997, 2002, 2009; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Orgun, 1996), with cyclic syntactic architecture (Abels, 2012; Bošković, 2014; Chomsky, 2001).

Following Distributed Morphology (Halle and Marantz, 1994), Cophonologies by Phase assumes that *vocabulary items* are mappings between morphosyntactic features and phonological features. Furthermore,

12 Note that Table 1 is not a complete summary of all the interactions discussed in this section. For example, it does not show schemata for monosyllabic, disyllabic, diphthong-final, or glottal alternating roots, or for forms with more than one suffix.

CbP proposes an enriched representation of the phonological component: In addition to segmental content and prosodic subcategorization frame, vocabulary items may specify a subranking of constraints which partially overrides the language's default phonological grammar (Sande, Jenks, and Inkelas, 2020).[13]

Cophonologies by Phrase proposes that phonological evaluation applies to phases. Thus, CbP departs from the assumptions of classic Cophonology Theory (Anttila, 1997; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Orgun, 1996; others), where every affix triggers a phonological cycle. The cophonologies of all the morphosyntactic features within a phase are compiled (including phase head and vocabulary item features) and added to the default phonology of the language (the *master* ranking; Anttila, 2002; Inkelas and Zoll, 2005, 2007), forming a cumulative ranking specific to that phase. Upon merging a phase head, spell-out is triggered and the phase is phonologically evaluated against that cumulative ranking. After spell-out, the phonology resets to the default (*master*) ranking. Thus, phonological rankings associated with morphosyntactic features scope at most over the phase in which they are introduced (Sande, Jenks, and Inkelas, 2020).

For example, the default (*master*) phonology of a toy language ranks the constraint A above B and B above C (42a). Phonological rankings are introduced with a fraktur font $\mathfrak{R}$. Asp, the head of the functional Aspectual Projection (AspP), ranks B above A (42b). The imperfective morphosyntactic feature IPFV ranks C above A (42c). The preculminative feature PRCL does not call for a deviation from the *master* ranking (42d).

(42) PHONOLOGICAL RANKINGS IN A TOY LANGUAGE

a. *master* $\longleftrightarrow$ { $\mathfrak{R}$: A $\gg$ B $\gg$ C }

b. Asp $\longleftrightarrow$ { $\mathfrak{R}$: B $\gg$ A }

c. IPFV $\longleftrightarrow$ { $\mathfrak{R}$: C $\gg$ A }

d. PRCL $\longleftrightarrow$ { $\mathfrak{R}$: n/a }

Following Bošković (2016), I assume that phase heads are spelled out together with their complements. In the toy language, Asp is a phase head. Thus, it triggers the spell-out and phonological evaluation of AspP (43). F stands for a generic Feature head and FP for a Feature Projection. Domains of phonological evaluation are represented with arcs.

(43) CUMULATIVE RANKINGS WITH PHASE-BASED SPELL-OUT

The constraint ranking during the phonological evaluation of a phase depends on the features present in that phase. I assume that when the default *master* ranking and a feature-specific ranking are in conflict, the latter overrides the former. Thus, in (43a), the phase head Asp reranks B above A. The preculminative feature PRCL does not alter the phonological ranking in any way. Thus, the phonological ranking at the spell-out of (43a) is B $\gg$ A $\gg$ C. In (43b), the phase head Asp ranks B above A and the imperfective feature IPFV reranks C above A. Thus, the phonological ranking at the spell-out of (43b) is { B, C } $\gg$ A.[14]

13 Constraint rankings potentially lead to paradoxes or unresolvable conflicts if different morphosyntactic features specify different cophonologies. For this reason, Sande, Jenks, and Inkelas (2020) adopt a weighted constraint grammar, with morpheme-specific weight adjustments, rather than rankings. To model morphophonological phenomena with two triggers, Sande (2020) adopts weighted constraints so that two weight increments on one constraint can gang up whenever both are introduced in the same phase. Since these problems do not arise in the fragment of the A'ingae grammar I analyze, I adopt rankings for simplicity.

14 In a ranked-constraint grammar, there may be more than one way to resolve two partial constraint rerankings. For example, given a *master* ranking A $\gg$ B $\gg$ C, the rerankings B $\gg$ A and C $\gg$ A could yield either B $\gg$ C $\gg$ A or C $\gg$ B $\gg$ A. The problem does not arise if one adopts a weighted-constraint model of the grammar instead, as in Sande, Jenks, and Inkelas (2020).

4.2 *The structure of a verb*

Cophonologies by Phase allows for the association of different phonological rankings to phase heads as well as individual morphosyntactic features. As such, CbP naturally captures the stratal organization of A'ingae morphophonological domains, while allowing for morpheme-specific dominance effects. I propose that the phonological grammar of the inner morphophonological domain is modeled by associating lower phrase heads with an *inner* cophonology. The phonological grammar of the outer morphophonological domain is modeled by associating higher phase heads with an *outer* cophonology. Finally, the deletion of stress (and glottalization) triggered by dominant suffixes is modeled by associating individual dominant suffixes with a *dominant* cophonology.

Specifically, I propose that there are four phase heads along the verbal spine which may be spelled out during the derivation. The projections of those heads do not correlate in any obvious way to prosodic categories, such as a word or a phrase. The first two heads are the verbal categorizing head *v* and the aspectual head Asp. (Note that AspP hosts verbal deixis in addition to aspectual features.) The heads *v* and Asp are associated with the *inner* cophonology. The *v*P projection (the first phase) contains only the verbal root and optionally the causative suffix *-ña*/*-an*/*-en* CAUS (for analyses of *v* as a phase head, see Chomsky, 2001; Embick, 2010). I treat the causative *-ña*/*-an*/*-en* CAUS as a verbalizing head because it is the only suffix capable of deriving verbs from nouns (and precategorial roots) (44).

(44) VERBS DERIVED WITH *-ÑA*/*-AN*/*-EN* CAUS

a. ***tsáuʔ***_ña_
tsáuʔ *-ña*
house -CAUS
"build a house"

b. ***sín***_a_
sín *-ña*
black -CAUS
"blacken"

c. ***sá***_pian_
sá_pe_ *-an*
flat -CAUS
"smash"

d. ***tsáuʔ***_paen_
tsáuʔ_pa_ *-en*
nest -CAUS
"nestle"

The AspP projection constitutes the second phase—it contains the other two voice suffixes as well as the verbal inflectional associated motion and aspectual suffixes. The treatment of the aspectual projection as a phase is non-standard. However, aspect has been proposed to be a phase head in, for example, Nez Perce (Deal and Wolf, 2017) and Muskogee (Guekguezian, 2021).[15] Furthermore, there is clear evidence for AspP as a morphosyntactic constituent in the grammar of A'ingae: The suffixes within the AspP can attach only to morphological verbs (45a-b), while suffixes outside of the AspP (e. g. in TP) can also attach to nominal predicates (45c-d).

(45) ASPP SUFFIXES LICIT ON VERBS, NOT NOUNS

a. _pan_***zá*** *-ji*
hunt -PRCL
"about to hunt"

b. ****tsá***_ndie_ *-ji*
man -PRCL
intended: "about to be a man"

c. _pan_***zá*** *-ʔfa*
hunt -PLS
"(they) hunted"

d. ***tsá***_ndie_ *-ʔfa*
man -PLS
"(they) are men"

Diagnostics for distinguishing the TP-internal morphemes from CP-internal morphemes include infinitival matrix clauses and nominalizations formed with the subordinating nominalizer *-ʔchu* SBRD. First, A'ingae matrix clauses may be either TP or CP projections (Dąbkowski, to appear). The second-position clitics (xi-xii in Table 2) may appear in finite (46a), but not infinitival matrix clauses (46b). Assuming that finite matrix clauses may project CP, but infinitival matrix clauses lack the CP layer, this shows that A'ingae second-position clitics are licensed only in matrix CPs.

Since partial ranking indeterminacy does not affect the analysis proposed in this paper, I adopt ranked constraints for simplicity. If desired, the analysis could be straightforwardly recast with weighted constraints.

15 One may speculate that the rarity of evidence for certain projections as phase heads could in part be due to the relative paucity of phase-oriented research on morphologically complex languages.

(46) CP CLITICS LICIT IN FINITE, NOT INFINITIVAL, MATRIX CLAUSES

a. ***ñá***(=*ngi*) *pan**zá**-ya*
   1SG=1 hunt-IRR
   "I will hunt." (distant/uncertain future)

b. ***ñá***(*=*ngi*) *pan**zá**-ye*
   1SG=1 hunt-INF
   "I will hunt." (proximate/certain future)

Second, the subordinating nominalizer *-ʔchu* SBRD takes TPs as its complements. Thus, it may co-occur with TP-internal (47a-b), but not CP-internal (47a-b), morphology.

(47) TP, NOT CP, SUFFIXES LICIT IN *ʔCHU*-NOMINALIZATIONS

a. *pan**zá** -ya -ʔchu*
   hunt -IRR -SBRD

b. *pan**zá** -ʔfa -ʔchu*
   hunt -PLS -SBRD

c. **pan**zá** -ʔta -ʔchu*
   hunt -IF.SS -SBRD

d. **pan**zá** -jama -ʔchu*
   hunt -PRHB -SBRD

The heads T and C are associated with the *outer* cophonology. The TP projection constitutes the third phase—it contains morphology typically associated with the inflected predicate, including subject plurality, reality status, polarity, and finiteness. The treatment of T as a phase head is non-standard. However, it has been argued for—again—in, e. g., Nez Perce (Deal, 2016). Moreover, A'ingae shows obligatory WH-movement. The WH-containing constituent must appear in the position which immediately precedes the second-position clitic (Dąbkowski, 2022). If embedded in a nonfinite TP, the WH-word may be extracted (48a) but it may also pied-pipe the entire TP (48b). Second-position clitics are circled (◯). Thus, assuming that only phases can undergo pied-piping (Abels, 2012, p. 73), A'ingae TPs are demonstrably phasal.

(48) OPTIONAL PIED-PIPING OF TP (Dąbkowski, 2022, p. 5)

a. *jun**gué**sû=ma* =*ki* ***ñá*** ***ké***=*nga* *a**fé**-ye* ***ín*ʔ***jan?*
   what=ACC =2 1SG 2SG=DAT give-INF want
   "What do you want me to give you?"

b. *jun**gué**sû=ma* ***ñá*** ***ké***=*nga* *a**fé**-ye* =*ki* ***ín*ʔ***jan?*
   what=ACC 1SG 2SG=DAT give-INF =2 want
   "What do you want me to give you?"

