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*Augmentation as affixation in Athabaskan languages**

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1 Introduction

Athabaskan languages display a remarkable cross-language similarity, yet at the same time the languages of this family differ from each other in restricted ways. This unity and variety provide a useful laboratory for phonological and morphological research. In this paper, we suggest that a certain case of unity which has been analysed as phonologically and morphologically motivated requires a purely morphological analysis.

The case in question is the well-known verbal disyllabic minimality requirement, which has been variously analysed as satisfaction of a disyllabic verb template (Slave; Rice 1990), satisfaction of a monosyllabic prefix-based portmanteau 'stem' (Navajo; McDonough 1990, 1996) or the result of stray consonant syllabification in the Minimal Word domain in verbs (Ahtna; Causley 1994). However, when data from other languages of the family are brought into the picture, a different, family-wide analysis suggests itself.

We propose that disyllabic minimality results from affixation of a vocalic tense-marking prefix to verbs. The theoretical interest of our simple morphological analysis lies in what it does not include: no disyllabic template, no special prefixal 'stem' morphemes and no unusual phonological domains. The morphological constraints required to analyse the data can be formally stated within the terms of Generalised Alignment theory (McCarthy & Prince 1993a).

The systematic existence of monosyllabic verbs in some of the languages presents the greatest challenge for any account of disyllabic minimality, including the present one. In our account of monosyllables in one of the languages, we are forced to tackle a long-standing phonological problem in Athabaskan linguistics – a complex set of onset/coda alternations involving certain verb prefixes. We trace the exceptional behaviour of these prefixes to a small set of prosodic subcategorisation constraints which these morphemes obey. Our analysis thus supports Generalised Alignment in particular and Optimality Theory in general: for the first time in Athabaskan linguistics, these alternations can be analysed entirely within the limits of the assumed theoretical framework.

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We begin this article by introducing certain useful, uncontroversial facts about the structure of Athabaskan languages (§2). Then we turn to minimality data from a variety of Athabaskan languages (§3) and review previous analyses of Slave, Ahtna and Navajo (§4). Next we present data from a variety of additional languages which are problematic in different ways for these approaches (§5). Then we introduce our morphological analysis of the augment (§6), showing how our analysis provides a simple account of minimality and also of two apparently unrelated phenomena. Finally, we turn to the monosyllabic verbs found in certain languages (§7). In §8 we summarise our conclusions.

2 Background

Athabaskan verb stems consist of a lexical root and, in most cases, a mode/tense/aspectual suffix as well (Leer 1979). In this article, we will refer to both suffixed and unsuffixed roots as STEMS unless the stem–root distinction is crucial.

The position class verbal morphology of Athabaskan languages is typically described as a verb stem preceded by zero or more rigidly ordered prefixes:

(1) *The Athabaskan verb prefix template* (after Hoijer 1971: 125)

	labels used in this paper
1. Zero or more adverbial prefixes	Adverbial
2. Prefix for the iterative paradigm	Iterative
3. Pluralising prefix	Distributive
4. Object pronoun prefix	Pronominal object
5. Deictic subject prefix	Pronominal subject
6. Zero, one or two adverbial prefixes	Qualifier
7. Prefix marking mode, tense or aspect	Conjugation/Negative Tense
8. Subject pronoun prefix	Inner subject
9. Classifier prefix	Classifier
10. Stem	

As Kari (1989) and Rice (1995) note, there is considerable uniformity in the inventory and ordering of prefix positions in Athabaskan languages, although prefixes furthest from the stem exhibit the most variability. In this article, we focus on the prefixes in positions 4–9 and their phonology. This group of prefixes is known in the Athabaskan literature as the CONJUNCT prefixes. Following work by McDonough (1990), Halpern (1992) and others, we analyse stems and conjunct prefixes as forming a prosodic compound.[1]

(2) $[\text{PRO-QUAL-CNJ/NEG-TENSE-INNER SUBJ-CLF}]_{\text{conjunct}}$ $[\text{STEM}]_{\text{prosodic stem}}$

There is a certain amount of evidence that the classifiers are extraprosodic to the conjunct domain (see §7.3).

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Hoijer's 'mode, tense or aspect' position is one which is now generally divided into distinct positions for tense, conjugation and (in some of the languages) negative prefixes. The TENSE prefixes (usually referred to as 'aspect' or 'mode' in the Athabaskan literature) mark the major tense/aspect/mood distinctions in Athabaskan languages. All of the languages contain an imperfect *vs.* perfective distinction, as well as a third category, optative or future (or both). Most verbs can be inflected in all tenses. The CONJUGATION prefixes define subclasses of perfective and imperfective verbs, and in some of the languages, future and optative verbs as well (Rice 1985, 1989, Rice & Hargus 1989).

Kari (1989), following Jetté (1906), refers to the prefixes of Hoijer's 'adverbial' position 6 as QUALIFIER prefixes, a term which is adopted in this paper. While normally only one prefix from a particular position is allowed, more than one qualifier and more than one pronominal prefix may occur in a single verb form. When more than one qualifier prefix is present, these occur in an order which can be predicted from their phonological shapes (Jetté 1906, cited in Kari 1989; cf. also Kari 1993). Pronominal prefix order appears to be similarly predictable (Hargus 1995).

3 Augmentation and syllabification

3.1 The status of [ə] in the conjunct prefixes

Following work by Speas (1982, 1984) and Wright (1984) on Navajo, many analysts of Athabaskan verb prefix phonology have assumed that the reflex of Proto-Athabaskan (PA) *ə is not an underlying segment in the prefixes of Athabaskan languages.[2] Thus, it has been assumed that the underlying representations of words such as those in (3) contain no prefixal /ə/ (the left edge of the stem is marked with |):

(3) *Derived prefix* [ə] (Sekani)[3]

/ɣ-n-|daç/	[ɣənədaç]	'they're dancing'
/ts'-n-|ʔ̀ĩh/	[ts'ənəʔ̀ĩh]	'we're stealing it'

This position directly challenges analyses which assume prefix /ə/ is underlying but deleted in specific environments (e.g. Kari 1973, Hargus 1985, Rice 1989). Two arguments for the no-underlying-ə analysis have been advanced. The first concerns predictability of vowel quality: Speas (1982: 123) noted that in Navajo, 'of the 16 conjunct prefix forms listed by Young and Morgan, all but 5 are of the form (C)i'. (Proto-Athabaskan *ə is [i] in Navajo.) The second argument is the apparent predictability of syllable structure: Speas's 'form (C)i' is a surface pattern plausibly derivable from an underlying consonant and a vowel epenthesised for syllabification.

In the first detailed analysis of an Athabaskan language which assumes no underlying prefix /ə/, Randoja (1989) investigates the question of

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whether prefixal syllable structure is indeed predictable, showing that many instances of [ə] in the verb prefixes of Halfway River Beaver can be supplied by the syllable template for that language, which she proposes to be $[CV]_{\sigma}$ for the conjunct domain. The derivation in (4), illustrating conjunct [ə]-epenthesis, is modelled after Randoja (1989: 229–230). (Consonants in parentheses are extrametrical; conjunct elements are bracketed.)

(4) [nàʔədədət'ets] 's/he kicked him/herself' (Halfway River Beaver)

	$nà_{ITER}$-$ʔd_{REFL\ OBJ}$-d_{QUAL}-d_{CLF}-$ʔets_{STEM}$					
σ-mapping	n à	[ʔ	d	d	d]	ʔe(ts)
(Stray Epenthesis)	C V	C V	C V	C V	C V	
	σ	σ	σ	σ	σ	
Word level	n à	[ʔ ə	d ə	d ə	t]' e	ts
(extraprosodicity turned off)	C V	C V	C V	C V	C V C	
	σ	σ	σ	σ	σ	

However, as noted by Randoja (1989), not all prefix syllables have the shape [Cə]. For example, in (4), while d_{QUAL} is [də], d_{CLF} fuses with the [ʔ]-initial stem as [t'] and never appears as [də]. This contrast between d_{CLF} and d_{QUAL} is unexplained by the syllable template. Randoja identified three groups of consonantal conjunct prefixes:

(5) *Conjunct prefix classification* (Randoja 1989)

context:	Group 1 pronominal, qualifier	Group 2 conjugation	Group 3 subject, classifier
#__ [stem	a. [Cə]	b. [Cə]	c. [əC]
prefix __ [stem	d. [Cə]	e. [əC]	f. [əC]
#__ prefix	g. [Cə]	h. [Cə]	i. [əC]
proposed UR:	/C/	/C/	/C/]σ

In Halfway River Beaver, according to Randoja's analysis, Group 1 prefixes are invariable onsets to epenthetic [ə], Group 3 prefixes are invariable codas to epenthetic [ə] and Group 2 prefixes vary between onset and coda to epenthetic [ə]. Although there are problems with the details of Randoja's analysis, her proposed typology of the consonantal prefixes represents an important observation about verb prefix shapes, and we will return to it later in this article.

To summarise, it has been claimed that many instances of conjunct [ə] are epenthetic in Athabaskan languages. If this is correct, the surfacing of /C/ prefixes as onsets or codas, a surface distribution that seems to be

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connected to prefix position in some way, is a problem that must be accounted for.

3.2 Augmentation

An additional argument that has been advanced for the epenthetic status of conjunct [ə] concerns the vowel which appears in forms which are said to be augmented to satisfy disyllabic minimality.[4] Verbal augmentation in Athabaskan languages is typically described via statements such as the following, on Slavey and Navajo, respectively:

> Some words do not have a meaningful prefix taken from one of the eleven slots. Instead, they add a prefix /ɛ-/ (often /hɛ-/ in Hay River and Fort Providence) which carries no meaning. (Howard 1990: 802).

> To insure syllable integrity, and to prevent the naked stem from appearing in lexical form... a meaningless element with the shape yi-~y-~w- is added. (Young & Morgan 1987: 112)

Augmentation is easiest to see in forms such as (6), which appear to be morphologically unprefixed, containing only a verb stem. In (6), the augment, whose phonological shape is always a reflex of PA *ə, is emphasised:[5]

(6) *Basic verbal augmentation data: bare stems*

language	*data*	*source*[6]	
S. Slavey	ɛ̲|tsɛ	's/he is crying'	DSS 802
	ɛ̲|zí	'it's roasting'	DSS 800
	ɛ̲|ʔéh	's/he is paddling'	DSS 46
Sekani	ə̲|tsəɣ	's/he is crying'	
	OBJ ə̲|č'ĩ	's/he has OBJ'	
	OBJ ə̲|bà	's/he (child, animal) is eating OBJ'	
Koyukon	ə̲|tsəh	's/he is crying'	KSS 30
	OBJ ə̲|haɳ	's/he is eating OBJ'	KSS 61
	OBJ ə̲|zəs	's/he is drinking OBJ'	KSS 72
Deg Hit'an	ʔə̲|trəχ	's/he is crying'	KH
	ʔə̲|ləχ	'it's swimming'	KH
	OBJ ʔə̲|hoɳ	's/he is eating OBJ'	KH
Witsuwit'en	hə̲|tsəɣ	's/he is crying'	
	hə̲|tl'et	's/he is farting'	
	hə̲|bəl	's/he is swinging'	
Navajo	yi̲|ča	's/he is crying'	NVP 106
	yi̲|dzi:h	'it's left'	NME 271
	ʔádin yi̲|le:h	's/he is vanishing, going away'	ALN 379
Hupa	ʔi̲|sahɬ	's/he is yawning'	SPG 41
Galice	ʔa̲|seh	's/he is crying'	GA 326
	ʔa̲d|yas	'it's snowing'	GAS 37

As can be seen in (6), an epenthetic word-initial consonant occurs in those languages in which onsetless [ə] (or its cognate) is not allowed.

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Since the augment has the same quality as the other prefix vowels which have been argued to be epenthetic, the phonological conditions which trigger the appearance of the augment have sometimes been assumed to be the same as those which lead to epenthetic vowels elsewhere in the verb prefixes. For example, Wright (1984: 465), observing that 'we need an *i*-insertion rule for Navajo in any case', implies that there is some overlap between the rule which accounts for the augment and that which accounts for other epenthetic vowels. However, it is easy to show that there must be morphological conditions on augmentation as well, because in no Athabaskan language does augmentation ever affect nouns:

(7) *Witsuwit'en nouns (no augmentation)*

ʔa 'fog'	tl'oɬ 'rope'
ʔaç 'snowshoe'	ye 'louse'
ts'o 'spruce'	bet 'mittens'

This striking contrast between nouns and verbs is one to which we will return several times in this article.

4 Previous analyses

In this section we review various recent approaches to the phenomenon illustrated in (6). Each is an account of augmentation in a specific language, combining phonological principles with morphological restrictions in various ways.

4.1 Template mapping

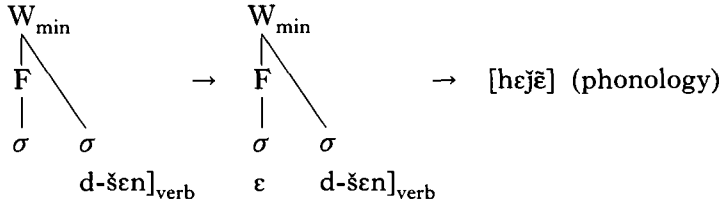
Rice (1990) convincingly argues that the stem and pre-stem syllables in Hare form a foot which is left-strong in verbs and right-strong in nouns. The foot serves as the domain of several phonological phenomena, including prominence, vowel assimilation and fricative voicing. Rice also suggests that the foot can be used to account for the verbal disyllabic minimality requirement:

(8) $W_{min} = F_{\sigma\sigma}$ (for the verb; the right branch must be the stem)

Starting at the right edge of the verb stem (or, as we will see in §5.2, the verb root), verbs are mapped R–L to the foot template. If the verb contains a syllabic prefix, the syllabic prefix satisfies the left syllable of the foot. If not, as in the case of 'sing' in (9), a syllable headed by [ɛ] is supplied by the prosodic template:

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(9) *Template-mapping derivation*



We call this the template-mapping analysis.

