On the historical source of \(a \sim u\) alternations in Dëne Sųłıné optative paradigms

Alessandro Jaker
University of Toronto, Toronto, CA
alessandro.jaker@utoronto.ca

In most dialects of Dëne Sųłıné, the optative prefix, reconstructed in Proto Dene as \(*ɡʷa\) (Krauss 1969), exhibits an alternation in verb paradigms: an \(a\)-vowel is found in the 1\(^{st}\) and 3\(^{rd}\) person singular forms (ɣʷa, wa, or ha, depending on the dialect), while an \(u\)-vowel is found elsewhere (ɣʷu, wu, hu). This alternation raises three questions. First, how could the same consonant \(*ɡʷ\) trigger both raising and lowering of the following vowel? Secondly, what phonological factors conditioned this alternation historically? And finally, does this alternation still belong to the synchronic phonology of modern Dëne Sųłıné dialects?

In this paper, I will explore what insights the Contrastivist Hypothesis (CH) (Hall 2007, Dresher 2009) can add to our understanding of this alternation. Representationally, the CH makes it possible to describe lowering to \(a\) as spreading of [low], while raising to \(u\) involves spreading of [round]. I propose that the choice of which process applied in which forms depended on prosodic factors. In addition, I show what insights the CH can contribute to internal reconstruction. Specifically, I argue that, under the CH, spreading of [low] cannot be a part of the modern synchronic phonology of Dëne Sųłıné, but rather originated at a time before a series of consonant shifts occurred in the language, in particular when the retroflex series was still part of the consonant inventory.

**Keywords:** Dëne Sųłıné; Dene (Athabaskan); historical linguistics; contrast

1 Introduction: Contrast and Internal Reconstruction

The Contrastivist Hypothesis (Hall 2007, Dresher 2009) states that phonological grammars only operate on those features which are necessary to distinguish the phonemes of a language from one another. The main empirical prediction of this hypothesis, when applied to synchronic phonology, is that the set of phonological processes that are active in a given language will be to some extent predictable based on the phonemic inventory of the language. For example, a process which spreads the vocalic feature [high] from a consonant onto a neighbouring vowel is predicted to be possible only if the feature [high] is contrastive as part of the consonant system (for example, to distinguish palatalized [kʲ] from non-palatalized [k]).

In the realm of diachronic linguistics, Oxford (2015) has shown that the Contrastivist Hypothesis can predict possible pathways of sound change within a language family—in particular which pairs of phonemes are likely to undergo merger (2015: 317). In this paper, I will apply the Contrastivist Hypothesis (CH) to a very different type of historical problem: a problem of internal reconstruction. I propose that it is possible to use modern surface alternations to deduce the phonemic inventory and the set of contrastive relations that existed in a language historically. In the case we will be examining, most dialects of Dëne Sųłıné exhibit an alternation between two different vowels in the optative—vowels...
which are represented orthographically as \(a\) and \(u\). I propose that this alternation involved the spreading of the features [low] and [round] from the preceding consonant, in different prosodic environments. Following the CH, we may therefore deduce that the features [low] and [round] were contrastive as part of the consonant system, at the time this alternation arose historically. Ultimately this method can inform our reconstruction of the consonant system which existed at an earlier stage of the language. In particular, this leads us to the conclusion that these vowel alterations originated at a time when the Proto Dene retroflex series was still part of the consonant inventory of the language.

Dene Suline is a Dene (Athabaskan) language spoken in northern Canada. With the exception of the Tets'ot'in dialect (Jaker & Cardinal under review), all dialects of Dene Suline exhibit an alternation between two different vowels in optative paradigms, which are usually written as \(a\) and \(u\) (LeGoff 1889, Li 1946, Cook 2004). In this paper, I will interpret these vowels phonetically as \([\text{ʌ}]\) and \([\text{uː}]\), which I will assume bear the features [low] and [round], respectively. Since previously published sources (Li 1946, Cook 2004) constitute the main source of data for this paper, we will begin by considering data from these sources, in the authors’ own transcription systems. In Table 1 I provide optative paradigms from Li and Cook. Li’s data are from speaker François Mandeville, collected at Fort Chipewyan, Alberta, in the summer of 1928. Cook’s paradigms in Table 1 are labelled as simply “A” and “B” in the original source; however we can infer that these are most likely northern Saskatchewan and Fort Resolution, respectively, based on data he provides elsewhere.

In comparing the forms in Table 1, there are two main features which stand out as systematic differences between the dialects. The first is the 3rd person plural form: in the dialect recorded by Li, this form has an \(u\) vowel with a length mark (\(huˑtsaɣ\)), whereas in both Dialect A and Dialect B, as recorded by Cook, this form has an \(a\) vowel (\(hewajën\), \(hehajën\)). The other main difference is in the initial consonant of the optative prefix: in Li it is consistently \(\gamma\), except in the 3rd person plural, whereas in Cook’s Dialect A it is \(w\), while in Dialect B it is \(h\). Apart from these differences, however, we can also discern a basic vowel alternation pattern common to all the dialects, which is to have an \(a\) vowel in the 1sg and 3sg forms, and an \(u\) vowel in the 2sg, 1pl, and 2pl forms. What is the source of this alternation?

|        | Optative of \textit{hetsagh} ‘cry’ (Li 1946: 413) | Optative of \textit{hejên} ‘sing’; Dialect A (Cook 2004: 44) | Optative of \textit{hejên} ‘sing’; Dialect B (Cook 2004: 44) |
|--------|---------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|
| 1st sg | \(ywastsay\)                                      | \(wasjên\)                                                | \(hasjên\)                                                |
| 2nd sg | \(ywułtsay\)                                      | \(wułjên\)                                                | \(hułjên\)                                                |
| 3rd sg | \(ywastsay\)                                      | \(wajên\)                                                 | \(hajên\)                                                 |
| 1st pl | \(ywútsay\)                                       | \(wułjên\)                                                | \(hułjên\)                                                |
| 2nd pl | \(ywuhłtsay\)                                     | \(wułhjên\)                                               | \(hułhjên\)                                               |
| 3rd pl | \(hułtsay\)                                       | \(hewajên\)                                               | \(hehajên\)                                               |

1 When citing data from previously published sources, I have retained the authors’ original transcription system. In my analyses, the transcription I use is based on IPA, with two exceptions (following convention for the Dene language family). First, I represent nasality as a nasal hook under the vowel \(<\text{a}>\) rather than a tilde over the vowel \(<\text{a}>\). Second, I represent the three laryngeal series for stops and affricates, the ‘aspirate’, ‘plain’, and ‘ejective’ consonants, as \(<\text{k}>\), \(<\text{g}>\), and \(<\text{k’}>\), respectively; in a more narrow transcription, these would be \([\text{k’}]\), \([\text{k}]\), and \([\text{k’}]\), respectively. In Cook’s orthography in (1), the consonant \(j\) represents an alveo-palatal affricate [\(d\j\)], while \(ê\) represents a reduced, mid, front-central vowel [\(\text{a}\)] or [\(\text{e}\)]. Cook also uses \(<\text{th}>\) for [\(\theta\)], \(<\text{dh}>\) for [\(\delta\)], and \(<\text{gh}>\) for [\(\gamma\)].
I propose that, at an earlier stage of the language, which in this paper I will call “Pre-Dëne Sųłıné”, this alternation was prosodically conditioned. Specifically, I propose that the optative prefix exhibited two different surface grades: a strong grade and a weak grade, as shown in Figure 1 (in IPA transcription). Therefore, I claim that forms with the u vowel in them in the modern language are reflexes of the strong grade of the optative, while the modern forms with a in them are reflexes of the weak grade. Formally, I will propose that the labio-uvular segment *ʁʷ in Pre-Dëne Sųłıné was specified as both [round] and [low]; lowering from ɛ to ʌ (in the weak grade) involved spreading of the feature [low], while raising from ɛ to uː (in the strong grade) involved spreading and de-linking of the feature [round] (§3.3).

Many of the basic descriptive generalizations upon which this proposal rests have been controversial in the literature. These include the reconstructed form of the optative prefix (§2.1), the reconstructed forms of some of the subject agreement markers (§2.2), as well as the Dëne Sųłıné vowel inventory, both historically as well as in the modern language (§3.2). Furthermore, it is known that Dëne Sųłıné, like many other Dene languages, underwent a chain-shift in the place of articulation of several consonant series (Krauss 1982). This potentially adds another dimension of uncertainty to reconstructing Pre-Dëne Sųłıné, since one does not know, a priori, whether the strong ~ weak alternation depicted in Figure 1 originated before or after this consonant shift.

By adopting the CH, I hope to offer a new perspective on many of these questions. Regarding the vowel system, the analysis I will present, of Pre-Dëne Sųłıné, relies heavily on the existence of a contrast between full and reduced vowels—essentially a contrast between long and short vowels, respectively, which existed in Proto Dene (Krauss 1964). This analysis is also consistent with the proposal by Krauss (1983) that at least some modern dialects of Dëne Sųłıné still preserve this contrast. Regarding the consonant system, adopting the CH makes it possible to date the alternation in Figure 1 relative to the consonant shift mentioned previously: I will argue that the alternation in Figure 1 must have originated at a stage of the language before the consonant shift had taken place, and in particular while the retroflex consonant series was still part of the consonant inventory of the language (§6.0). Finally, the CH can help clarify the extent to which the alternation in Figure 1 might still be part of the synchronic phonology of some modern Dëne Sųłıné dialects. I conclude that this seems to vary by dialect, and depends on the set of phonological contrasts in the dialect—in particular, whether a dialect contrasts a series of labio-velars with plain velars, and whether or not it maintains the full ~ reduced vowel contrast (§7.0).

The remainder of this paper is organized as follows. In §2.0 I provide background on the language, including background on the structure of the Dene verb. In §3.0 I provide

---

**Figure 1**: Reconstruction of Pre-Dëne Sųłıné strong grade and weak grade of optative prefix.
a proposal for the historical source of this alternation in Pre-Dene Sųłìné, in word-initial position. In §4.0, I extend the analysis to account for the behaviour of the optative prefix after conjunct and disjunct prefixes. In §5.0, I argue that spreading of the feature [low], which occurred historically in the weak grade, can no longer be a part of the synchronic phonology of modern Dene Sųłìné dialects. In §6.0, I extend this argument, to show that the alternation in Figure 1 must have originated at a time before a series of consonant shifts took place, specifically when the retroflex series was still part of the consonant inventory. Finally in §7.0 I explore the synchronic status of a ~ u alternations in modern Dene Sųłìné dialects.

2 Background
In this section, I will discuss some of the background assumptions upon which my proposal rests. In §2.1, I discuss the reconstructed form of the optative prefix in Proto Dene (PD). In §2.2 I discuss the reconstructed forms of the subject agreement prefixes. Finally, in §2.3 I provide background on the structure of the Dene verb, and how it has been modeled in Lexical Phonology.