Finally, The CP projection (the last phase) contains morphology typically associated with full clauses, including clause type, evidentiality, interrogative force, mood, etc.

Across the four phases (*v*P, AspP, TP, CP), certain suffixes are stress-deleting—these are associated with the *dominant* cophonology. There is no predictor of which suffixes are dominant. The mappings between phase heads and morphosyntactic features on one hand, and cophonologies on the other, are summarized in (49).[16] The complete morphological template of the A'ingae verb is given in Table 2. The verbal root is at the bottom; the closer a suffix is to the root, the lower it is in the template, mimicking the orientation of a syntactic tree.

(49) FEATURE-COPHONOLOGY MAPPINGS IN A'INGAE

a. v, Asp $\longleftrightarrow$ { $\mathfrak{R}$: *inner* }

b. T, C $\longleftrightarrow$ { $\mathfrak{R}$: *outer* }

c. RCPR, IPFV, PRHB, ... $\longleftrightarrow$ { $\mathfrak{R}$: *dominant* }

I assume that AspP and CP layers do not undergo spell-out if they do not introduce any new phonologically overt suffixes (*pruning* in Embick, 2015). The TP layer does not undergo spell-out if it does not introduce any new phonologically overt suffixes, unless it is the last phasal projection (i. e. unless the CP layer is absent). In Table 2, this is represented by parenthesizing the AspP, TP, and CP phases. Thus, at maximum, one verb may undergo up to four phonological evaluations. This happens when each of the four phases introduces new segmental material (50a). At a minimum, each verb undergoes two phonological evaluations. This happens even if the verb consists only of a bare root (50b).

16 While the T and C heads associated with the *outer* cophonology are higher than the v and Asp heads associated with the *inner* cophonology, CbP's architecture does not prevent there from being a language with *inner* and *outer* cophonologies in alternate phases (e. g. *inner*, *outer*, *inner*, *outer*). Moreover, CbP's formalism does not restrict the number of phonologies that may exist in one language. For an argument again imposing such restrictions as part of a phonological formalism, see Inkelas and Zoll (2007).

(CP ⟷ { 𝔑: *outer* })

(xii) SUBJECT PERSON: *=ngi* 1, *=ki* 2, *=tsû* 3

(xi) SENTENCE-LEVEL: *=te* RPRT, *=ti* YNQ

(x) CLAUSE TYPE

SUBORDINATE: *-ʔta* IF.SS, *-ʔja* IF2.SS, *-ʔni* IF.DS, *-ʔma* FRST, *-saʔne* APPR

COSUBORDINATE: *-pa* SS, *-si* DS

MATRIX: *-ja* IMP, *-kha*$^{\emptyset}$ IMP2, *-ʔse* IMP3, *-jama*$^{\emptyset}$ PRHB, *-ʔya* VER

(TP ⟷ { 𝔑: *outer* })

(ix) FINITENESS: *-ye* INF

(viii) POLARITY: *-mbi* NEG

(vii) REALITY: *-ya* IRR

(vi) SUBJECT NUMBER: *-ʔfa* PLS

(AspP ⟷ { 𝔑: *inner* })

(v) ASSOCIATED MOTION: *-ʔngi*$^{\emptyset}$ PROX, *-ʔnga*$^{\emptyset}$ DIST

(iv) ASPECT: *-ʔje*$^{\emptyset}$ IPFV, *-ji* PRCL, *-kha*$^{\emptyset}$ PAUC, *-ʔñakha*$^{\emptyset}$ SMFC

(iii) PASSIVE: *-ye*$^{\emptyset}$ PASS

(ii) RECIPROCAL: *-khu*$^{\emptyset}$ RCPR

*v*P ⟷ { 𝔑: *inner* }

(i) CAUSATIVE: *-ña/-an/-en* CAUS

(0) VERBAL ROOT: √

LEGEND

∅ ⟷ { 𝔑: *dominant* }

plain inner dominant

preglottalized inner dominant

outer dominant

Table 2: Morphophonological template of the A'ingae verb (building on Dąbkowski, 2021b).

(50) a. AT MOST FOUR PHONOLOGICAL EVALUATIONS PER VERB

[[[[***indi*** ***-ân***]$_{vP}$ *-khu* *-ʔje* *-ngi*]$_{\text{AspP}}$ *-ʔfa* *-ya*]$_{\text{TP}}$ *-ʔni* *=nde*]$_{\text{CP}}$
be fermented -CAUS -RCPR -IPFV -PROX -PLS -IRR -IF.DS =RPRT

"allegedly$_{\text{RPRT}}$ if$_{\text{IF}}$ (they$_{\text{PLS}}$) will$_{\text{IRR}}$ come$_{\text{PROX}}$ to be$_{\text{IPFV}}$ fermenting$_{\text{CAUS}}$ among themselves$_{\text{RCPR}}$, (someone else$_{\text{DS}}$) ..."

b. AT LEAST TWO PHONOLOGICAL EVALUATIONS PER VERB

[[***kúʔfe***]$_{vP}$]$_{\text{TP}}$
play

"played"

I assume that morphologically complex verbs are created via head movement and that syntax and phonology proceed cyclically. This is to say, the verbal head of each phase undergoes phonological evaluation before further movement up the verbal spine. This marks a departure from the assumptions of Sande, Jenks, and Inkelas (2020), where head movement precedes phonological evaluation. (If Sande, Jenks, and Inkelas's assumptions were adopted, only one spell-out per a morphologically complex verb would be possible.)

4.3 *The inner cophonology*

In this section, I analyze the *inner* cophonology, which captures the phonological grammar of the A'ingae verbal roots and recessive suffixes in the inner morphological domain. The *inner* cophonology is active at the spell-out of *v*P, which contains the root and the causative suffix, as well as AspP, which contains other voice, aspectual, and associated motion morphology.

Recall from Section 3.1 that A'ingae verb roots can be divided into three broad classes: stressless, stressed, and glottalized. First, I will consider the stressless roots. Stressless roots do not have underlying stress or glottalization. I propose that stress is not assigned to stressless roots within the inner morphophonological domain (53). Thus, stressless roots remain stressless even after spell-out. This is modeled with DEPENDENCE(FOOT) (51), which prevents the construction of new metrical structure. DEPENDENCE(FOOT) outranks all constraints favoring candidates which innovate stress, including PARSESYLLABLES (52).

(51) DEPENDENCE(FOOT), or: DEPF
For every metrical foot in the output, there is a metrical foot in the input.

(52) PARSESYLLABLES, or: PRSσ
Assign a violation mark for each unfooted syllable in the output.

Metrical feet are delimited with parentheses ( ). In the tableaux, the first row states which phase is being spelled out and lists the cophonologies present during its phonological evaluation. Roots are first subject to spell-out in the *v*P phase associated with the *inner* cophonology, hence *v*P : *inner*. Finally, A'ingae footing is trochaic. Hence, the tableaux do not explicitly consider candidates with iambic feet.

		*v*P : *inner*	
(53)	a. *afe*	DEPF ⟫	PRSσ
☞ i.	*afe*		∗∗
ii.	*(áfe)*	∗!	
	give		

	*v*P : *inner*	
b. *atapa*	DEPF ⟫	PRSσ
☞ i. *atapa*		∗∗∗
ii. *(áta)pa*	∗!	∗
breed		

Observe that the outputs of (53) differ from the surface forms given in Section 3, which showed that stressless bases have stress assigned to the right edge of the inner domain if there are outer suffixes, or to the penultimate syllable of the word if there are no outer suffixes. I propose that this stress assignment takes place in the outer domain, targeting the stressless outputs of the inner domain.

Now I will consider the stressed roots. I propose that the underlying form of stressed roots contains metrical structure. (For other accounts which postulate underlying metrical structure, see Alderete, 1999; Caballero, 2011; Rolle, to appear). Faithfulness to input metrical structure is modeled with MAXIMALITY(FOOT) (54).

(54) MAXIMALITY(FOOT), or: MAXF
For every metrical foot in the input, there is a corresponding metrical foot in the output.

MAXIMALITY(FOOT) ensures that underlying metrical structure is retained in the output (55). MAXIMALITY(FOOT) outranks all constraints which favor candidates deviating from input stress (e. g. PHASEANTIMAXIMALITY(FOOT{}) (72) to be introduced in Section 4.4). In the tableaux below, these constraints are shown schematically with ellipsis (…).

(55)

a. (***ká**ti*)	*v*P : *inner* Maxf ≫	...
i. *kati*	*!	
☞ ii. (***ká**ti*)		*
iii. *ka*(***tí***)	*!	

cast

b. (***á**fa*)*se*	*v*P : *inner* Maxf ≫	...
i. *afase*	*!	
☞ ii. (***á**fa*)*se*		*
iii. *a*(***fá**se*)	*!	

offend

Finally, I consider the glottalized roots. In glottalized roots, the position of glottalization is predictable. In disyllabic roots, glottalization surfaces in the rime of the first syllable. In trisyllabic roots, glottalization surfaces in the rime of the second syllable. Moreover, all glottalized roots have word-initial stress.

To model the A'ingae glottal stop data, I propose that within the inner morphological domain in A'ingae, the glottal stop *ʔ* is a facultative feature of the metrical foot (56). As such, it exists on the metrical tier and requires a metrical foot to surface. For similar analyses of glottalization as a prosodic feature, see Bradley (1970), Firth (1948), Penner (2019), and Pike and Small (1974).

(56) Glottal stop as feature of the metrical foot in the inner domain

a. (× . ʔ) .
***á** khe pa*
forget

b. . (× . ʔ).
*a **tá** pa je*
breed IPFV

c. . (× ʔ .)
*fû **ndûi** ngi*
sweep PROX

The constraint which captures this position of the glottal stop in the A'ingae feature geometry is Foot{ʔ} (57). Since the glottal stop is a feature of metrical foot, it needs to a metrical foot to surface, but its exact position with the foot is determined through a ranking of different constraints.

(57) Foot{ʔ}, or: f{ʔ}
The glottal stop is a facultative feature of the metrical foot. Assign a violation mark for every stray glottal stop outside of a metrical foot.