4.2 Consonant rescue

As will be discussed in §§5.4.1 and 7.4, Ahtna is one of a small number of Athabaskan languages which lack augmentation of bare stems, unlike the languages in (6). However, augmentation effects occur in Ahtna with qualifier prefixes. Causley (1994: 68), focusing exclusively on verbs, suggests the following analysis of Ahtna augmentation within an Optimality Theory framework:

> Prestem epenthesis is driven by the need to jointly satisfy PARSE in parsing all prefix consonants and to satisfy the requirements of *COMPLEX which prohibits complex onsets or codas. These two constraints force the consistent violation of FILL in prestem position.

Causley (1994: 54) provides the tableau in (10) to explain pre-stem epenthesis with the qualifier prefix *d-* in [tsɛy'tsiy dɛyæ:n] 'the knife is sharp' (AD 433):[7]

(10) /d|yæ:n/

	ALIGN-L	*COMPLEX	PARSE	FILL
a. .dyæ:n.		*!		
b. <d>.yæ:n			*!	
c. d<y>æ:n.			*!	
d. .[ɛ]d.yæ:n.	*!			*
☞ e. .d[ɛ].yæ:n.				*

According to this analysis, [dɛyæ:n] is preferred over [dyæ:n] because the latter violates *COMPLEX. [dɛyæ:n] is also preferred over [yæ:n] or [dæ:n] because the latter fail to parse morphologically specified material. Finally, [dɛyæ:n] is preferred over [ɛdyæ:n] because phonological words must begin with morphological material by ALIGN-L (11), and [ɛ] does not belong to any morpheme:

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(11) ALIGN-L (Causley 1994: 52)
Align(PrWd-L, MWd-L)

Since [dC] is tolerated elsewhere in Ahtna, Causley further assumes that the preceding analysis only holds within a 'Minimal Word' domain consisting of stem and pre-stem syllables, obviously very similar to the foot constituent proposed by Rice (1990) for Hare. We call this the consonant-rescue analysis.

4.3 I-stem minimum

McDonough (1990, 1996) suggests that a Navajo verb is a compound consisting of two stems, a leftmost 'inflectional stem' (corresponding to the rightmost conjunct prefixes), and a rightmost, root-based 'verb stem':

(12) *Compounding analysis of prefixed verbs* (McDonough 1996: 241)
AGR | [QU | stem]$_{\text{INFL}}$ + [CL | stem]$_{\text{VERB}}$

McDonough further assumes that the I-stem is a portmanteau consisting of conjugation, perfective and subject morphemes which have fused into a single morpheme, a stem which is inflected for person and number. Every verb contains one such portmanteau morpheme. Concerning the rationale for this extensive portmanteauism, McDonough (1990: 32) states that:

> the interaction between mode and subject is not predictable and not recoverable from the lists of mode and subject... Variation is completely idiosyncratic... divergence must be corrected by rule. The rules will be ad hoc... [and] bear little resemblance to processes that are the usual domain of phonology.

For example, as can be seen from (13), the 1st person singular subject prefix, normally *š* or *s-*, is absent in a subset of perfective verbs, where a vowel *é-* occurs instead. In McDonough's analysis, this *é-* is a portmanteau marking 1st person singular subject and perfective in such verbs:

(13) *Sample Navajo I-stem morphemes* (McDonough 1996: 239)

	$_{\text{S}}$IMPF	$_{\text{S}}$PERF	$_{\text{S}}$PERF
1	šiš	sé	sis
2	sí	síní	síní
3		si	yis
1DUAL	siid	siid	siid
2DUAL	soh	soo	sooh

McDonough (1990) suggests that a minimality requirement – monosyllabicity – holds of all stems, root- or inflection-based, so that all verbs, being compounds of two stems, are minimally disyllabic. We call this the I-stem analysis.

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4.4 Summary

Each analysis derives augmentation from a combination of phonological and morphological factors. The consonant-rescue analysis derives augmentation via syllabification of stray consonants within a special domain in verbs. In the template-mapping approach, the augment appears when needed to satisfy a disyllabic verb template. The I-stem minimum approach derives the augment by proposing a new verbal morphological constituent, an inflectional stem, which has a one-syllable minimum.

5 Empirical challenges to previous analyses

In this section we discuss data which are problematic in different ways for each approach.

5.1 ɬ-prefixes

In many of the languages, the augment occurs to the left of $ɬ_{CLF}$ or its reflex (*h-* in Slave and Sekani):

(14) *Augmentation with* $ɬ_{CLF}$

language	*data*		*source*
Slave	OBJ ɛ̲h|čɛh	's/he is boiling OBJ'	GS 488
	OBJ ɛ̲h|ʔáh	's/he is chewing, gnawing on OBJ'	DSS 22
	OBJ ɛ̲h|θɛh	's/he is tanning OBJ (a hide...)'	DSS 132
Sekani	OBJ a̲h|gək	's/he is rubbing, massaging OBJ'	
	OBJ a̲h|ʔa	's/he is hiring OBJ'	
	OBJ a̲h|bets	's/he is cooking OBJ by boiling'	
Deg Hit'an	ʔoç ʔə̲ɬ|tse	's/he is making snowshoes'	KH
	ʔə̲ɬ|yoθ	'it's snowing'	KH
	ʔə̲ɬ|ðeç	'it's numb'	KH
Witsuwit'en	hə̲ɬ|ɣis	's/he itches'	
	hə̲ɬ|tsən	'it stinks'	
	cən hə̲ɬ|ɣəs	'termite' (lit. it drills wood)	
Salcha	ə̲ɬ|ts'əy̆	'it's windy'	
	ə̲ɬ|čã	'it's raining'	
	OBJ ə̲ɬ|bæts	's/he is cooking OBJ'	

A natural question to ask is whether the word-initial vowel is present in (14) simply to syllabify the *ɬ-* or *h-* prefix (as in the consonant-rescue analysis), or whether it occurs for some other reason, such as to satisfy a disyllabic template. In this section, we will suggest that the forms in (14) are problematic for the consonant-rescue analysis, and that the word-initial vowels must have a different source.

Our argument will build on insights of Rice (1989: 940ff) into the structure of Slave. She notes that in some cases, 'nouns and verbs not only share roots, but share themes', where a verb theme is the verb root and any lexically specified prefixes. 'There are some nouns in Slave that occur

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with a prefix in some dialect and that are related to verbs. When the related verb theme has an *h-* classifier, this morpheme is present in the prefixed noun form.'

(15) *Slave noun, verb theme pairs* (sharing h_{CLF} in surface form)

nouns	*verb themes*
goh|fĩh 'axe' (Hare)	h-|fĩh 'action with axe' (Hare)
goh|zé 'hook at end of stick'	h-|sé 'hook' (VB)
ʔɛh|dzo 'trap' (N)	h-|dzo 'trap' (VB)

The nouns in (15) are lexicalised with the verbal prefixes *go-* (AREAL) and *ʔ(ɛ)-* (UNSPECIFIED OBJECT). In contrast to the data in (15), nouns paired with verb themes consisting of *h-*+stem lack the *h-* when the noun contains no vocalic prefix:

(16) *Slave noun, verb theme pairs* (not sharing h_{CLF} in surface form)

nouns	*verb themes*	
|tθĩh 'axe'	h-|tθĩh	'chop with axe'
|xáh 'club'	h-|xah	'club, handle stick-like object (uncontrolled)'

Rice notes that:

> [in] nouns, the classifier is generally lost since it does not become part of a syllable. If, however, a syllable is placed before it... the classifier remains. The facts that it is generally only verbs that have a phonetic classifier and that it is only verbs that require a prestem syllable are thus related: the syllable allows the classifier a phonetic realisation.

Thus Slave deletes the stray consonantal prefix in the nouns in (16), rather than epenthesising to rescue it. Therefore consonant rescue cannot be the explanation for augmentation in the Slave verb forms in (14).

In other languages as well, Rice's remarks for Slave correctly predict that the vowel preceding the *ɬ-* classifier in the verbal forms in (14) is not added to rescue a stray consonant. In Salcha and Witsuwit'en, [ɬC] is a well-formed onset, in both nouns and verbs:

(17) *Word-initial* [|ɬC] *in two languages with verbal* [əɬ|C]

Salcha	noun	ɬts'əy̨	'birch fungus ashes'
	verbs	ɬnalʔæ̆	'you (PL) are looking at each other'
		ɬts'itθ'ək	'we're listening to each other'
Witsuwit'en	nouns	ɬc'ət	'different place'
		ɬq'aq	'split fish (non-salmon)'
	verbs	ɬts'əstc'əy	'we shot each other'
		ɬdəlyəl	'it's as white as it'

The lack of epenthesis in these forms is therefore a problem for a consonant-rescue account of epenthesis in the respective *ɬ-* classifier verb

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forms in (14) for these languages. The pre-stem vowels must occur in those forms for some other reason.

5.2 Disyllabic stems

Most Athabaskan verb stems are consonant-initial monosyllables. However, in some of the languages, a minor number of disyllabic stems also occur. Significantly, disyllabic stems, when attested, never fail to undergo augmentation in augmenting languages:[8]

(18) *Augmentation of disyllabic stems*

Deg	te ʔə̲ | zrəŋətl	's/he is bailing water, water pump'	KH
Hit'an	ʔə̲ | gəŋəsr	's/he is ticklish'	KH
Slave	hɛ̲h | bɛlí	's/he is swinging OBJ'	GS 488
	ɛ̲ | líɛ	'it's hurt, sore'	DSS 345
	ɛ̲h | dɛðɛ, ɛ̲h | dɛði	'it's twisted'	DSS 94
	ɛ̲h | k'ólɛ	's/he is making it soft, doughy'	DSS 303
	ɛ̲h | ts'í:lɛ	'it's curved'	DSS 596
Navajo	yi̲l | žólí	'it's soft, tender, fluffy'	ALN 786
Sekani	ə̲ | wàse	's/he itches'	
	ʔəlà a̲h | t'oɣəs	's/he is paddling a boat'	

In (18), we have included stems from some languages which end in a vowel which is the word-final reflex of PA *ə for that language (Sekani *-e*, Slave *-ɛ*, Navajo *-i*), a vowel which Rice (1989: 816) has analysed as a suffix of uncertain meaning in Slave.

Notice that the augmentation of disyllabic stems illustrated here is problematic for the template approach: why does the second syllable of the stem not satisfy the template and therefore block augmentation? The only way to salvage the template-mapping approach is to stipulate that mapping to the template begins at the right edge of the root, not the suffixed stem. However, manipulation of the template-mapping approach seems unsatisfying and unexplanatory. The augmentation of disyllabic stems suggests that the Athabaskan case is fundamentally different from that of Lardil, where syllabic affixation does block augmentation (Wilkinson 1988).

5.3 Augmentation with syllabic prefixes

The disyllabic template and consonant-rescue analyses depend on the idea that certain verb forms are deficient in foot or syllable structure, and must be augmented to satisfy a formal requirement. Trisyllabic verb forms composed of verb stem, syllabic prefix and the augment argue strongly against both of these deficit-based analyses.

In Deg Hit'an and Witsuwit'en, when the *də-* classifier is the only prefix to a verb, it appears in an augmented [ədə]- form (with epenthetic word-initial [ʔ] in Deg Hit'an and [h] in Witsuwit'en).

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(19) də- *classifier*

Deg Hit'an	ʔədə|q'oθ	's/he is exercising'
	ʔədə|ǰaɬ	's/he is busy'
	ʔədə|ɢəsr	's/he arrived (crawling)'
Witsuwit'en	hədə|tl'ol	'it's braided'

The Witsuwit'en 1st person dual subject prefix *dəd-*, an inner subject prefix, similarly appears in augmented form [[h]ədət]- when word-initial:

(20) dəd- (1DUAL SUBJ)

dendət|'az	'we (DUAL) went inside'
hədət|wəs	'we (DUAL) are ticklish'
hədət|ges	'we (DUAL) are scratching him/her (hard)'

In Witsuwit'en there are two other syllabic prefixes which exhibit slightly different but analogous behaviour. The pronominal object prefixes *ni(y)-* (1DUAL OBJ) and *nəxw-* (1/2PL OBJ) are *ni-* and *nəxw-* before a consonant, but have longer forms *niyə-* and *nəxwə-* when they precede the verb stem:

(21) *Witsuwit'en* [CV(C)] *vs.* [CVCə]-

ni(y)$_{1\text{DUAL OBJ}}$	q'ɛqɛ nic'ədət|'əy	'someone has us (DUAL) as friends'
	q'ɛqɛ niyət|'əy	's/he has us (DUAL) as friends'
	niyə|dlet	'it's licking us (DUAL)'
nəxw$_{1/2\text{PL OBJ}}$	nəxwniɬ|t'əxw	'it stung us/you (PL) on face'
	nəxwə|dlet	'it's licking us/you (PL)'
	nəxwə|ges	's/he is scratching us/you (PL)'

The trisyllabic data seen in Deg Hit'an and Witsuwit'en are a problem for the template-mapping analysis, since the leftmost syllable of the template should be satisfied by the syllabic prefix. Instead, there is an extra syllable in such forms. In addition, the position of this extra syllable, to the left of the classifier or inner subject, but to the right of the pronominal prefixes, cannot be accounted for.

5.4 Failure of augmentation

The next set of examples – monosyllabic verb forms – are problematic for both the template-mapping and I-stem minimum approaches. Both hypotheses predict that no verb form should ever be smaller than disyllabic.