2.1 The historical form of the optative prefix
As shown in Figure 1, I reconstruct the underlying form of the optative prefix in Pre-Dene Sųłìné as */ʁʷɛ/, consisting of a voiced labio-uvular fricative, followed by a mid front vowel. This is very similar to the reconstructed PD (Proto Athapaskan) form as proposed by Krauss. Krauss (1969: 63) reconstructs the PD optative prefix as *ɣʷə (with a labiovelar fricative), derived from an earlier *ɢʷə (with a labio-uvular stop). Later in the same paper, he suggests that *ɢʷə was itself derived from a combination of an imperfective prefix *ɢα plus the irrealis prefix *ʊ, and that this combination had both a full grade *ɢu and a reduced grade *ɢʷə (1969: 69)—again very similar to my proposal in Figure 1. In reconstructing the Pre-Dene Sųłìné optative prefix as *ʁʷɛ, I am following the methodological principle of reconstructing this intermediate stage as being as close as possible to the modern language, in the absence of evidence to the contrary. Thus, because the reflex of PD *ə is e in Dene Sųłìné (in prefixes), I reconstruct *ɛ rather than *ə; similarly, because the initial consonant of the optative prefix is spirantized in our earliest historical materials (e.g. LeGoff 1889, Li 1946), I reconstruct the initial consonant as *ʁ instead of *ɢ. However, nothing in my analysis depends on these particular assumptions: formally, the analysis in §3.0 would be the same whether the Pre-Dene Sųłìné optative were *ɢʷə or *ʁʷɛ.

An alternative reconstruction of the optative was proposed by Leer (2000). Leer reconstructs the Proto Dene optative as *ʁυ, consisting of a voiced uvular fricative, followed by a reduced high-rounded vowel. In my opinion, there are three arguments against this proposal. The most direct evidence comes from the Tłı̨chǫ (Dogrib) language, in which, in the Behchokǫ̀ dialect as described by Ackroyd (1982), the reflex of the optative prefix is we [we], as shown in Table 2. Ackroyd’s transcription system is given in regular type; my

| Table 2: Optative of edǫ ‘drink’ (Ackroyd 1982: 118). |
|--------------|--------------|--------------|
| **Singular** | **Plural**   |              |
| wehdǫ [wɛ] | ‘I must drink’ | wɪdǫ [wɛ] | ‘Let’s (2) drink’ |
| wɪdǫ [wɛ] | ‘You (sg) must drink’ | waḥdǫ [wɛ] | ‘You (du/pl) must drink’ |
| weḥdǫ [wɛ] | ‘He must drink’ | giūdʊ [gɛ] | ‘They (du/pl) must drink’ |
|                 |              | tsi’dǫ [tsɛ] | ‘Let’s (pl) drink’ |
standardized re-transcription is added in brackets [ ]; in Tłı̨chǫ, Low tones are marked, while High tones are unmarked.

While we [wɛ] is a perfectly regular reflex of *ɢʷə in prefix position (just as [ɛ] is a regular reflex of PD *ə in prefixes in Tłı̨chǫ more generally), a sound change from PD *υ > ɛ in Tłı̨chǫ prefix vowels has not been previously proposed.2 A second argument against reconstructing the PD optative prefix as *ⱱ is that there are some Dene languages, including North Slavey and the Tsets’ítiné dialect of Dene Sųłíné, where the optative prefix is indeed analyzed as /ɣu/ underlyingly. In these languages, there is no a ~ u alternation in the optative as in Table 1 and Figure 1. Rather, what we observe are either length alternations in the case of Tsets’ítiné (Jaker & Cardinal under review §5.8), or alternations between o and u in the case of North Slavey (Rice 1989: 548–550). It is probably not an accident that the optative prefix does not surface as wa3 or ha in languages where the underlying form is /ɣu/: the feature [low] will most likely not spread onto a vowel already specified as [round] (see §3.3). It follows that, at the time when the vowel alternation in Figure 1 arose historically, the vowel of the optative prefix was not *u but rather *ɛ.

Finally, a sound change from PD *ɢʷə to ɣu seems to be part of a more general sound change in this group of languages, involving the simplification of labialized dorsal consonants to plain velars, with rounding moving onto a neighbouring reduced vowel. Indeed, this is still a change in progress in some Dene Sųłíné dialects, as shown in the examples in Table 3.

One final question regarding the optative in Pre-Dene Sųłíné is: why not reconstruct the optative as */ʁʷʌ/, with the surface form the same as in the weak grade? This is what is assumed for the modern language by Li, who posits the basic form of the optative as ɣwa (1946: 413), while Cook posits the basic form as either wa or ha, depending on the dialect (2004: 39). Formally, it is certainly possible to derive bu: from b’ʌ via spreading of the feature [low] and de-linking of [low], and I will suggest that eventually the a ~ u alternation was indeed re-structured this way (§7.1). However, the goal of this paper is to explain the historical source of this alternation. If the PD optative was *ɢʷə, as discussed previously, then at some point historically, either *ə or its reflex *ɛ must have lowered to *ʌ in the weak grade, and this lowering process is part of what needs to be explained.

Table 3: Comparison of dialects both with and without labio-velar series (Cook 2004: 23).4

| Tadoule Lake (conservative) | English gloss | Elsewhere (Innovative) |
|-----------------------------|---------------|------------------------|
| kwéń                        | ‘fire (wood)’  | kón/kún                |
| degwèth                     | ‘it is new’    | degóth/degúth          |
| yágwèle                     | ‘butterfly’    | yágole/yágule          |
| sughwá                      | ‘good/well’    | sugha/suwa             |

---

2 See Marinakis (2004) for discussion of the historical development of Tłı̨chǫ consonants and vowels. See also Howren & Coleman (1971) for a study of Tłı̨chǫ optatives.

3 The optative does surface as wah or gah in N. Slavey in the 2nd person plural, where it derives from /ghu-ah/. E.g. šégahhtì or šéwåti ‘you (pl) will eat’ and fégahhtì or fëwåtì ‘you (pl) must break it in half’ (Rice 1989: 550, using Rice’s orthography).

4 In Cook’s orthography, the symbol <ɛ> can represent [ɛ], [ə], or [ʌ], depending on phonological environment; Cook does not specify the quality of this vowel following a labiovelar.
2.2 The historical shapes of subject agreement prefixes

Next we will examine the reconstructed historical forms of the subject agreement prefixes. These are the prefixes which occur to the immediate right of the optative prefix (with the exception of the 3pl marker *qɛ, which occurs to the left), and it is the combination of the optative prefix with the subject agreement prefixes that results in either the full grade or the reduced grade of the optative, as in Figure 1. In Table 4, the subject agreement prefixes are highlighted in bold.

In the third person singular, subject agreement is zero (Ø), such that the optative prefix occurs by itself. The reconstruction of the 1st person singular subject prefix in PD is problematic, in that it has been reconstructed with a special symbol <$>, whose precise phonetic quality is unclear (Krauss 1977: 36; Leer 2000: 105–106). By reconstructing this prefix as *ʃ for Pre-Dëne Sųłıné in Table 4, I am anticipating my conclusion in that the a ~ u alternations in the Dëne Sųłıné optative originated before the chain-shift which occurred in consonant place (which shifted *ʃ > s, *s > θ). Thus, *ʃ is the presumed historical source of modern s, prior to the chain shift (cf. Krauss 1982).

The reconstruction of the 1st person dual/plural prefix in PD has also been controversial. Leer reconstructs this prefix as *i’D, a single syllable with a full constricted vowel (2000: 105). My reconstruction of this prefix as *ɛ in Pre-Dëne Sųłıné would be the regular reflex of this form, following tonogenesis. On the other hand, Story reconstructs this prefix as originally trisyllabic, *ayə’dəD (1989: 500). For the purposes of this paper, distributional evidence suggests that the 1st person dual/plural prefix behaves as a single, heavy syllable of the shape VːC, which is reflected in my proposed reconstruction.

The 2nd person singular prefix in PD is reconstructed as *ŋə (Krauss & Leer 1981: 47; Leer 2000: 105–106). Here again I follow the same logic as with the 1st person singular prefix. In at least some modern Dene Sųłıné dialects, there is evidence for an underlying palatal nasal /ɲ/, in the 2nd person singular and perfective prefixes, which behaves differently from the alveolar nasal /n/ (Jaker & Cardinal under review: §1.2.2, 2.3). This is similar to what has been reported for Slave (Rice 1989: 61–62). The regular historical source of a modern palatal nasal /ɲ/, prior to the consonant shift, would be *ŋ (a palatalized velar nasal), which happens to be the same as the reconstructed PD consonant.

It has been observed that in some Dene languages, the 2nd person singular prefix has two different forms. In modern Dene Sųłıné, ne is the disjunct form, which occurs word-initially or after a so-called disjunct prefix, while ʃ (with a nasal vowel) is the conjunct form, which occurs after one or more conjunct prefixes (see §2.3 for explanation of conjunct and disjunct), as was observed by Li (1946: 409, 411–412). Kari (1975) observed that distinct conjunct and disjunct forms of the 2nd person singular also occur in Navajo and Tanaina.

Table 4: Pre-Dëne Sųłıné combinations of subject agreement prefixes and *ŋəɛ.

| 1st person | Dual/Plural |
|------------|-------------|
| Underlying form | Surface form | Underlying form | Surface form |
| *ɡɛ / *ɡɛ / *ɡɛ | *ɡɛ | *ɡɛ | *ɡɛ |
| *ɡɛ / *ɡɛ | *ɡɛ | *ɡɛ | *ɡɛ |
| *ɡɛ / *ɡɛ | *ɡɛ | *ɡɛ | *ɡɛ |

---

5 See Krauss (2005) for an overview of the development of tone from glottal constriction in Dene languages.

6 The late Michael Krauss (p.c.) suggested that this reconstruction was phonotactically unlikely, because Proto Dene did not otherwise have constricted reduced vowels in prefixes. See also Leer (2005: 279) for discussion of constricted reduced vowels.
In both Navajo and Tanaina, Kari derives the conjunct form from the disjunct form by means of a rule of nasal absorption (1975: 335, 342). Similarly, for Pre-Dene Sųłıné, I will treat *ŋɛ (the disjunct form) as the basic underlying form, from which the conjunct form *ː is derived via regular phonological rules (see §3.3).

In the 2nd person plural, Krauss reconstructs the Proto Dene form of this prefix as *αχʷ, from a still earlier (Proto Dene-Eyak) *nαχʷ (1965: 25). That is, with a reduced low vowel (*α). For Pre-Dene Sųłıné, I assume that this prefix was already vowel-initial, as its combination with any preceding prefix behaves as a single syllable. I also assume that the labialization had already moved off of the final consonant and onto the preceding vowel, yielding *ʊχ, as shown in (5). This accounts for the rounded vowels found in the 2nd person plural, both in the optative and elsewhere.