Assuming that stress is an obligatory correlate of metrical structure in A'ingae, then if glottalization is a feature of metrical structure, it will always coocur with stress. Thus, Foot{ʔ} captures the fact that all glottalized roots are stressed. Since stress and the position of glottalization are fully predictable in roots, I propose that neither need be underlyingly specified. As such, the underlying forms of glottalized roots will be represented simply as /*root*,ʔ/. (For a similar treatment of glottalization in Mixtec, see Macaulay and Salmons, 1995).

The position of glottalization and stress in glottalized roots is derived through the interaction of several constraints: Maximality(ʔ) (58) ranks above Dependence(Foot), which ensures that in order to comply with Foot{ʔ}, supplying feet in the output is preferred to deleting the glottal stop. Align(ʔ-R, Foot-R) (59) favors the right-alignment of metrical feet with glottal stops. However, Align(ʔ-R, Foot-R) is outranked by NonFinality(ʔ) (60), which ensures that glottal stops never appear word-finally.

(58) Maximality(ʔ), or: Maxʔ
For every glottal stop in the input, there is a corresponding glottal stop in the output.

(59) Align(ʔ-R, Foot-R), or: Alʔ
Every glottal stop is right-aligned with a metrical foot.

(60) NonFinality(ʔ), or: NFʔ
A glottal stop is not final in a prosodic word.

This ranking correctly derives the position of stress and glottalization in disyllabic (61) and trisyllabic (62) glottalized roots. When glottalization is a metrical feature, this is represented with an $\underbrace{\text{underbrace}}$ which spans the foot and encloses the glottal stop. Thus, when glottalization is a facultative feature of a metrical foot, the underbrace spans the entire foot which contains glottalization.

(61)	*seje,ʔ*	*v*P : *inner* f{ʔ},	Maxʔ,	NFʔ ⟫	Depf,	Alʔ)
i.	*seje*		*!			
ii.	*seje,ʔ*	*!				*
☞ iii.	(***séʔ**je*)				*	*
iv.	(***sé**jeʔ*)			*!	*	
	cure					

(62)	*akhepa,ʔ*	*v*P : *inner* f{ʔ},	Maxʔ,	NFʔ ⟫	Depf,	Alʔ)
i.	*akhepa*		*!			
ii.	*akhepa,ʔ*	*!				*
iii.	(***áʔ**khe*)*pa*				*	*!
☞ iv.	(***á**kheʔ*)*pa*				*	
v.	*a*(***khéʔ**pa*)				*	*!
vi.	*a*(***khé**paʔ*)			*!	*	
	forget					

The position of glottalization in the glottalized roots which alternate between the monosyllabic (C)VVʔ and the disyllabic (C)V.ʔV is a matter of cyclic phonological evaluation: If a suffix is present within the *v*P cycle, the root is realized as (C)VVʔ, and as (C)V.ʔV otherwise.

When an alternating root is uninflected, it undergoes phonological evaluation by itself. The output is a disyllabic (C)V.ʔV, which avoids violating the high-ranking NonFinality(ʔ) (63). (This analysis builds on Repetti-Ludlow et al.'s (2019), who propose that glottalization is underlyingly word-final and undergoes metathesis to avoid non-finality, e. g. /*tsauʔ*/ → [*tsaʔu*] 'house.') The following tableaux are abbreviated, showing only the constraints and candidates relevant to the discussion at hand.

(63)	*kûi,ʔ*	*v*P : *inner* f{ʔ},	NFʔ ⟫	Alʔ)
i.	*kûi,ʔ*	*!		*
ii.	(***kû́iʔ***)		*!	
☞ iii.	(***kû́**.ʔi*)			*
iv.	(***kû́**.iʔ*)		*!	
	drink			

The root and the causative -*ña*/-*an*/-*en* caus are spelled out within the same cycle. This is to say, the root does not undergo phonological evaluation before the attachment of -*ña*/-*an*/-*en* caus. As such, the glottal stop in the input has not been linearized. ParseSyllables outranks Align(ʔ-R, Foot-R), favoring candidates with fewer unparsed syllables. With the attachment of -*ña*/-*an*/-*en* caus, the root now precedes a CV sequence, so there is no risk of violating NonFinality(ʔ). Thus, the form of the root in the output, where the glottal stop is linearized, is the monosyllabic (C)VVʔ (64).

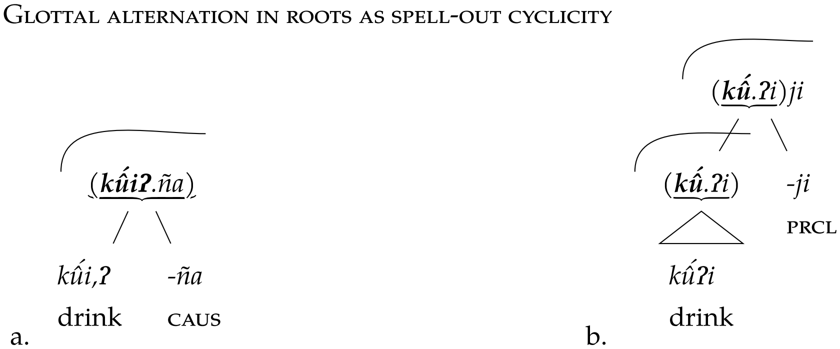
		*v*P : *inner*			
(64)	*kûi,ʔ-ña*	f{ʔ},	NFʔ,	Prsσ ≫	Alʔ)
i.	*kûi.ña,ʔ*	*!		*!*	
ii.	*(**kû́**.ʔi)ña*			*!	*
iii.	*(**kû́**.iʔ)ña*			*!	
☞ iv.	*(**kû́iʔ**.ña)*				*
v.	*(**kû́i**.ñaʔ)*		*!		
	drink-caus				

Other morphemes attach after the root's phonological evaluation at *v*P spell-out. Thus, their base contains glottalization which has previously been linearized. Previously spelled-out material in the input is represented with square brackets [ ]. Linearity(ʔ) (65) outranks ParseSyllables, preventing glottal metathesis.[17] Thus, alternating roots suffixed with *v*P-external morphology surface as disyllabic (C)V.ʔV (66). The derivations of (64) and (66) are represented as trees in (67a) and (67b), respectively.

(65) Linearity(ʔ), or: Linʔ
For every precedence relationship of a glottal stop in the input, the same precedence relationship persists in the output.

		AspP : *inner*			
(66)	*[(**kû́**.ʔi)]-ji*	f{ʔ},	Linʔ ≫	Prsσ ≫	Alʔ)
i.	*kûi.ji,ʔ*	*!	*	**	*
☞ ii.	*(**kû́**.ʔi)ji*			*	*
iii.	*(**kû́**.iʔ)ji*		*!	*	
iv.	*(**kû́iʔ**.ji)*		*!		*
	drink-prcl				

(67) Glottal alternation in roots as spell-out cyclicity



Recessive suffixes introduced in the inner morphological domain are subject to the same phonological grammar as roots, including a high ranking of Maximality(Foot), Maximality(ʔ) ≫ Dependence(Foot). As

17 I assume that non-linearized glottal stops do not have precedence relationships. Thus, the winning candidate in (64) does not incur any violations of Linearity(ʔ).

such, when a stressless root is spelled out with a recessive suffix, the output is stressless (68-69a). When a stressed (or glottalized) root is spelled out with a recessive suffix, the output is stressed (and glottalized) (68-69b). This generalization holds true of suffixes introduced in *v*P (68) as well as AspP (69).

			*v*P : *inner*		
(68)	a.	*afe-an*	Maxf,	Maxʔ ⟫	Depf
☞	i.	*afian*			
	ii.	(*áfian*)			*!
		give-caus			

		*v*P : *inner*		
b.	*seje,ʔ-an*	Maxf,	Maxʔ ⟫	Depf
i.	*sejian*		*!	
☞ ii.	(***séʔ****jian*)			*
	cure-caus			

			AspP : *inner*		
(69)	a.	[*atapa*]-*ji*	Maxf,	Maxʔ ⟫	Depf
☞	i.	*atapaji*			
	ii.	(*áta*)*paji*			*!
		breed(53b)-prcl			

		AspP : *inner*		
b.	[(*áfa*)*se*]-*ji*	Maxf,	Maxʔ ⟫	Depf
i.	*afaseji*	*!		
☞ ii.	(*áfa*)*seji*			
	offend(55b)-prcl			

The constraint ranking seen in this section has been labeled *inner*. More precisely, it is a compilation of two rankings: *master* and *inner*. Unless there is positive evidence that the activity of a constraint is morphologically-restricted, I assume that it is part of the overarching (*master*) phonology of the language. Thus, the faithfulness constraints (Maximality, Dependence, Linearity) as well as the markedness constraints NonFinality(ʔ) and ParseSyllables belong in the *master* ranking.[18] The metrical glottalization constraint Foot{ʔ} and the alignment constraint Align(ʔ-R, Foot-R) are active only in the inner morphophonological domain. As such, they belong in the *inner* cophonology. The phonological rankings motivated so far are given in (70).

(70) Phonological rankings in A'ingae, first iteration
  a. *master:* { Maxf, Maxʔ, Linʔ } ⟫ Depf ⟫ Prsσ, NFʔ
  b. *inner:* f{ʔ}, { NFʔ, Prsσ } ⟫ Alʔ)

The compilation of the *master* ranking and the *inner* ranking is given in (71). Ranking compilations are represented with the join symbol ($\bigoplus$), as in Sande, Jenks, and Inkelas (2020). Since the *master* ranking is a component of every phonological ranking in the language, *master* $\bigoplus$ *inner* is abbreviated as *inner* in the preceding tableaux. In the tableaux to follow, "*master* $\bigoplus$" will also be omitted from the ranking label.

(71) *Master* ranking compiled with *inner* ranking
  master $\bigoplus$ *inner:* f{ʔ}, { Maxf, Maxʔ, Linʔ } ⟫ Depf ⟫ { NFʔ, Prsσ } ⟫ Alʔ)

4.4 *The dominant cophonology*

In this section, I analyze the *dominant* cophonology, which captures the phonological grammar of the A'ingae dominant suffixes, including preglottalized dominant suffixes. Here, I focus on the dominant suffixes introduced in the inner morphological domain, i. e. on the interaction of the *inner* and *dominant* cophonologies. The analysis of the outer dominant suffixes is postponed until Section 4.5.