5.4.1 *Unaugmented stems.* Kari (1990: 43) notes that three of the Athabaskan languages, Ahtna, Dena'ina and Kato, fail to exhibit the basic augmentation phenomenon illustrated above in (6). In these languages, there is no augmentation in 3rd person singular forms which contain no prefixes.

(22) a. *Dena'ina failure of augmentation: unprefixed verbs*

|čəɣ	's/he is crying'	AD 43
|ɣen	's/he is hollering'	WPK 83

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b. *Kato failure of augmentation : unprefixed verbs*

Goddard	H&T	interpretation	
tce'	|čeh	's/he is crying'	KD 114-5
qãL	|qʌɬ	's/he walked'	KT 75-8
tc'in	|č'in	's/he said'	KT 76-12

c. *Ahtna failure of augmentation : unprefixed verbs*

|qæ:s	's/he (customarily) arrives by boat'	AD 672
|su:χ	'it's (customarily) beautiful'	AD 202
OBJ|tsæ:ɬ	's/he is chopping OBJ'	AD 419
OBJ|ɣa:n	's/he is making OBJ'	AD 204

As noted by Kari (1990) and Causley (1994), Ahtna verbs with classifier prefixes also surface as monosyllables:

(23) *Ahtna failure of augmentation : classifier prefixed verbs*

l_{CLF}	l|soɬ	's/he is lying'	AD 464
	l|ɢay	'it's white'	AD 697
	l|tsi:	'it's made'	AD 679
$ɬ_{CLF}$	ɬ|ts'i:χ	'it (customarily) blows'	AD 411
	ɬ|ci:χ	'it (customarily) rains'	AD 202
	ɬ|tæ:n	's/he is lying dead'	AD 328
d_{CLF}	d|a:n	'it's eaten'	AD 680
	OBJ t|na:n	's/he is drinking OBJ'	AD 652

In Kato as well, there is no vowel before the classifier prefix:

(24) *Kato failure of augmentation : classifier prefixed verbs*

	Goddard	H&T		
$ɬ_{CLF}$	-L gai	ɬ|gai	'it's white'	EKL 28–29
	-L tcīk	ɬ|či:k	'it's red'	EKL 28–29
	-L cûñ^{E}	ɬ|šəŋ'	'it's black'	EKL 28–29
	-L cīk	ɬ|ši:k	'it's shining'	EKL 28–29
d_{CLF}	-t biñ	t|biŋ	'it's sharp, pointed'	EKL 28–29

Dena'ina data with classifier prefixes are unavailable. But the forms in (25), with s_{CNJ}, clearly lack the augment:

(25) *Dena'ina failure of augmentation :* s_{CNJ} *prefixed verbs*

š|dlač	'it's cooked'	DD 198
z|t'a	'it's roasted, baked, fried'	DD 198

As pointed out above, any verbs which are smaller than disyllabic are problematic for both the template-mapping and I-stem minimum approaches.

5.4.2 *Phrasally conditioned augmentation.* In Salcha and Minto, the presence of the augment depends on other phrasal elements.

In Minto, if no other word occurs within a sentence, the augment appears on an unprefixed verb. However, if any other word is present in the sentence, the augment does not appear on the verb:

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(26) *Minto* [ə]∼∅ *alternations*

a.	ə̲|trəx	's/he is crying'
	dənæ |trəx	'the man is crying'
b.	ə̲|bætr	'it's cooking (by being boiled)'
	ɬuk'æ |bætr	'fish is cooking'
c.	ə̲|čæsr	'it's melting'
	srəsr k'ʊx |čæsr	'bear fat is melting'

In Salcha forms which contain no conjunct prefix or only a classifier prefix, the augment is variably present in citation forms.

(27) *Salcha* [ə]∼∅ *variation*

\|tsəx∼ə̲\|tsəx 's/he is crying' SL

However, the augment appears when the preceding word ends with a stressed syllable (28a, c), but not when the preceding word ends with an unstressed syllable (28b, d):

(28) *Salcha post-stress obligatory augment*

a.	č'ətθi̋ʔə̲|ʔáɬ	's/he is eating meat'	SL
b.	ɬúgə|ʔáɬ	's/he is eating fish'	SL
c.	ǰíts ə̲|ɣã́	's/he is making gloves'	
d.	sʔǽgəʔ|ɣã́	's/he is making my dresses'	SL

Both template-mapping and I-stem hypotheses predict that the presence of the augment should be independent of word-external elements.

5.4.3 *Morphologically restricted augmentation.* In Witsuwit'en, s_{CNJ} is systematically [s]-, not [əs]- or [sə]-, when the verb stem initial consonant is a plain coronal [d t t']. If no other verb prefixes are present, the resulting verb is a monosyllable:

(29) *Witsuwit'en failure of augmentation*: s_{CNJ} + [d t t']

s̲\|de 's/he is sitting'
s̲\|tan 'it (rigid OBJ) is'
s̲\|t'ɛ 'it's roasted, fried'

The s_{CNJ} prefix is also systematically [s]- before d_{CLF} or l_{CLF} (with s_{CNJ} and l_{CLF} coalescing to [ɬ]). Again, if no other verb prefixes are present, the resulting verb is a monosyllable:

(30) *Witsuwit'en failure of augmentation*: s_{CNJ} + d_{CLF} or l_{CLF}

			cf. 1SG SUBJ	
— d_{CLF}	s̲giz (s̲-d-|yiz)	's/he is breathing'		
	s̲d|gwət	's/he was poked'		
	s̲d|liz	'it's been boiled'		
— l_{CLF}	ɬ̲|dəw	'it cramped up'	səgəldəw	'I cramped up'
	ɬ̲|ɣil	'it's wrapped up'	secɬɣil	'I wrapped it'
	ɬ̲|ɢuh	'it's trapped'	səcɬɢuh	'I trapped it'

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The monosyllabicity of the forms in (30) contrasts with the disyllabicity of other *s*-prefixed forms. In (31), s_{CNJ} is [sə] before stems which do not begin with plain coronals:

(31) *Witsuwit'en augmented verbs*: s_{CNJ} + stem

sə|bel	'it's rolled up'	sə|ʔay	'it (compact OBJ) is'
sə|liʔ	's/he became'	sə|tlɛɣ	'it (mushy OBJ) is'
sə|zəl	'it's warm'	OBJ sə|dzih	'it grabbed OBJ (with claws)'
sə|yin	's/hę is standing'	sə|c'əl	'it's broken, torn'
sə|qoy	's/he vomited'	sə|ɢi	'it's dried out'

Verbs containing only the 1st person singular object prefix /s/- also surface as [sə], rather than [s]:

(32) *Witsuwit'en augmented verbs*: $s_{1SG\ OBJ}$ + stem

sə\|dlet 'it's licking me'
sə\|ɢes 'it's scratching me (hard)'

Verbs containing only the 1st person singular subject prefix *s*- contain a syllable [həs]- (with epenthetic [h]), also contrasting with [s] in (29)–(30):

(33) *Witsuwit'en augmented verbs*: $s_{1SG\ SUBJ}$ + stem

həs\|dlet 'I'm licking it'
həs\|tl'et 'I'm farting'

The monosyllabic forms discussed in this section are problematic for both the template-mapping and I-stem hypotheses.

5.5 Summary

In this section, we have seen various kinds of data which are problematic for previous approaches to augmentation when considered as possible frameworks for a family-wide analysis of this phenomenon. The disyllabic template is stymied both by forms which are smaller than disyllabic and forms with syllabic prefixes which fail to satisfy the leftmost syllable of the template. The I-stem minimum hypothesis also fails to account for monosyllabic forms. Finally, the consonant-rescue approach has difficulties with [ɬC] clusters in verbs.

6 Augmentation as affixation

6.1 The tense prefix /ə/-

The data presented in §5 show that augmentation (or lack thereof) is independent of stem and/or prefix syllable count. Before we suggest an account of augmentation which is consistent with this generalisation, one

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additional characteristic of verbs in Athabaskan languages is relevant: it has often been observed that there are no infinitives in the languages of this family (e.g. Dogrib; Saxon 1986: 11). We therefore propose that all verbs in Athabaskan languages have a tense prefix:

(34) OBLIGATORY TENSE

Every verb contains a tense prefix.

Since Krauss (1970), analysts of Athabaskan languages have assumed that the imperfective is morphologically unmarked; i.e. that verbs with no overt tense/mode/aspect prefix are simply interpreted as imperfect, just as verbs with no overt subject prefix are interpreted as 3rd person singular. However, following Hoijer (1971: 137), who posits a PA prefix *ə- marking the 'disjunct imperfective', we propose that the so-called augment in Athabaskan languages is a tense prefix, or rather a pair of tense prefixes, whose phonological shape is /ə/-. We will differ from Hoijer in suggesting that /ə/- has a wider distribution than the imperfective, also occurring in a limited set of perfective verbs. As will be shown in the remainder of this section, positing a tense prefix /ə/- explains the otherwise perplexing differences between noun and verb while relating a universal property of Athabaskan verbs to a phonologically overt prefix: all verbs are tensed, therefore all verbs must be marked with tense.

We illustrate our proposal more concretely with the tense/mode/aspect prefixes of Witsuwit'en (hereafter simply referred to as the 'tense' prefixes). In (35), allomorphs of the tense prefixes are separated by /; not all allomorphs are illustrated:

(35) *Witsuwit'en tense prefix inventory*

PERFECTIVE	a.	intsɛɣ	's/he cried'
in-/en-/ən-/ə-	b.	hənli	's/he is'
	c.	OBJ sədzih	'it grabbed OBJ (with claws)'
	d.	nəsye	'I arrived, came for the first time'
PERFECTIVE NEG	e.	wec'oniyil	's/he didn't pick berries'
i-/e-			
OPTATIVE	f.	nusqɛʔ	'I should go around by boat'
u-/o-			
FUTURE	g.	taqɛɬ	's/he will go by boat'
a-/i-	h.	wetəzisqɛtl	'I won't go by boat'
PROGRESSIVE	i.	ts'ɛqɛɬ	'we're going by boat'
ɛ-/i-	j.	iqɛɬ	's/he is going by boat'
IMPERFECTIVE	k.	hətsəɣ	's/he is crying'
ə-	l.	c'onəyin	's/he is picking berries'
	m.	hədeç	's/he (customarily) sits'
	n.	wətsats'əqɛç	'we (customarily) come by boat'

In Witsuwit'en, OBLIGATORY TENSE is satisfied by prefixing one of the affixes in (35).

There are two features of particular interest in (35): (i) There are two

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homophonous prefixes: $ə_{IMPF}$, which is present in the imperfective forms (35k–n), and $ə_{PERF}$, which occurs in certain perfective forms (35c–d). In the remainder of this article, we will refer to both prefixes collectively as $ə_{TENSE}$ when the distinction between them is not crucial. (ii) All of the tense prefixes in (35) are vowel-initial while prefixes of neighbouring positions are overwhelmingly consonantal. The tense prefixes therefore differ systematically in phonological form from the more canonical consonant-bounded conjunct prefixes. Our newly proposed $ə_{TENSE}$ fits in well with the other prefixes of this position.[9]

Notice that, in our view, not all instances of [ə] in the verb prefixes of Athabaskan languages are epenthetic. Both $ə_{PERF}$ and $ə_{IMPF}$, for example, contain underlying /ə/. We also assume that morpheme-internal, non-alternating /ə/ as in Witsuwit'en *nəxw-* (1/2PL OBJ) and *dəd-* (1DUAL SUBJ) is an underlying vowel. However, we will continue to assume that other instances of [ə] in the conjunct prefixes are epenthetic.

Let us review the similarities and differences between our proposal and the previous approaches to augmentation discussed in §4. In Rice's template-mapping approach, the left branch of the disyllabic verb template is analysed as resulting from verbal word formation:

> A second word formation rule is required for verbs. Every verb must have at least one syllable preceding the stem. This syllable is added to verbs by a word formation rule that inserts a syllable before a verb stem...
>
> [syllable $[X]_V]_V$ (Rice 1989: 942)

Although Rice's analysis, like ours, is fundamentally morphological, we have suggested different morphological and phonological content for this prefix: it is a tense prefix whose phonological shape is a reflex of *ə-. As we pointed out above, the template-mapping approach and the foot which underlies it capture certain facts of Slave in an appealing way. However, unlike our analysis, this approach will not work for other languages with slightly different morpheme shapes.

Our analysis is also similar in certain ways to McDonough's (1990, 1996) I-Stem proposal. Like McDonough, we posit a large role for morphology in accounting for so-called augmentation. In fact, morphology – prefixation – lies at the heart of our analysis, but our analysis posits distinct underlying conjugation, tense, negative and subject prefixes, including $ə_{TENSE}$, rather than portmanteau combinations of these morphemes.

Turning to the phonological implications of our analysis, recall the contrast between Salcha [ɬts'əẙ] 'birch fungus ashes' and [əɬts'əẙ] 'it's windy' discussed in §5.1. In our analysis, there is no affixation of $ə_{IMPF}$ to the noun, whereas the verb contains this prefix by OBLIGATORY TENSE:

(36) *Salcha* [$ə_{IMPF}$-ɬ-|C] *in verbs*

$ə_{IMPF}$-ɬ-|ts'əẙ	'it's windy'
TENSE-CLF-windy	

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The disyllabic stems discussed in §5.2 also receive an explanatory solution. All verb stems, whether monosyllabic or disyllabic, must have a tense prefix:

(37)

	Sekani /t'oɣəs/ 'paddle'	
	(verb) ←	→ (noun)
OBJ-$ə_{IMPF}$ + h_{CLF} + t'oɣəs		[t'oɣəs] 'paddle'
[aht'oɣəs] 'paddle OBJ'		

Satisfaction of OBLIGATORY TENSE is independent of the number of syllables in the stem.