2.3 Left-to-right syllable counting and the Lexical Phonology model

At the beginning of this paper, I suggested that the a ~ u vowel alternation in Dene Sųłıné can be thought of as representing different grades of the optative: the vowel a derives from the weak grade, while the vowel u derives from the strong grade. In this section, I will propose that the distribution of strong and weak grades can itself be derived from more general principles: stress and iambic feet. Specifically, I propose that Pre-Dene Sųłıné was a quantity-sensitive, left-to-right iambic language; as part of this system, the strong grade of the optative was used in the strong position of an iambic foot, while the weak grade of the optative was used in the weak position of an iambic foot.

In a quantity-sensitive iambic system, the three canonical foot types are (Light-Heavy), (Light-Light), and (Heavy) (Hayes 1995: 65). A heavy syllable will always occupy the strong (stressed) position of a foot. If a heavy syllable follows a light syllable, they will form a (Light-Heavy) foot; if it follows another heavy syllable, it will form a (Heavy) foot by itself. If the iambic system is left-to-right, this means that, word-initially, a light syllable will always be in weak position, while a heavy syllable will always be in strong position.

In Table 5 we have a reconstruction of the paradigm for *hɛtɽaːɣ ‘cry’ (hetsay in the modern language). When the optative prefix is word-initial and is syllabified as part of a light syllable, it occurs in the weak grade, with the vowel *ʌ. We observe this in the 1st person and 3rd person singular forms (I assume that the 1sg subject prefix *ʃ did not contribute weight). Where the optative occurs as part of a heavy syllable, word-initially, it occurs in the strong grade, with the vowel *u. We observe this in the 2nd person singular, 1st person plural and 2nd person plural forms. In these cases, the word-initial heavy syllable is the result of coalescence rules at the segmental level, which must precede iambic foot parsing (see §3.4). Finally, the 3rd person plural form is somewhat different. In this case, the first two syllables might be expected to form a (Light-Light) foot, but instead form a

| Table 5: Pre-Dene Sųłıné paradigm of *hɛtɽaːɣ ‘cry’, with iambic feet. |
|---|---|---|---|---|
| | Underlying form | Output | Underlying form | Output |
| 1st person | /ʃ*ɛʃ-tʃaːɣ/ OPT-1SGS-cry | (ʃ*ɛʃˈtʃaːɣ) | /ʃ*ɛʃ-ɪd-tʃaːɣ/ OPT-1PLS-cry | (ʃ*ɛʃˈtʃaːɣ) |
| 2nd person | /ʃ*ɛʃ-ŋʲɛ-tʃaːɣ/ OPT-2SGS-cry | (ʃ*ɛʃˈtʃaːɣ) | /ʃ*ɛʃ-ʊχ-tʃaːɣ/ OPT-2PLS-cry | (ʃ*ɛʃˈʊχˈtʃaːɣ) |
| 3rd person | /ʃ*ɛʃ-tʃaːɣ/ OPT-cry | (ʃ*ɛʃˈtʃaːɣ) | /qɛ-ʃ*ɛʃ-tʃaːɣ/ 3PLS-OPT-cry | (qɛˈʃɛʃˈtʃaːɣ) |
(Light-Heavy) foot, *(qɛ.ˈʁuː). I propose that this is an incidence of iambic lengthening. This process will be formalized in §3.4.

If the location of strong and weak positions of iambic feet depends on left-to-right syllable counting, one very important question is: from where exactly do we start counting? There is evidence that this is not necessarily the left edge of the prosodic word. Specifically, in all of our available sources, there are at least some prefixes which do not seem to “count,” as far as selecting the grade of the optative is concerned. To illustrate, let us compare two paradigms from Li (1946): the optative of hɛtsaɣ ‘cry’ as seen previously in Table 1, and the optative of ts’ɛˑðir ‘wake up’. In the latter case, we see that addition of the prefix ts’ɛ’ has no effect on the form of the optative, and the distribution of strong and weak grades of the optative is the same for both verbs. Forms are given in Li’s original transcription; paradigm cells using the strong grade are shaded grey.

Why does the prefix ts’ɛ seem to be ‘invisible’ in Table 6? According to the system originally developed by Li, prefixes can be divided into three groups: “conjunctive” (conjunct) prefixes which are closest to the stem, and “disjunctive” (disjunct) prefixes, which are farther from the stem (1946: 410), plus a third group of prefixes which are “between” conjunct and disjunct (1946: 410, 415). It is precisely these “in between” prefixes which exhibit variability in the published literature on Dëne Sųłíné optatives. Recall that, in the paradigms in Table 1, the 3rd person plural form exhibits the strong grade of the optative in the example from Li (1946), hursay ‘they will cry’, whereas the same paradigm cell exhibits the weak grade in the examples from Cook (2004), hewajën and hehajën ‘they will sing’. This variability is related to the fact that he is one of the prefixes which Li classifies as “in between” conjunct and disjunct. How might we model this variability?

From the perspective of Lexical Phonology (Kiparsky 1982, 1985), the categories of conjunct prefixes and disjunct prefixes correspond, loosely speaking, to stem level affixes and word level affixes, respectively. However, just as Li noted a third category of “in between” prefixes, Lexical Phonology approaches to Dene languages have realized the need for additional lexical levels, besides the Stem Level and Word Level, which are normally assumed for morphologically less complex languages. In fact, a total of 6 levels have been proposed (Hargus 1988, Jaker & Kiparsky under review), as illustrated in Figure 2.

Under the Lexical Phonology model, the Dene verb is viewed as having the structure of a right-branching tree, with successive layers of prefixes being added outward from the stem. This particular structure has been termed the “Stem-Core” model (Halpern 1992; see also Randoja 1990). The prefixes which Li regarded as “in between” comprise the so-called “deictic” prefixes he ‘3pl subject’, ts’ɛ ‘impersonal subject’, ʔɛ ‘unspecified object’, ʔɛdɛ ‘reflexive object’, and ɬɛ ‘reciprocal object’, as well as the object agreement prefixes.

**Table 6:** Comparison of optative paradigms with and without a disjunct prefix (Li 1946).

| Li’s transcription | English gloss | Li’s transcription | English gloss |
|--------------------|--------------|--------------------|--------------|
| ywastsay           | ‘I will cry’ | ts’ɛ’ywastdir      | ‘I will wake up’ |
| ywuṭsay            | ‘you (sg) will cry’ | ts’ɛ’ywuṭdir      | ‘you (sg) will wake up’ |
| ywatsay            | ‘he/she will cry’ | ts’ɛ’ywaṭdir      | ‘he/she will wake up’ |
| ywuṭṣay            | ‘we will cry’ | ts’ɛ’ywuṭdir      | ‘we will wake up’ |
| ywuhṣay            | ‘you (pl) will cry’ | ts’ɛ’ywuḥdir      | ‘you (pl) will wake up’ |
| hursay             | ‘they will cry’ | ts’ɛ’hurṣdir      | ‘they will wake up’ |

7 The meaning of this prefix is uncertain.
including sɛ ‘1sg object’, nɛ ‘2sg object’, and yɛ ‘3sg object’ (Li 1946: 416; examples in Li’s orthography). These occupy positions 5–7 of the Dene verbal template, which correspond to Levels 3 and 4 of the Lexical Phonology model. Thus, from a Lexical Phonology perspective, these “in between” prefixes are added after the conjunct prefixes (at Level 2), but before the disjunct prefixes (at Level 5).

How does this relate to the optative? In Li’s data, we observe the strong grade of the optative following the Level 2 prefix nɛ (e.g. nustɛ́ ‘I will lie down’), following the Level 3 prefix hɛ (e.g. huˑtsaɣ ‘they will cry’) as well as the Level 4 prefix yɛ (e.g. yuˑɬtsi ‘he/she will make it’) (1946: 413–414). On the other hand, in Cook’s data, we find the strong grade following a Level 2 prefix (e.g. nusdá ‘I will sit down’ (2004: 128)), but the weak grade following a Level 3 prefix (e.g. hehajën ‘they will sing’ (2004: 44)). From a Lexical Phonology perspective, it is actually part of the normal life-cycle of phonological processes that they become restricted to smaller and smaller morphological domains over time (Bermúdez-Otero 2015: 382–385). That is, phonological processes begin as ‘automatic’ phonetic implementation rules Postlexically, where they apply across word boundaries, and enter the lexical phonology at the point where they become restricted to individual words (Kiparsky 2015). In the present case, it appears that for Li’s speaker, François Mandeville, whom he recorded in 1928, and who was born in 1878 (Mandeville 2009), the syllable counting and stress assignment which resulted in selection of the strong or weak grade of the optative were Level 4 processes; by the time Cook collected his data in the later part of the 20th century, the same alternation appears to have become a Level 2 process. Thus it would appear we have evidence, from the documentary linguistic record, of a phonological process becoming more restricted in its domain of application during the course of the 20th century. While it is by no means necessary for such a change in the domain of application of a process to take place, it is consistent with what researchers in Lexical Phonology have observed of phonological processes generally. We will see in §7.0, however, that there continues to be variation between speakers in the behaviour of Level 3 prefixes, even to the present.

---

8 Template positions are based on Rice (1989), shown at the base of the diagram in (8).

9 Cook does provide a single form yultsi ‘he/she will make it’ (2004: 154), with the strong grade of the optative following an object agreement prefix. However, Cook does not provide any complete paradigms of the optative preceded by object agreement, so it is not clear if this one form is meant to exemplify a more general pattern.
In reconstructing the source of the $a \sim u$ alternation in Pre-Dëne Sųłıné, we may follow the above logic in reverse. That is, we may hypothesize that, as we go farther back in time, the domain of syllable counting and stress assignment affecting the optative involved larger and larger domains—including disjunct (Level 5) prefixes as well. However, in §4.0 we will see that, in the reconstructed scenario, assigning the optative alternation to Level 5 or Level 4 seems to predict the same result, which may have contributed to its re-analysis as a Level 4 process.

3 Analysis

In the previous section (§2), we considered strong and weak alternations in the optative from a prosodic perspective, in terms of syllable count and syllable weight. In this section (§3), we will consider these same alternations from a segmental perspective. The main question to be addressed will be: given that the complex labio-uvular segment $^{*}ʁʷ$ causes the following vowel $ɛ$ to lower to $a$ in the weak grade, and raise to $uː$ in the strong grade, how is it possible that the same segment can cause both raising and lowering of the following vowel? Specifically, if the vowel $a$ (or $a$ or $α$) is [+low], while the vowel $uː$ is [+high], it would seem that the segment $^{*}ʁʷ$ would need to be specified as [+low, +high]—something which is assumed to be impossible in almost all versions of feature theory (Chomsky & Halle 1968: 305; DeLacy 2007). This problem obtains if one assumes a representational null hypothesis, where all features are fully specified, without any internal organization or hierarchical structure.

3.1 The Contrastivist Hypothesis

My solution to this apparent logical contradiction is to adopt underspecified representations (Archangeli 1988). Specifically, the particular version of underspecification theory I will adopt is contrastive specification, as formulated under the Contrastivist Hypothesis (CH) (Hall 2007; Dresher 2009). This hypothesis is stated in (1).