18 Technically, all constraints are part of every cophonology. What differs among the cophonologies is the relative ranking of those constraints. Thus, the listing of various partial rankings should be understood as a convenient notation adopted for ease of exposition: When a constraint shows no activity, I do not explicitly represent it in a ranking. Formally, the constraint can still be thought of as present but ranked too low to influence the output.

Dominant suffixes delete stress and—if introduced in the inner morphophonological domain—also glottalization. I model dominance with an AntiFaithfulness constraint (Alderete, 1999, 2001). AntiFaithfulness constraints require that the input and the output differ along a certain dimension. For A'ingae dominant suffixes, this dimension is the metrical structure, as modeled with PhaseAntiMaximality(Foot{}) (72),[19] which ranks in the *dominant* cophonology above Maximality(Foot), Maximality(ʔ), and Linearity(ʔ).

(72) PhaseAntiMaximality(Foot{}), or: ¬Max[f{}]
For no metrical foot or its feature in the previously spelled-out phase, is there a corresponding metrical foot or a corresponding metrical feature in the output. I. e., assign a violation for each metrical foot and each glottal stop in the previously spelled-out phase that is also present (and also a feature of the metrical foot) in the output.

The basic function of PhaseAntiMaximality(Foot{}) is to delete metrical structure. To this extent, its mechanics are similar to those of the AntiFaithfulness constraints proposed by Alderete (1999, 2001). However, PhaseAntiMaximality(Foot{}) differs from Alderete's AntiFaithfulness in three ways.

First, I assume that the deletion of a metrical foot entails the deletion of all of the features of that foot. (For a similar intuition for Danish, see Firth, 1948.) Correspondingly, PhaseAntiMaximality(Foot{}) is formulated as requiring the deletion of all metrical structure features. Thus, metrical glottalization in the inner domain gets deleted by dominant suffixes along with stress. In the name of the constraint, this is represented with the curly brackets ({}).

Second, PhaseAntiMaximality(Foot{}) is sensitive only to the metrical structure (and glottalization) in the previously spelled-out phase. Thus, the glottalization of preglottalized dominant suffixes is exempt from PhaseAntiMaximality(Foot{}) in the phase in which those suffixes are introduced.

Third, PhaseAntiMaximality(Foot{}) involves universal, not existential, quantification. Thus, when both stress and glottalization are present in the previously spelled-out phase, it does not suffice to delete either to avoid a violation of PhaseAntiMaximality(Foot{}). Rather, both stress and glottalization must be deleted.

In short, PhaseAntiMaximality(Foot{}) requires erasing metrical structure and all the features that depend on it, i. e. glottal stops within the inner domain. Since PhaseAntiMaximality(Foot{}) involves universal quantification, it incurs one violation if the output is faithful to the metrical foot or glottalization, and two violations if the output is faithful to both.

Dominant suffixes are associated with the *dominant* cophonology. When introduced in the inner morphophonological domain, the phonological grammar at their spell-out combines the *inner* cophonology and the *dominant cophonology*. The output of the phonological evaluation is therefore determined by both.

When a dominant suffix attaches to a stressless base, stress deletion is vacuous. When a dominant suffix attaches to a stressed base, input stress is deleted (73). The output form depends on the properties of the *dominant* and *inner* cophonologies. The fact the stress is deleted is due to the *dominant* cophonology. The fact that no new stress is assigned is due to the *inner* cophonology. (In a later outer-domain cycle, stress is assigned to the right edge of the inner domain if there are outer suffixes, or to the penultimate syllable of the word if there are no outer suffixes.)

19 The analysis assumes that the (edges of the) spelled-out phase can be identified in the following cycle. The constraints which access this information include PhaseAntiMaximality(Foot{}), Maximality(]ʔ) (discussed shortly), and Align(Stress-R, Phase-R) (discussed in Section 4.5). As referred to in constrain definitions, *phase* is not a syntactic object, but a phonological diacritic which identifies the previously phonologized part of the string. Importantly, the identity of particular morphemes or even general morphological categories such as a *root* or *suffix* are not accessed by phonology. As such, the grammatical modularity (Scheer, 2012) assumed in CbP is not violated. Since only the boundaries of the immediately preceding phase are accessible (the internal structure of that phase is not), this naturally implements *bracket erasure* assumed by Kiparsky (1982). For similar mechanisms in classic Cophonology Theory, where only the identity of the morphological base is known, but its morphological composition is not, see Caballero (2011) and Orgun and Inkelas (2002). For arguments in favor of PhaseFaithfulness, the positive counterpart of PhaseAntiFaithfulness, see McPherson and Heath (2016).

(73)	[(**á**fa)se]-ye	AspP: *inner* ⊕ *dominant* ¬Max[f{}] ⟫	Maxf,	Depf
☞ i.	*afaseye*		*	
ii.	*(**á**fa)seye*	*!		
iii.	*afa(s**é**ye)*		*	*!

offend(55b)-PASS

Within the inner morphophonological domain, glottalization is a feature o of the metrical foot. Thus, it is targeted for deletion by PhaseAntiMaximality(Foot{}) along with stress. As before, the output is stressless due to Dependence(Foot) in the *inner* cophonology (74).

(74)	[(**á**kheʔ)pa]-khu	AspP: *inner* ⊕ *dominant* f{ʔ},	¬Max[f{}] ⟫	Maxf,	Maxʔ ⟫	Depf
☞ i.	*akhepakhu*			*	*	
ii.	*akheʔpakhu*	*!	*	*		
iii.	*(**á**khe)pakhu*		*!		*	
iv.	*(**á**kheʔ)pakhu*		*!*			
v.	*akhe(**pá**khu)*			*	*	*!

forget(62)-RCPR

In the inner domain, the glottal stop is a feature of the metrical foot. Thus, when a preglottalized suffix is attached, a metrical foot is constructed in order to avoid a stray glottal feature. If the last syllable of the base to which a preglottalized dominant suffix attaches is light (monophthongal), Align(ʔ-R, Foot-R) yields stress two syllables to the left of the preglottalized suffix (75).

(75)	[atapa]-ʔje	AspP: *inner* ⊕ *dominant* f{ʔ},	¬Max[f{}] ⟫	Maxf,	Maxʔ ⟫	Depf,	Alʔ)
i.	*atapaje*				*!		
ii.	*atapaʔje*	*!					*
☞ iii.	*a(**tá**paʔ)je*					*	
iv.	*ata(**pá**ʔje)*					*	*!

breed(53b)-IPFV

If the last syllable of the base to which a preglottalized dominant suffix attaches is heavy (diphthongal), the higher-ranking FootShape = (×μ) (76) yields stress on the last syllable of the base (77). I assume that FootShape = (×μ) is not limited to a morphological context, and therefore belongs in the *master* ranking.[20]

20 FootShape = (×μ) subsumes three more atomic constraints: FootBinarity (FtBin), RhythmicType=Trochaic (Trochee), and Weight→StressPrinciple (WSP). FootBinarity ensures that feet comprise two units, be they syllabic or moraic (McCarthy and Prince, 1986; Prince, 1980; Prince and Smolensky, 1993). RhythmicType=Trochaic favors the left-prominent trochee over the right-prominent iamb (Hayes, 1985, 1995). WSP assigns violations for heavy syllables in unstressed positions (Prince, 1990).
FtBin eliminates all feet other than 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 the relative ranking of FtBin, Trochee, and WSP is not crucial to the analysis, I subsume the three constraints under FootShape = (×μ), which is violated whenever one of FtBin, Trochee, or WSP is.

(76) FootShape = (×μ), or: (×μ)
The left branch of a foot is strong (i. e. feet are trochaic) and the right branch is a single mora (i. e. light; not a diphthong).

(77)	[*fûndûi*]-*ʔje*	AspP: *inner* ⊕ *dominant* f{ʔ},	¬Max[f{}] ⟫	Maxʔ,	(×μ) ⟫	Depf,	Alʔ)
	i. *fûndûije*			*!			
	ii. *fûndûiʔje*	*!					*
	iii. (***fû́ndûiʔ***)*je*				*!	*	
☞	iv. *fû*(***ndû́iʔ****je*)					*	*

sweep-ipfv

All preglottalized suffixes introduced in the inner domain are dominant.[21] Thus, they delete stress and glottalization from the base to which they attach. The preglottalization of the suffix itself is not a target of PhaseAntiMaximality(Foot{}) because the suffix is external to the previously spelled-out phase. However, a metrical foot is constructed to avoid a stray glottal stop feature violating PhaseAntiMaximality(Foot{}) in the output (78). I assume that metrical glottalization can be realized only once per foot. Thus, the candidate (78v) which has two glottal stops incurs one violation of Foot{ʔ}.

(78)	[(*ákheʔ*)*pa*]-*ʔje*	AspP: *inner* ⊕ *dominant* f{ʔ},	¬Max[f{}] ⟫	Maxf,	Maxʔ ⟫	Depf,	Alʔ)
	i. *akhepaje*			*	**!		
	ii. *akhepaʔje*	*!		*	*		*
	iii. (***ákheʔ***)*paje*		*!*		*		
☞	iv. *a*(***khépaʔ***)*je*			*	*	*	
	v. *a*(***khéʔpaʔ***)*je*	*!	*	*	**	*	*
	vi. *akhe*(***páʔ****je*)			*	*	*	*!

forget(62)-ipfv

Observe that input stress may happen to fall on the same syllable as the stress assigned due to the presence of glottalization after input stress deletion (79). The metrical foot of the winning candidate does not incur a violation of PhaseAntiMaximality(Foot{}) because it is a "different" foot from the input foot. More precisely, the output foot does not stand in a *correspondence relation* with the input foot (McCarthy and Prince, 1995). Correspondences (or lack thereof) between the input and the output are indicated with subscripts ($_{x,y}$).

21 A hypothetical preglottalized inner recessive suffix would assign stress to the syllable which contains the second mora to its left (iiia-b), while retaining preexisting stress and glottalization (iiic-d). Preglottalized inner recessive suffixes are unattested.

