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 analyzed 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 analyzed 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 analyze the data can be formally stated within the terms of Generalized Alignment theory (McCarthy and 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

longstanding phonological problem in Athabaskan linguistics---a complex set of onset/coda alternations involving certain verb prefixes. We trace the exceptional behavior of these prefixes to a small set of prosodic subcategorisation constraints which these morphemes obey. Our analysis thus supports Generalized Alignment in particular and Optimality Theory in general: for the first time in Athabaskan linguistics, these alternations can be analyzed entirely within the limits of the assumed theoretical framework.

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 <u>stems</u> 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. The prefix for the iterative paradigm.	Iterative
3. A pluralising prefix.	Distributive
4. An object pronoun prefix.	Pronominal object
5. A deictic subject prefix	Pronominal subject
6. Zero, one or two adverbial prefixes.	Qualifier
7. A prefix marking mode, tense or aspect.	Conjugation/Negative
	Tense
8. A subject pronoun prefix.	Inner subject
9. A classifier prefix.	Classifier
10. A 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 analyze stems and conjunct prefixes as forming a prosodic compound. As pointed out by Hargus (1995), some of the languages present evidence that these are domains of different types (hence the labels CONJUNCT and PROSODIC STEM in (2):

(2.)   [Pro*1*-Qual-Cnj/Neg-Tense-Inner subject-Classifier]_{CONJUNCT} [Stem]_{PROSODIC STEM}

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

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 mark the major tense/aspect/mood distinctions in Athabaskan languages. All of the languages contain an imperfective 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 and 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,[2] many analysts of Athabaskan verb prefix phonology have assumed that the reflex of Proto-

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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), O (object), op (optative), pf (perfective), pro (pronominal), prog (progressive), qual (qualifier), refl (reflexive), S (subject), unsp (unspecified).

[2]All branches (Pacific Coast, Apachean, Mackenzie R. (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 and 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,

Athabaskan (PA) *ə is not an underlying segment in the prefixes of Athabaskan languages. 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-\|ʔìh/ | [ts'ənəʔìh] | '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 whether prefixal syllable

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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. (1) In Navajo and Slave, [V́] = 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. (2) Nasal vowels are transcribed [V̨]. (3) In Witsuwit'en and Ahtna, [c] = voiceless aspirated palatal stop and [g] = voiceless unaspirated palatal stop. (4) In Minto and Deg Hit'an, [dr tr tr'] etc. are retroflex consonants. (5) In all of the languages, there is a three-way contrast in onset position between voiceless unaspirated, voiceless aspirated, and glottalized 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 glottalized codas, whereas most other languages---e.g. Navajo, Witsuwit'en, Sekani, Slave---neutralize this contrast in favor 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 neutralized the glottalized vs. voiceless unaspirated coda distinction, there is an innovative syllable-final voicing contrast between 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, [ẙ] is voiceless [y].

We have also standardized glosses of third person singular verb forms. Most human subjects of such verbs are glossed 'he/she' whereas most inanimate subjects are glossed 'it'. In some of the languages, there is a verb prefix which marks an unspecified third person subject. Verbs with this prefix are translated with 'someone' or 'something'. We generally translate third person singular imperfective verbs with the English progressive ('is crying') as opposed to simple present ('cries'), which we reserve for verbs in the customary aspect.

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 $_\sigma$[CV] for the conjunct domain. The derivation in (4), illustrating conjunct [ə] epenthesis, is modeled after Randoja (1989: 229-30). (Consonants in parentheses are extrametrical; conjunct elements are bracketed.)

(4.)   [nàʔədədət'ets] 'he/she kicked him/herself' (Halfway R. Beaver)

	nà$_{iter}$-ʔd$_{reflO}$-d$_{qual}$- d$_{clf}$-ʔets$_{stem}$
σ Mapping (Stray Epenthesis)	nà [ʔ d d d] ʔe(ts) CV CV CV CV CV |/ |/ |/ |/ |/ σ σ σ σ σ
Word level (extraprosodicity turned off)	nà [ʔ ə d ə d ə t]'ets CV CV CV CV CVC |/ |/ |/ |/ |/ / σ σ σ σ σ

However, as noted by Randoja (1989), not all prefix syllables have the shape [Cə]. For example, in (4), *d-* qualifier is [də], *d-* classifier fuses with the [ʔ]-initial stem as [t'] and never appears as [də]. This contrast between *d-* classifier and *d-* qualifier 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
(I) #___[stem	(a) [Cə]	(b) [Cə]	(c) [əC]
(II) pfx ___ [stem	(d) [Cə]	(e) [əC]	(f) [əC]
(III) #___ pfx	(g) [Cə]	(h) [Cə]	(i) [əC]
proposed UR:	/C/	/C/	/C/]$_\sigma$

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

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onsets or codas, a surface distribution that seems to be connected to prefix position in some way, is a problem that must be accounted for.

3.2 Augmentation[4]

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. Verbal augmentation in Athabaskan languages is typically described via statements such as the following:

> Howard (1990:802) (Slavey): '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.'

> Young and Morgan (1987:112) (Navajo): '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.'

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,[5] is emphasised:

(6.)   Basic verbal augmentation data, bare stems

language	data		source[6]
S. Slavey	ɛ|tsɛ	'he/she is crying'	DVSS 802
	ɛ|zí	'it's roasting'	DVSS 800
	ɛ|ʔɛ́h	'he/she is paddling'	DVSS 46

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[4]We follow Chomsky and Halle (1968) in selecting the terms <u>augment</u> and <u>augmentation</u> over other terms (<u>pegging</u>, <u>epenthesis</u>, <u>prothesis</u>) that have been used to describe this phenomenon in Athabaskan languages.

[5]Krauss and 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 tables references are abbreviated as follows: AD = Kari (1990), DD = Kari (1994), DVSS = Howard (1990), EKL = Goddard (1912), GA = Hoijer (1966), GAS = Hoijer (no date), GS = Rice (1989), KT = Goddard (1909), KH = unpublished Kari and Hargus fieldnotes, KSS = Jones, Thompson and Axelrod (1983), NL = Young and Morgan (1987), NME = Goossen (1967), NVPP = Kari (1973), SL = Kari, Moffit and Tuttle (1993), SPG = Golla (1985), WPK = Kalifornsky (1991), WS = Willie and Saxon (1995). All uncited data come from our own fieldnotes.

Sekani	ə	tsəɣ	'he/she is crying'	
	O ə	č'i̜	'he/she has O'	
	O ə	bà	'he/she (child, animal) is eating O'	
Koyukon	ə	tsəh	'he/she is crying'	KSS 30
	O ə	han̦	'he/she is eating O'	KSS 61
	O ə	zəs	'he/she is drinking O'	KSS 72
Deg Hit'an	ʔə̱	trəχ	'he/she is crying'	KH
	ʔə̱	ləχ	'it's swimming'	"
	O ʔə̱	hon̦	'he/she is eating O'	"
Witsuwit'en	hə̱	tsəɣ	'he/she is crying'	
	hə̱	tl'et	'he/she is farting'	
	hə̱	bəl	'he/she is swinging'	
Navajo	yi̱	ča	'he/she is crying'	NVPP 106
	yi̱	dzi:h	'it's left'	NME 271
	ʔádin yi̱	le:h	'he/she is vanishing, going away'	ALN 379
Hupa	ʔi̱	sahł	'he/she is yawning'	SPG 41
Galice	ʔa̱	seh	'he/she is crying'	GA 326
	ʔa̱d	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.