(1) The Contrastivist Hypothesis (Hall 2007: 20; Dresher 2009: 74)

*The phonological component of a language $L$ operates only on those features which are necessary to distinguish the phonemes of $L$ from one another.*

Under this approach, the phonemes of a language are assigned their features through a procedure called the Successive Division Algorithm. This procedure is defined in (2).

(2) The Successive Division Algorithm (Dresher 2009: 16)

a) Begin with no feature specifications: assume all sounds are allophones of a single undifferentiated phoneme.

b) If the set is found to consist of more than one contrasting member, select a feature and divide the set into as many subsets as the feature allows for.

c) Repeat step (b) in each subset: keep dividing the inventory into sets, applying successive features in turn, until every set has only one member.

The result of this procedure is that the phonemes of a language are represented in the form of a tree (see Figure 4), where each phoneme is specified for only those features which are necessary to distinguish it from other phonemes. In the case of Dëne Sųłıné, I propose that the vowels $a$ and $α$ are specified as [low], while the vowels $u$ and $uː$ are specified as [round] (but not [high]). This means that it is possible for a single segment such as $^{*}ʁʷ$ to be specified as both [low] and [round], which can impart both an $a$-colouring and an $u$-colouring, respectively, to neighbouring vowels, without resulting in any logically contradictory fea-
ture specifications. The formal representation of feature spreading will be explained in §3.3, following discussion of the vowel inventory in §3.2. In the remainder of sections §3 and §4, I will simply assume that *e* is specified as [round] and [low]; in §5 and §6 I will justify and make fully explicit my assumptions regarding the place features of consonants.

### 3.2 Representation of the Dëne Sųłıné vowel inventory

The vowel inventory of modern Dëne Sųłıné has been controversial in the literature. The main question centers around the reflex of PD full ~ reduced vowels in Dëne Sųłıné: to what extent this contrast is maintained, and— in so far as it is— whether it should be thought of as a length contrast or a vowel quality contrast.

Cook, in his 1983 paper *Chipewyan Vowels*, described the Dëne Sųłıné language as exhibiting a six vowel system, as depicted in Figure 3.

Cook characterized this system as a vestige of the PD full ~ reduced vowel contrast, in the sense that he regarded *a* as a reduced vowel, and all of the other vowels as full vowels (1983: 417). However, in his view, “full” and “reduced” refer to vowel quality only, representing peripheral versus central vowels, respectively. Thus, there is no underlying length contrast in Dëne Sųłıné, according to this view (Cook 1983: 424). Ackroyd (1976) reconstructed essentially the same vowel system for ‘Proto Northeast Athapaskan’ (PNEA), a hypothesized subgroup of languages comprising Tłı̨chǫ, Dëne Sųłıné, North Slavey, South Slavey, and possibly others. Thus, under this view, contrasts such as PD full *ʁʷ* versus reduced *ʁ*, or full *w* versus reduced *u*, not only do not survive in modern Dëne Sųłıné, but had already undergone merger in the remote past.

In contrast to this view, Krauss (1983) reported work with a speaker from northern Saskatchewan, Mary Jane Kasyon, whose speech exhibited a vowel length contrast, even in monomorphemic stems. Krauss describes this contrast as being, in many cases, a direct reflex of the PD full ~ reduced vowel contrast. Thus Krauss finds modern Dëne Sųłıné [aˑ] from PD *aˑ*, [a] from PD *a*, [eˑ] from PD *eˑ*, [e] from PD *e*, [o] and [u] from PD *u*, and [uˑ] from PD *u*. Krauss suggests that the original PD full ~ reduced system may have evolved into a five vowel system with a long ~ short contrast, although there appears to be a gap in the inventory in that there is no short [i] (in stems).

Similarly, in later work, Cook described an underlying vowel length contrast in the dialect of Cold Lake, Alberta (Cook 2004: 28–30). For the Tetsó̲t’í̲né (Yellowknife) dialect, Haas (1968) noted long vowels (deriving from historical full vowels) in at least some stems, e.g. *sɛts’áˑne ‘my wife’* (1968: 175). For this same dialect, a phonetic study by Jaker (2018) found evidence for an 8 vowel system: five full vowels [ɑː], [ɛː], [iː], [oː], [ʊː], and three reduced vowels, [ɐ], [ɘ], and [ɵ].

What we may draw from the above observations is that, if the PD contrast between full and reduced vowels, including the contrasts between *ʁʷ* vs. *ʁ* and *w* vs. *u*, is preserved in at least some dialects of modern Dëne Sųłıné, then it is reasonable to infer that this set of contrasts was present at an earlier stage of the language as well. Therefore, for Pre-Dëné Sųłıné, I propose the vowel inventory shown in Figure 4. There are seven underlying
vowels: four full vowels /aː/, /eː/, /iː/, /uː/, and three reduced vowels /ʌ/, /ə/, and /ʊ/. This is essentially the same as the reconstructed PD system. In addition, I propose two additional surface vowels, short [ɔ] and long [oː]. Short [ɔ] is the result of an allophonic vowel lowering process in stems which lowers /ʊ/ to [ɔ] before non-nasal codas, e.g. modern k'ɔθ 'cloud' from PD *q'ʊθ (Krauss 2005: 91); long [oː] results from vowel coalescence in prefixes, i.e. /aː-ʊ/ → [oː]. Formally, I assume that any vowel which bears the feature [full] underlingly will be interpreted by the phonology as bimoraic, while vowels which do not bear this feature will be interpreted as monomoraic (see Tuttle 1998: 196 for a similar claim regarding full and reduced vowels).

In terms of the Successive Division Algorithm (SDA) in (2), the proposed ordering of features in Pre-Dene Sųłíné is [full] > [round] > [low] > [high]. There are two characteristics of the vowel hierarchy in Figure 4 which may be somewhat surprising. The first is that there is an asymmetry in the representation of vowel height, if we compare the rounded vowels to the unrounded vowels. Among the unrounded vowels, the contrast between phonetically high and mid vowels is represented by presence or absence of [high]. Thus, /iː/ is [high], while /eː/ lacks [high]. On the other hand, among the rounded vowels, the parallel contrast between phonetically high and mid vowels is represented by the presence or absence of [low]. Thus, [ɔ] is [low], while /eː/ lacks [low]. On the other hand, among the rounded vowels, the parallel contrast between phonetically high and mid vowels is represented by the presence or absence of [low]. Thus, [ɔ] and [ɔ] are [round][low], while /uː/ and /ʊ/ are merely [round] (and not [low]). There are three arguments to support this asymmetrical representation of vowel height. The first is evidence from morphophonemics, from the modern language. In modern Dene Sųłíné, in verbal prefixes, /a/ and /u/ coalesce to form [o], as in /na-uh-l-zé/ → nốlţé 'you (pl) hunt (imperfective)' (Cook 2004: 47; example given in Cook’s orthography); on the other hand, a similar coalescence of /a/ and /i/ to yield [e] is not attested. This asymmetry in coalescence patterns is predicted by the representations in Figure 4: whereas /ʌ/ or /aː/ can spread a [low] feature onto /u/ or /uː/ to yield a vowel which is [low][round], spreading of a [low] feature onto /iː/ would yield a vowel which is [low][high]—a combination which is formally impossible. A second argument in favour of the asymmetric representation of vowel height is that there is evidence, historically, for a parallel asymmetry in the consonant system—this will be discussed in §6.0. Finally, the most important argument in favour of Figure 4 is that it allows for an elegant account of consonant-vowel interactions: each of the three vowel *colourings*

---

10 I assume that the vowel /aː/ has two allophones: [a] in stems, and [ɛ] in prefixes.
which consonants may impart to neighbouring vowels in Dëne Sųłíné—the *a-colouring, *i-colouring, and *u-colouring*—can be accounted for by the spreading of just one feature from a vowel to a neighbouring consonant. Thus, the *a-colouring results from spreading of [low], the *u-colouring results from spreading of [round], and the *i-colouring results from spreading of [high]. These interactions will be examined in more detail in §3.3.

The other characteristic of the representations in Figure 4 is that the phonological features used do not necessarily correspond to surface phonetic properties of the vowels. In particular, use of the feature [low] does not entail that the vowel is phonetically low: the vowels /ɔ/ and /oː/ bear the feature [low], but are phonetically mid vowels. In this case, one could think of the feature [low] as meaning “lower”: vowels which bear this feature are lower than they would otherwise be by default. Since, under this system [round] vowels are high by default, adding the feature [low] results in a vowel which is lower than a high vowel—i.e. a mid vowel. See Ghini (2001: 192) for a similar use of [low] to distinguish /o/ from /u/, in Miogliola.

### 3.3 Vowel alternations as feature spreading

In this section, I will provide a formal representational account of consonant-vowel interactions in Pre-Dëne Sųłíné, in terms of feature spreading. The basic facts to be accounted for are the three vowel colourings mentioned above. All three vowel colourings are relevant to a complete account of the optative: the *i-colouring is associated with the 2nd person singular subject prefix *ŋʲə, and helps explain why the 2nd person singular paradigm cell (in the optative) exhibits the strong grade. The *a-colouring and *u-colouring are both associated with the optative prefix itself: the *a-colouring is observed in the weak grade, while the *u-colouring is observed in the strong grade.

The first step is to establish the feature-geometric representation of the vowels. I assume that, under a given class node, features are arranged in a one-dimensional, linear string, which reflects the ordering of features in the SDA, for that language (see Spahr 2014: 559 and Spahr 2016: 64–69 for a similar proposal). Regarding place features, following Padgett & NíChiosáin (1993), I employ two place nodes: the CPlace node, which hosts consonantal place features, and the VPlace node, which hosts vocalic place features. Thus, I assume that for Pre-Dëne Sųłíné, vocalic features are arranged under the VPlace node as shown in Table 7.

We will begin by considering the *i-colouring—that is, spreading of the feature [high], which occurs when either the 2nd person singular subject prefix *ŋʲə is preceded by another conjunct prefix. This results in the so-called ‘conjunct form’ of these prefixes, which contains the full nasal vowel *iː. This alternation, between *ŋʲə ~ ɨː, has been reconstructed all the way back to PD (Krauss & Leer 1981). Even in modern Dëne Sųłíné, Li sometimes writes these forms with a long vowel, e.g. ḥiłat ‘go to sleep!’ (Li 1946: 400).

If we assume that the conjunct form *jː is derived from the disjunct form *ŋʲɛ/ within the synchronic phonology of Pre-Dëne Sųłíné, this actually involves several phonological

### Table 7: Vowel features under the VPlace node (Pre-Dëne Sųłíné).

| Reduced Vowels | Full Vowels |
|----------------|-------------|
| /ʌ/  | /aː/  | /ɜ/  | /ɔ/  | /æː/  | /ɛː/  | /iː/  | /oː/  | /uː/  |
|      | [low]  | [round] | [round] | [low]  | [full]  | [full]  | [full]  | [full]  | [low]  |
rules operating in concert: (a) raising of the preceding vowel from ə to iː, (b) syncope of the following vowel, (c) nasalization of the preceding vowel, and (d) deletion of the nasal consonant itself. Given the complexity of this process, the main question is: are any of these rules responsible for conditioning the others?