(iii) Various bases with hypothetical unattested preglottalized inner recessive -*ʔcv* sfx

a.	b.	c.	d.
*/ *atapa* -*ʔcv* /	*/ *fûndûi* -*ʔcv* /	*/ *áfase* -*ʔcv* /	*/ *ákheʔpa* -*ʔcv* /
[*atápa* -*ʔcv*]	[*fûndû́i* -*ʔcv*]	[*áfase* -(*ʔ*)*cv*]	[*ákheʔpa* -(*ʔ*)*cv*]
breed -sfx	sweep -sfx	offend -sfx	forget -sfx

(79)	[(*káti*)$_x$]-*ʔje*	AspP: *inner* ⊕ *dominant* f{ʔ},	¬Max[f{}] ⟫	Maxf ⟫	Depf,	Alʔ)
i.	*katiʔje*	*!		*		
ii.	(*kátiʔ*)$_x$ *je*		*!			
☞ iii.	(*kátiʔ*)$_y$ *je*			*	*	
iv.	*ka*(*tíʔje*)$_y$			*	*	*!

cast(55a)-IPFV

When two preglottalized dominant suffixes attach within one phase, stress is assigned to the syllable which contains the second mora to the left of the first suffix (81). The preglottalization of the second suffix is deleted. I model this with the positional faithfulness constraint Maximality(]ʔ) (80), which favors the preservation of phase boundary-adjacent glottal stops. I assume that the effect of two dominant suffixes on the phonological ranking of the phase in which they are evaluated is the same as the effect of one dominant suffix.

(80) Maximality(]ʔ), or: Max]ʔ
For every glottal stop adjacent to a phase boundary in the input, there is a corresponding glottal stop in the output.

(81)	[*atapa*]-*ʔje*-*ʔngi*	AspP: *inner* ⊕ *dominant* f{ʔ},	Max]ʔ,	Maxʔ ⟫	Depf,	Alʔ)
i.	*atapajengi*		*	*!*		
ii.	*atapaʔjengi*	*		*!		*
☞ iii.	*a*(*tápaʔ*)*jengi*			*	*	
iv.	*a*(*tápaʔ*)*jeʔngi*	*			*	*!
v.	*ata*(*páʔje*)*ngi*			*	*	*!
vi.	*ata*(*pájeʔ*)*ngi*		*	*!	*	
vii.	*ata*(*páʔjeʔ*)*ngi*	*			*	*!
viii.	*atapa*(*jéʔngi*)		*	*!	*	*

breed(53b)-IPFV-PROX

In interim summary, by proposing that the deletion of a prosodic node (the metrical foot) entails the deletion of all of its features (glottalization), the account captures the fact that in A'ingae the deletion of stress triggered within the inner domain also deletes glottalization. The *dominant* cophonology and the revised *master* and *inner* rankings are given in (82).

(82) Phonological rankings in A'ingae, second iteration
  a. *master:* { Maxf, Max]ʔ, Maxʔ, Linʔ, (×μ) } ⟫ Depf ⟫ Prsσ, NFʔ
  b. *inner:* f{ʔ}, { NFʔ, Prsσ } ⟫ Alʔ)
  c. *dominant:* ¬Max[f{}] ⟫ { Maxf, Maxʔ, Linʔ }

4.5 *The outer cophonology*

In this section, I analyze the *outer* cophonology, which characterizes the outer morphological domain. The *outer* cophonology is active at the spell-out of TP, which contains morphology typically associated with the inflected predicate, as well as CP, which contains morphology associated with full clauses. First, I focus on the outer recessive suffixes, which are not associated with a suffix-specific cophonology. I conclude the analysis with outer dominant suffixes, which involve the interaction of the *outer* and *dominant* cophonologies.

When TP suffixes attach to a stressless base, stress is assigned to the last syllable of the inner domain (85). The base may be stressless because it originated as such or because its stress was deleted by a dominant suffix. The assignment of stress to the last syllable of the inner domain is modeled with LexicalWord≈ProsodicWord (83), which requires stress on every word, and Align(Stress-R, Phase-R) (84), which favors alignment of that stress with the right edge of the previously spelled-out phase. In the *outer* cophonology, LexicalWord≈ProsodicWord ranks above Align(Stress-R, Phase-R), and Align(Stress-R, Phase-R) ranks above Dependence(Foot). I assume that Align(Stress-R, Phase-R) is evaluated gradiently, incurring one violation for each syllable separating stress from the right edge of the previously spelled-out phase.

(83) LexicalWord≈ProsodicWord, or: Lx≈ω
Every lexical word corresponds to a prosodic word.

(84) Align(Stress-R, Phase-R), or: Alσ́]
Primary stress is right-aligned with the right edge of the previously spelled-out phase.

		TP : *outer*		
(85)	[*afaseye*]-*ya*	Lx≈ω ⟫	Alσ́] ⟫	DepF
i.	*afaseyeya*	*!		
ii.	(***á****fa*)*seyeya*		*!**	*
iii.	*a*(***fá****se*)*yeya*		*!*	*
iv.	*afa*(***sé****ye*)*ya*		*!	*
☞ v.	*afase*(***yé****ya*)			*
vi.	*afaseye*(***yá***)		*!	*

offend-pass(73)-irr

I propose that the phonological character of the glottal stop in A'ingae differs between the two morphophonological domains. In the inner domain, the glottal stop is a facultative feature of the metrical foot (56). In the outer domain, the glottal stop is regular segmental consonant (86). The constraint which captures the segmental of glottalization in the *outer* cophonology is Consonant{ʔ} (87). Observe that even the glottalization which was introduced as metrical in the inner domain (86a-c) is moved to the segmental tier once it undergoes an *outer* cophonology spell-out.

(86) Glottal stop as a regular consonantal segment in the outer domain

a. (× .) .
á *kheʔ pa*
forget

b. . (× .) .
a ***tá*** *pa ʔje*
breed ipfv

c. . (× .)
fû ***ndûi*** *ʔngi*
sweep prox

d. . . (× .)
a ta ***pá*** *ʔfa*
breed pls

(87) Consonant{ʔ}, or: C{ʔ}
Glottal stops are regular consonantal segments. Assign a violation mark for every glottal stop which is a feature of the metrical foot.

Since glottalization is a regular consonant, it does not have any effect on stress. Stress is assigned in a regular fashion, i. e. to the last syllable of the previously spelled out domain (88). When glottal stops are regular consonants, there is no underbrace. Candidates (88i-ii) and (88iii-iv) have the same phonetic realization, but contrast in what tier the glottal stop lives on. In (88i,iii), the glottal stop is a feature of the metrical foot. In (88ii,iv), it is a regular consonantal segment. Thus, candidates (88i,iii) violate Consonant{ʔ}.

		TP: *outer*		
(88)	[*atapa*]-*ʔfa-ya*	C{ʔ},	Alσ́] ⟫	Depf
i.	*a(<u>**tá**paʔ</u>)faya*	*!	*	*
ii.	*a(**tá**paʔ)faya*		*!	*
iii.	*ata(<u>**páʔ**fa</u>)ya*	*!		*
☞ iv.	*ata(**páʔ**fa)ya*			*
v.	*atapaʔ(**fá**ya)*		*!	*

breed(53b)-pls-irr

Maximality(Foot) ranks above Align(Stress-R, Phase-R). Thus, stress from the previously spelled-out phase is retained. If glottalization is present, it is retained, but it is moved from the metrical tier to the segmental tier and it is no longer a feature of the metrical foot (89).[22]

		TP: *outer*			
(89)	[*a(<u>**tá**paʔ</u>)je*]-*ya-mbi*	C{ʔ},	Maxf,	Maxʔ ⟫	Alσ́]
i.	*a(**tá**pa)jeyambi*			*!	**
ii.	*a(<u>**tá**paʔ</u>)jeyambi*	*!			**
☞ iii.	*a(**tá**paʔ)jeyambi*				**
iv.	*atapa(**jé**ya)mbi*		*!	*	
v.	*atapaʔ(**jé**ya)mbi*		*!		

breed-ipfv(75)-irr-neg

If there are no TP suffixes but there are CP suffixes, TP does not undergo phonological evaluation. If the previously spelled-out phase does not have stress, stress is assigned at CP spell-out to the last syllable of the previously spelled-out phase (i. e. AspP or *v*P if no suffixes were introduced in AspP) (90).

		CP: *outer*			
(90)	[*atapa*]-*saʔne*	C{ʔ},	Maxf,	Maxʔ ⟫	Alσ́]
i.	*a(**tá**pa)saʔne*				*!
☞ ii.	*ata(**pá**saʔ)ne*				
iii.	*atapa(**saʔ**ne)*				*!

breed(53b)-appr

If there are both TP and CP suffixes and the inner domain does not have stress, stress is assigned to the last syllable of the previously spelled-out phase at TP spell-out (91a) and preserved at CP spell-out (91b).

22 In the outer domain, all winning candidates incur a violation of the low-ranking Foot{ʔ} (not shown in the *outer* tableaux). In addition, I assume that changing the tier of the glottal stop between the inner and outer domain incurs a violation of a Faithfulness constraint which prevents relinking features. Since the violations of that Faithfulness constraint do not contribute to determining the output beyond what is already modeled with Foot{ʔ} and Consonant{ʔ}, I do not show it in the tableaux.

(91) a.	[*atapa*]-*ʔfa*	TP : *outer* C{ʔ},	Maxf ⟫	Alσ́]
i.	*a*(***tápa**ʔ*)*fa*			*!
☞ ii.	*ata*(***páʔ**fa*)			
iii.	*atapaʔ*(***fá***)			*!
	breed(53b)-pls			

b.	[*ata*(***páʔ**fa*)]-*ja*	CP : *outer* C{ʔ},	Maxf ⟫	Alσ́]
☞ i.	*ata*(***páʔ**fa*)*ja*			*
ii.	*atapaʔ*(***fá**ja*)		*!	
iii.	*atapaʔfa*(***já***)		*!	*
	breed-pls(91a)-imp			

This derives the generalization that if the outer domain (TP and/or CP) suffixes are present and the inner domain was stressless, stress is assigned to the right edge of the inner domain.

If neither TP nor CP suffixes are present, only TP undergoes spell-out. If the inner domain was stressless, stress is assigned to the penultimate syllable. Observe that stress in A'ingae is never final. To capture this fact, I propose that NonFinality(Stress) (93) is ranked above Align(Stress-R, Phase-R). Recall that Align(Stress-R, Phase-R) is evaluated gradiently, incurring one violation for each syllable separating stress from the right edge of previously spelled-out phase. This derives the "default" penultimate stress assignment (94).