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 i̱- 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'
ʔaç	'snowshoe'
ts'o	'spruce'
tl'oł	'rope'
ye	'louse'
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.) $W_{minimum} = F_{\sigma\sigma}$ (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:

(9.)   Template mapping derivation

$$
\begin{array}{ccc}
W_{min} & & W_{min} \\
| & & | \\
F & \rightarrow & F \\
|\quad\backslash & & |\quad\backslash \\
\sigma \quad \sigma & & \sigma \quad \sigma \\
\quad\; \text{d-šɛn]}_{verb} & & \varepsilon \quad \text{d-šɛn]}_{verb}
\end{array}
$$

$$\downarrow$$

$$\boxed{[\text{hɛǰɛ̜}] \qquad \text{(phonology)}}$$
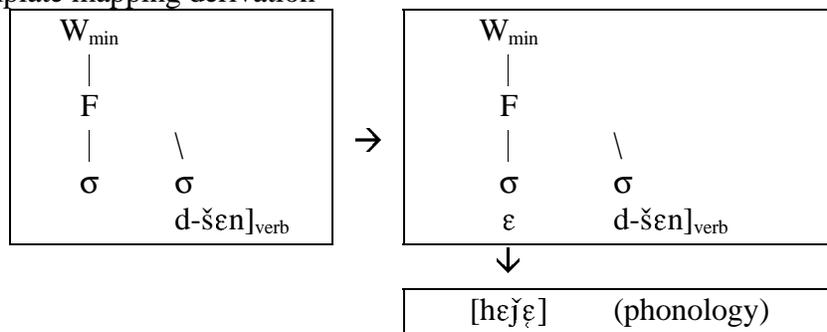
We call this the template mapping analysis.

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 d̠ɛyæ:n] 'the knife is sharp' (AD 433):

(10.) INPUT → /d + yæ:n/

Candidates	Align-L	*Complex	Parse	Fill
1. .dyæ:n.		*!		
2. <d>.yæ:n[7]			*!	
3. d<y>æ:n.			*!	
4. .[ɛ]d.yæ:n.	*!			*
☞ 5. .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-Left (11), and [ɛ] does not belong to any morpheme:

(11.) Align-Left (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]INFL + [CL | stem]VERB

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[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.

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McDonough further assumes that the I-stem is a portmanteau is 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 first 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 first person singular subject and perfective in such verbs:

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

	s-imperfective	*s-perfective*	*s-perfective*
1	šiš	sé	sis
2	sí	síní	síní
3		si	yis
1d	siid	siid	siid
2d	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.

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 the ɬ- classifier or its reflex (*h-* in Slave and Sekani):

(14.)   Augmentation with ɬ- classifier

Slave	O ɛh|čɛh	'he/she is boiling O'	GS 488
	O ɛh|ʔáh	'he/she is chewing, gnawing on O '	DVSS 22
	O ɛh|θɛh	'he/she is tanning O (a hide…)'	DVSS 132
Sekani	O ah|gək	'he/she is rubbing, massaging O'	
	O ah|ʔa	'he/she is hiring O'	
	O ah|bets	'he/she is cooking O by boiling'	
Deg Hit'an	ʔoç ʔəɬ|tse	'he/she is making snowshoes'	KH
	ʔəɬ|yoθ	'it's snowing'	"
	ʔəɬ|ðeç	'it's numb'	"
Witsuwit'en	həɬ|ɣis	'he/she itches'	
	həɬ|tsən	'it stinks'	
	cən həɬ|ɣəs	'termite' (lit. it drills wood)	
Salcha	əɬ|ts'əẙ	'it's windy'	
	əɬ|čạ	'it's raining'	
	O əɬ|bæts	'he/she is cooking O'	

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 (1989:940 ff.) 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 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-* classifier in surface form)

nouns		*verb themes*	
goh|fịh	'axe' (Hr)	h-|fịh	'action with axe' (Hr)
goh|zɛ́	'hook at end of stick'	h-|sɛ́	'hook' (verb)
ʔɛh|dzo	'trap' (noun)	h-|dzo	'trap' (verb)

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-* classifier in surface form)

nouns		verb themes	
|tθi̜h	'axe'	h-|tθi̜h	'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 ł- classifier in the verbal forms in (14) is not added to rescue a stray consonant. In Salcha and Witsuwit'en, [łC] is a well-formed onset, in both nouns and verbs:

(17.) Word-initial [|łC] in two languages with verbal [əł|C]

Salcha	noun	łts'əy̌	'birch fungus ashes'
	verbs	łnalʔæ̜	'you (pl.) are looking at each other'
		łts'itθ'ək	'we're listening to each other'
Witsuwit'en	nouns	łc'ət	'different place'
		łq'aq	'split fish (non-salmon) '
	verbs	łts'əstc'əy	'we shot each other'
		łdəlyəl	'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 ł- classifier verb 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 ʔə|zrəŋətl	'he/she is bailing water, water pump'	KH
Hit'an	ʔə|gəŋəsr	'he/she is ticklish'	"
Slave	hɛh|bɛlí	'he/she is swinging O'	GS 488
	ɛ̠|líɛ	'it's hurt, sore (re an illness, a wound, or a given area of one's body'	DVSS 345
	ɛ̠h|dɛðɛ, ɛ̠h|dɛði	'it's twisted (re a rope, the grain of a tree, etc.)'	DVSS 94
	ɛ̠h|k'ólɛ	'he/she is making it soft, doughy, is mashing it (mud or other substances)'	DVSS 303
	ɛ̠h|ts'íːlɛ	'it's curved (re a bent tree, etc.)'	DVSS 596
Navajo	yi̠l|žólí	'it's soft, tender, fluffy'	ALN 786
Sekani	ə|wəse	'he/she itches'	
	ʔəlà a̠h|t'oɣəs	'he/she 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 analyzed 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.

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[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'.

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).

(19.) *də*- classifier

Deg Hit'an	ʔ<u>ədə</u>|q'oθ	'he/she is exercising'
	ʔ<u>ədə</u>|ǰaɬ	'he/she is busy'
	ʔ<u>ədə</u>|Gəsr	'he/she arrived (crawling)'
Witsuwit'en	h<u>ədə</u>|tl'ol	'it's braided'

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

(20.) *dəd*- first person dual subject

den<u>dət</u>|'az	'we (du.) went inside'
h<u>ədət</u>|wəs	'we (du.) are ticklish'
h<u>ədət</u>|Ges	'we (du.) are scratching him/her (hard)'

In Witsuwit'en there are two other syllabic prefixes which exhibit slightly different but analogous behavior. The pronominal object prefixes *ni(y)*- first person dual object and *nəxw*- first/second person plural object 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)-₁dO	q'ɛqɛ <u>nic</u>'ədət|'əy	'someone has us (du.) as friends'
	q'ɛqɛ <u>niy</u>ət|'əy	'he/she has us (du.) as friends'
	<u>niy</u>ə|dlet	'it's licking us (du.)'
nəxw-₁/₂pO	<u>nəxw</u>niɬ|t'əxw	'it stung us/you (pl.) on face'
	<u>nəxw</u>ə|dlet	'it's licking us/you (pl.)'
	<u>nəxw</u>ə|Ges	'he/she 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.

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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 third person singular forms which contain no prefixes.