'Augmentation' with syllabic prefixes (§5.3) is now also straightforward:

(38) *Witsuwit'en syllabic prefixes*

$niy_{1DUAL\ OBJ}$-$ə_{IMPF}$'s/he has us (DUAL)'	niyə | t'əy
$ə_{IMPF}$-$dəd_{1DUAL\ SUBJ}$ 'we (DUAL) are ticklish'	hədət | wəs

Our analysis also solves the problem of the position of the augment to the left or right of a syllabic prefix: this is a consequence of affix-order restrictions. The tense prefix occurs to the left of inner subjects but to the right of object prefixes.

Finally, a simple account of Randoja's Group 1 (qualifier, pronominal) and 3 (subject, classifier) consonantal prefix groups (cf. (5)) is now also possible. The vowel-initial tense prefix is like a pivot around which consonantal prefixes are morphologically positioned. Verbs containing one consonantal Group 1 prefix /C_1/ surface as [C_1V] and those containing one consonantal Group 3 prefix /C_3/ as [VC_3], simply by prefix-ordering constraints. The forms with [C_1ə] and [əC_3] noted by Randoja in (5) are just the special case which arises when the tense prefix is $ə_{TENSE}$. In (41), forms with u-/o-$_{OPT}$ and ɛ-/i-$_{PROG}$ are provided for comparison with those containing $ə_{IMPF}$:

(39) *Witsuwit'en verbs with one Group 1/3 prefix and one tense prefix*

Group 1		
n_{QUAL}	nədeç	's/he is dancing'
	nudeç	'let him/her dance'
t_{QUAL}	nən təzuh	's/he is spitting'
	nən tozuh	'let him/her spit'
$c'_{UNSP\ OBJ}$	c'əges	's/he is scratching something (hard)'
	c'oges	'let him/her scratch something (hard)'
$s_{1SG\ OBJ}$	sədlet	'it's licking me'
	sodlet	'let it lick me'

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Group 3

$s_{1SG\ SUBJ}$	[h]əsbəl	'I'm swinging'
	isʔɛn[10]	'I see him/her/it'
$xw_{2PL\ SUBJ}$	[h]əxwqɛç	'you (DUAL) (customarily) sit'
	ixwʔɛn	'you (PL) see him/her'
d_{CLF}	OBJ [h]ətne	's/he is drinking OBJ'
	OBJ utneʔ	'let him/her drink OBJ'
$ɬ_{CLF}$	[h]əɬɣis	's/he itches'
	uɬɣis	'let him/her itch'

We also automatically account for the distribution of vowels in forms which contain more than one Group 1 and 3 prefix:

(40) *Witsuwit'en verbs with two Group 1/3 prefixes and one tense prefix*

	Group 1		*Group 3*	
	n_{QUAL}		$ɬ_{CLF}$, d_{CLF}, l_{CLF}	
	t_{QUAL}		$s/c_{1SG\ SUBJ}$	
Group 1				
$h_{3PL\ SUBJ}$	h[ə]nədeç	'they're dancing'	həɬɣis	'they itch'
n_{QUAL}	ntadeç	'we'll dance'	nəsdeç	'I'm dancing'
Group 3				
$c/s_{1SG\ SUBJ}$	—		[h]əcɬɣis	'I itch'
			ig[ə]lgih	'I'm running'
			[h]əstne	'I'm drinking it'

Verbs with one Group 1 and one Group 3 prefix contain a prefix syllable of the shape $[C_1VC_3]$-, since the consonantal prefixes occur to the left and right, respectively, of the vocalic tense prefix. Verbs with two Group 1 prefixes contain a prefix sequence $[C_1(V)C_1V]$-, with the presence of the first vowel dependent on whether $[C_1C_1]$ is a possible word-initial onset. Verbs with two Group 3 prefixes behave analogously.

In §7.3, we will propose an analysis of the more complicated Group 2 prefixes, omitted from (39)–(40). In the remainder of this section we discuss two additional phonological advantages of the analysis which are not related to augmentation *per se*: an account of the distribution of nasal prefixes to verbs *vs.* nouns, and an account of alternations involving the 4th person plural subject prefix.

6.2 Nasal prefixes to verbs *vs.* nouns

In some of the languages, there is an asymmetry between nouns and verbs with respect to the pronunciation of nasal consonants which at first glance appears to be unrelated to augmentation. In Witsuwit'en, a few noun stems begin with a lexically specified /nC/ sequence. In (41a, c, e), the noun stem is prefixed with the unspecified possessor prefix c'(ə)-:

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(41) /nC/ *nouns*

a.	c'ə|n.dec	'flower'
b.	tseɬɣil|.ndec rosehip + flower	'rose'
c.	c'ə|n.t'aq	'forehead'
d.	ʔəɬ|.nt'aq beaver dam + forehead	'front part of beaver dam'
e.	c'ə|n.cəs	'nose'
f.	həda|.ncəs moose + nose	'moose nose'

As can be seen in (41), when stem-initial /nC/ is word-initial, as it is in the righthand member of compounds (41b, d, f), the phonetic form also contains [nC], with no vowel breaking up the sequence.

Now consider verbs which contain the n_{QUAL} prefix:

(42) /n/- *prefixes to consonant-initial verb stems*

a.	nə|deç, *n|deç	's/he is dancing'
b.	nta|deç	's/he will dance'
c.	yəleɣ kw'əsəl nə|ʔɛs	's/he is helping him/her string beads'
d.	yəleɣ kw'əsəl nta|ʔɛs	's/he will help him/her string beads'
e.	nəc'ənə|qəyʔ	's/he is sewing'
f.	nəc'ənta|qəyʔ	's/he will sew'

In (42b, d, f), n_{QUAL} is simply [n] before a consonant. Yet in (42a, c, e), where n_{QUAL} is also apparently followed by a consonant (the initial consonant of the verb stem), this prefix is pronounced [nə]-.

In an analysis which lacks $ə_{TENSE}$, this difference between nouns and verbs is puzzling.[11] Why should the sequence [nC], well-tolerated in nouns and in certain places in the verb, be nonetheless impossible in verbs when C is the verb stem-initial consonant? However, the puzzle disappears if $ə_{TENSE}$, which intervenes between qualifier and verb stem by affix order restrictions, is posited:

(43) /n_{QUAL}-$ə_{IMPF}$|$stem_V$/

n_{QUAL}-$ə_{IMPF}$|deç	[nədeç]	's/he is dancing'
n_{QUAL}-t_{QUAL}-a_{FUT}|deç	[ntadeç]	's/he will dance'

Like the Salcha [ɬ]-prefixed nouns and verbs, the nasal-prefixed nouns in Witsuwit'en lack $ə_{TENSE}$, surfacing with the licit [nC] sequence at the left edge.

6.3 4th person subject prefix

The reflex of the PA prefix *č'^{W}- (Thompson 1993) is generally referred to as either 4th person subject[12] (e.g. Navajo) or 1st person plural subject (e.g. Witsuwit'en). In many but not all of the languages, this prefix alternates between affricate and fricative forms. As discussed in Hargus (1996), the affricate allomorph is always syllable-initial:

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(44) a. *Navajo* 4SG SUBJ *prefix*: [ǰ]- *allomorph*

context	*form*		
$_{wd}$[__ V	baa ǰíí.ča	's/he cried about it'	WS
V __ V	yóóʔ a.ǰíí.yá	's/he is lost'	WS
$_{wd}$[__ .C	ǰi.doo.ɣááɬ	's/he (4P) will come'	WS

b. *Witsuwit'en* 1PL SUBJ *prefix*: [ts']- *allomorph*

$_{wd}$[__ V	ts'o.deʔ	'let's sit'
V __ V	de.we.ts'e.ʔəs	'we (DUAL) didn't walk inside'
C __ V	ne.nəxw.ts'o.t'ɛnʔ	'we should see you (PL) again'
$_{wd}$[__ C.	ts'ən.di.deʔ	'we were sick'
C __ C.	wə.ɣən.ts'ən.tɛs.dil	'we failed'
V __ C.	we.ts'ən.di.del	'we weren't sick'
$_{wd}$[__ .C	ts'ə.dil.kwəs	'we coughed'
C __ .C	ne.nəxw.ts'ə.ta.t'ɛɬ	'we'll see you (PL) again'

The fricative allomorph of this prefix is always syllable-final (/V __ .C):

(45) a. *Navajo* 4PL SUBJ *prefix*: [ž]/[z]-*allomorph*

V__.C	aɣááɬ k'íž.ní.tiʔ	's/he broke the rattle'	WS
	č'íž.níʔą̌	's/he carried it (compact OBJ) out'	NL 77
	šiɬ dziz.deez.kaad	's/he gave me a slap'	NL 77

b. *Witsuwit'en* 1PL SUBJ *prefix*: [z]- *allomorph*

V __ .C	bət ɣez.ta.neɬ	'we'll cook'
	wez.taɬ.yic	'we won't save him/her'

The puzzle which this prefix presents, if all instances of conjunct [ə] are epenthetic, is the following. When the 4th person/1st person plural subject prefix follows a vowel and immediately precedes the stem or a syllabic classifier, the prefix should be in the V __ .C context which conditions the fricative allomorph. Yet in this context, the affricate allomorph invariably occurs:

(46) a. *Navajo* 4SG SUBJ *prefix : postvocalic and pre-stem*

a.ǰi|.yą́	's/he is eating it'	NL 77

b. *Witsuwit'en* 1PL SUBJ *prefix : postvocalic and pre-stem or presyllabic classifier*

[ʔə.ts'ə|.t'əχ], *[ʔəz|.t'əχ]	'we're working'
[c'ə.ts'ə|.tl'o]	'we're knitting'
[ho.ts'ə|.ts'et]	'we're telling a lie'
[ɬq'ɛts'ədə|tsəyʔ]	'we love each other'

Since the fricatives are acceptable syllable-final consonants elsewhere, there is no phonological reason to epenthesise a pre-stem vowel. In fact, the reason lies outside the phonology: these forms, being imperfective, must contain $ə_{IMPF}$ or cognate vowel:

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(47) *Witsuwit'en*

[ho#ts'$_{\text{1PL SUBJ}}$-ə$_{\text{IMPF}}$|.ts'et] 'we're telling a lie'

Thus, the prevocalic (affricate) allomorph rather than the coda (fricative) allomorph must be used in such forms.

6.4 Summary

We have proposed that all Athabaskan verbs are prefixed with tense, consistent with the fact that all Athabaskan verbs are finite. Verbal augmentation thus results from affixation to verbs of ə$_{\text{TENSE}}$, a prefix used in imperfect and certain perfective verbs. Our analysis immediately shows its usefulness in solving a number of problems, not only noun/verb asymmetries like augmentation and nasal qualifier shapes but also alternations of the 4th person subject verb prefix. We predict that similar evidence for the verb prefix we propose can be found in all the languages of this family. In the next section, we turn to the most problematic languages for our hypothesis – those which exhibit monosyllabic verbs – and we show that even for these languages evidence for our hypothesis can be found in certain contexts. Thus, the child learning an Athabaskan language would find ample evidence that all verbs have a tense prefix.

7 Failure of augmentation

In this section we offer an account of the monosyllabic verb data reviewed in §5.4. We first make explicit our views on how affix-order restrictions in languages with position class morphology are formally stated. Then we analyse the monosyllabic verbs in Salcha, Witsuwit'en and Ahtna. Just as these data were problematic for previous approaches to augmentation, they appear to be counterexamples to our proposal, and it will be necessary to explore the phonologies of these languages in some detail in order to present convincing analyses. However, there is a common thread to the analysis of each language. We will suggest that MAX-ə (McCarthy & Prince 1995), a constraint which penalises candidates for deleting input /ə/, is lower-ranked than other constraints:

(48) MAX-ə

A segment consisting of /ə/ in the input should correspond to a segment consisting of [ə] in the phonetic representation.

The satisfaction of these higher-ranked constraints leads to optimal deletion of [ə] in the forms considered here.

7.1 Position class morphology in Generalised Alignment

Anderson (1996) and Potter (1996) have suggested that Generalised Alignment theory (McCarthy & Prince 1993a) can account for the restrictions on clitic and affix order which are found in some languages.

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Anderson (1996) analyses clitic order restrictions as a ranked set of EDGEMOST constraints, e.g. EDGEMOST (*e*,L) or EDGEMOST (*e*,R) for some element *e*. According to this analysis, clitics compete for appearance at the left or right edge of some domain. The morpheme with the highest ranking EDGEMOST constraint will appear in the privileged domain-edge position when more than one EDGEMOST-obeying morpheme is present.

Potter (1996) argues that affix-order restrictions in Western Apache and SiSwati can also be accounted for by ranking of affixes with respect to root or stem (derived base) edge. Potter further proposes that alignment constraints in languages with position class morphology obey the Mirror Principle (Baker 1985, Speas 1990, 1991), which is invoked as the explanation for cross-linguistic similarities in affix order in languages with position class morphology.

Following this work, we assume that in each Athabaskan language there is a set of constraints which align the right edges of prefixes with the left edge of the verb stem. These are illustrated in (49) for the Athabaskan conjunct prefixes, assuming a modified version of the Hoijer model in (1):

(49) *Stem-Alignment constraints*

Align(Classifier-R, Stem_V-L)	(CLF-STEM)	≫
Align(Subject-R, Stem_V-L)	(SUBJ-STEM)	≫
Align(Tense-R, Stem_V-L)	(TENSE-STEM)	≫
Align(Conjugation-R, Stem_V-L)	(CNJ-STEM)	,
Align(Negative-R, Stem_V-L)	(NEG-STEM)	≫
Align(Qualifier-R, Stem_V-L)	(QUAL-STEM)	≫
Align(Pronominal-R, Stem_V-L)	(PRO-STEM)	

Viewing affix order as a ranked set of Alignment constraints allows for the possibility that other constraints might intervene somewhere in the list. Indeed, this is a possibility that we will exploit below.