(93) NonFinality(Stress), or: NFσ́
Primary stress is not final in a prosodic word.

(94)	[*akhepayeji*]	TP : *outer* C{ʔ},	Maxf,	NFσ́,	Lx≈ω ⟫	Alσ́]
i.	*akhepayeji*				*!	
ii.	*akhe*(***pá**ye*)*ji*					**!
☞ iii.	*akhepa*(***yé**ji*)					*
iv.	*akhepaye*(***jí***)			*!		
	forget-pass-prcl[23]					

Finally, there are two dominant CP suffixes: -*jama*$^{\emptyset}$ prhb and -*kha*$^{\emptyset}$ imp2. The outer dominant suffixes assign stress to the immediately preceding syllable regardless of preexisting stress but they keep preexisting glottal stops intact. These properties emerge from the interaction of the *outer* and *dominant* cophonologies. The *dominant* cophonology ranks PhaseAntiMaximality(Foot{}) high, which results in the erasure of preexisting stress and allows Align(Stress-R, Phase-R) of the *outer* cophonology to assign stress to the right edge of the previous phase (i. e. immediately before the outer dominant suffix). Even though PhaseAntiMaximality(Foot{}) is ranked high by the *dominant* cophonology, in the *outer* cophonology the glottal stop is a consonant, not a metrical feature (Consonant{ʔ}), so PhaseAntiMaximality(Foot{}) is not violated by the glottalization retained in the output. The glottal stop is a regular consonant in the outer domain, whether it was introduced as a consonant (96) or a metrical feature, for example by an inner preglottalized suffix (95). Thus, regardless of the glottal stop's original character, it is preserved in the output.

23 The spelled-out phase in the input of (94) consists of the stressed and glottalized root (*ákheʔ*)*pa* 'forget' and two suffixes -*ye*$^{\emptyset}$ pass and -*ji* prcl. In the AspP cycle, the inner dominant -*ye*$^{\emptyset}$ pass deleted the stress and glottalization of (*ákheʔ*)*pa* 'forget,' and the inner recessive -*ji* prcl did not assign any. Thus, the input to the late CP spell-out is the stressless *akhepayeji* 'forget-pass-prcl.'

(95)	[*a*(***tá**pa*ʔ)*je*]-*jama*	CP: *outer* ⊕ *dominant* C{ʔ},	¬MAX[f{}] ⟫	MAXf,	MAXʔ ⟫	ALσ́]
i.	*a*(***tá**paʔ*)*jejama*	*!	**			**
ii.	*a*(***tá**paʔ*)*jejama*		*!			**
iii.	*atapa*(***jé**ja*)*ma*			*	*!	
☞ iv.	*atapaʔ*(***jé**ja*)*ma*			*		
v.	*atapaʔje*(***já**ma*)			*		*!

breed-IPFV(75)-PRHB

(96)	[*ata*(***páʔ**fa*)]-*jama*	CP: *outer* ⊕ *dominant* C{ʔ},	¬MAX[f{}] ⟫	MAXf,	MAXʔ ⟫	ALσ́]
i.	*ata*(***páʔ**fa*)*jama*		*!			**
ii.	*atapa*(***fá**ja*)*ma*			*	*!	
☞ iii.	*atapaʔ*(***fá**ja*)*ma*			*		
iv.	*atapaʔfa*(***já**ma*)			*		*!

breed-PLS(91a)-PRHB

In summary, by proposing that the phonological character of the A'ingae glottalization differs between the inner and the outer domain (metrical feature in the former, but not the latter), the account captures the fact that stress deletion in the inner domain also deletes glottal stops, but stress deletion in the outer domain does not. The final *master* ranking as well as the *inner*, *outer*, and *dominant* cophonologies are given in (97).

(97) PHONOLOGICAL RANKINGS IN A'INGAE, FINAL ITERATION
  a. *master:* { MAXf, MAX]ʔ, MAXʔ, LINʔ, (×μ) } ⟫ DEPf ⟫ PRSσ, NFσ́, NFʔ
  b. *inner:* f{ʔ}, { NFʔ, PRSσ } ⟫ ALʔ)
  c. *outer:* C{ʔ}, { MAXf, NFσ́, Lx≈ω } ⟫ ALσ́] ⟫ DEPf
  d. *dominant:* ¬MAX[f{}] ⟫ { MAXf, MAXʔ, LINʔ }

The interactions among the three cophonologies *inner*, *outer*, and *dominant* capture the characteristics of the phonological processes triggered by A'ingae verbal suffixes. They are summarized in Table 3. Observe that the deletion of glottalization never occurs independently stress deletion. Thus, there is a missing cell in the space of logically possible combinations of stress and glottalization deletion. This is a consequence of the fact that stress deletion only triggers the deletion of glottalization within the *inner* domain, where glottalization is a facultative property of the metrical foot (40), and stress deletion is the only lexical parameter needed to account for the differences between individual morphemes (41).

	inner	*inner* ⊕ *dominant*	*outer*	*outer* ⊕ *dominant*
STRESS	preserved	deleted	preserved	deleted
GLOTTALIZATION	preserved	deleted	preserved	preserved
IF ABSENT OR DELETED, STRESS (RE)ASSIGNED	only due to glottalization: (×μʔ)		to the R-edge of spelled-out phrase	

Table 3: Interactions of the *inner*, *outer*, and *dominant* cophonologies.

5 REJECTED ALTERNATIVES

The CbP account of A'ingae glottalization is couched in a relatively powerful framework and uses a variety of formal devices. Specifically, the analysis posits (i) different phonological grammars associated with different morphological strata (*inner* vs. *outer*), (ii) different phonological grammars associated with individual morphosyntactic features (*dominant*), (iii) different tiers and feature geometries for the glottal stop between the inner and the outer domain, and (iv) AntiFaithfulness as the mechanism for stress deletion. As such, one may reasonably wonder whether there is a less formally elaborate, but equally insightful, analysis available.

In this section, I examine three alternative accounts which do away with (i), (iii), and (iv). In Section 5.1, I consider a purely representational analysis where the preglottalized inner and outer suffixes have different underlying forms (i) and briefly comment on representational accounts of dominance. For an extended discussion of the latter (ii), see Dąbkowski (2021b). In Section 5.2, I outline an analysis that retains cophonological rankings, but eschews analyzing glottalization as a metrical feature within the inner domain and models glottalization's effect on stress entirely as a matter of Alignment (iii). In Section 5.3, I sketch an analysis which dispenses with the PhaseAntiMaximality(Foot{}), a member of the controversial family of AntiFaithfulness constraints, in favor of *Structure (iv). I conclude that the alternative analyses make incorrect predictions or fall short of capturing the central generalizations about the A'ingae morphophonology stated in Section 3.4. Lastly, in Section 5.4, I bring explicit attention to two recalcitrant corners of the data (the alternating glottalized roots and forms with multiple inner preglottalized suffixes) which naturally fall out of CbP's architectural assumption of phase-based spell-out but are problematic for fully parallel and fully cyclic frameworks.

5.1 *Representational analyses*

In this section, I consider a representational analysis of the difference between the inner and the outer suffixes. For an extensive discussion of representational analyses of A'ingae dominance (stress deletion), see Dąbkowski (2021b).

Preglottalized suffixes introduced in the inner domain assign stress to the syllable which contains the second mora to the left of the glottal stop, while preglottalized suffixes of the outer domain have no such effect. To capture this pattern, the analysis presented in Section 4 posits two different phonological grammars for the inner and outer domains. In a purely representational account, where the phonological grammar of a language is taken to be fully uniform, this difference must be attributed to differing underlying forms.

A plausible proposal might model the difference between the inner and outer suffixes with partial metrical structure. Under this analysis, the glottal stop of the preglottalized inner suffixes is immediately followed by the right edge of a metrical foot (98a) (for more on simplified bracketed grid theory, see Halle and Idsardi, 1995). The outer suffixes do not have underlying metrical structure (98b).

(98) Representational analysis
  a. *inner: -ʔ)je* ipfv, *-ʔ)ngi* prox, *-ʔ)nga* dist, ...
  b. *outer: -ʔfa* pls, *-ya* irr, *-ʔta* if.ss, *-ja* imp, ...

When a suffix comes with a partial metrical foot, the rest of the foot is supplied in the output (99a-b). When a suffix has no underlying metrical structure, regular stress assignment takes place (99c-d). This captures the basic difference with respect to stress assignment between the preglottalized inner and outer suffixes.

(99) Preglottalized inner or outer suffixes, representational analysis

a.	b.	c.	d.
/ *atapa -ʔ)je* /	/ *atapa -ʔ)ngi* /	/ *atapa -ʔfa* /	/ *atapa -ya* /
[*a(**tá**pa -ʔ)je*]	[*a(**tá**pa -ʔ)ngi*]	[*ata(**pá** -ʔfa)*]	[*ata(**pá** -ya)*]
breed -ipfv	breed -prox	breed -pls	breed -irr

Nevertheless, the representational analysis is not adopted for four reasons. First, the representational analysis has no way of capturing the generalization that the preglottalized suffixes which assign stress to the syllable which contains the second mora to the left of the glottal stop all precede the preglottalized suffixes which have no effect on stress. In other words, under the representational analysis, nothing prevents the existence of suffixes such as *-*ʔ)ta* IF.SS which follows -*ʔfa* PLS, or *-*ʔje* IPFV which precedes -*ʔ)ngi* PROX. Under the CbP analysis, such orderings are ruled out by the phonological grammars of the suffixes' respective domains.

Second, the glottalization/stress generalization which holds of the inner suffixes, whereby stress is assigned to the syllable which contains the second mora to the left of the glottal stop (22-26), also holds in roots (7). The CbP analysis reflects this by subjecting both roots and inner suffixes to the same *inner* cophonology. The representational analysis offers no insight into this patterning. For example, it provides no reason as to why glottalized but stressless roots such as **akheʔpa* 'forget' do not exist in A'ingae.