(22.)   Dena'ina failure of augmentation, unprefixed verbs

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

(23.)   Kato failure of augmentation, unprefixed verbs

Goddard's transcription	our interpretation		
tceʻ	|čeh	'he/she is crying'	KT 114-5
qạL	|qʌɬ	'he/she walked'	KT 75-8
tc'in	|č'in	'he/she said'	KT 76-12

(24.)   Ahtna failure of augmentation, unprefixed verbs

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

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

(25.)   Ahtna failure of augmentation, classifier prefixed verbs

l- _clf_	l|soɬ	'he/she is lying'	AD 464
	l|Gay	'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	'he/she is lying dead'	AD 328
d-_clf_	d|a:n	'it's eaten'	AD 680
	O t|na:n	'he/she is drinking O'	AD 652

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

(26.)   Kato failure of augmentation, classifier prefixed verbs

	Goddard	*interpreted*		
ł-_{clf}	-L gai	ł|gai	'it's white'	EKL 28-29
	-L tc̄ik	ł|či:k	'it's red'	"
	-L cûñ^E	ł|šəŋ'	'it's black'	"
	-L c̄ik	ł|šik	'it's shining'	"
d-_{clf}	-t biñ	t|biŋ	'it's sharp, pointed'	"

Dena'ina data with classifier prefixes are unavailable. But the forms in (27), with *s-*conjugation, clearly lack the augment:

(27.)   Dena'ina failure of augmentation, s- conjugation prefixed verbs

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

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:

(28.)   Minto [ə]~Ø alternations

ə|trəx	'he/she is crying'
dənæ |trəx	'the man is crying'
ə|bætr	'it's cooking (by being boiled)'
łuk'æ |bætr	'fish is cooking'
ə|časr	'it's melting'
srəsr k'ʊx |časr	'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.

(29.)   Salcha [ə]~Ø variation

|tsəx ~ ə̱|tsəx   'he/she is crying'   SL

However, the augment appears when the preceding word ends with a stressed syllable (30)(a,c), but not when the preceding word ends with an unstressed syllable (30)(b,d):

(30.)   Salcha post-stress obligatory augment

	a.	č'ətθí̱ʔ ə̱|ʔáɬ	'he/she is eating meat'	SL
	b.	ɬúgə |ʔáɬ	'he/she is eating fish'	"
	c.	ǰíts ə̱|ɣá̱	'he/she is making gloves'	
	d.	sʔǽgəʔ |ɣá̱	'he/she 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-* conjugation 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:

(31.)   Witsuwit'en failure of augmentation, *s-* conjugation + [d t t']

s̱|de   'he/she is sitting'
s̱|tan   'it (rigid O) is'
s̱|t'ɛ   'it's roasted, fried'

The *s-* conjugation prefix is also systematically [s]- before *d-* or *l-* classifier prefix (with *s-* conjugation and *l-* classifier coalescing to [ɬ]). Again, if no other verb prefixes are present, the resulting verb is a monosyllable:

(32.)   Witsuwit'en failure of augmentation, *s-* conjugation + *d-* or *l-* classifier

			cf. 1sS
___d-clf	s̱giz (s̱-d-|yiz)	'he/she is breathing'	
	s̱d|gwət	'he/she was poked'	
	s̱d|liz	'it's been boiled'	
___l-clf	ɬ|dəw	'it cramped up'	səgəldəw 'I cramped up'
	ɬ|ɣil	'it's wrapped up'	səcɬɣil 'I wrapped it'
	ɬ|Guh	'it's trapped'	səcɬGuh 'I trapped it'

The monosyllabicity of the forms in (32) contrasts with the disyllabicity of other s-prefixed forms. In (33), *s-* conjugation is [sə] before stems which do not begin with plain coronals:

(33.)   Witsuwit'en augmented verbs, *s*- conjugation + stem

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

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

(34.)   Witsuwit'en augmented verbs, *s*-first person singular object + stem

s̲ə̲|dlet	'it's licking me'
s̲ə̲|Ges	'it's scratching me (hard)'

Verbs containing only the first person singular subject prefix *s*- contain a syllable [həs]- (with epenthetic [h]), also contrasting with [s] in (31)-(32):

(35.)   Witsuwit'en augmented verbs, *s*-first person singular subject + stem

h̲ə̲s̲|dlet	'I'm licking it'
h̲ə̲s̲|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 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:

(36.)   Obligatory Tense

Align (Stem$_V$, L, tense, R)
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 imperfective, just as verbs with no overt subject prefix are interpreted as third 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, 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 (37), allomorphs of the tense prefixes are separated by /; not all allomorphs are illustrated:

(37.)   Witsuwit'en tense prefix inventory

tense		*example*	
perfective	in-/en-/	(a) i̱ntsɛɣ	'he/she cried'
	ən-/	(b) hə̱nli	'he/she is'
	ə-	(c) O sə̱dzih	'it grabbed O (with claws)'
		(d) nə̱sye	'I arrived, came for the first time'
perfective neg.	i-/e-	(e) wec'oni̱yil	'he/she didn't pick berries'
optative	u-/o-	(f) nu̱sqɛʔ	'I should go around by boat'
future	a-/	(g) ta̱qɛɬ	'he/she will go by boat'
	i-	(h) wetəzi̱sqɛtl	'I won't go by boat'
progressive	ɛ-/	(i) ts'ɛ̱qɛɬ	'we're going by boat'
	i-	(j) i̱qɛɬ	'he/she is going by boat'
imperfective	ə-	(k) hə̱tsəɣ	'he/she is crying'
		(l) c'onə̱yin	'he/she is picking berries'
		(m) hə̱deç	'he/she (customarily) sits'
		(n) wətsats'ə̱qɛç	'we (customarily) come by boat'

In Witsuwit'en, Obligatory Tense is satisfied by prefixing one of the affixes in (37).

There are two features of particular interest in (37). (1) There are two homophonous prefixes: /ə/$_{impf}$-, which is present in the imperfective forms (37)k-n, and /ə/$_{pf}$-, which occurs in certain perfective forms (37)c-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. (2) All of the tense prefixes in (37) are vowel-initial while prefixes of neighboring 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/- perfective and /ə/- imperfective, for example, contain underlying /ə/. We also assume that morpheme-internal, non-alternating /ə/ as in Witsuwit'en *nəxw*- 1/2pO and *dəd*- 1dS 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 analyzed 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,

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[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. However, it seems that there may be canonical phonological shapes associated with prefix positions in Athabaskan languages, perhaps a special case of the fact that affixes, as opposed to stems, have different phonological shapes in many languages (Nida 1949, McCarthy and Prince 1994).

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:

(38.) Salcha [ə$_{impf}$ -ɬ-|C] in verbs

ə $_{impf}$-ɬ-|ts'əẙ 'it's windy'
tense-clf-windy

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

(39.)

	Sekani /t'oɣəs/ 'paddle'	
(verb) ↙		↘ (noun)
O+ə$_{impf}$+h$_{clf}$+t'oɣəs 'paddle O' [aht'oɣəs]		[t'oɣəs] 'paddle'

Satisfaction of Obligatory Tense is independent of the number of syllables in the stem.