To illustrate the constraints in (49), consider Witsuwit'en [tastəɬ] 'I'll kick it (once)'. This word contains three prefixes, t_{QUAL}, a_{FUT}, $s_{\text{1SG SUBJ}}$, as well as the future stem *-təɬ* of 'kick OBJ (once)'.

(50) /t_{QUAL}-a_{FUT}-$s_{\text{1SG SUBJ}}$|təɬ_{STEM}/ 'I'll kick it (once)'

	SUBJ-STEM	TENSE-STEM	QUAL-STEM
☞ a. t-a-s-|təɬ		*	**
b. t-s-a-|təɬ	*!		**
c. s-t-a-|təɬ	*!*		*
d. s-a-t-|təɬ	*!*	*	
e. a-t-s-|təɬ		*!	*
f. a-s-t-|təɬ	*!	**	

As shown in (50), we assume, following Anderson and Potter, that violations of affix-order constraints are assigned gradiently: a prefix earns

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one * for every prefix that intervenes between it and the stem, and violations are awarded for the number of intervening prefixes, not segments.

The model in (49) must be considered an oversimplification with regard to prefix positions (Stem-Alignment constraints). Recall from §2 that multiple qualifier and pronominal prefixes may be present in a single verb form. For prefixes of these positions, rather than a single constraint, such as QUAL-STEM, there is a ranked set of Stem-Alignment constraints:

(51) *Qualifier-internal affix order: Witsuwit'en*

$\text{Align}(s_{\text{QUAL}}\text{-R}, \text{Stem}_{\text{V}}\text{-L}) \gg$
$\text{Align}(t_{\text{QUAL}}\text{-R}, \text{Stem}_{\text{V}}\text{-L}) \gg$
$\text{Align}(n_{\text{QUAL}}\text{-R}, \text{Stem}_{\text{V}}\text{-L}) \gg$
$\text{Align}(d_{\text{QUAL}}\text{-R}, \text{Stem}_{\text{V}}\text{-L}) \gg$
$\text{Align}(u_{\text{QUAL}}\text{-R}, \text{Stem}_{\text{V}}\text{-L}) \gg$
$\text{Align}(w_{\text{QUAL}}\text{-R}, \text{Stem}_{\text{V}}\text{-L})$
etc.

It appears that all affix-order restrictions in Athabaskan languages can be described completely within the Generalised Alignment framework. However, not all of the necessary constraints are Stem-Alignment constraints. In §7.3 we will see that the set of Stem-Alignment constraints in (49) and (51) must be supplemented with a small number of prosodic subcategorisation constraints (Inkelas 1989, McCarthy & Prince 1993a). In one set of cases, these cause prefixes to appear in unexpected orders.

7.2 Phrasally conditioned augmentation: Salcha

As noted above in §5.4.2, Salcha and Minto show phrasal influences on the presence of the augment, resulting in monosyllables in certain contexts. For reasons of space, we analyse only Salcha in this section.[13] Recall that in Salcha forms which contain no conjunct prefix or only a classifier prefix, the augment can be present or not in citation forms ([tsəx] ~ [ətsəx] 's/he is crying'). However, the augment appears when the preceding word ends with a stressed syllable ([č'ətθíʔ əʔáɬ] 's/he is eating meat') but not with an unstressed syllable ([ɬúgə ʔáɬ] 's/he is eating fish'). We will suggest that in Salcha, ə_{TENSE} is prefixed to verbs when morphologically required, but its actual presence in surface forms depends on phrase-level phonological constraints. In Salcha, ə_{TENSE} is not parsed (i.e. it is deleted) if its presence would lead to a phrase-level stress lapse.

In Salcha, feet are moraic trochees, parsed from the right edge of the stem (Tuttle 1992, 1995a, b, to appear). Monomoraic vowels are [ə ʊ]; bimoraic vowels are [a æ i u]. Coda consonants contribute to syllable weight.

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(52) a. FOOT-FORM: Moraic trochee

b. *Stress data*
(č'ə.dzə)(.dzə́s) 'I'm dancing'
(č'ìn)(.dzə́s) 'you (SG) are dancing'

The data in (52b) also indicate that main stress is rightmost in a Prosodic Word.

Since feet are minimally and maximally bimoraic, unfooted [Cə] syllables can arise:

(53) *Unfooted monomoraic syllables*
č'ə(nàə)ðə(ʔī́)~č'(nàəð)(ʔī́) 's/he stole something'

As shown in (53), the nuclei of the unfooted syllables [ðə] and [č'ə] are optionally deleted. We suggest that in Salcha, MAX-ə and PARSE-SYLL are of equal rank:

(54) PARSE-SYLL: Parse syllables into feet.

(55) /$ə_{IMPF}$|tsəx/ 's/he is crying'

	PARSE-SYLL	MAX-ə
☞ a. $ə_{IMPF}$(|tsəx)	*	
☞ b. <$ə_{IMPF}$>(|tsəx)		*

However, FOOT-FORM dominates both constraints:

(56) /č'$_{UNSP\ OBJ}$-n$_{QUAL}$-æð$_{CNJ}$-ə$_{PERF}$|ʔin/ 's/he stole something'

	FOOT-FORM	PARSE-SYLL	MAX-ə
☞ a. č'ə(næ)ðə(ʔī)		**	
☞ b. č'(næð)(ʔī)			**
c. (č'ənæ)ðə(ʔī)	*!	*	

PARSE-SYLL is also dominated by RHYTHM, a clash avoidance constraint (Tuttle 1992, 1995a):

(57) RHYTHM

Metrical heads of Prosodic Words should be separated by one unstressed syllable.

Rhythm does not regulate word-internal heads of feet, only main stresses (metrical heads of Prosodic Words). Returning to the Salcha augmentation data, we add foot structure and Prosodic Word boundaries **[ ]**:

(58) /$ə_{IMPF}$|ʔaɬ/ 's/he is eating'
a. **[**č'ə(tθîʔ)**]** **[**ə-(|ʔaɬ)**]** 's/he is eating meat'
b. **[**(ɬu)gə**]** **[**⟨ə⟩-(|ʔaɬ)**]** 's/he is eating fish'

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In (58b), $ə_{IMPF}$ is unparsed because the stress lapse would violate RHYTHM. The metrical heads of the two words would be separated by two syllables, *not one*:

(59) /ɬugə $ə_{IMPF}$ | ʔaɬ/ 's/he is eating fish'

	RHYTHM	PARSE-SYLL	MAX-ə
a. [(ɬu)gə] [ə-(| ʔaɬ)]	*!	**	
☞ b. [(ɬu)gə] [<ə>-(| ʔaɬ)]		*	*

However, in (58a), /ə/- is retained to prevent word-stress clash:

(60) /č'ətθīʔ $ə_{IMPF}$ | ʔaɬ/ 's/he is eating meat'

	RHYTHM	PARSE-SYLL	MAX-ə
☞ a. [[č'ə(tθīʔ)] [ə(ʔaɬ)]		*	
b. [č'ə(tθīʔ)] [<ə>(ʔaɬ)]	*!		*

The winning candidate in (60) is the one which is most faithful to the input. In this case its only fault is a PARSE-SYLL violation.

To summarise, the Salcha verbs which exhibit phrasally conditioned 'augmentation' are prefixed with $ə_{IMPF}$. However, the phonetic occurrence of the vowel of this prefix is determined by interaction of MAX-ə with higher-ranked prosodic constraints such as RHYTHM. In some forms, adherence to RHYTHM leads to the phonetic absence of $ə_{IMPF}$.

7.3 Monosyllabic verbs in Witsuwit'en

Recall that although Witsuwit'en regularly augments unprefixed verb stems to disyllabic, certain s_{CNJ} verbs are monosyllabic:

(61) *Witsuwit'en monosyllabic prefixed verbs*

[.s̲de.] 's/he is sitting'
[.s̲dgwət.] 'it's been poked'
[.ɬɣil.] 'it's bundled, packaged'

The data in (61) are a clear challenge to our claim that all Athabaskan verbs contain a vocalic tense prefix. In this section, we suggest that $ə_{PERF}$ is morphologically prefixed but phonetically absent in forms like (61) because of a higher-ranked prosodic subcategorisation (Alignment) constraint on this prefix which requires that s_{CNJ} and certain other elements be adjacent. Failure to preserve /ə/ in such forms is the most cost-effective way of conforming to this alignment constraint.

s_{CNJ} is one of three Group 2 prefixes in Witsuwit'en, the other two being n_{CNJ} and s_{NEG}. Recall that, unlike the Group 1 and 3 prefixes, the Group 2 prefixes alternate between onset and coda:

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(62) *Onset~coda alternations of Witsuwit'en* s_{CNJ}, *a Group 2 prefix coda*

a.	$n_{DIST}\#s_{CNJ}\text{-}ə_{PERF}\text{-}d_{CLF}\|$	bəɣenəstɢəz	'several were skinned'
b.	$c'_{UNSP\ OBJ}\text{-}s_{CNJ}\text{-}ə_{PERF}$ $\text{-}dəd_{1DUAL\ SUBJ}\|$	c'əsdətbəz	'we (DUAL) stretched something out'
c.	$ts'_{1PL\ SUBJ}\text{-}z_{CNJ}\text{-}ə_{PERF}\|$	ts'əztl'et	'we farted'
d.	$u_{QUAL}\text{-}z_{CNJ}\text{-}ə_{PERF}\|$	yeɣ uzye	's/he passed him, her'
e.	$y_{3SG\ OBJ}\text{-}s_{CNJ}ə_{PERF}\text{-}ɬ_{CLF}\|$	yəɬtsəy	's/he made it'
onset			
f.	$s_{CNJ}\text{-}ə_{PERF}\|$	səliʔ	's/he became'
g.	$s_{CNJ}\text{-}ə_{PERF}\text{-}ɬ_{CLF}\|$	sbe səɬʔəy	's/he is waiting for me'
h.	$ha_{\text{'up'}}\#s_{CNJ}\text{-}ə_{PERF}\|$	hasəye	's/he walked uphill'
i.	$n_{DIST}\#s_{CNJ}\text{-}ə_{PERF}\|$	ʔət'ɛn q'ənsəye	's/he made a business trip'
j.	$s_{CNJ}\text{-}ə_{PERF}\text{-}s_{1SG\ SUBJ}\|$	səsdliʔ	'I became'[14]
k.	$s_{CNJ}\text{-}ə_{PERF}\text{-}xw_{2PL\ SUBJ}\|$	səxwliʔ	'you (PL) became'
cluster			
l.	$s_{CNJ}\text{-}ə_{PERF}\text{-}d_{CLF}\|$	sdətl'əw	'it's been knitted'
m.	$s_{CNJ}\text{-}ə_{PERF}\text{-}d_{CLF}\|$	sdgwət	'it's been poked'
n.	$s_{CNJ}\text{-}ə_{PERF}\text{-}l_{CLF}\|$	ɬɣil	'it's bundled, packaged'
o.	$s_{CNJ}\text{-}ə_{PERF}\text{-}dəd_{1DUAL\ SUBJ}\|$	sdətqɛ	'we (DUAL) are sitting'
p.	$s_{CNJ}\text{-}ə_{PERF}\|d$	sde	's/he is sitting'

Inspection of (62) indicates that s_{CNJ} is an onset when conjunct-initial and followed by no classifier (62f, h, i) or $ɬ_{CLF}$ (62g), or when followed by an inner subject prefix other than 1st person dual (62j, k). s_{CNJ} is a coda when non-word-initial and followed by either d_{CLF} or l_{CLF} (62a) or $dəd_{1DUAL\ SUBJ}$ (62b), or when preceded by a conjunct prefix and not followed by an inner subject prefix (62c–e). s_{CNJ} is C_1 of an onset cluster when word-initial and when $ə_{PERF}$ is followed by d_{CLF} or l_{CLF} (62l–n), $dəd_{1DUAL\ SUBJ}$ (62o) or stem-initial [d t t'] (62p). In forms where s_{CNJ} is a coda or part of an onset cluster, $ə_{PERF}$ is present underlyingly but not phonetically.

We begin this section with an account of the onset-coda alternation of s_{CNJ}. (This prefix also exhibits a voicing alternation (Hargus 1991), which we ignore.) Our analysis of the monosyllables then follows from this analysis.

Differences between nouns and verbs indicate that the [ə] which occurs in s_{CNJ} forms like [səliʔ] 's/he became' (see §5.4) is an instance of $ə_{PERF}$ rather than epenthetic [ə]. In Witsuwit'en, [sC] clusters occur word-initially, not only in prefixed verbs like [sde] but also in unprefixed nouns:

(63) *Word-initial* sC *in Witsuwit'en*

sqaq 'child'	sqanzul 'mulch'
syəl 'osprey'	scenyəq 'area under standing tree'

The contrast between *s*-prefixed verbs and nouns is therefore analogous to the problems noted above (§§6.1, 6.2) for *ɬ-* and *n*-prefixed nouns *vs.*

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verbs: a cluster permitted in nouns like [sqaq] 'child' does not occur where expected in verbs like [səqoy] 's/he vomited' (except in special cases like [sde] 's/he is sitting'). As in our proposed solutions to the earlier problems, we suggest that the phonological difference between the nouns and verbs in the [sC] cases has a morphological basis. Only the verbs are prefixed with $ə_{PERF}$.