I propose that spreading of the feature [high], from *ŋʲ onto the preceding vowel, was the trigger for this entire set of rules. In particular, since in my reconstruction of the Pre-Dëne Sųłíné vowel system in Figure 4 and Table 7 there is a gap in the vowel inventory, such that there is no short [i] (similar to what Krauss (1983) observed for the modern language), spreading of the feature [high] onto a preceding vowel necessarily requires that the feature [full] also be inserted—otherwise, spreading of [high] would violate Structure Preservation (Kiparsky 1985). This is illustrated in Figure 5.

This long vowel then triggers syncope of the vowel of the following syllable, i.e. īŋʲɛ → īŋʲ, which then triggers nasalization of ī to į̄ː and deletion of the nasal consonant. This entire complex process will be formalized as a rule-based derivation in §3.4.

Next, we will examine the u-colouring—that is, spreading of the feature [round], which occurs in the strong grade of the optative. This process also involves insertion of the feature [full], though for a somewhat different set of reasons in different paradigm cells. In the 2nd person singular form, the vowel following ŋʲɛ (as discussed previously) would have already applied. Similarly, in the 1st person plural form the vowel is also already full, while in the 2nd person plural, the two adjacent reduced vowels would coalesce to form a full vowel, i.e. */ʁʷɛ-ʊh/ → ſʷuːh → ſuːh. Finally, in the 3rd person plural form, I propose that the feature [full] is inserted as part of a proses of iambic lengthening, as shown in Figure 6 below.

---

**Figure 5:** Representation of *ŋʲ → *iːŋʲ (spreading of [high], insertion of [full]).

**Figure 6:** Representation of *ʁʷə → *ʁuː (spreading of [round]).
Finally, we will examine the a-colouring which some consonants may impart onto neighbouring vowels, also called **gamma lowering** (Hargus 1988: 144). I assume that spreading of the feature [low], from *ʁʷ* onto a neighbouring vowel, operates as a kind of default or “elsewhere” rule. This is illustrated in Figure 7.

To summarize, we have seen that the representational system which I have proposed in this section, based on the Contrastive Hierarchy, is able to succinctly describe the three colourings which consonants may impart to neighbouring vowels as consisting of the spreading of just one feature: the a-colouring involves the spreading of [low], the i-colouring involves the spreading of [high], and the u-colouring involves the spreading of [round]. In some cases, the feature [full] is inserted as well. In the next section, we will examine how these feature spreading processes are conditioned by, and interact with, the prosodic environments described earlier in §2.3.

### 3.4 Prosodic conditioning

In §2.3 I provided an account of vowel alternations in the optative from a prosodic perspective, while in §3.3 I provided an account of the same alternation from a segmental perspective. In this section, I will integrate these two perspectives, by showing how feature spreading rules can be conditioned by their prosodic environment. My goal in this section will be to provide a complete derivation of the optative paradigm of the verb *hɛtɽaːɣ* ‘cry’, as shown in Table 5.

First we will derive the singular forms: *ʁʷʌʃtɽaːɣ* ‘I will cry’, *ʁųːtɽaːɣ* ‘you (sg) will cry’, and *ʁʷʌtɽaːɣ* ‘he/she will cry’. The first step is a formalization of the rules. The rule of [low] spreading, which occurs in the 1st and 3rd person singular forms, can be stated as in (3). In order for this rule to apply only in the “elsewhere” case, I have imposed a condition such that (3) applies only if spreading of [round] (to be defined in (9)) has not applied.

(3) **Spreading of [low]**

```
C V
[low]
```

“The feature [low] spreads from a consonant onto the following vowel.”

**CONDITION:** Applies only if Spreading and de-linking of [round] (9) has not applied.

The set of rules involved in deriving the 2nd person singular form is more complicated. Broadly speaking, this can be thought of as a two-step process: first the optative prefix *ʁʷɛ* combines with the 2nd person singular subject prefix ɲʲɛ to derive the conjunct form, */ʁʷɛ-ɲʲɛ/ → ʁʷίː (see Figure 7: Representation of *ʁʷə* → *ʁʷʌ* (spreading of [low]).)
vowel *ʁʷɛŋʲɛ → *ʁʷŋʲɛ: The first rule in the series, which provides the ‘trigger’ for all of the following rules, is the spreading of [high] from *ŋʲɛ to the preceding vowel, as shown in (4).

(4) Spreading of [high]

\[
\begin{array}{c}
V \\
\text{[high]}
\end{array} 
\quad \text{→} \quad 
\begin{array}{c}
C \\
\text{[high]}
\end{array}
\]

As discussed in §3.3, since short *[i] is, under the current proposal, not part of the vowel inventory for Pre-Dêne Sųliné, the feature [full] must be inserted as well, in order to satisfy Structure Preservation. The rule for [full] insertion is shown in (5).

(5) Insertion of [full]

\[
\begin{array}{c}
V \\
\text{[high]}
\end{array} 
\quad \text{→} \quad 
\begin{array}{c}
V \\
\text{[full]} \\
\text{[high]}
\end{array}
\]

The rules so far would yield *ʁʷiːŋʲɛ. In order to derive *ʁʷįː, we need a set of rules which will account for syncope of *ɛ, nasalization of the vowel *iː, and deletion of the nasal consonant in syllable coda position. These rules are given in (6)–(8).

(6) Syncope of a reduced vowel following a full vowel

\[
\begin{array}{c}
V \\
\text{[full]}
\end{array} 
\quad \text{→} \quad 
\begin{array}{c}
\emptyset / C \\
C \\
\text{[full]}
\end{array}
\]

“A monomoraic vowel deletes, when a bimoraic vowel occurs in the preceding syllable.”

In (6), I assume that any vowel which is [full] projects two moras on the moraic tier, while any vowel which lacks the feature [full] projects only one mora. The rule in (6) is formally stated in terms of moras rather than in terms of the feature [full] since, when using monovalent features, it is not possible to specify the target of a rule as lacking a certain feature (the rule would simply apply to all vowels).

(7) Vowel nasalization

\[
\begin{array}{c}
V \\
\text{[nasal]}
\end{array} 
\quad \text{→} \quad 
\begin{array}{c}
C \\
\text{[nasal]}
\end{array}
\]

(8) Nasal coda deletion

\[
\begin{array}{c}
C \\
\text{[nasal]}
\end{array} 
\quad \text{→} \quad 
\begin{array}{c}
\emptyset / \_
\end{array}
\]

The rules presented so far would derive *ʁʷŋʲɛ from */ʁʷvŋʲɛ/. There is one last step necessary in order to derive the desired output *ʁʷŋʲɛ, and that is spreading and de-linking of
Jaker: On the historical source of a ~ u alternations in Dëne Sųłíné optative paradigms

The feature [round]. This rule applies only in the strong position of an iambic foot, as shown in (9).

(9) Spreading and de-linking of [round]

\[
\begin{array}{c}
\text{C} \\
\text{V} \\
\text{[round]} \\
\end{array}
\]

“The feature [round] de-links from a consonant and spreads onto a following vowel in the strong position of an iambic foot.”

This raises the question: what would motivate spreading and de-linking of the feature [round], in the strong position of an iambic foot? According to González (2003), there is a relationship between sonority and prosodic position. Specifically, syllables in prosodically weak positions prefer to have low-sonority nuclei and high-sonority onsets (e.g. \(\text{wə} \)), whereas syllables in prosodically strong positions prefer to have high-sonority nuclei and low-sonority onsets (e.g. \(\text{ta} \)). Regarding the vowels, if we interpret sonority in the strictest sense, referring only to aperture features, then the fact that [uː] occurs in the strong grade, while [ʌ] occurs in the weak grade, seems to run contrary to this proposed generalization—since [uː] is technically less sonorous than [ʌ].

I suggest instead that the locus of explanation for this vowel alternation is actually on the preceding consonant. Specifically, I suggest that spreading and de-linking of the feature [round] in the strong grade serves to make the onset consonant less sonorous, by removing its labial glide articulation. On the other hand, spreading of the feature [low] in the weak grade does not seem amenable to this type of explanation: in the mapping */ʁʷɛ/ \(\rightarrow\) *ʁʷʌ, sonority of the onset consonant is unchanged, while the sonority of the vowel has increased—the opposite of what would be expected in prosodically weak position. Thus, while it is formally possible to formulate the rule of [low] spreading in (3) as applying only in the weak position of an iambic foot, this would imply a certain teleology which is probably not appropriate for this process. Rather, it seems better to think of the two rules, in (3) and (9), as disjunctive: [round] spreading (9) applies in the strong position of an iambic foot, while [low] spreading (3) applies elsewhere.

A derivation of the optative singular forms of the verb *\(\text{hetɽaːɣ} \) ‘cry’ is given in Table 8. Numbers in parentheses after each rule refer to the figure where that rule was defined.

The derivation in Table 8 could be summarized as follows: the segmental rules (4)–(8) feed Iambic Foot Construction, and the iambic feet which are constructed feed either spreading and de-linking of [round] (9) or spreading of [low] (3), disjunctively. Thus, in column (b), the rules (4)–(8) transform what would otherwise be a (Light-Light)(Heavy) prosodic pattern into a (Heavy)(Heavy) pattern. Since the optative prefix therefore falls in the strong position of an iambic foot, [round] spreading and de-linking apply. On the other hand, in columns (a) and (c), rules (4)–(8) do not apply, leaving the input (Light-Heavy) pattern unchanged. This places the optative prefix in the weak position of an iambic foot, and therefore [low] spreading applies instead.

We will now derive the plural forms *\(\text{ʁúːtɽaːɣ} \) ‘we will cry’, *\(\text{ʁuːtɽaːɣ} \) ‘you (pl) will cry’, and *\(\text{qɛʁuːtɽaːɣ} \) ‘they will cry’, as seen previously in Table 5. Regarding the 1\(st \) person plural form, in the mapping */ʁʷɛ-íːd-tɽaːɣ/ \(\rightarrow\) *ʁʷíː.tɽaːɣ \(\rightarrow\) *ʁúːtɽaːɣ, there is a technical issue which arises when the feature [round] spreads onto the vowel [iː], which is already specified as [high]: under the proposed vowel inventory in (12), there is no [high]
[round] vowel, and so the creation of such a vowel would violate Structure Preservation. Therefore, it is necessary that when [round] spreads onto the vowel [iː], the feature [high] be de-linked simultaneously, as shown in (10). Also, in the 1st person plural, the coda consonant d of the 1st person plural prefix *íːd must also be deleted in coda position, as shown in (11).