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

(40.) Witsuwit'en syllabic prefixes

niy$_{1dO}$-ə$_{impf}$-	niyə̲|t'əy	'he/she has us (du.)'
ə$_{impf}$-dəd$_{1dS}$-	hə̲dət|wəs	'we (du.) are ticklish'

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 (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$_1$V] and those containing one consonantal Group 3 prefix /C$_3$/, as [VC$_3$], simply by prefix ordering constraints. The forms with [C$_1$ə] 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-* optative and *ɛ/i-* progressive are provided for comparison with those containing ə- imperfective:

(41.) Witsuwit'en verbs with one Group 1/3 prefix + 1 tense prefix

Group 1	n- qual	nədeç	'he/she is dancing'
		nudeç	'let him/her dance'
	t- qual	nən təzuh	'he/she is spitting'
		nən tozuh	'let him/her spit'
	c'- unspO	c'əGes	'he/she is scratching something (hard)'
		c'oGes	'let him/her scratch something (hard)'
	s- 1sO	sədlet	'it's licking me'
		sodlet	'let it lick me'
Group 3	s- 1sS	[h]əsbəl	'I'm swinging'
		isʔɛn[10]	'I see him/her/it'
	xw- 2pS	[h]əxwqɛç	'you (du.) (customarily) sit'
		ixwʔɛn	'you (pl.) see him/her'
	d- clf	O [h]ətne	'he/she is drinking O'
		O utneʔ	'let him/her drink O'
	ɬ - clf	[h]əɬɣis	'he/she itches'
		uɬɣis	'let him/her itch'

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

(42.) Witsuwit'en verbs with two Group 1/3 prefixes + 1 tense prefix

		Group 1 n- qual t- qual	Group 3 ɬ-, d-, l- clf s/c- 1sS
Group 1	h- 3pS n- qual	h[ə]nədeç 'they're dancing' ntadeç 'we'll dance'	həɬɣis 'they itch' nəsdeç 'I'm dancing'
Group 3	c/s- 1sS	---	[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 (41)-(42). In the remainder of this section we discuss two additional phonological advantages of the analysis which are not related to augmentation per se: an

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

account of the distribution of nasal prefixes to verbs vs. nouns, and an account of alternations involving the fourth 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 (43)(a,c,e), the noun stem is prefixed with the unspecified possessor prefix c'(ə)-:

(43.)   /nC/ nouns

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

As can be seen in (43), when stem-initial /nC/ is word-initial, as it is in the righthand member of compounds (43)b,d,f, the phonetic form also contains [nC], with no vowel breaking up the sequence.

Now consider verbs which contain the *n-* qualifier prefix:

(44.)   /n/- prefixes to consonant-initial verb stems

a.	<u>nə</u>|deç, *<u>n</u>|deç	'he/she is dancing'
b.	<u>n</u>ta|deç	'he/she will dance'
c.	yəleɣ kw'əsəl <u>nə</u>|ʔɛs	'he/she is helping him/her string beads'
d.	yəleɣ kw'əsəl <u>n</u>ta|ʔɛs	'he/she will help him/her string beads'
e.	nəc'ə<u>nə</u>|qəyʔ	'he/she is sewing'
f.	nəc'ə<u>n</u>ta|qəyʔ	'he/she will sew'

In (44)(b,d,f), the *n-* qualifier is simply [n] before a consonant. Yet in (44)(a,c,e), where *n-* qualifier is also apparently followed by a consonant (the initial consonant of the verb stem), this prefix is pronounced [nə]-.

In an analysis which lacks $\mathrm{\partial_{tense}}$-, 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 $\mathrm{\partial_{tense}}$-, which intervenes between qualifier and verb stem by affix order restrictions, is posited:

(45.)　/n$_{qual}$-$\mathrm{\partial_{impf}}$ -|stem$_V$/

n$_{qual}$-$\mathrm{\partial_{impf}}$-|deç	[nədeç]	'he/she is dancing'
n$_{qual}$-t$_{qual}$-a$_{fut}$-|deç	[ntadeç]	'he/she will dance'

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

6.3 Fourth person subject prefix

The reflex of the PA prefix *č'ʷ- (Thompson 1993) is generally referred to as either fourth person subject[12] (e.g. Navajo) or first 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:

(46.)　Navajo 4sS prefix, [ǰ]- allomorph

context	*form*		
$_{wd}$[___V	baa ǰíí.ča	'he/she cried about it'	WS
V___V	yóóʔ a.ǰíí.yá	'he/she is lost'	WS
$_{wd}$[___.C	ǰi.doo.ɣááɬ	'he/she (4th p.) will come'	WS

(47.)　Witsuwit'en 1pS prefix, [ts']- allomorph

context	*form*	
$_{wd}$[___V	<u>ts'</u>o.deʔ	'let's sit'
V___V	de.we.<u>ts'</u>e.ʔəs	'we (du.) didn't walk inside'

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[11]Deverbal nouns also exhibit the verbal pattern:

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 and Morgan (1992:851) describe the fourth person subject prefix as referring to 'a person, in both a specific and an impersonal sense, or a personified animal.' Willie and Saxon (1995) provide an overview of the functions of this prefix in Athabaskan languages.

C___V	ne.nəxw.<u>ts</u>'o.t'ɛnʔ	'we should see you (pl.) again'
ₗᵈ[___C.	<u>ts</u>'ən.di.deʔ	'we were sick'
C___C.	wə.ɣən.<u>ts</u>'ən.tɛs.dil	'we failed'
V___C.	we.<u>ts</u>'ən.di.del	'we weren't sick'
ₗᵈ[___.C	<u>ts</u>'ə.dil.kwəs	'we coughed'
C___.C	ne.nəxw.<u>ts</u>'ə.ta.t'ɛɬ	'we'll see you (pl.) again'

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

(48.)   Navajo 4pS prefix, [ž]/[z]- allomorph

V___.C	aɣááɬ k'í<u>ž</u>.ní.tiʔ	'he/she broke the rattle'	WS
	č'í<u>ž</u>.níʔą́	'he/she carried it (compact O) out'	NL 77
	šiɬ dzi<u>z</u>.deez.kaad	'he/she gave me a slap'	NL 77

(49.)   Witsuwit'en 1pS prefix, [z]- allomorph

V___.C	bət ɣe<u>z</u>.ta.neɬ	'we'll cook'
	we<u>z</u>.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 fourth person/first 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:

(50.)   Navajo 4sS prefix, post-vocalic and pre-stem

a.<u>ǰi</u>|.yą́	'he/she is eating it'	NL 77

(51.)   Witsuwit'en 1pS prefix, post-vocalic and pre-stem or pre-syllabic classifier

[ʔə.<u>ts</u>'ə|.t'əχ], *[ʔə<u>z</u>|.t'əχ]	'we're working'
[c'ə.<u>ts</u>'ə|.tl'o]	'we're knitting'
[ho.<u>ts</u>'ə|.ts'et]	'we're telling a lie'
[ɬq'ɛ<u>ts</u>'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:

(52.)   Witsuwit'en [ho#<u>ts</u>'₁ₚₛ-$ə_{impf}$|.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$_{tense}$-, a prefix used in imperfective 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 fourth 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 analyze the monosyllabic verbs in Salcha, Witsuwit'en, and Ahtna. Just as these data were problematic for previous approaches to augmentation, they appear to be counter-examples 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 and Prince 1995), a constraint which penalises candidates for deleting input /ə/, is lower ranked than other constraints:

(53.)   **Max-ə:** A segment containing /ə/ in the input should correspond to a segment containing [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 Generalized Alignment

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

Anderson (1996) analyzes 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 (54) for the Athabaskan conjunct prefixes, assuming a modified version of the Hoijer model in (1):

(54.) Stem-Alignment constraints

	Align version of constraint	*Informal name*
	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 (54), consider Witsuwit'en [tastəɬ] 'I'll kick it (once)'. This word contains three prefixes, *t-* qualifier, *a-* future, *s-* first person singular subject, as well as the future stem *-təɬ* of 'kick O (once)'.

(55.) Input /t$_{qual}$-, a-$_{fut}$, s$_{1sS}$-, təɬ$_{stem}$/ 'I'll kick it (once)'

		Candidates	**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 (55), we assume, following Anderson and Potter, that violations of affix order constraints are assigned gradiently: a prefix earns 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 (54) 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 Qualifier-Stem, there is a ranked set of Stem-Alignment constraints:

(56.)   Qualifier-internal affix order, Witsuwit'en

	Align (s_{qual}, R, $Stem_V$, L)
»	Align (t_{qual}, R, $Stem_V$, L)
»	Align (n_{qual}, R, $Stem_V$, L)
»	Align (d_{qual}, R, $Stem_V$, L)
»	Align (u_{qual}, R, $Stem_V$, L)
»	Align (w_{qual}, R, $Stem_V$, L)
	etc.