Lastly, the inner dominant suffixes delete stress and glottalization but the outer dominant suffixes delete only stress. So far, stress deletion has been left out of the discussion since deletion is not straightforwardly implemented using representational means (cf. Köhnlein, 2016; Trommer and Zimmermann, 2014; Zimmermann, 2017). However, regardless of which account of deletion one might eventually adopt, the purely representational analysis does not capture the stratal (*inner* vs. *outer*) organization of the A'ingae grammar (the first and second argument) and does not posit a formal link between glottalization and metrical structure (unlike CbP, where the glottal stop depends on a prosodic node in the inner domain). Thus, it is difficult to imagine a non-stipulative representational account of why the inner, but not the outer, dominant suffixes delete glottalization. In brief, the representational analysis fails to capture the first central generalization about the A'ingae morphophonology (40).

Alternatively, one could flesh out a representational analysis of the A'ingae dominance while permitting different phonological rankings for the two different morphological domains. This would bring the A'ingae system into the fold of Stratal Optimality Theory (Bermúdez-Otero, 1999, 2012; Jaker and Kiparsky, 2020; Kiparsky, 2000, 2008; others), where the inner and outer domain may be modeled essentially as in CbP (i. e. with different phonological rankings for the *inner* and *outer* strata), but the unpredictable suffix-specific dominance effects are attributed to the underlying representations of the dominant morphemes. For a discussion and arguments against such analyses couched in Stratal OT and Gradient Symbolic Representations (Rosen, 2016; Smolensky and Goldrick, 2016; Zimmermann, 2018a,b), as well as a floating metrical structure (cf. floating negative tone in Kushnir, 2019) and empty prosodic nodes analyses (Trommer and Zimmermann, 2014; Zimmermann, 2017), see Dąbkowski (2021b).

5.2 *ALIGNMENT-only analysis*

In the analysis laid out in Section 4, two *inner* cophonology constraints relate metrical structure and glottalization: FOOT{ʔ}, which penalizes stay glottal stops without a metrical foot, and ALIGN(ʔ-R, FOOT-R), which favors right-alignment of the metrical foot with the glottal stop. The functions of the two constraints are partially overlapping: Assuming that MAXIMALITY(ʔ) and ALIGN(ʔ-R, FOOT-R) rank above DEPENDENCE(FOOT), these two constraints are by themselves sufficient to trigger the construction of a metrical foot given an input glottal stop, making recourse to FOOT{ʔ} ostensibly unnecessary (100).

		AspP : *inner*		
(100)	[*atapa*]-*ʔje*	Maxʔ,	Alʔ) ≫	Depf
	i. *atapaje*	*!		
	ii. *atapaʔje*		*!	
☞	iii. *a*(*tápaʔ*)*je*			*
	iv. *ata*(*páʔje*)		*!	*
	breed-ipfv			

The above observation might lead one to propose an Alignment-only analysis, where the inner and the outer morphological domains differ in the ranking of Align(ʔ-R, Foot-R), but the different phonological character of the glottal stop between the two domains (a prosodic feature in the inner and a regular segment in the outer) is never invoked (101).

(101) Alignment-only analysis, first iteration
  a. *master:* NFσ́, NFʔ, (×μ), Maxf, Maxʔ ≫ Depf
  b. *inner:* { NFʔ, Max]ʔ, Maxʔ, Alʔ) } ≫ { Depf, (×μ) }
  c. *outer:* { Maxf, NFσ́, Lx≈ω } ≫ Alσ́] ≫ { Depf, Alʔ) }
  d. *dominant:* ¬Max[f] ≫ { Maxf, Maxʔ }

The Alignment-only analysis is not adopted because it struggles with capturing the fact that the inner dominant suffixes also delete glottalization in addition to stress. In this analysis, inner glottalization is not a property of the metrical foot, so the PhaseAntiMaximality(Foot) is not able to delete glottalization (102).

(102) PhaseAntiMaximality(Foot), or: ¬Max[f]
For no metrical foot in the previously spelled-out phase is there a corresponding metrical foot in the output. I. e., assign a violation for each metrical foot in the previously spelled-out phase that is also present in the output.

In the Alignment-only analysis, PhaseAntiMaximality(Foot) triggers stress deletion, but it does not target glottal stops. Given that Maximality(ʔ) outranks Dependence(Foot), this analysis predicts that the deleted metrical structure will be recreated in the output (103), even if PhaseAntiMaximality(Foot) ranks above both Maximality(Foot) and Maximality(ʔ) (101d). Metrical feet in the input and output are subscripted ($_{x,\,y}$) to indicate whether they are in a correspondence relation (McCarthy and Prince, 1995).

		AspP : *inner* ⊕ *dominant*				
(103)	[(*ákheʔ*)$_x$*pa*]-*khu*	¬Max[f] ≫	Maxf,	Maxʔ,	Alʔ) ≫	Depf
☹	i. *akhepakhu*		*	*!		
	ii. *akheʔpakhu*		*		*!	
	iii. (*ákhe*)$_x$*pakhu*	*!		*		
	iv. (*ákheʔ*)$_x$*pakhu*	*!				
💣	v. (*ákheʔ*)$_y$*pakhu*		*			*
	forget-rcpr					

One solution to the above problem would be to say that dominant suffixes reverse the ranking of Maximality(ʔ) and Dependence(Foot) (104d). However, this solution has two major downsides. First, it is stipulative. Under this analysis, it just so happens that the suffixes which delete stress also rerank the two faithfulness constraints.

This solution fails to capture the intuition that in the inner domain, stress and glottalization have a close relationship, which does not hold in the outer domain. Thus, it misses the first central generalization (40).

(104) Alignment-only analysis, second iteration

d. *dominant:* ¬Max[f] ≫ { Maxf, Maxʔ }, Depf ≫ Maxʔ

Second, postulating that the dominant suffixes rank Dependence(Foot) above Maximality(ʔ) incorrectly predicts the deletion of glottalization from inner preglottalized dominant suffixes (105).

		AspP: *inner* ⊕ *dominant*				
(105)	[*atapa*]-*ʔje*	¬Max[f] ≫	Maxf,	Alʔ),	Depf ≫	Maxʔ
💣 i.	*atapaje*					*
ii.	*atapaʔje*			*!		
☹ iii.	*a*(***tá**paʔ*)*je*				*!	
iv.	*ata*(***páʔ**je*)			*!	*	
	breed-ipfv					

To remedy this, one could posit special faithfulness to the glottal stops introduced by preglottalized suffixes. To formalize this analysis, one would need to formulate a morphologically-indexed Maximality($ʔ_{sfx}$) constraint (106), which is violated specifically by the deletion of suffix glottal stops and which ranks above Dependence(Foot) (107a).

(106) Maximality($ʔ_{sfx}$), or: Max$ʔ_{sfx}$
For every glottal stop in an input suffix, there is a corresponding glottal stop in the output.

(107) Alignment-only analysis, third iteration

a. *master:* NFσ́, NFʔ, Maxf, { Maxʔ, Max$ʔ_{sfx}$ } ≫ Depf, (×μ)

CbP is a strictly modular model of the grammar where the phonological and morphosyntactic components cannot access each other. The phonological constraints are fully general (not indexed to specific morphemes). Morpheme-specific phonology is captured indirectly, by associating morphosyntactic features with different cophonological rankings. CbP's indirect reference architecture captures a number of robust empirical generalizations, including *stem scope*, which is the observation that the scope of a phonological process triggered by a morpheme is the stem to which it attaches, and *bracket erasure*, which says the information about the morphological composition of previous phases is inaccessible to subsequent phases (Inkelas and Zoll, 2007).

Allowing for morphologically-indexed constraints, such as Maximality($ʔ_{sfx}$), introduces mechanisms that can violate stem scope and bracket erasure, weakening the theory's predictive power. (For other arguments against indexed-constraint approaches, see e. g. Inkelas and Zoll, 2007; Orgun, 1996; Orgun and Inkelas, 2002; Scheer, 2012.) Thus, the Alignment-only analysis is not adopted. Finally, the Maximality($ʔ_{sfx}$) constraint implies that suffixes may be more faithful than roots. This goes against the typological trend for roots to license more contrasts, such as the root-affix faithfulness meta-condition of McCarthy and Prince (1995).

5.3 **Structure analysis*

The second central generalization states that stress deletion is the only unpredictable suffix-triggered phonological process (41). The deletion of stress may be accompanied by stress reassignment to the syllable which contains the second mora to the left of the suffix (if the stress-deleting suffix is inner and preglottalized), to the last syllable of the previously spelled-out domain (if the stress-deleting suffix is outer), or no stress reassignment (if the stress-deleting suffix is inner and plain, i. e. not preglottalized). Importantly, whether and where stress is reassigned is determined by the phonological grammar of the domain in which the stress-deleting suffix is introduced. As such, it need not be stipulated as an idiosyncratic property of the stress-deleting suffix.

The Cophonologies by Phases analysis of Section 4 formalizes this insight by associating the stress-deleting suffixes with the *dominant* cophonology. The *dominant* cophonology is characterized by a high ranking of PhaseAntiMaximality(Foot{}), which ensures that the output will not be faithful to input stress. Stress reassignment (or its lack) follows from the *inner* and *outer* cophonologies which characterize the two respective morphophonological domains of A'ingae.

In an analysis that does not make recourse to PhaseAntiMaximality(Foot{}), stress deletion must be captured via different means. A natural candidate is the *Foot constraint (108), a member of the *Structure family of constraints, which penalizes metrical structure present in the output.

(108) *Foot, or: *f
Assign a violation mark for each metrical foot in the output.

A high ranking of *Foot ensures that the output will be stressless. Thus, *Foot is unlike PhaseAntiMaximality(Foot{}), which demands only that the output stress be different from the input stress, but does not by itself penalize stressed outputs. Since the plain inner dominant suffixes yield stressless outputs, an *inner dominant* cophonology which ranks *Foot above both Maximality(Foot) and Maximality(ʔ) correctly models their behavior (109).

		AspP : *inner* ⊕ *dominant*			
(109)	[(*ákheʔ*)*pa*]-*khu*	f{ʔ},	*f ⟫	Maxf,	Maxʔ
☞ i.	*akhepakhu*			*	*
ii.	*akheʔpakhu*	*!		*	
iii.	(*á*khe)*pakhu*		*!		*
iv.	(*ákheʔ*)*pakhu*		*!		
	forget-rcpr				

However, it does not model the behavior of preglottalized inner dominant or outer dominant suffixes, which reassign stress in the output. To model the preglottalized inner dominant suffixes, Maximality($ʔ_{sfx}$) must dominate Maximality(ʔ) in the *master* ranking (110a). The outer dominant suffixes are modeled by ranking LexicalWord≈ProsodicWord and Align(Stress-R, Phase-R) above Maximality(Foot) in the *outer cophonology* (110e).