(10) De-linking of [high] conditioned by [round] spreading

\[
\begin{array}{ccc}
\text{C} & \text{V} \\
\text{[round]} & \text{[high]} \\
\end{array}
\]

(11) Coda d deletion

\[d \rightarrow \emptyset / \_\_ ]_\sigma\]

In the 2nd person plural form, the main question is the formal representation of vowel coalescence, whereby */ʁʷɛ-ʊχ/ \(\rightarrow\) "wuχ. That is, even prior to spreading and de-linking of [round] from the onset consonant *ʁʷ, the vowels e and u coalesce to form the full vowel uː, which I will assume consists of a single vocalic root node. For present purposes, I will collapse the entire coalescence process down to just two rules. I assume that each of the two input vowels, \(V_1\) and \(V_2\), is already associated with a mora underlyingly. The Coalescence rule in (12) de-links the mora from \(V_1\) and associates it to \(V_2\), and also de-links all place features of \(V_1\) and re-associates them to \(V_2\). \(V_1\) is then deleted by stray erasure.

(12) Coalescence

\[
\begin{array}{c}
\text{H} \\
\text{V}_1 \\
\text{[α]} \\
\end{array}
\quad
\begin{array}{c}
\text{H} \\
\text{V}_2 \\
\text{[β]} \\
\end{array}
\]
When the features of $V_1$ associate to $V_2$, any featural incompatibilities which arise will be resolved according to the language’s vowel strength hierarchy. The Contrastive Hierarchy predicts that the vowel (or consonant) strength hierarchy of a language will mirror the ordering of features and the SDA (Dresher 2009: 148). In (10), for example, we saw that the feature [round] displaces the feature [high], and indeed [round] is ordered before [high] in the feature hierarchy in Figure 4. Later, in §7.1, we will also see evidence that, in the modern language, [round] is stronger than [low], which is also predicted by Figure 4.

The result of the coalescence rule in (12) is an output vowel ($V_2$) which retains the strongest feature(s) of both vowels, and which has two moras. In order to be well-formed, however, a bimoraic vowel requires insertion of the feature [full], as in (13).

(13) Insertion of [full]

```
    V
   / \   / \   /
  /   V   V   /
 /     \   \   \
\[full]\   \   \   \\```

Finally, we come to the 3rd person plural form *qesautray. In order to derive the long vowel uː in this form, we need to add a rule of iambic lengthening. I propose that this rule operates at the moraic level, changing a (Light-Light) iambic foot into a (Light-Heavy) foot (Prince 1990, 1991), which in turn results in insertion of the feature [full], as in (13). The rule of iambic lengthening is defined in (14).

(14) Iambic Lengthening