It appears that all affix order restrictions in Athabaskan languages can be described completely within the Generalized 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 (54) and (56) must be supplemented with a small number of prosodic subcategorisation constraints (Inkelas 1989, McCarthy and 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 analyze 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] ~ [ə̱tsəx] 'he/she is crying'). However, the augment appears when the preceding word ends with a stressed syllable ([č'ətθí̧ʔ ə̱ʔáɬ] 'he/she is eating meat') but not with an unstressed syllable ([ɬúgə ʔáɬ] 'he/she 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.

(57.)   **Foot-Form:** Moraic trochee

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[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).

(58.)   Stress data

(č'ə̀.dzə)(.dzə́s)	'I'm dancing'
(č'ìn)(.dzə́s)	'you (sg.) are dancing'

The data in (58) also indicate that main stress is rightmost in a Prosodic Word.
Since feet are minimally and maximally bimoraic, unfooted [Cə] syllables can arise:

(59.)   Unfooted monomoraic syllables

č'ə(næ̀)ðə(ʔí) ~ č'(næ̀ð)(ʔí)	'he/she stole something'

As shown in (59), 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:

(60.)   **Parse-Syll:** Parse syllables into feet.

(61.)   /ə$_{impf}$-|tsəx/ 'he/she is crying'

		Parse-Syll	Max-ə
☞	ə$_{impf}$-(|tsəx)	*	
☞	<ə$_{impf}$>-(|tsəx)		*

However, Foot-Form dominates both constraints:

(62.)   /č'$_{unspO}$-n$_{qual}$-æð$_{cnj}$-ə$_{impf}$-|ʔin/ 'he/she stole something'

		Foot-Form	Parse-Syll	Max-ə
☞	č'ə(næ)ðə(ʔi̧)		**	
☞	č'(næð)(ʔi̧)			**
	(č'ənæ)ðə(ʔi̧)	* !	*	

Parse-Syll is also dominated by Rhythm, a clash avoidance constraint (Tuttle 1992,
1995a):

(63.)   **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 [ ]:

(64.) /ə_{impf}-|ʔaɬ/ 'he/she is eating'

a.	[č'ə(tθi̧ʔ)] [ə-(|ʔaɬ)]	'he/she is eating meat'
b.	[(ɬu)gə] [<ə>-(|ʔaɬ)]	'he/she is eating fish'

In (64)b., 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:

(65.) /ɬugə ə_{impf}-|ʔaɬ/ 'he/she is eating fish'; Rhythm » Parse-Syll, Max-ə

	Rhythm	Parse-Syll	Max-ə
[(ɬu)gə] [ə-(|ʔaɬ)]	* !	**	
☞ [(ɬu)gə] [<ə>-(|ʔaɬ)]		*	*

However, in (66)a., /ə/- is retained to prevent word stress clash:

(66.) /č'ət θi̧ʔ ə_{impf}-|ʔaɬ/ 'he/she is eating meat'

	Rhythm	Parse-Syll	Max-ə
☞ [č'ə(tθi̧ʔ)] [ə(ʔaɬ)]		*	
[č'ə(tθi̧ʔ)] [<ə>(ʔaɬ)]	*!		*

The winning candidate in (66) 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-* conjugation verbs are monosyllabic:

(67.)   Witsuwit'en monosyllabic prefixed verbs

[.sde.]	'he/she is sitting'
[.sdgwət.]	'it's been poked'
[.ɬɣil.]	'it's bundled, packaged'

The data in (67) are a clear challenge to our claim that all Athabaskan verbs contain a vocalic tense prefix. In this section, we suggest that ə_{pf}- is morphologically prefixed but phonetically absent in forms like (67) because of a higher ranked prosodic subcategorisation (Alignment) constraint on this prefix which requires that *s-* conjugation

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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- conjugation is one of three Group 2 prefixes in Witsuwit'en, the other two being *n*- conjugation and *s*- negative. Recall that, unlike the Group 1 and 3 prefixes, the Group 2 prefixes alternate between onset and coda:

(68.)   Onset~coda alternations of Witsuwit'en *s*- conjugation, a Group 2 prefix

coda	a. n_{dist}#[ə]$\underline{S}_{cnj}$-<ə$_{pf}$>-d$_{clf}$-	bəɣenəstGəz	'several were skinned'
	b. c'$_{unspO}$[ə]-$\underline{S}_{cnj}$-<ə$_{pf}$>-dəd$_{1dS}$-	c'ə$\underline{s}$dətbəz	'we (du.) stretched s.th. out'
	c. ts'$_{1pS}$[ə]-$\underline{Z}_{cnj}$-<ə$_{pf}$>-	ts'ə$\underline{z}$tl'et	'we farted'
	d. u$_{qual}$-$\underline{Z}_{cnj}$-<ə$_{pf}$>-	yeɣ u$\underline{z}$ye	'he/she passed him, her'
	e. y$_{3sO}$[ə]-<$\underline{S}_{cnj}$><ə$_{pf}$>-ɬ$_{clf}$-	yə$\underline{ɬ}$tsəy	'he/she made it'
onset	f. $\underline{S}_{cnj}$-ə$_{pf}$-	$\underline{s}$əliʔ	'he/she became'
	g. $\underline{S}_{cnj}$-ə$_{pf}$ -ɬ$_{clf}$-	sbe $\underline{s}$əɬʔəy	'he/she is waiting for me'
	h. ha$_{'up}$#$\underline{S}_{cnj}$-ə$_{pf}$ -	ha$\underline{s}$əye	'he/she walked uphill'
	i. n_{dist}#$\underline{S}_{cnj}$-ə$_{pf}$ -	ʔət'ɛn q'ən$\underline{s}$əye	'he/she made a business trip'
	j. $\underline{S}_{cnj}$-ə$_{pf}$ -s$_{1sS}$-	$\underline{s}$əsdliʔ	'I became'[14]
	k. $\underline{S}_{cnj}$-ə$_{pf}$ -xw$_{2sP}$-	$\underline{s}$əxwliʔ	'you (pl.) became'
cluster	l. $\underline{S}_{cnj}$-<ə$_{pf}$>-d[ə]$_{clf}$-	$\underline{s}$dətl'əw	'it's been knitted'
	m. $\underline{S}_{cnj}$-<ə$_{pf}$>-d$_{clf}$-	$\underline{s}$dgwət	'it's been poked'
	n. $\underline{S}_{cnj}$-<ə$_{pf}$>-l$_{clf}$-	$\underline{ɬ}$ɣil	'it's bundled, packaged'
	o. $\underline{S}_{cnj}$-<ə$_{pf}$>-dəd$_{1dS}$-	$\underline{s}$dətqɛ	'we (du.) are sitting'
	p. $\underline{S}_{cnj}$-<ə$_{pf}$>- d	$\underline{s}$de	'he/she is sitting'

Inspection of (68) indicates that *s*- conjugation is a coda when non-word-initial and followed by either *d*- or *l*- classifier (68)a or *dəd*- first person dual subject (68)b, or when preceded by a conjunct prefix and not followed by an inner subject prefix (68)c-e. *S*-conjugation is an onset when conjunct-initial and followed by no classifier (68)f,h-i or *ɬ*-classifier (68)g, or when followed by an inner subject prefix other than first person dual (68)j-k. *S*- conjugation is C$_1$ of an onset cluster when word-initial and followed by *d*- or *l*-classifier (68)l-n, *dəd*- first person dual subject (68)o, or stem-initial [d t t'] (68)p.