Next consider the morphological positions of the conjugation and tense prefixes. As summarised in (49), part of which is repeated as (64), conjugation occurs to the left of tense:

(64) s_{CNJ} precedes $ə_{PERF}$
TENSE-STEM ≫ CNJ-STEM

The order $n_{CNJ} + in_{PERF}$ can be seen in forms such as [dəc'aznindil] 'we got lost'. Similarly, the occurrence of s_{CNJ} to the left of $ə_{PERF}$ can be seen most clearly in forms like (62f–i), which contain s_{CNJ} and $ə_{PERF}$ and no other conjunct prefixes, or forms containing an inner subject prefix, such as (62j–k).

Turning now to forms like (62c–e), we introduce a prosodic subcategorisation constraint on the s_{CNJ} prefix:

(65) ALIGN-CODA-s_{CNJ}: ALIGN-R(s_{CNJ}, σ)
s_{CNJ} should be a coda

ALIGN-CODA is the reflex of a Proto-Athabaskan syncope rule (Krauss 1969) of uncertain generality. At least synchronically, it must be considered lexically restricted since the Group 1 prefixes do not surface as codas in analogous positions:

(66) Group 1 n/d_{QUAL} *vs.* Group 2 s_{CNJ}

a.	/u_{QUAL}-n_{QUAL}-$ə_{IMPF}$|yin	'pick'
	dəgi u<u>n</u>əyin	's/he is picking huckleberries'
	/u_{QUAL}-d_{QUAL}-$ə_{IMPF}$|taɬ	'kick'
	detəc yu<u>d</u>əta<u>ɬ</u>	's/he is kicking at the door'
b.	/u_{QUAL}-z_{CNJ}-⟨ə⟩$_{PERF}$|ye	'SG go'
	ye<u>ɣ</u> u<u>z</u>ye	's/he went past him/her'

Thus, there is an inherent phonological conflict between CNJ-STEM, which places s_{CNJ} in ideal onset position to the left of the vowel-initial tense prefixes, and ALIGN-CODA, which wants the prefix to be a coda.

The tableaux in (67) and (68), in which s_{CNJ} and $ə_{PERF}$ are preceded by a vocalic and a consonantal conjunct prefix, respectively, illustrate satisfaction of ALIGN-CODA. In (67), both candidates satisfy all relevant affix-

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order constraints, TENSE-STEM, CNJ-STEM and QUAL-STEM. However, candidate (a) violates ALIGN-CODA, thus losing to (b), which does not:

(67) /u_{QUAL}-s_{CNJ}-$ə_{PERF}$|ye/ 's/he went past (POSTPOS OBJ)'

	TENSE-STEM	CNJ-STEM	QUAL-STEM	ALIGN-CODA	MAX-ə	NOCODA
a. u.zə|ye		*	**	*!		
☞ b. uz.<ə>|ye		*	**		*	*

Thus ALIGN-CODA outranks both MAX-ə and NOCODA.

In (68), in which s_{CNJ} and $ə_{PERF}$ are preceded by a consonant, satisfaction of the Stem-Alignment constraints is analogous to that shown in (67), and therefore omitted:

(68) /ts'$_{1PL\ SUBJ}$-z_{CNJ}-$ə_{PERF}$|tl'et/ 'we farted'

	*COMPLEX	DEP-ə	ALIGN-CODA	MAX-ə	NOCODA
a. .ts'zə|	*!		*		
b. ts'[ə].zə|		*	*!		
☞ c. ts'[ə]z.<ə>|		*		*	*

Candidate (68a) fatally violates *COMPLEX (Prince & Smolensky 1993):

(69) *COMPLEX: Avoid tautosyllabic VV or CC.

(68b) avoids this violation by epenthesising [ə], but thereby violates DEP-ə (McCarthy & Prince 1995) as well as ALIGN-CODA.

(70) DEP-ə: Output [ə] should correspond to input /ə/.

(68c) avoids the *COMPLEX violation with [ə]-epenthesis, thereby violating DEP-ə, but is superior to (68b) in that ALIGN-CODA is satisfied (by deletion of $ə_{PERF}$).

Now consider forms which contain inner subject prefixes. Since s_{CNJ} is an onset in such forms, *COMPLEX must outrank ALIGN-CODA:

(71) /u_{QUAL}-z_{CNJ}-$ə_{PERF}$-$xw_{2PL\ SUBJ}$|dil/ 'you (PL) went past (POSTPOS OBJ)'

	*COMPLEX	ALIGN-CODA
☞ a. u.zəxw|		*
b. u.z<ə>xw|	*!	

A potential problem for this analysis is presented by forms like (62a) [bə.ɣe.nəst.gəz] 'several were skinned', which contains a coda sequence of *s-* followed by a classifier prefix. In this form, s_{CNJ} cannot be an onset (*[bəɣensətgəz]), despite the fact that the coda is apparently already occupied by d_{CLF}, just like $xw_{2PL\ SUBJ}$ in the winning candidate in (71). To explain why forms like [bəɣenəstgəz] do not incur a *COMPLEX violation,

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we follow Randoja (1989), McDonough (1990) and others in analysing the consonantal classifier prefixes as extraprosodic, not members of the conjunct domain. Independent evidence for this in Witsuwit'en is provided by the fact that the only conjunct $[C_1C_2]$ coda clusters have a classifier prefix as C_2, as seen in §6.1.

Returning to [səliʔ], we present a tableau of this form in (72). Inspecting (72), we see that it is not enough to satisfy ALIGN-CODA with epenthesis as do candidates (c) and (d) (recall that **[ ]** delimit the Prosodic Word).

(72) /s_{CNJ}-$ə_{PERF}$|liʔ/ 's/he became'

	TENSE-STEM	CNJ-STEM	ONSET	DEP-ə	ALIGN-L	ALIGN-CODA	DEP-h
☞ a. [sə|liʔ]		*				*	
b. s[<ə>|liʔ]		*			*!	*	
c. [[ə]s<ə>|liʔ]		*	*!	*			
d. [[hə]s<ə>|liʔ]		*		*!			*
e. [[h]əs|liʔ]	*!						*

There must be some more compelling reason to epenthesise, as in the avoidance of a *COMPLEX violation seen in (72). Candidate (b), which, like the winning candidate in (68), deletes $ə_{PERF}$, is ruled out here by ALIGN-L (cf. McCarthy & Prince 1993b):

(73) ALIGN-L: Align-L(Morphological Word, Prosodic Word)

In Witsuwit'en onset clusters [sC], [ɬC] and [nC] are limited to word-initial position, where they can be analysed as constituting a mismatch between the phonological and morphological word. These two categories are otherwise required to coincide, as dictated by ALIGN-L in (73).

The tableau in (72) allows us to gain further insight about the relative importance of ALIGN-CODA in the grammar of Witsuwit'en. s_{CNJ} should be a coda but only if this is possible at relatively little phonological cost.

Finally, note that (72e) shows that ALIGN-CODA-s_{CNJ} can never be satisfied by violation of the affix-order restrictions on these prefixes; i.e. by violating CNJ-STEM and TENSE-STEM. That is, the phonetic sequence [əz] that occurs in forms like [ts'əztl'et] results from [ə]-epenthesis and [ə]-deletion, not metathesis of s_{CNJ} and $ə_{PERF}$. In this respect, s_{CNJ} differs from s_{NEG}, a historically related prefix (Krauss 1969). Synchronically, s_{NEG} is in complementary distribution with the conjugation prefixes, and there is no evidence that s_{CNJ} and s_{NEG} occupy distinct morphological positions. Like s_{CNJ}, s_{NEG} obeys a coda subcategorisation constraint (74):

(74) ALIGN-CODA-s_{NEG}: Align-Coda(s_{NEG}, σ)

s_{NEG} should be a coda

However, unlike s_{CNJ}, which only occurs with $ə_{PERF}$ or $ə_{IMPF}$, s_{NEG} occurs with u/o_{OPT}, i/a_{FUT}, $i/ɛ_{PROG}$ as well as $ə_{IMPF}$:

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(75) we#s_{NEG} + tense prefixes

coda

$c'_{UNSP\ OBJ}$-ε_{PROG}-s_{NEG}|	wec'ɛsʔɛnʔ	's/he doesn't see anything'
u_{OPT}-s_{NEG}|	nəwesʒut[15]	's/he shouldn't skate around'
t-o_{OPT}-s_{NEG}|	nən wetosʒuc	's/he shouldn't spit'
t_{QUAL}-a_{FUT}-s_{NEG}|	nəwetasʒut	's/he won't skate around'
s_{NEG}-$ə_{IMPF}$|	westl'et	's/he isn't farting'
$ts'_{1PL\ SUBJ}$-$ə_{IMPF}$-s_{NEG}|	wets'əstl'et	'we're not farting'
$ə_{IMPF}$-s_{NEG}-$ɬ_{CLF}$|	weɬɣits	's/he doesn't itch'
y_{PRO}-$ə_{IMPF}$-s_{NEG}-$ɬ_{CLF}$|	weyəɬʔəts	's/he isn't sneezing'

onset

$c'_{UNSP\ OBJ}$-s_{NEG}-ε_{PROG}-$xw_{2PL\ SUBJ}$|	wec'əsɛxwʔɛnʔ	'you (PL) don't see anything'
s_{NEG}-o_{OPT}-$h_{2PL\ SUBJ}$|	nəwesohzut	'you (PL) shouldn't skate around'
t_{QUAL}-z_{NEG}-u_{OPT}-$h_{2PL\ SUBJ}$|	nən wetəzuhzuc	'you (PL) shouldn't spit'
t_{QUAL}-z_{NEG}-i_{FUT}-$xw_{2PL\ SUBJ}$|	nəwetəzixwzut	'you (PL) won't skate around'
s_{NEG}-$ə_{IMPF}$-$xw_{2PL\ SUBJ}$|	wesəxwtl'et	'you (PL) aren't farting'
s_{NEG}-$ə_{IMPF}$-$xw_{2PL\ SUBJ}$-$ɬ_{CLF}$|	wesəxwɬɣits	'you (PL) don't itch'
y_{PRO}-z_{NEG}-$ə_{1MPF}$-$c_{1SG\ SUBJ}$-$ɬ_{CLF}$|	weyəzəcɬʔəts	'I'm not sneezing'

Since there is metathesis of the negative and tense prefixes in the coda forms of (75), ALIGN-CODA-s_{NEG} must outrank TENSE-STEM:

(76) /we_{NEG}#t_{QUAL}-s/z_{NEG}-u/o_{OPT}\|zuc/ 's/he shouldn't spit'

	ALIGN-CODA-s_{NEG}	TENSE-STEM	NEG-STEM	DEP-ə
a. we.t[ə].zu|	*!		*	*
☞ b. we.tos.|		*		

However, this metathesis of s_{NEG} and a vocalic tense prefix is blocked by *COMPLEX in forms with an inner subject prefix:

(77) /we_{NEG}#t_{QUAL}-s_{NEG}-u/o_{OPT}-$h_{2PL\ SUBJ}$\|zuc/ 'you (PL) shouldn't spit'

	*COMPLEX	ALIGN-CODA-s_{NEG}	TENSE-STEM	NEG-STEM	DEP-ə
a. we.tzuh.|	*!	*	*	**	
☞ b. we.t[ə].zuh.|		*	*	**	*
c. we.tozh.|	*!		**	*	

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(77) shows that a phonological constraint, *COMPLEX, outranks the morphological prosodic subcategorisation and Stem-Alignment constraints, regulating metathesis of the negative and tense prefixes. Thus the relative ranking of ALIGN-CODA with respect to TENSE-STEM determines whether satisfaction of the former is via metathesis or via epenthesis and deletion.

Finally, we turn to s_{CNJ} forms containing $dəd_{1DUAL\ SUBJ}$. These motivate the introduction of another prosodic subcategorisation constraint on s_{CNJ}:

(78) SD: Align(s_{CNJ}-R, [d t t']-L)
s_{CNJ} should be adjacent to /d t t'/.

SD, which states that s_{CNJ} must be adjacent to a following morpheme-initial plain coronal, whether that plain coronal is the d_{CLF} or stem-initial [d t t'],[16] is another Witsuwit'en reflex of the aforementioned Proto-Athabaskan syncope rule (Krauss 1969). SD is an unusual Alignment constraint in that the aligned-to category is not a member of the Prosodic Hierarchy, but a set of segments. The irrelevance of syllable conditioning can be seen in comparing [st.] (62a), [s.d] (62b) and [.sd] (62l), all products of SD. Moreover, some version of this strange constraint appears to exist in every Athabaskan language.[17] SD is directly responsible for the fact that the winning candidate in (79) contains MAX-ə and ALIGN-L violations. (In (79), all candidates tie on the Stem-Alignment constraints, which have been omitted.)

(79) /s_{CNJ}-$ə_{PERF}$-$dəd_{1DUAL\ SUBJ}$|qɛ/ 'we (DUAL) are sitting'

	SD	ALIGN-L	ALIGN-CODA-s_{CNJ}	MAX-ə
a. [sədət|qɛ]	*!		*	
☞ b. s<ə>[dət|qɛ]		*		*

We also see from this tableau that SD outranks ALIGN-L.

Given this analysis, the monosyllabic prefixed verbs like [sde] are easy to account for. We suggest that unlike [səliʔ], [ə] is deleted in [sde] under pressure from SD, resulting in an onset cluster.

(80) /s_{CNJ}-$ə_{PERF}$|de/ 's/he is sitting'

	SD	DEP-ə	ALIGN-L	ALIGN-CODA-s_{CNJ}	MAX-ə	DEP-h
a. [sə|de]	*!			*		
b. [[hə]s<ə>|de]		*!			*	*
☞ c. s<ə>[|də]			*	*	*	

The winning candidate in (80) is therefore a monosyllabic verb.