```
* *(σ σ) (σ σ)
V V → V V
```

“A monomoraic vowel becomes bimoraic in the strong position of an iambic foot.”

A derivation of the plural forms is given in Table 9. Those rules which are active in this derivation are highlighted in bold.

In Table 9, the rule of [full] insertion must apply twice: after Coalescence (12) in columns (a) and (b), and after iambic lengthening in column (c). It is probably best to regard this rule as a persistent rule, which applies at any point in the derivation to repair mis-matches between mora count and the feature [full].

4 Further issues: the optative following conjunct and disjunct prefixes

In the previous section, I presented an analysis of the optative prefix */ʁʷɛ/ in word-initial position and following the 3rd person plural subject prefix *qɛ. In §2.3, I also presented data which show that, in modern Dene Sųłíné, the behaviour of the optative following a disjunct (Level 5) prefix is the same as word-initially. However, there is an important class of examples missing from the analysis so far—namely, the optative */ʁʷɛ/ following a conjunct (Level 2) prefix—this is what is referred to in the Dene linguistics literature as conjunct position. In the modern language, the general pattern is that when the optative
Table 9: Derivation of the optative plural forms of *hetrəɬy 'cry'.

| Input | Column (a) | Column (b) | Column (c) |
|-------|------------|------------|------------|
| /w*ɛ-ɪː-tɬaːɡ/ | /w*ɛ-ʊx-tɬaːɡ/ | /wɛ-ɛ-ɬaːɡ/ |
| /ɔɐp-1plS-cry | /ɔɐp-2plS-cry | /3plS-ɔɐp-cry |
| Spreading of [high] (4) | —— | —— | —— |
| Coda deletion (11) | w*ɛ.i.tɬaːɡ | —— | —— |
| Coalescence (12), Insertion of [full] (13) | w*ɛ.tɬaːɡ | w*uz.tɬaːɡ | —— |
| Syncope (6) | —— | —— | —— |
| Nasalization (7) | —— | —— | —— |
| Nasal deletion (8) | —— | —— | —— |
| Iambic Foot Construction | (w*ɛ)(tɬaːɡ) | (w*uz)(tɬaːɡ) | (qɛ.w*ɛ)(tɬaːɡ) |
| Iambic Lengthening (14), Insertion of [full] (13) | —— | —— | (qɛ.w*ɛ)(tɬaːɡ) |
| Spreading and de-linking of [round] (9), de-linking of [high] (10) | (wɛː)(tɬaːɡ) | (wuz)(tɬaːɡ) | (qɛ.wuː)(tɬaːɡ) |
| Spreading of [low] (3) | —— | —— | —— |
| Surface form | (wɛː)(tɬaːɡ) | (wuz)(tɬaːɡ) | (qɛ.wuː)(tɬaːɡ) |
| English gloss | ‘we will cry’ | ‘you (pl) will cry’ | ‘they will cry’ |

Table 10: Optative paradigms in conjunct position, according to Li (1946: 413–414).

| | Optative of netéih ‘lie down’ | Optative of tunɛdi ‘be drowned’ | Optative of hɛlzɛ ‘start to hunt’ |
|---|-------------------|-------------------|-------------------|
| 1<sup>st</sup> person singular | nʊstɛ | tunusdą | hʊsze |
| 2<sup>nd</sup> person singular | nʊtɛ | tumudą | hulzɛ |
| 3<sup>rd</sup> person singular | nʊtɛ | tumudą | hulzɛ |
| 1<sup>st</sup> person plural | nʊtɛs | tunúdą | hʊlzɛ |
| 2<sup>nd</sup> person plural | nuhtɛs | tumuhdą | hulzɛ |
| 3<sup>rd</sup> person plural | hɛnʊtɛs | tuheヌdą | hɪhulzɛ |

prefix appears in conjunct position, the strong grade is used throughout the entire paradigm. Some examples from Li (1946) are given in Table 10.

Although Li only marks long vowels in the 1<sup>st</sup> person plural forms (ʊ or ʊ̈), nevertheless we may consider all of the forms in Table 10 reflexes of the strong grade of the optative, based on my hypothesis in §1.0 that optative forms in the modern language with u in them are reflexes of the strong grade, while forms with a are reflexes of the weak grade. The question then becomes: why should the optative always surface in the strong grade in conjunct position, and does this follow from the analysis presented previously in §3.4?

The choice of the strong grade in conjunct position is predicted by my proposal, in most cases, without the need for any additional rules. This is illustrated in Table 11, where I derive the reconstructed forms *nɛsəɬtɛ: ‘I will lie down’, *nɛsəɬtɛ: ‘you (sg) will lie down’, and *nɛsəɬtɛ: ‘he/she will lie down’. The gloss ‘QUAL’ beneath ne refers to the so-called qualifier prefixes, which originated historically as noun class and aspectual prefixes, but now appear to be semantically empty in many modern Dene languages (see Rice 2000: 324–341 for discussion of these prefixes).

As illustrated in Table 11, addition of a conjunct prefix before the optative ensures that the optative will surface in the strong grade in all of the forms shown, via left-to-right iambic foot parsing. When a thematic conjunct prefix such as ne occurs in the weak position of an iambic foot, it thereby places the optative prefix in strong position. From the
output forms in Table 11, the modern forms can be derived through regular sound change. Thus: *nuːʃ.téː > *nuːʃ.ʁʷɛ-ʃ-téː: > nuːʃ.ʁʷɛ-ŋʲɛ-téː: > nuːʃ.ʁʷɛ-téː: > nuːʃ.ʁʷiːŋʲ-ʃ-téː: > nuːʃ.ʁʷįː-ʃ-téː: > nuːʃ.ˈʁʷɛʃ-téː: > nuːʃ.ˈʁʷeːʃ-téː: > nuːʃ.ˈʁuːʃ-téː: > nuːʃ.ˈʁųː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁuː-ʃ-téː: > nuːʃ.ˈʁu-
The only consonants which consist of only VPlace features, but no CPlace features, are glides. Therefore, the consequences of this sound change are as follows. When the consonant *[^r] loses its CPlace node, the result would be a [low] glide; since this is impossible, the segment is deleted. Thus: *[^r] > Ø, by (15). On the other hand, in the case of *[^rʷ], while the feature [low] can not be realized on a glide, the feature [round] can. Therefore, [low] is deleted, and the result is a round glide: *[^rʷ] > w, by (15).

Table 12 shows a sequence of sound changes which take the output of the rules in Table 11 as their point of departure, to derive the modern forms in Table 10.

Finally, we will briefly consider the behaviour of the optative in Pre-Dëne Sųłíné, following a disjunct prefix—also known as a Level 5, or Word Level prefix. Previously in §2.3, I showed that, in the modern language, disjunct prefixes are invisible from the point of view of vowel alternations in the optative. This is consistent with what is known about the life cycle of phonological processes generally: they tend to become restricted to smaller and smaller domains over time (Bermúdez-Otero 2015). However, I also noted that, according to this same logic, it follows that phonological processes which today are restricted to small domains (e.g. Level 2) applied over progressively larger domains, the farther we go back into the past. Therefore, it would seem to follow that, in Pre-Dëne Sųłíné, the *[^rʷ] ~ *[^r] alternations in the optative should have been either a Word Level (Level 5) or even a Postlexical process. This means that disjunct prefixes ought to have been visible to the *[^rʷ] ~ *[^r] alternation, in much the same way as conjunct prefixes. Therefore, why then do we not observe reflexes of the strong grade of the optative throughout the paradigm whenever a disjunct prefix is present, in much the same way as we do for conjunct prefixes, as in Table 10?

It seems that, in PD, all disjunct prefixes either contained a full vowel (*CVː), or a reduced vowel followed by a consonant (*CVC) (Leer 1975). In other words, all disjunct prefixes, such as *[^qe] ‘straight in a line’ (1975: 6), *[^na] ‘reversative’ (1975: 13), and *[^dag] ‘up on top’ (1975: 9) constituted heavy syllables. In a left-to-right iambic system, a heavy syllable at the left edge of the word will constitute a monosyllabic (Heavy) foot all by itself; therefore, it has no effect on whatever follows it. The same is true if there are multiple disjunct prefixes. To illustrate, let us consider the verb jaltː ‘speak, pray’ (transcription as discussed in §1.0). In Table 13, we can compare and contrast the reconstructed Pre-Dëne Sųłíné forms in column (a), with the same forms from a modern speaker, Daniel Alphonse from Black Lake, Saskatchewan, in column (b).

The stress and foot boundaries shown in column (b) are based on my own subjective impression; however, my intent in including these is to illustrate that, in the modern language, the selection of the strong or weak grade of the optative bears no direct relation to the position of surface stress—we can see, for example, instances of the weak grade
Table 13: Optative of jʌtiː ‘speak, pray’, reconstructed and modern, with footing.

| 1st person singular | Column (a) Pre-Déné Sųłíiné (reconstructed) | Column (b) Black Lake, SK (modern) |
|---------------------|---------------------------------------------|---------------------------------|
| *(ˈjaː)(ʁʷʌˈs.ˈtiː) | *(ˈjaː.ˈwʌs)(ˈtiː) | |
| 2nd person singular | *(ˈjaː)(ʁuːɬ)(ˈtiː) | *(ˈjaː.ˈwuːɬ)(ˈtiː) |
| 3rd person singular | *(ˈjaː)(ʁʷʌˈɬ.ˈtiː) | *(ˈjaː.ˈwʌɬ)(ˈtiː) |
| 1st person plural | *(ˈjaː)(ˈʁuːl)(ˈtiː) | *(ˈjaː.ˈwúɬ)(ˈtiː) |
| 2nd person plural | *(ˈjaː)(ˈʁuːɬ)(ˈtiː) | *(ˈjaː.ˈwuːɬ)(ˈtiː) |
| 3rd person plural | *(ˈjaː)(qɛ.ˈʁuːɬ)(ˈtiː) | *(ˈjaː.ˈhʉːɬ)(ˈtiː) |

Data in column (b) elicited on 11/28/19; re-transcribed from author’s notes.

Finally, regarding the tendency of phonological processes to become restricted to smaller and smaller domains over time, it is interesting that, so long as all disjunct prefixes constituted heavy syllables, the output predicted from the *ʁʷʌ ~ *ʁuː vowel alternation in Pre-Dene Sųłíiné operated at Level 5, all of the modern forms can be derived from Pre-Dene Sųłíiné surface forms by regular sound changes, such as [low] consonant vocalization and vowel length neutralization, as discussed previously.¹¹

So far, I have presented a reconstruction of the *ʁʷʌ ~ *ʁuː alternation in Pre-Dene Sųłíiné. For the remainder of this paper, I will ask the questions (1) what else can we infer about Pre-Dene Sųłíiné, at the time that this alternation arose, and (2) to what extent is this alternation still a part of the synchronic phonology of modern Dene Sųłíiné? To begin, let us first consider the consonant inventory of modern Dene Sųłíiné. Table 14 is based on Li (1946: 398), except that I assume an additional underlying phoneme /ɲ/, a palatal nasal (Krauss & Leer 1981), to account for the behaviour of the 2nd person singular subject prefix, and the perfective prefix—see also Rice (1989: 61–62) for discussion of nasals in Slavey.

The main problem concerns the two dorsal series, which I have labeled “velar” and “labiovelar” above. Recall that, for Pre-Dene Sųłíiné, I have assumed thus far that the segment *ʁʷ, and by extension the entire labio-uvular series, is specified as both [round] and [low]. Under the CH, this can only be the case if there exist other series which are non-[round] and non-[low]. In the modern language, of the two dorsal series, it is clear that the labiovelar is the only series which is [round] (based on its articulation, and morphophonemic behaviour). However, it is theoretically possible that both the velar and

¹¹ An alternative interpretation of these facts could be that, in Pre-Dene Sųłíiné, disjunct prefixes were not part of the verb word at all, and only became incorporated into the word later, after the *a ~ *u vowel alternations had already been established. This would be consistent with the usual assumption in the Dene linguistics literature, that the disjunct prefixes are later additions to the verb word than the conjunct prefixes (Keren Rice, p.c.).
Jaker: On the historical source of a ~ u alternations in Dëne Sųłıné optative paradigms

labiovelar series are specified as [low]—perhaps contrasting with the alveo-palatal series, which could constitute a non-[low] series under the dorsal node.

To see that this is not the case, however, consider the data in Table 15, which contain the γɛ conjugation marker. This prefix is a conjunct prefix just like the optative, and occurs in a very similar set of phonological and morphological environments. Even so, γɛ never triggers gamma lowering (cf. Hargus 1988: 144), i.e. spreading of [low] onto the following vowel, even in the exact same set of phonological and morphological environments we saw this happen with *ʁʷə. This is illustrated in Table 15. Examples are given in the author’s original orthography; in Cook’s orthography, <gh> represents [ɣ] and <j> represents [dʒ]; in Li’s transcription, <c> represents [ʃ].

If the γɛ conjugation marker, and by extension the entire velar series, is not specified as [low], then this creates a problem: it would appear that the labiovelar series is specified as [low] redundantly, something claimed to be impossible under the CH. I will suggest, however, that spreading of [low] in the optative is no longer part of the synchronic grammar of modern Dëne Sųłíné—rather, the underlying form of the optative has been restructured to /ɣʷʌ/—this is also the underderlying form assumed by Li (1946: 413). If neither of the dorsal series are associated synchronically with the feature [low], then it is reasonable to call these series “velar” and “labiovelar” in the modern language, rather than “uvular” and “labiouvular”—this is because the feature [low] is assumed to be a property of uvular and pharyngeal, but not velar consonants (Padgett & Ní Chiosáin 1993).

Even if spreading of [low] is no longer part of the synchronic grammar, the observed asymmetry between the optative prefix and the γɛ conjugation marker is still interesting, from a historical perspective: why is it that, historically, the optative prefix *ʁʷɛ triggered gamma lowering, while the γɛ conjugation marker did not? In the next section, I will suggest that this can tell us something interesting about how the Dëne Sųłíné consonant system was organized historically.
6 The importance of the historical ‘retroflex’ (*kʷ > *tʃʷ > *tɽ) series

In the previous section, I argued that [low] spreading in the optative cannot be a part of the synchronic grammar of modern Dëne Şúłı̨nę, because if ɣʷ (< *ʁʷ) were specified as a [round][low] segment, it would lack a [round] but non-low segment with which it contrasts. In this section, however, I will argue that such a series of segments did exist historically—and these were what are called the retroflex consonants in the Dene linguistics literature.

The retroflex series is so named because in the majority of Dene languages which preserve this series as distinct (e.g. Hän, Gwich’in, Upper Kuskokwim, Tolowa), it is pronounced as a series of posterior, apical affricates and fricatives, with a slight rhotic quality (tɽ, dɽ, tɽ’, sɽ, zɽ) (cf. Krauss 1964, Krauss 2005). However, there is some disagreement in the literature regarding the historical development of this series. In early work, Krauss proposed that this series originated as a series of rounded front velar consonants in Proto-Athabaskan-Eyak (PAE), which was preserved intact in Proto Athabaskan (Proto Dene): (*kʷ, *gʷ̯, *kʷ’, *x̯ʷ, *ɣʷ̯) (1964: 122). This series contrasted with three other dorsal series: a front velar unrounded series (*k, *g̯, *k’, *x̯, *ɣ̯), a rounded uvular (“back velar”) series (*qʷ, *ɢʷ, *qʷ’, *χʷ, *ʁʷ), and an unrounded uvular series (*q, *ɢ, *q’, *χ, *ʁ). Thus, this reconstruction posited an essentially symmetrical system of four dorsal consonant series: front and back velars, both rounded and unrounded.

In later work (Krauss 1982, Krauss 2005), Krauss assumes that, already by the PD stage the front rounded velar series had evolved into a series of rounded alveopalatal consonants (*tʃʷ, *dʒʷ, *tʃʷ’, *ʃʷ, *ʒʷ), which then evolved into retroflexes in some of the modern Dene languages. Leer (2005) takes this line of reasoning one step further, and assumes that this consonant series had already evolved into a true retroflex series by the PD stage (2005: 284). All of these proposals are consistent with the view that the series in question originated as a rounded front velar series, which evolved into a rounded alveopalatal series as an intermediate stage, before eventually becoming a retroflex series; the proposals merely differ as to when exactly these changes occurred. In this section, I will use the term retroflex in a broad sense, to refer to this series at all stages of its history, given that the precise character of this series historically is somewhat uncertain. However, I hope that some of the arguments presented in this section may provide some insight into the development of the retroflex series historically in Dëne Şúłı̨nę.