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*-conjugation forms like [səliʔ] 'he/she became' (see 5.4) is an instance of ə$_{pf}$- rather than

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

epenthetic [ə]. In Witsuwit'en, [sC] clusters occur word initially, not only in prefixed verbs like [sde] but also in unprefixed nouns:

(69.)   Word-initial sC in Witsuwit'en

sqaq	'child'
syəl	'osprey'
sqanzul	'mulch'
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 *ł*- and *n*-prefixed nouns vs. verbs: a cluster permitted in nouns like [sqaq] 'child' does not occur where expected in verbs like [sə̱qoy] 'he/she vomited' (except in special cases like [sde] 'he/she 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 ∂_{pf}-.

Next consider the morphological positions of the conjugation and tense prefixes. As summarised in (54), part of which is repeated as (70), conjugation occurs to the left of tense.

(70.) s_{cnj}- precedes ∂_{pf}-

	Align version of constraint:	*informal name:*
	Align (Tense, R, Stem$_V$, L)	Tense-Stem
»	Align (Conjugation, R, Stem$_V$, L)	Cnj-Stem

The order n_{cnj}- + in_{pf}- can be seen in forms such as [dəc'az<u>nin</u>dil] 'we got lost'. Similarly, the occurrence of s_{cnj}- to the left of ∂_{pf}- can be seen most clearly in forms like (68)f-i, which contain s_{cnj}- and ∂_{pf}- and no other conjunct prefixes, or forms containing an inner subject prefix, such as (68)j-k.

Turning now to forms like (68)c-e, we introduce a prosodic subcategorisation constraint on the *s*- conjugation prefix:

(71.)   **Align-Coda(-s$_{cnj}$)**: Align-R (s_{cnj}, σ)
        S- conjugation 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:

(72.)   Group 1 *n-*/*d-* qualifiers vs. Group 2 *s-* conjugation

/u$_{qual}$-n$_{qual}$-ə$_{impf}$-|yin 'pick'	dəgi un̲əyin	'he/she is picking huckleberries'
/u$_{qual}$-d$_{qual}$-ə$_{impf}$-|taɬ 'kick'	detəc yud̲ətaɬ	'he/she is kicking at the door'
/u$_{qual}$-z$_{cnj}$-<ə>$_{pf}$-|ye 'sg. go'	yeɣ uz̲ye	'he/she 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 (73)-(74), in which *s*$_{cnj}$- and ə$_{pf}$- are preceded by a vocalic and a consonantal conjunct prefix, respectively, illustrate satisfaction of Align-Coda. In (73), both candidates satisfy all relevant affix order positioning constraints, Tense-Stem, Cnj-Stem and Qual-Stem. However, candidate a. violates Align-Coda, thus losing to b., which does not:

(73.)   /u$_{qual}$-s$_{cnj}$-ə$_{pf}$-\|ye/ 'he/she went past (postpositional object)'

	Tense-Stem	Cnj-Stem	Qual-Stem	Align-Coda	Max-ə	NoCoda
a. u.z̲ə|ye		*	**	*!		
☞ b. uz̲.<ə>ye		*	**		*	*

Thus Align-Coda outranks both Max-ə and NoCoda.

In (74), in which *s*$_{cnj}$- and ə$_{pf}$- are preceded by a consonant, satisfaction of the Stem-Alignment constraints in (74) is analogous to that shown in (73), and therefore omitted:

(74.)   /ts'$_{1pS}$-z$_{cnj}$-ə$_{pf}$-tl'et 'fart'/ 'we farted'

		*Complex	Dep-ə	Align-Coda	Max-ə	NoCoda
a.	.ts'z̲ə|	*!		*		
b.	ts'[ə].z̲ə|		*	*!		
c. ☞	ts'[ə]z̲.<ə>|		*		*	*

Candidate (74)a fatally violates *Complex (Prince and Smolensky 1993):

(75.)   ***Complex:** Avoid tautosyllabic VV or CC.

(74)b. avoids this violation by epenthesising [ə], but thereby violates Dep-ə (McCarthy and Prince 1995) as well as Align-Coda.

(76.)   **Dep-ə**: Output [ə] should correspond to input /ə/.

(74)c. avoids the *Complex violation with [ə] epenthesis, thereby violating Dep-ə, but is superior to (74)b. in that Align-Coda is satisfied (by deletion of $ə_{pf}$).

Now consider forms which contain inner subject prefixes. Since s_{cnj}- is an onset in such forms, *Complex must outrank Align-Coda:

(77.)   /u_{qual}-z_{cnj}-$ə_{pf}$-xw_{2pS}-|dil 'pl. go'/ 'you (pl.) went past (postpositional object)'

			*Complex	Align-Coda
a.	☞	u.zəxw|		*
b.		u.z<ə>xw|	*!	

A potential problem for this analysis is presented by forms like [ʔə.də*s*t.c'əy] 'he/she shot him/herself (once)' and (68)e. [yə<*s*>ɬ.tsəy] 'he/she made it'. These forms contain a coda sequence of *s*- followed by a classifier prefix (the coronal fricative sequence [sɬ] is pronounced [ɬ]). In such forms, s_{cnj}- cannot be an onset (*[ʔədəs̱ə̱tc'əy], *[yəs̱ə̱ɬtsəy]), despite the fact that the coda is apparently already occupied with d_{clf}-and $ɬ_{clf}$-, just like xw_{2pS}- in the winning candidate in (77). To explain why forms like [ʔə.dəst.c'əy] do not incur a *Complex violation, we follow Randoja (1989), McDonough (1990) and others in analyzing 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 (78). Inspecting (78), 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.)

(78.)   /s_{cnj}-$ə_{pf}$-|liʔ/ 'he/she 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 (78). Candidate b., which deletes $ə_{pf}$- like the winning candidate in (74), is ruled out here by Align-L (cf. McCarthy and Prince 1993b):

(79.)   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 analyzed as constituting a mismatch between the phonological and morphological word. These two categories are otherwise required to coincide, as dictated by Align-L in (79).

   The tableau in (78) 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 (78)e. 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'<u>əz</u>tl'et] results from [ə]-epenthesis and [ə]-deletion, not metathesis of s_{cnj}- and $ə_{pf}$-. In this respect, s_{cnj}- differs from s_{neg}-, a historically related prefix (Krauss 1969). Synchronically, *s*- negative is in complementary distribution with the conjugation prefixes, and there is no evidence that *s*- conjugation and *s*- negative occupy distinct morphological positions. Like s_{cnj}-, s_{neg}- obeys a coda subcategorisation constraint (80):

(80.)   **Align-Coda-s_{neg}**: Align-Coda (s_{neg}, σ)
   S- negative should be a coda.