(110) *Structure analysis
a. *master:* Max$ʔ_{sfx}$ ⟫ { Maxf, Max]ʔ, Maxʔ, (×μ) } ⟫ Depf, NFσ́, NFʔ
b. *inner:* f{ʔ}, { NFʔ, (×μ) } ⟫ Alʔ)
c. *inner dominant:* f{ʔ}, *f ⟫ { Maxf, Max]ʔ, Maxʔ }, { NFʔ, (×μ) } ⟫ Alʔ)
d. *outer:* C{ʔ}, { Maxf, NFσ́ } ⟫ Lx≈ω ⟫ Alσ́] ⟫ Depf
e. *outer dominant:* C{ʔ}, Lx≈ω ⟫ Alσ́] ⟫ { Maxf, NFσ́ } ⟫ Depf

An analysis along these lines is pursued by Dąbkowski (2021b). However, the *Structure analysis is not adopted here for two reasons. First, it requires invoking the morphologically-indexed constraint Maximality($ʔ_{sfx}$). Second, it fails to formally relate the phonological properties of (i) the *inner dominant* suffixes to the *inner* cophonology, (ii) the *outer dominant* suffixes to the *outer* cophonology, and (iii) the *inner dominant* suffixes to the *outer dominant* suffixes, and instead posits four unrelated cophonological rankings. Thus, the *Structure analysis misses the second central generalization about the A'ingae morphophonology (41).

5.4 *Phase-based spell-out*

Finally, I would like to bring explicit attention to CbP's postulate of phase-based spell-out. Cophonologies by Phase proposes that phonological evaluation is cyclic and proceeds phase-by-phase. However, the morphosyntactic features present within one phase are spelled out all at once and evaluated in parallel. This distinguishes CbP from other frameworks of the phonology-morphosyntax interface,[24] and naturally captures the behavior of alternating glottalized roots and forms with multiple inner preglottalized suffixes, which pose challenges for *fully parallel* models, where the entire morphological word is phonologically evaluated all at once (e. g. McCarthy and Prince, 1993a,b; Pater, 2009; Prince and Smolensky, 1993), as well as *fully cyclic* models, where each morpheme triggers a separate phonological cycle (e. g. Bobaljik, 2000; Caballero, 2011; Inkelas, 2008; Matushansky, 2006).

First, recall that a few glottalized roots alternate between monosyllabic (C)VVʔ and disyllabic (C)V.ʔV, depending on the morphological context. When followed by the derivational suffix *-ña* CAUS, they surface as monosyllabic (12). When by themselves (9) or followed by an inflectional suffix, such as *-ji* PRCL (10), they surface as disyllabic (C)V.ʔV. In the CbP analysis of Section 4, this falls out directly from phase-based spell-out: The first phase to undergo phonological evaluation is *v*P, which includes the root (63) and the causative *-ña* CAUS (64), but excludes all other suffixes (66). This is also the assumption of Distributed Morphology (Embick, 2010), where the root and the categorizing *v* head constitute one spell-out domain, but the pattern of glottal alternation is difficult to capture in a fully parallel framework. Any constraint ranking which correctly predicts (111a) and (111b) will fail to predict (111c), and vice versa.[25]

(111) a.	*kûi,ʔ*	X ≫	Y
i.	(***kû́iʔ***)	*!	
☞ ii.	(***kû́***.*ʔi*)		*

drink

b.	*kûi,ʔ-ji*	X ≫	Y
i.	(***kû́iʔ****ji*)	*!	
☞ ii.	(***kû́***.*ʔi*)*ji*		*

drink-PRCL

c.	*kûi,ʔ-ña*	X ≫	Y
☹ i.	(***kû́iʔ****ña*)	*!	
💣 ii.	(***kû́***.*ʔi*)*ña*		*

drink-CAUS

Likewise, the pattern would be difficult to capture in a framework where the root always constitutes a cycle by itself. If the root undergoes spell-out before suffixation, it is not clear why it surfaces either as monosyllabic (C)VVʔ or as disyllabic (C)V.ʔV, depending on the morphological context. Inkelas (1989) accounts for root cycle variation with morphological boundedness—free roots constitute cyclic domains, but bound roots do not. In A'ingae, the factor which decides on the root cycle is a property of the suffix, not the root.

Second, recall that stress in forms with two inner preglottalized dominant suffixes is assigned to the syllable which contains the second mora to the left of the first of those suffixes (27). The glottal stop of the second suffix is deleted. If both suffixes are introduced in the same phase, they both contribute the same *dominant* cophonology to the phonological ranking of their phase, which deletes stress from the previous phase. Importantly, there is no step in the derivation where the first suffix has undergone phonological evaluation but the second one has not.

In this way, CbP differs from classic Cophonology Theory, where it is often assumed that each suffix associated with its own cophonological grammar undergoes phonological evaluation immediately upon combining with its base, before any further morphology takes place (Caballero, 2011; Inkelas, 2008; Inkelas and Zoll,

24 Stratal Optimality Theory, like CbP, is also partially cyclic. However, Stratal OT disallows morpheme-specific phonologies (Jaker and Kiparsky, 2020), making it difficult to model the A'ingae stress-deletion facts (Dąbkowski, 2021b).

25 This problem could be remedied by assuming a prosodic boundary between *v*P and AspP. However, in the absence of independent evidence for the existence of such a boundary, the solution is purely stipulative.

2007), as emphasized by Orgun and Inkelas (2002). This fully cyclic model incorrectly predicts that the stress assigned by the first preglottalized suffixes will be erased by the second preglottalized suffix (112).

(112) Two preglottalized AspP suffixes, cyclic evaluation

*ata(**páje**ʔ)ngi

a(**tápa**ʔ)*je* -*ʔngi*$^{\emptyset}$
-PROX

atapa -*ʔje*$^{\emptyset}$
breed -IPFV

The same prediction is made by Alderete's (1999, 2001) fully-parallel theory of Transderivational Anti-Faithfulness, without CbP, where given two dominant suffixes in a structure such as /*root-sfx*$^{\emptyset}$*-sfx*$^{\emptyset}$/, the second suffix always wins over the first one (Alderete, 1999, p. 181). Both frameworks predict that dominance effects are strictly cyclic, with the outermost dominant suffix dominating over all previous suffixes. The prediction is falsified by the A'ingae forms with multiple preglottalized inner dominant suffixes.

6 CONCLUSION

I formulated two generalizations about A'ingae glottalization. First, the relationship of glottalization to stress depends on the morphophonological domain. In the inner domain, glottalization triggers stress assignment and undergoes deletion along with stress. In the outer domain, glottalization does not trigger assignment and is not affected by stress deletion. Second, when controlled for the morphophonological domain and segmental content, the variability in the phonological processes triggered by A'ingae suffixes reduces to one parameter: some suffixes preserve metrical structure, while others delete it.

To capture the first generalization, I proposed that glottalization is a facultative feature of the metrical foot in the inner domain, and as such, it undergoes deletion whenever the metrical foot undergoes deletion. To capture the second generalization, I proposed that the division between two morphophonological domains crosscuts a distinction between recessive and dominant suffixes. I formalized this proposal by associating the two morphophonological domains with the *inner* and *outer* cophonologies and the dominant suffixes with the *dominant* cophonology.

The organization of the A'ingae phonological grammar shows that (i) stratally organized morphological domains may be characterized by different phonological grammars (*inner* vs. *outer*), but also that (ii) individual affixes might be associated with phonological grammars of their own (*dominant*). Furthermore, (iii) the phonologies of morphological domains and individual affixes interact. This demonstrates the need for a framework capable of capturing stratal morphophonology, morpheme-specific phonological effects, as well as their interactions.

I implemented my analysis in Cophonologies by Phase (Sande, 2019; Sande, Jenks, and Inkelas, 2020; others). CbP captures the organization of the A'ingae grammar, as it allows for associating different phonological rankings to phase heads as well as individual morphosyntactic features. The first property models the stratal organization of the *inner* and *outer* cophonologies (i). The second property models the fact that individual morphemes may be unpredictably associated with the *dominant* cophonology (ii). Thus, Cophonologies by Phase succeeds at fully capturing the generalizations about the phonology of the A'ingae glottal stop.

Significantly, an affix-specific cophonology may interact with the cophonology of its domain in a non-trivial way (iii): A dominant suffix deletes stress and glottalization if it is introduced in the inner domain (*inner* $\oplus$ *dominant*), but only deletes stress if it is introduced in the outer domain (*outer* $\oplus$ *dominant*). This is reminiscent of Sande's (2020) *morphologically-conditioned phonology with two triggers*, where a single phonological process is triggered by the presence of two morpheme-specific phonologies in the same phase. In the case of A'ingae, however, the two relevant cophonologies (phase head-specific *inner* or *outer* and morpheme-specific *dominant*) do not gang up to trigger a single process, but rather jointly define the characteristics of a process (deletion of stress and glottalization vs. deletion of stress alone). Thus, the A'ingae data show a new kind of phonological process with multiple triggers, bearing out yet another prediction of Cophonologies by Phase.

Finally, the typological profile of A'ingae and the phonological phenomena it exhibits are unlike those presented in previous CbP literature. There are very few case studies to date motivating the framework's architectural assumptions. Two of them come from Guébie (Sande, 2019) and Somali (Green and Lampitelli, in prep.). Sande (2019) leverages CbP to account for root-controlled ATR harmony, vowel replacement, and scalar tone shift phenomena across Guébie's oft-monomorphemic words. Green and Lampitelli (in prep.) use CbP to model Somali subject marking, exponed with subtractive tone, segmental content, both, or neither. The present study deals with stress assignment, stress deletion, and prosodic glottalization within subword domains of A'ingae's highly agglutinative verbs. Thus, it contributes a new line of evidence for CbP by demonstrating the insight the framework affords and the utility it has in modeling formally different phenomena in typologically dissimilar languages.

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