To summarise our account of the monosyllabic prefixed verbs of Witsuwit'en, we have claimed that $ə_{PERF}$ is morphologically present in forms like [sde] but not parsed. Monosyllabicity results from the existence of a high-ranking prosodic subcategorisation constraint on s_{CNJ}, SD. As in Salcha, MAX-ə is a low-ranking constraint in Witsuwit'en.

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Since the monosyllabic verbs in Witsuwit'en are a special case of Group 2 prefix behaviour, it was necessary to develop an account of the onset–coda alternations which are characteristic of this class of prefixes. Our account required a second prosodic subcategorisation constraint on s_{CNJ}, ALIGN-CODA-s_{CNJ}, which compels this prefix to be a coda whenever phonologically convenient. A related prefix, s_{NEG}, provided evidence that a similar prosodic subcategorisation constraint, ALIGN-CODA-s_{NEG}, outranked TENSE-STEM, thus resulting in satisfaction of ALIGN-CODA-s_{NEG} by metathesis.

A somewhat surprising result of our analysis is the uncovering of evidence for prosodic morphology in Witsuwit'en. Prosodic morphology is typically found in languages with reduplication, prosodically governed infixation and/or 'prosodic templates'. McCarthy & Prince (1993b) have suggested that prosodic morphology can be characterised as P ≫ M, where P is some purely phonological constraint and M is a constraint that holds of some morpheme or morpheme class. In (81), we summarise the evidence for phonology outranking morphology in Witsuwit'en. (In our summary, constraints of the shape Align (MCat, Cat) are considered morphological.)

(81) *Witsuwit'en P ≫ M constraint ranking*

*COMPLEX ≫ ALIGN-CODA-s_{CNJ}	uzəxw- > uz⟨ə⟩xw-
DEP-ə ≫ ALIGN-CODA-s_{CNJ}	sə|liʔ > [hə]s⟨ə⟩|liʔ
*COMPLEX ≫ ALIGN-CODA-s_{NEG}	t[ə]zuh- > tozh-
*COMPLEX, ALIGN-CODA-s_{NEG} ≫ TENSE-STEM	tos- > tzu-, t[ə]zu-
DEP-ə ≫ ALIGN-L	s⟨ə⟩[de] > [[hə]s⟨ə⟩de]

Since Athabaskan languages lack reduplication, and do not clearly exhibit prosodic infixation or prosodic templates, our analysis indicates that prosodic morphology can be found in a wider variety of languages than has previously been reported.

Notice that in our account there are basically only two kinds of conjunct prefixes, those which are morphologically to the left of the tense prefixes, and those which are to the right:

(82) *Two types of conjunct prefixes*

PRO-, QUAL-, CNJ/NEG-STEM ≪ TENSE-STEM ≪ SUBJ-, CLF-STEM
Group 1 Group 3

As we have seen, the so-called Group 2 prefixes distinguish themselves from garden-variety Group 1 prefixes by two special prosodic subcategorisation constraints on these prefixes, ALIGN-CODA and SD. Note that this analysis predicts that prefixes elsewhere in the verb might exhibit analogous special behaviour, a prediction which appears to be correct. The 2nd person singular subject prefix has onset and coda forms in many of the languages (e.g. Sekani onset [n] in [nətsəɣ] 'you (SG) are crying'; coda [n] realised as nasalisation in [dĩbə̀t] 'you (SG) are hungry'). Also, there is a conjunct prefix *ɬ-* which exhibits onset ~ coda alternations in many of the

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languages (Krauss 1969) (e.g. Witsuwit'en [ɬəyəl] 's/he is white'; [wəlyəl] 'it (AREAL) is white'). While the analysis of such forms lies beyond the scope of this article, we believe they will very likely yield to a prosodic subcategorisation account similar to what we have sketched here for the Witsuwit'en s_{CNJ} and s_{NEG}.

7.4 Unaugmented stems in Ahtna

We turn now to the unaugmented stems characteristic of Ahtna, Dena'ina and Kato. Of these three languages, only Ahtna has sufficient published documentation to allow us to formulate an analysis. A challenge for our account is to predict why certain monosyllabic verbs, such as [su:χ] 'it's (customarily) beautiful' are systematically well-formed in Ahtna. We claim that Ahtna is like the other languages we have seen so far in prefixing ε_{TENSE}, and that as in Salcha and Witsuwit'en, MAX-ε is relatively low-ranking in Ahtna.

Before turning to the monosyllables, we first establish the existence of ε_{TENSE} in Ahtna. Consider the Group 1 prefixes in Ahtna. Our analysis correctly predicts [Cε] syllables for the consonantal qualifier and pronominal prefixes when these directly precede the verb stem.[18]

(83) a. *Verbs with exactly one consonantal qualifier prefix*

n_{QUAL}	inɛ|ʔi:s	's/he is stealing it'	AD 679
d_{QUAL}	idɛ|ɣa:t	's/he is shaking it'	AD 205
	sasuhwdɛ|ʔa:	'I'm happy'	AD 77
	tl'oɣ dɛ|ya:n	'it's eating grass'	AD 429
$ɣ_{QUAL}$	nɛn' ɣɛ|na:	's/he is working'	AD 288
	naχc'ɣɛ|ta:n	's/he hobbled back'	AD 202
t_{QUAL}	tɛ|zæ:χ	's/he (customarily) spits'	AD 453
	natɛ|qæ:s	's/he (customarily) returns by boat'	AD 453

b. *Verbs with exactly one consonantal pronominal prefix*

$q_{3PL\ SUBJ}$	qɛ|t'a:s	'they cut OBJ'	AD 686
	naqɛ|tl'u:	'they're getting dressed'	AD 679
	nqɛ|qɛʔ	'they keep on paddling'	AD 674
$c'_{UNSP\ OBJ}$	c'ɛ|ya:n	's/he is eating something'	AD 121
	c'ɛ|t'a:s	's/he is cutting something for a period of time'	AD 687
	nc'ɛ|ɣɛʔ	's/he keeps on packing something'	AD 213
$ts'_{1PL\ SUBJ}$	ts'ɛ|t'a:s	'we're cutting it'	AD 686
	nɛqɛts'ɛ|qæ:χ	'we're turning around while paddling'	AD 674
	ts'ɛ|dzæ:χ	'we're caulking it'	AD 678

With a sequence of qualifier prefixes, ε_{TENSE} follows the rightmost qualifier:

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(84) *Verbs with multiple qualifier prefixes*

d_{QUAL}-n_{QUAL}	nitnɛ|t'a:ni	'printed cloth' (lit. it's decorated)	AD 73
	tl'oɣ tnɛ|yæ:χ	'grass is growing'	AD 420
n_{QUAL}-$ɣ_{QUAL}$	ngɛl|gan	'it's overly dry'	AD 192
	niɬtaχngɛd|liʔ	'it got tangled'	AD 281
d_{QUAL}-n_{QUAL}-$ɣ_{QUAL}$	iɣaʔ htngɛzd|la:	's/he measured it (with a line)'	AD 267

(84) also indicates that Ahtna allows more generous consonant clusters at syllable margins, especially at word edges, than any other language examined in this article.[19]

Turning now to the Group 3 prefixes, as noted in §5.4.1, $ɛ_{TENSE}$ is absent when the only other verbal prefix is a classifier:

(85) *Classifier-prefixed verbs*

$ɬ_{CLF}$	OBJ ɬ|tsi:	's/he is making (SG OBJ)'	AD 386
d_{CLF}	tu: t|na:n	's/he is drinking water'	AD 652
l_{CLF}	l|gay	'it's white'	AD 193

However, in related forms containing a qualifier or pronominal prefix in addition to a classifier prefix, [ɛ] appears between the two consonantal morphemes exactly in the position of the tense prefixes:

(86) *Verbs with one pronominal or qualifier prefix and one classifier prefix*

$ts'_{1PL\ SUBJ}$-$ɛ_{TENSE}$-$ɬ_{CLF}$	OBJ ts'ɛɬtsi:	'we're making it (SG OBJ)'	AD 678
$c'_{UNSP\ OBJ}$-$ɛ_{TENSE}$-d_{CLF}	c'ɛtna:n	's/he is drinking something'	AD 681
n_{QUAL}-$ɛ_{TENSE}$-l_{CLF}	tsæ:y nɛlgay	'tea is weak'	AD 193

Next, consider forms containing an inner subject prefix. In (87), we exemplify these prefixes when preceded by (a) a consonant, (b) a vowel or (c) nothing:

(87) 1SG SUBJ /ɛs/-, 2SG SUBJ /i/- and 2PL SUBJ /oh/- prefix data *preceded by*:

a.	$c'_{UNSP\ OBJ}$	c'ɛs|t'a:s	'I'm cutting something for a period of time'	AD 687
		c'i|t'a:s	'you (SG) are cutting something...'	AD 687
		c'oh|t'a:s	'you (PL) are cutting something...'	AD 687
b.	$ɣo_{OPT}$	nɣos|ʔi:s	'I steal it' (OPT)	AD 679
		nɣu|ʔi:s	'you (SG) steal it' (OPT)	AD 679
		nuh|ʔi:s	'you (PL) steal it' (OPT)	AD 679

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c. (word-initial)	ʔɛs|ya:n	'I'm eating it'	AD 680
	ʔi|ya:n	'you (SG) are eating it'	AD 680
	ʔoh|ya:n	'you (PL) are eating it'	AD 680

We follow Kari (1990) in analysing all three prefixes as underlyingly vowel-initial. Note that the (b) forms show that vowel sequences are disallowed in Ahtna.

Finally, we turn to one of the Group 2 prefixes, s_{NEG}.[20] ε_{TENSE} is absent when s_{NEG} is the only verbal prefix, but sequences of qualifier + s_{NEG} are separated by ε_{TENSE} in forms lacking an inner subject prefix:

(88)	s_{NEG}	ʔɛlɛʔ stsaɣɛ	's/he isn't crying'	AD 446
	$n_{QUAL}+s_{NEG}$	inɛsʔi:gɛ	's/he isn't stealing it'	AD 679

To summarise, the Group 1 prefixes provide evidence of ε_{TENSE} in Ahtna in exactly the position we predict. Group 2 and 3 prefixes also provide evidence of ε_{TENSE} in forms in which the Group 2 or 3 prefix is preceded by a Group 1 prefix. The monosyllabic data to be accounted for are forms in which there is only a Group 2 or 3 prefix, or no prefix at all.

First consider verbs with no prefixes other than ε_{TENSE}. Recall that Ahtna epenthesises [ʔ] before word-initial onsetless syllables. In (89), we suggest that the candidate with unparsed [ɛ] wins because it violates neither ONSET nor DEP-ʔ.

(89) Ahtna /ε_{IMPF}|tsaɣ/ 's/he is crying'

	ONSET	DEP-ʔ	MAX-ɛ
a. ɛ-|tsaɣ	*!		
b. [ʔ]ɛ-|tsaɣ		*!	
☞ c. <ɛ>-|tsaɣ			*

ONSET and DEP-ʔ dominate MAX-ɛ. The situation contrasts with that found in most other Athabaskan languages, such as Witsuwit'en, where ONSET and MAX-ə dominate the cognate DEP constraint:

(90) Witsuwit'en /ə$_{IMPF}$|tsəɣ/ 's/he is crying'

	ONSET	MAX-ə	DEP-h
a. ə-|tsəɣ	*!		
☞ b. [h]ə-|tsəɣ			*
c. <ə>-|tsəɣ		*!	

3rd person singular classifier prefixed stems in Ahtna also show that ONSET and DEP-ʔ dominate MAX-ɛ. In addition, such forms show that consonant clusters are not highly penalised, as might be expected:

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(91) OBJ /$\varepsilon_{\text{IMPF}}$-$ɬ_{\text{CLF}}$|tsi:/ 's/he is making OBJ'

	ONSET	DEP-ʔ	MAX-ε	*COMPLEX
a. ɛɬ|tsi:	*!			
b. [ʔ]ɛɬ|tsi:		*!		
☞ c. <ε>-ɬ|tsi:			*	*

The remaining class of monosyllabic forms mentioned above – 3rd person singular forms with s_{NEG} – can be given an identical treatment.

Finally, 1st person singular subject forms, which surface with [ɛ], unlike classifier prefixed verbs, might seem to present a problem for our account. However, such forms have two instances of prefix /ɛ/ in the input:

(92) /$\varepsilon_{\text{IMPF}}$-$\varepsilon s_{\text{1SG SUBJ}}$|ya:n/ 'I'm eating it'

	ONSET	DEP-ʔ	MAX-ε
a. ɛ.ɛs|ya:n	**!		
b. ɛ[ʔ]ɛs|ya:n	*	*!	
☞ c. <ε>[ʔ]ɛs|ya:n		*	*
d. [ʔ]ɛ.ɛs|ya:n	*	*!	
e. [ʔ]ɛ[ʔ]ɛs|ya:n		**!	

If ONSET and DEP-ʔ have the same rank, then [ɛ] is correctly predicted to be preserved in such forms.

Notice that what was a central descriptive problem in Ahtna phonology according to Causley (1994) disappears under our morphological account. As observed by Causley, consonant sequences (e.g. [dɣ]) which are tolerated in certain parts of the verb ([dɣal|du:ts'ɛ] 'it's tiny') are elsewhere resolved by epenthesis ([idɛ|ɣa:ɬ] 's/he is shaking it'). As discussed above, Causley's solution was to suggest that high ranking of *CLUSTER occurs only in the Minimal Word. In our account, certain consonant clusters are broken up in certain parts of the word but not others because of the morphological position of the vowel-initial tense prefixes.

Our analysis of Ahtna recognises the phonological and morphological similarities between Ahtna and other Athabaskan languages, but identifies two primary differences, both phonological, between Ahtna and the other languages:

(i) *COMPLEX is relatively low-ranking in Ahtna. Thus Ahtna allows longer and more diverse onset clusters than other Athabaskan languages we have seen.