However, unlike s_{cnj}, which only occurs with $ə_{pf}$- or $ə_{impf}$-, s_{neg}- occurs with *u/o*- optative, *i/a*- future, *i/ɛ*- progressive as well as *ə*- imperfective:

(81.)   we#s- negative + Tense prefixes

coda			
	c'$_{unspO}$-ɛ$_{prog}$-s$_{neg}$-|	wec'ɛ<u>s</u>ʔɛnʔ	'he/she doesn't see anything'
	u$_{op}$-s$_{neg}$-|	nəwe<u>s</u>zut[15]	'he/she shouldn't skate around'
	t-o$_{op}$-s$_{neg}$-|	nən weto<u>s</u>zuc	'he/she shouldn't spit'
	t$_{qual}$-a$_{fut}$-s$_{neg}$-|	nəweta<u>s</u>zut	'he/she won't skate around'
	s$_{neg}$-<ə$_{impf}$>-|	we<u>s</u>tl'et	'he/she isn't farting'
	ts'$_{1pS}$-ə$_{impf}$-s$_{neg}$-|	wets'ə<u>s</u>tl'et	'we're not farting'
	<ə$_{impf}$>-<s$_{neg}$>-ɬ$_{clf}$-|	we<u>ɬ</u>ɣits	'he/she doesn't itch'
	y$_{pro}$-ə$_{impf}$-<s$_{neg}$>-ɬ$_{clf}$-|	weyəɬʔəts	'he/she isn't sneezing'

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

onset	c'_{unspO}-s_{neg}-ɛ_{prog}-xw_{2pS}-	wec'ə<u>sɛ</u>xwʔɛnʔ	'you (pl.) don't see anything'
	s_{neg}-o_{op}-h_{2pS}-	nəwe<u>s</u>ohzut	'you (pl.) shouldn't skate around'
	t_{qual}-z_{neg}-u_{op}-h_{2pS}-	nən wetə<u>z</u>uhzuc	'you (pl.) shouldn't spit'
	t_{qual}-z_{neg}-i_{fut}-xw_{2pS}-	nəwetə<u>zi</u>xwzut	'you (pl.) won't skate around'
	s_{neg}-ə_{impf}-xw_{2pS}-	we<u>s</u>əxwtl'et	'you (pl.) aren't farting'
	s_{neg}-ə_{impf}-xw_{2pS}-ɬ_{clf}-	we<u>s</u>əxwɬɣits	'you (pl.) don't itch'
	y_{pro}[ə]-z_{neg}-ə_{impf}-c_{1sS}-ɬ_{clf}-	weyə<u>z</u>əcɬʔəts	'I'm not sneezing'

Since there is metathesis of the negative and tense prefixes in the coda forms of (81), Align-Coda-s_{neg} must outrank Tense-Stem:

(82.) /we_{neg}#t_{qual}-s_{neg}-u/o_{op}-|zuc/ 'he/she shouldn't spit'

		Align-Coda-s_{neg}	Tense-Stem	Neg-Stem	Dep-ə
a.	we.t[ə].<u>z</u>u|	*!		*	*
b. ☞	we.to<u>s</u>.		*		

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

(83.) /we_{neg}#t_{qual}-s_{neg}-u/o_{op}-h_{2pS}|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.|	*!		**	*	

(83) 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 rank 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_{1dS}-. These motivate the introduction of another prosodic subcategorisation constraint on *s*_{cnj}-:

(84.) **SD**

Align (s_{cnj}, R, [d t t'], L)
S- conjugation 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*- classifier 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.] (68)a., [s.d] (68)b., and [.sd] (68)l., 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 (85) contains Max-ə and Align-L violations. (In (85), all candidates tie on the Stem-Alignment constraints, which have been omitted.)

(85.) /s_{cnj}-$ə_{pf}$-dəd$_{1dS}$-qɛ 'du. sit'/ 'we (du.) 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.

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[16]This version of SD will correctly cause sequences of s_{cnj}- and l_{clf}- to be adjacent if *l*-classifier is analyzed as a sequence of *d*- classifier + *ɬ*- classifier, as suggested by (e.g.) Pinnow (1964) and Sapir and Hoijer (1967), and as seems warranted by the well known morphological relationships between these prefixes (*0:d::l:ɬ*).

[17]SD also regulates the onset~coda alternations of *n*- conjugation:

coda	a. ne$_{iter}$#n-$_{cnj}$-<ə$_{pf}$>-dəd$_{1dS}$-|	ninendət'az	'we (du.) stopped walking again'
	b. u$_{qual}$-n-$_{cnj}$-<ə$_{pf}$>- dəd$_{1dS}$-d$_{clf}$-|	undətge	'we (du.) are shy'
	c. u$_{qual}$-n-$_{cnj}$-<ə$_{pf}$>-d$_{clf}$-|	unge	'he/she is shy'
	d. ne$_{iter}$#ts'$_{1pS}$[ə]-n-$_{cnj}$-<ə$_{pf}$>-d$_{clf}$|	ninets'əndil	'we stopped walking again'
onset	e. n-$_{cnj}$-in$_{pf}$-|	ninye	'he/she arrived'
	f. n-$_{cnj}$-ə$_{pf}$-s$_{1sS}$-|	nəsye	'I arrived'
	g. u$_{qual}$-n-$_{cnj}$-ə$_{pf}$-s$_{1sS}$-d$_{clf}$-|	unəsge	'I am shy'
	h. dəc'a$_{lost}$#z$_{1pS}$-n$_{cnj}$-in$_{pf}$-|	dəc'azninʔaɣ	'we fooled him/her'
cluster	i. n-$_{cnj}$-<ə$_{pf}$>-dəd-$_{1dS}$-|	ndət'az	'we (du.) arrived'

In fact, all coda instances of n$_{cnj}$- (a.-d.) can be accounted for by SD alone. *N*-conjugation forms analogous to *s*- conjugation [yə<s>ɬtsəy], [uzye], 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.

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.

(86.) /s$_{cnj}$-ə$_{pf}$-|de 'sg. sit'/ 'he/she 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>[|de]			*	*	*	

The winning candidate in (86) is therefore a monosyllabic verb.

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

Since the monosyllabic verbs in Witsuwit'en are a special case of Group 2 prefix behavior, 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 P » M in Witsuwit'en. McCarthy and Prince (1993b) have suggested that P » M is the fundamental characteristic of languages with prosodic morphology, typically found in languages with reduplication and/or templates which specify both a minimum and maximum prosodic shape. (In our summary in (87), constraints of the shape Align (MCat, Cat) are considered morphological.)

(87.) 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 have neither reduplication nor 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:

(88.)   Two types of conjunct prefixes

Pro-Stem, Qual-Stem, Cnj/Neg-Stem «	Tense-Stem «	Subject-Stem, 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 behavior, a prediction which appears to be correct. The *ɬ*- qualifier prefix exhibits similar onset~coda alternations in many of the languages (Krauss 1969) (e.g. Witsuwit'en [ɬəyəl] 'he/she is white'; [wə*l*yəl] 'it (areal) is white'). The second person singular subject prefix has onset and coda forms as well in many of the languages (e.g. Sekani onset [n] in [nətsəɣ] 'you (sg.) are crying'; coda [n] realised as nasalisation in [d̨ibə̀t] 'you (sg.) are hungry'). 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*-conjugation and *s*- negative.