(ii) MAX-ε is low-ranking in Ahtna relative to DEP-ʔ. Thus, $\varepsilon_{\text{TENSE}}$ is absent in certain word-initial contexts because there is a relatively low

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penalty for deleting [ɛ] compared to the penalty for epenthesising the default onset [ʔ].

We are thus able to relate the difference in surface vowel distribution to syllable structure, an area of phonology in which Ahtna obviously differs from most of the other languages.

8 Conclusion

In this paper, we have offered a purely morphological analysis of the widespread disyllabic minimality constraint on Athabaskan verbs. We have claimed that all of the languages of this family have a set of tense prefixes, including a reflex of PA *$ə_{TENSE}$. Given our conception of the morphology, surface disyllabicity is epiphenomenal, resulting largely from the vowel-initial shape of *$ə_{TENSE}$ and its templatic position to the right of most other verb prefixes.

Our analysis is an appropriate synchronic analysis of each of the languages, not just one which provides a useful account of historical development. As seen in the preceding section, even the languages with monosyllabic verbs provide evidence for our analysis, since these languages, like all the others we have examined, have reflexes of *ə following at least pronominal and qualifier prefixes. No language has been reported as having anything like a non-finite verb form. Ours is the only analysis that relates the syntactic generalisation to 'disyllabic minimality' phenomena.

While we have accounted for only a small part of the intricacies of Athabaskan verb prefix phonology, our account nonetheless has a number of empirical advantages over earlier work. Augmentation with disyllabic stems and syllabic prefixes can be accounted for because augmentation – as affixation – is independent of stem shape. Lack of augmentation can be accounted for by appropriate ranking of certain phonological and morphological constraints whose satisfaction requires violation of MAX-ə. Also, our account lends itself to an explanation of Randoja's (1989) conjunct prefix typology, thanks to the ranking of Stem-Alignment constraints, which provided opportunities for interaction with certain other phonological and morphological constraints.

Notice that assigning morpheme-specific effects to the morphology relieves phonology of the burden of complexity, so that the true phonological constraints required to analyse the verb prefix phonologies of Athabaskan languages are just members of the normal constraint arsenal. The most striking areas of difference among the languages are therefore in lexical representations and in the ranking of phonological constraints.

In addition to offering a better description of Athabaskan languages, our analysis has certain theoretical implications as well. Our analysis affirms Anderson's and Potter's accounts of position class morphology as a ranked set of Alignment constraints. However, in order to account for some of the data, it was necessary to recognise that certain prefixes obey prosodic

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subcategorisation constraints specific to these prefixes. One of the prosodic subcategorisation constraints posited here, ALIGN-CODA-s_{CNJ}, involved alignment to a prosodic constituent edge, the syllable, but the other, SD, required alignment to a segmentally defined edge, a type not illustrated in McCarthy & Prince (1993a). It remains to be seen whether this type of prosodic subcategorisation constraint exists in other languages.

Finally, our analysis of the Group 2 prefixes of Witsuwit'en, which uncovered several cases of $P \gg M$, lends support to an Optimality Theoretic approach to Prosodic Morphology from a language family which is not usually thought of as having this kind of morphology.

The problem of Athabaskan augments is therefore important not only descriptively, but theoretically as well. An analysis which correctly predicts both intra- and inter-linguistic variation goes a step beyond description towards explanation. It is significant that the solution that works is one which does not assume that all paradigmatic variation can be explained by either phonological or morphological factors, but allows for a powerful role for morphology and for the interaction of phonology and morphology as well.

NOTES

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[1] We list the morphological abbreviations used in this paper: CLF (classifier), CNJ (conjugation), DIST (distributive), FUT (future), IMPF (imperfective), ITER (iterative), NEG (negative), OBJ (object), OPT (optative), PERF (perfective), PRO (pronominal), PROG (progressive), QUAL (qualifier), SUBJ (subject), UNSP (unspecified).

[2] All branches (Pacific Coast, Apachean, Mackenzie River; Howren 1975) of the family are represented in this article, as well as a variety of northern Athabaskan languages, which do not form a coherent subgrouping (Krauss 1973, Krauss & Golla 1981). The following is a full list of the languages (and dialects) included in this paper: Ahtna, Babine/Witsuwit'en (Witsuwit'en, Babine), Beaver (Halfway River), Deg Hit'an, Dena'ina, Dogrib, Hupa, Galice, Kato, Koyukon, Navajo, Sekani, Slave (Slavey, Hare) and Tanana (Salcha, Minto).

Ahtna dialects are abbreviated following Kari (1990: 20): L (Lower), C (Central), W (Western), M (Mentasta). The Babine/Witsuwit'en language (Kari & Hargus 1989) has also been referred to as simply Babine (Story 1984). Deg Hit'an is also known as Ingalik and Deg Xinag. In this article we use the language name preferred by the Alaska Native Language Center. The dialects of Slave are Hare, Bearlake, Mountain and Slavey (Rice 1989). Howard (1990) is a description of a dialect he calls 'South Slavey', which is the same as Rice's 'Slavey'. According to Krauss (1973), Salcha and Minto are two of the dialects of the Tanana language.

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[3] To aid in the comparison of languages, we have retranscribed data from our sources using standard phonetic symbols but adopting the following Athabaskan transcription conventions. (i) In Navajo and Slave, [V̀] = high tone vowel; low tone vowels are unmarked. In Sekani and Minto, [V̀] = low tone vowel; high tone vowels are unmarked. In transcriptions of stress, [V́] = primary stress, and [V̀] = secondary stress. (ii) In Minto and Deg Hit'an, [dr tr tr'], etc. are retroflex consonants. (iii) In all of the languages, there is a three-way contrast in onset position between voiceless unaspirated, voiceless aspirated and glottalised stops and affricates, transcribed [d t t'], etc., respectively. A few of the languages – e.g. Ahtna, Dena'ina – preserve the PA contrast between voiceless unaspirated and glottalised codas, whereas most other languages – e.g. Navajo, Witsuwit'en, Sekani, Slave – neutralise this contrast in favour of voiceless unaspirated codas. In this latter group of languages, the voiceless unaspirated codas are transcribed here with the Athabaskanist voiceless aspirate symbols ([t], etc.). In a subset of the languages which have neutralised the glottalised *vs.* voiceless unaspirated coda distinction, there is an innovative contrast between syllable-final voiced and voiceless unaspirated stops and affricates (e.g. Deg Hit'an). In those languages, the normal symbols for voiced and voiceless stops ([d t], etc.) are used to transcribe coda consonants. In Salcha, [y̬] is voiceless [y].

We have also standardised glosses of 3rd person singular verb forms.

[4] We follow Chomsky & Halle (1968) in selecting the terms AUGMENT and AUGMENTATION over other terms (PEGGING, EPENTHESIS, PROTHESIS) that have been used to describe this phenomenon in Athabaskan languages.

[5] Krauss & Leer (1981: 45) reconstruct a verbal augment *ə for Proto-Athabaskan. In Slave and Ahtna, the reflex of *ə is [ɛ], in Navajo and Hupa [i] and in Galice [a].

[6] In examples references are abbreviated as follows: AD = Kari (1990), DD = Kari (1994), DSS = Howard (1990), EKL = Goddard (1912), GA = Hoijer (1966), GAS = Hoijer (no date), GS = Rice (1989), KH = unpublished Kari & Hargus fieldnotes, KSS = Jones *et al.* (1983), KT = Goddard (1909), NL = Young & Morgan (1987), NME = Goossen (1967), NVP = Kari (1973), SL = Kari *et al.* (1993), SPG = Golla (1985), WPK = Kalifornsky (1991), WS = Willie & Saxon (1995). All uncited data come from our own fieldnotes.

[7] In candidate forms in our tableaux, elements of the input which are not parsed (i.e. deleted) in candidate forms are enclosed in angled brackets. Epenthetic elements are enclosed in square brackets.

[8] Howard (1990: 797) remarks about the Slave stem that 'it is the last syllable, or in some cases the last two syllables, of the word'.

[9] We hypothesise that the tense prefixes in Athabaskan languages are typically vowel-initial, recognising that it would be impossible to defend a claim that the tense prefixes are always vowel-initial. In Athabaskan linguistics it has long been claimed that there are canonical shapes associated with stems and with prefixes occurring within particular domains (disjunct *vs.* conjunct, for example), perhaps a special case of the fact that affixes, as opposed to stems, have different phonological shapes in many languages (Nida 1949, McCarthy & Prince 1994). We propose taking this line of argument a step further, allowing for the association of particular prefix positions with canonical shapes.

[10] Witsuwit'en allows word-initial onsetless syllables headed by [i] or [u].

[11] Deverbal nouns also exhibit the verbal pattern:

(i) *noun*	*cf. verb*	
nə|t'ay 'berry'	niz|t'ay	'it got ripe'
nə|t'əc 'muscle'	niɬ|t'əc	'you push, pull, apply muscle'
nə|gət 'fear'	wewənə|gət	'it's dangerous'

[12] Young & Morgan (1992: 851) describe the 4th person subject prefix as referring to 'a person, in both a specific and an impersonal sense, or a personified animal'.

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Willie & Saxon (1995) provide an overview of the functions of this prefix in Athabaskan languages.

[13] The analysis of the Minto monosyllabic verbs is similar but complicated by the existence of lexical tone in that dialect. See Tuttle (in preparation).

[14] This form contains an epenthetic [d].

[15] The facts are slightly different in the Babine dialect. See Story (1989).

[16] This version of SD will correctly cause sequences of s_{CNJ} and l_{CLF} to be adjacent if l_{CLF} is analysed as a sequence of $d_{CLF}+ɬ_{CLF}$, as suggested by e.g. Pinnow (1964) and Sapir & Hoijer (1967), and as seems warranted by the well-known morphological relationships between these prefixes (∅:d::l:ɬ).

[17] SD also regulates the onset ~ coda alternations of n_{CNJ}:

(i) *coda*

a. $ne_{ITER}\#n_{CNJ}\text{-}ə_{PERF}\text{-}dəd_{1DUAL\,SUB}\|$	ninendət'az	'we (DUAL) stopped walking again'
b. $u_{QUAL}\text{-}n_{CNJ}\text{-}ə_{PERF}\text{-}dəd_{1DUAL\,SUBJ}\text{-}d_{CLF}\|$	undətge	'we (DUAL) are shy'
c. $u_{QUAL}\text{-}n_{CNJ}\text{-}ə_{PERF}\text{-}d_{CLF}\|$	unge	's/he is shy'
d. $ne_{ITER}\#ts'_{1PL\,SUBJ}\text{-}n_{CNJ}\text{-}ə_{PERF}\text{-}d_{CLF}\|$	ninets'əndil	'we stopped walking again'

onset

e. $n_{CNJ}\text{-}in_{PERF}\|$	ninye	's/he arrived'
f. $n_{CNJ}\text{-}ə_{PERF}\text{-}s_{1SG\,SUBJ}\|$	nəsye	'I arrived'
g. $u_{QUAL}\text{-}n_{CNJ}\text{-}ə_{PERF}\text{-}s_{1SG\,SUBJ}\text{-}d_{CLF}\|$	unəsge	'I am shy'
h. $dəc'a_{\text{'lost'}}\#z_{1PL\,SUBJ}\text{-}n_{CNJ}\text{-}in_{PERF}\|$	dəc'aznin?ay	'we fooled him/her'

cluster

i. $n_{CNJ}\text{-}ə_{PERF}\text{-}dəd_{1DUAL\,SUBJ}\|$	ndət'az	'we (DUAL) arrived'

In fact, all coda instances of n_{CNJ} (a)–(d) can be accounted for by SD alone. n_{CNJ} forms analogous to s_{CNJ} [uzye], [yə⟨s⟩ɬtsəy], etc., which provided the motivation for ALIGN-R-s_{CNJ}, do not exist due to the fact that n_{CNJ} must occur with the *in*-allomorph of the perfective prefix in forms lacking an inner subject prefix.

[18] Some variation in the pronunciation of Ahtna [Cɛ] is recorded in Kari (1990). Compare n_{QUAL}, d_{QUAL} and $ɣ_{DUAL}$ [C] forms below with the [Cɛ] forms in (83):

(i) n_{QUAL}	ts'iɬɣu q'an n|tæ:s	's/he (customarily) goes to bed early'	AD 328
	nyæ:χ, nɛ|yæ:χ	's/he is growing'	AD 420, 652
	c'a:n n|ya:n	's/he is eating bread'	AD 429
$ɣ_{QUAL}$	ɣɛt|na:, at|na:	's/he is working'	AD 288
d_{QUAL}	ʔɛɬ d|ya:ni	that which eats spruce boughs)	AD 429
q_{QUAL}	qɛ|næ:s, h|næ:s	's/he is talking'	AD 286, 425
	qɛ|ni:s, h|ni:s	's/he (customarily) talks'	AD 685

In forms prefixed with the 3rd person singular object prefix *y*-, there is analogous variation:

(ii)	i|tsæ:ɬ, yɛ|tsæ:ɬ	's/he is chopping it'	AD 419
	i|t'a:s	's/he is cutting it'	AD 686

We interpret this as reflecting variant pronunciations of such [Cɛ] syllables in Ahtna.

[19] Kari (1990: 653) notes that 'at the left-hand edge of the syllable before the stem, clusters of two to five consonants can occur. However, it is also possible to find a second [ɛ]- inserted to break up some clusters of conjunct prefixes. The exact clusters and rule ordering conditions are not yet worked out'.

[20] Verbs prefixed only with s/z_{CNJ} are also monosyllabic in Ahtna. Their analysis lies outside the scope of this article.

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