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]

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[18]Some variation in the pronunciation of Ahtna [Cε] is recorded in Kari (1990). Compare *n*-, *d*- and *ɣ*- qualifier [C] forms below with the [Cε] forms in (89):

| n-qual | ts'iɬɣu q'a n̲|tæ:s | 'he/she (customarily) goes to bed early' | AD 328 |

(89.)   Verbs with exactly one consonantal qualifier prefix

n-_{qual}	<u>inɛ</u>|ʔi:s	'he/she is stealing it'	AD 679
d-_{qual}	<u>idɛ</u>|ɣa:t	'he/she is shaking it'	AD 205
	sasuhw<u>dɛ</u>|ʔa:	'I'm happy'	AD 77
	tl'oɣ <u>dɛ</u>|ya:n	'it's eating grass'	AD 429
ɣ-_{qual}	nɛn' <u>ɣɛ</u>|na:	'he/she is working'	AD 288
	naχc'<u>ɣɛ</u>|ta:n	'he/she hobbled back'	AD 202
t-_{qual}	<u>tɛ</u>|zæ:χ	'he/she (customarily) spits'	AD 453
	nat<u>ɛ</u>|qæ:s	'he/she (customarily) returns by boat, returns paddling'	AD 672

(90.)   Verbs with exactly one consonantal pronominal prefix

q-_{3pS}	<u>qɛ</u>|t'a:s	'they cut O'	AD 686
	na<u>qɛ</u>|tl'u:	'they're getting dressed'	AD 679
	n<u>qɛ</u>|qɛʔ	'they keep on paddling'	AD 674
c'-_{unspO}	<u>c'ɛ</u>|ya:n	'he/she is eating something'	AD 121
	<u>c'ɛ</u>|t'a:s	'he/she is cutting s.th. for a period of time'	AD 687
	n<u>c'ɛ</u>|ɣɛʔ	'he/she keeps on packing something'	AD 213
ts'-_{1pS}	<u>ts'ɛ</u>|t'a:s	'we're cutting it'	AD 686
	nɛqɛ<u>ts'ɛ</u>|qæ:χ	'we're turning around while paddling'	AD 674
	<u>ts'ɛ</u>|dzæ:χ	'we're caulking it'	AD 678

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

	<u>n</u>yæ:χ, <u>nɛ</u>|yæ:χ	'he/she is growing'	AD420, 652
	c'a:n <u>n</u>|ya:n	'he/she is eating bread'	AD 429
ɣ-_{qual}	<u>ɣɛ</u>t|na:, <u>at</u>|na:	'he/she is working'	AD 288
d-_{qual}	ʔɛɬ <u>d</u>|ya:ni	'spruce grouse, spruce hen' (lit. that which eats spruce boughs)	AD 429
q-_{qual}	<u>qɛ</u>|næ:s, <u>h</u>|næ:s	'he/she is talking'	AD 286, 425
	<u>qɛ</u>|ni:s, <u>h</u>|ni:s	'he/she (customarily) talks'	AD 685

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

<u>i</u>|tsæ:ɬ, <u>yɛ</u>|tsæ:ɬ	'he/she is chopping it'	AD 419
<u>i</u>|t'a:s	'he/she is cutting it'	AD 686

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

(91.)   Verbs with multiple qualifier prefixes

d-_{qual}-n-_{qual}	nitnɛ|t'a:ni	'printed cloth' (lit. it's decorated)	AD 73
	tl'oɣ <u>tnɛ</u>|yæ:χ	'grass is growing'	AD 420
n-_{qual}-ɣ-_{qual}	<u>ngɛ</u>l|Gan	'it's overly dry'	AD 192
	niɬtaχ<u>ngɛ</u>d|liʔ	'it got tangled'	AD 281
d-_{qual}-n-_{qual}-ɣ-_{qual}	iɣaʔ h<u>tngɛ</u>zd|la:	'he/she measured it (with a line)'	AD 267

(91) 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, ε_{tense}- is absent when the only other verbal prefix is a classifier:

(92.)   Classifier prefixed verbs

ɬ-_{clf}	O ɬ|tsi:	'he/she is making (sg. O)'	AD 386
d-_{clf}	tu: <u>t</u>|na:n	'he/she 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:

(93.)   Verbs with one pronominal or qualifier prefix and one classifier prefix

ts'_{1pS}-ɛ_{tense}-ɬ_{clf}	O ts'ɛɬtsi:	'we're making it (sg. O)'	AD 678
c'_{unspO}-ɛ_{tense}-d_{clf}	<u>c'ɛ</u>tna:n	'he/she is drinking something'	AD 681
n_{qual}-ɛ_{tense}-l_{clf}	tsæ:y <u>nɛ</u>lGay	'tea is weak'	AD 193

Next, consider forms containing an inner subject prefix. In (94), we exemplify these prefixes when preceded by a consonant, a vowel, or nothing:

(94.)   1sS /ɛs/-, 2sS /i/-, and 2pS /oh/- prefix data

preceded by:			
a. c'_{unspO}	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

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[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.'

b. ɣo_optative	nɣos|ʔi:s	'I steal it' (optative)	AD 679
	nɣu|ʔi:s	'you (sg.) steal it' (optative)	AD 679
	nuh|ʔi:s	'you (pl.) steal it' (optative)	AD 679
c. (word	ʔɛs|ya:n	'I'm eating it'	AD 680
initial)	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 analyzing 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*- negative.[20] ε_{tense}- is absent when *s*- negative is the only verbal prefix, but sequences of qualifier + *s*- negative are separated by ε_{tense}- in forms lacking an inner subject prefix:

(95.) _S- negative_

| s-_neg_ | ʔɛlɛʔ s̲tsaɣɛ | 'he/she isn't crying' | AD 446 |
| n-_qual_+s-_neg_ | in̲ɛ̲s̲ʔi:gɛ | 'he/she 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 (96), we suggest that the candidate with unparsed [ɛ] wins because it violates neither Onset nor Dep-ʔ.

(96.) /ε_{impf}-\|tsaɣ/ 'he/she is crying'

		Onset	**Dep-ʔ**	**Max-ɛ**
a.	ɛ-|tsaɣ	*!		
b.	[ʔ]ɛ-|tsaɣ		*!	
c. ☞	<ɛ>-|tsaɣ			*

Onset and Dep-ʔ dominate Max-ɛ. This situation contrasts with that found in most other Athabaskan languages, such as Witsuwit'en, where Onset and Max-ə dominate the cognate Dep constraint:

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[20]Verbs prefixed only with *s/z*- conjugation are also monosyllabic in Ahtna. Their analysis lies outside the scope of this article.

(97.) Witsuwit'en /əimpf-|tsə ɣ/ 'he/she is crying': Onset, Max-ə » Dep-h

		Onset	Max-ə	Dep-h
a.	ə-|tsəɣ	*!		
b. ☞	[h]ə-|tsəɣ			*
c.	<ə>-|tsəɣ		* !	

Third person singular classifier prefixed stems in Ahtna also show that Onset and Dep-ʔ dominate Max-ε. In addition, such forms show that consonant clusters are not highly penalised, as might be expected:

(98.) O /εimpf-ɬclf-tsi:/ 'he/she is making O'

		Onset	Dep-ʔ	Max-ε	*Complex
a.	εɬ|tsi:	*!			
b.	[ʔ]εɬ|tsi:		*!		
c. ☞	<ε>-ɬ|tsi:			*	*

The remaining class of monosyllabic forms mentioned above---third person singular forms with *s-* negative---can be given an identical treatment.

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

(99.) /εimpf-εs1sS-|ya:n/ 'I'm eating it'

		Onset	Dep-ʔ	Max-ε
a.	ε.εs|ya:n	**!		
b.	ε[ʔ]εs|ya:n	*	*!	
c. ☞	<ε>[ʔ]εs|ya:n		*	*
d.	[ʔ]ε.εs|ya:n	*	*!	
e.	[ʔ]ε[ʔ]εs|ya:n		**!	

If Onset and Dep-ʔ have the same rank, then [ε] 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 word ([dɣal|du:ts'ε] 'it's tiny') are elsewhere resolved by epenthesis ([idε|ɣa:ɬ] 'he/she 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

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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:

- *Complex is relatively low ranking in Ahtna. Thus Ahtna allows longer and more diverse onset clusters than other Athabaskan languages we have seen.
-
- Max-ε is low ranking in Ahtna relative to Dep-$ʔ$. Thus, ε_{tense}- is absent in certain word-initial contexts because there is a relatively low penalty for deleting [ε] 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 analyze 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 recent 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 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 and 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 » 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.

9. References

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