If we reconstruct a feature hierarchy for Pre-Dëne Şúłı̨nę under the most stringent possible assumptions—namely that the underlying form should be the same as the surface form, and that the grouping of phonemes under different nodes should reflect their surface phonetic character (for example, coronal segments do not appear under the dorsal node, and vice versa)—then the reconstructed hierarchy in Figure 8 would be consistent with the data presented thus far. For ease of exposition, the labial series has been omitted.

In Figure 8, I assume that dorsal is the default place of articulation, which is unmarked in relation to [coronal]. This representation is supported by the existence of the t > k shift in some dialects of the language (e.g. Haas 1968), which can be modeled as deletion of the [coronal] node. In Figure 8, we can see that in order for the labio-uvular (*qʷ) series to be contrastively specified as [low], it needs to have a contrastive sister located under [round], and under the non-coronal (dorsal) node. It follows therefore that, at the time at which [low] spreading was phonologically active, the “retroflex” series was not only still present in the language, but was still a front rounded velar series (*kʷ). If this series had already evolved into a true retroflex series (*tɽ), or even a rounded alveo-palatal series (*tʃʷ), then this series would need to be moved under the coronal node, in which case the *qʷ series would no longer have a contrastive sister, and could no longer be specified.
Jaker: On the historical source of a ~ u alternations in Dëne Sųłíné optative paradigms

Art. 67, page 26 of 33

The reconstructed consonant system in Figure 8 therefore closely resembles the system originally reconstructed by Krauss (1964: 122) for PAE.

An additional argument for the reconstructed hierarchy in Figure 8 is that the ordering of vocalic place features is identical to the feature ordering still used in the modern language (as in Figure 4). Thus, the ordering is [coronal] > [lateral] > [round] > [low] > [high], with the last three features in the same order as in the vowel system. Note also that the consonants also exhibit a featural asymmetry in a manner entirely parallel with the vowel system: the [round] consonants contrast in the feature [low], while the unrounded consonants contrast in the feature [high]. This asymmetry is reflected in my transcription, where I write the unrounded front velars, which are phonologically [high], with a superscript j (*kʲ), whereas I write the rounded front velars, which are not phonologically specified with the [high] feature, with a subscript (*k̯ʷ).

The asymmetrical feature hierarchy in Figure 8 would explain why, in Dëne Sųłíné, we observe spreading of [low] with the optative prefix, but not with the ɣɛ conjugation marker—something which is the opposite pattern of what is observed in many other Dene languages, such as Slavey (Rice 1989) and Tłı̨chǫ (Ackroyd 1982). For Dëne Sųłíné itself, the main empirical hypothesis I would like to advance is that, just as Krauss (1982) demonstrated that the PD *kʲ series maintained its dorsal place of articulation in Dëne Sųłíné longer than was previously believed, so too there is evidence that the PAE *k̯ʷ series also retained its dorsal articulation in Dëne Sųłíné much longer than was previously assumed—in particular, long enough to allow for the process of [low] spreading (or gamma lowering) in the optative. And by the same token, we may surmise that the a ~ u alternations observed in Dëne Sųłíné optative paradigms are quite ancient, dating back to a time when the consonant system resembled that reconstructed by Krauss (1964) for PAE.

7 What is the status of a ~ u alternations in the modern language?

In §5 I argued that spreading of [low] could no longer be a part of the synchronic phonology of modern Dëne Sųłíné, and in §6.0 I attributed this to the loss of the historical retroflex series. However, nothing precludes the spreading of [round] in the synchronic grammar, assuming the UR of the optative has been restructured to /ɣʷʌ/. In this section, I will suggest that that the synchronous analysis of optative a ~ u alternations in Dëne Sųłíné varies by dialect (and possibly from speaker to speaker) based on two criteria: (1) does a labiovelar series exist underlyingly, and (2) does a contrast between full and

---

**Figure 8:** Reconstructed (non-labial) consonant place feature hierarchy for Pre-Dene Sųłíné.

![Diagram of Consonant Place Feature Hierarchy](image-url)
reduced vowels exist underlyingly? Based on these criteria, a dialect (or speaker) may exhibit either phonological [round] spreading, phonologically conditioned allomorph selection, or morphologically conditioned allomorph selection.

This typology is consistent with the overall goals of the CH, in that it shows how the synchronic phonological status of an alternation in a given dialect is related to the phonemic inventory of that dialect. In addition, as we shall see, it also describes a pathway by which a phonological alternation can ‘exit’ the phonology and become morphologized, as it reaches the end of its life cycle. In this section, we will examine each of the three scenarios outlined in Table 16 in turn.

### 7.1 Vowel alternations as spreading of [round]

First I will present data from a conservative speaker, Allan Adam, now residing in Paddockwood, Saskatchewan (originally from Fond du Lac, Saskatchewan). Mr. Adam is also a trained professional Dëne Sųłíné interpreter and translator. Mr. Adam preserves labiovelar consonants in his speech, and also exhibits a contrast between full and reduced vowels. Thus, the phonological system for this speaker is very similar to the Dëne Sųłíné system described by Li (1933, 1946) many decades ago. The optative paradigm of *hɛdʒən ‘sing’* is given in Table 17.

In Mr. Adam’s speech, the vowel length difference between [ʌ] and [uː] is very clear, such that the speaker even volunteered (without being asked directly), “it’s a long *u* sound. The *u* is long,” in reference to the 3rd person plural form. This speaker also exhibits an interesting alternation between [ɣ] in the strong forms, and [w] in the weak forms—consistent with González’s (2003) predictions about the relationship between sonority and prosodic position. Given that there is a surface alternation between [ɣ] and [w], and given that the speaker pronounces labiovelars elsewhere, it is reasonable to suppose that the optative prefix is still underlyingly /ɣʷʌ/ for this speaker. That being the case, the alternations in Mr. Adam’s optative paradigm can be analyzed in a very similar way to the reconstructed Pre-Dëne Sųłíné system examined in §3: the feature [round] spreads and de-links in the strong forms, in order to decrease onset sonority. The only differences are that the vowel [ʌ] in the weak forms is not the result of a spreading process, but is underlying,

### Table 16: Summary of criteria for synchronic status of *a ~ u* alternations.

| Labiovelar series preserved underlyingly? | Full ~ reduced vowel contrast preserved underlyingly? | Synchronic status of *a ~ u* alternations |
|------------------------------------------|---------------------------------------------------|------------------------------------------|
| yes                                      | yes                                               | [round] spreading, prosodically conditioned |
| no                                       | yes                                               | Phonologically conditioned allomorph selection |
| no                                       | no                                                | Morphologically conditioned allomorph selection |

### Table 17: Optative paradigm of *hɛdʒən ‘sing’* (Allan Adam, Black Lake/Fond du Lac, SK).

|         | Singular | Plural       |
|---------|----------|--------------|
| 1st person | (wasˈdʒən) | (ˈɣů)(dʒən) |
| 2nd person | (ˈɣ으면)(dʒən) | (ˈɣɯh)(dʒən) |
| 3rd person | (waˈdʒən) | (ˈɦу)(dʒən) |

Originally elicited 5/8/2018; re-elicited 12/2/2019.

---

12 There is some variation in the strong forms between [ɣ], [w], and [h], whereas the weak forms uniformly have [w]. The speaker’s intuition is that in the strong forms, both [ɣ] and [w] are acceptable.
and also /ɣʷ/ lenites to [w] in the weak forms (in this case, to increase onset sonority). Under this hypothesis, it is interesting to note that the feature [round] displaces—i.e. is stronger than—the feature [low], which it also outranks in the feature hierarchy in Figure 4. This is predicted by the CH.

### 7.2 Vowel alternations as phonologically conditioned allomorph selection

Next we will examine data from another speaker, Mr. Daniel Alphonse of Black Lake, Saskatchewan. Mr. Alphonse’s phonological system is also conservative in that it maintains a contrast between full and reduced vowels, as shown in Table 18.

The main difference between Mr. Alphonse’s dialect in Table 18, and Mr. Adam’s dialect in Table 17, is that Mr. Alphonse uses the consonant [w] for the optative prefix throughout the paradigm, rather than having a y ~ w alternation. Given this fact, it is somewhat unlikely that one could posit /ɣʷʌ/ as the underlying form of the optative prefix for this speaker. Rather, under standard assumptions regarding phonological abstractness, the initial consonant must be re-structured to /w/ underlyingly.

This has two major consequences. The first is that it is no longer possible to analyze the vowel alternations in (41) as [round] spreading and de-linking in prosodically strong position. Recall from §3.4 that the whole point of [round] spreading is to reduce the sonority of the onset consonant where the rule applies; in this case, since the onset consonant is [w] regardless, such spreading is unmotivated. Therefore, the most likely alternative is that the strong and weak grades of the optative in Table 18 are chosen through **phonologically conditioned allomorph selection**. Phonologically conditioned allomorph selection is when a given morpheme has two (or more) underlying forms, and the phonology selects whichever allomorph would be most harmonic in a given environment (Kager 1996; Rubach & Booij 2001; Anderson 2008). Allomorph selection is used extensively by Hargus in her analysis of the Dene language Witsuwit’en (Hargus 2007: 671–730). In the case of Table 18, if the two allomorphs of the optative are /wʌ/ and /wuː/, what conditions the choice between them?

I suggest that, broadly speaking, the allomorphy is conditioned by stress. /wʌ/ is the default or “elsewhere” allomorph, because, being a light syllable, it can fit into the weak position of an iambic foot. However, /wuː/ is chosen where the syllable needs to be stressed or heavy for independent reasons. For example, the 2sg, 1pl, and 2pl forms all have an additional vowel as part of the subject agreement prefixes ne, íd, and uh, which add an extra mora and therefore constrain the output vowel to be long.

The only form which seems not to fit this line of explanation is the 3rd person plural form, hɛwʌdʒən, where, on the surface, there appears to be a mis-match between stress and the choice of allomorph. However, this is actually the second major consequence of restructuring the optative from /ɣʷʌ/ to /wʌ/ ~ /wuː/. Since the optative is a Level 2 (conjunct) prefix, at the point where it enters the derivation and the allomorphs are selected, it can only see other Level 2 (conjunct) prefixes. The prefix he ‘3rd person plural’

| Table 18: Optative paradigm of hɛdʒən ‘sing’ (Allan Adam, Black Lake/Fond du Lac, SK). |
|-----------------------------------------------|
| **Singular** | **Plural** |
|----------------|------------|
| **1st person** | (was:ˈdʒən) | (wú:ˈdʒən) |
| **2nd person** | (wu:ˈkˈdʒən) | (wu:ˈhˈdʒən) |
| **3rd person** | (wu:ˈdʒən) | (hɛ:ˈwu:ˈdʒən) |

Originally elicited 5/8/2018; re-elicited 11/28/2019.
is only added later (at Level 3). Therefore, once the vowel alternations in the optative are re-analyzed as allomorph selection, it necessary follows that the choice of allomorph will only be sensitive to Level 2 prefixes.

### 7.3 Vowel alternations as morphologically conditioned allomorph selection

The third and final logical possibility listed in the dialect typology in Table 16 is a dialect which has lost both the labio-velar series as well as the full ~ reduced vowel contrast underlyingly. Cook, in his chapter on linguistic change and variation in Dene Sųłíné, suggests that all dialects except Tadoule Lake, Manitoba have lost the labio-velar series (2004: 23), and all dialects except Cold Lake, Alberta have lost the full ~ reduced vowel contrast (2004: 28–30). Therefore, according to Cook, the majority of dialects would fall into this category (although more data are needed in order to verify this claim).

In such dialects, which have lost contrastive vowel length in prefixes, there would no longer be any way to phonologically derive the distribution of a and u vowels which we have seen. Rather, while we would still posit two allomorphs, /wa/ and /wu/ (note: these no longer differ in length), their distribution would be morphologically governed, based on morphosyntactic features. The most likely analysis would be that /wu/ is constrained to appear only when the subject is 2nd person, or 1st person plural, whereas /wa/ is the elsewhere allomorph.

### 8 Conclusion

In this paper, I have explored the importance of contrast in informing historical reconstruction. I have used the Contrastive Hierarchy to deduce under what sets of conditions a certain alternation, the a ~ u alternation in optative paradigms, could have arisen. Specifically, I argued that this alternation arose at a much earlier stage of the language, at a time in which not only was the retroflex series still present, but in fact still retained its front rounded velar (*kʷ*) pronunciation. I also outlined a set of conditions under which this alternation might ‘exit’ the phonology and be re-interpreted as lexically listed allomorphy. These conditions, too, involve the set of contrasts in the phonological system. I have suggested that what ultimately causes phonological processes to become morphologized is not derivational opacity, but rather a change in the phonological inventory of the language, and the loss of certain key phonological contrasts. In this way, by linking the phonological status of an alternation to the set of contrastive relations in a language, the Contrastivist Hypothesis helps to limit phonological abstractness, and describes a pathway of diachronic change whereby new morphological patterns can arise.

It seems that the Contrastivist Hypothesis is unique among phonological theories, in that it enables one to use morphophonemic alternations to infer other structural properties of a language historically, at the time when these alternations originated. Since opaque and semi-fossilized morphophonemic alternations, such as I have examined here, are found throughout the Dene language family, the Contrastivist Hypothesis may open up new possibilities both for the internal reconstruction of individual Dene languages, as well as comparative reconstruction for the family as a whole.

**Abbreviations**

1sgS = 1st person singular subject, 2sgS = 2nd person singular subject, 1plS = 1st person plural subject, etc., 1sgO = 1st person singular object, etc., CH = Contrastivist Hypothesis, IPA = International Phonetic Association, OPT = optative, PD = Proto Dene, PNEA = Proto Northeast Athapaskan, SDA = Successive Division Algorithm, PAE = Proto Athabaskan-Eyak, QUAL = qualifier
Acknowledgements
I wish to thank Keren Rice and Elan Dresher, of the University of Toronto, for their help with the development of this paper, as well as three anonymous Glossa reviewers. I also wish to thank Allan Adam and Daniel Alphonse for sharing their language with me, and for contributing data to this paper. Finally, I wish to thank participants of Phonetics and Phonology in Europe 2015 for comments on an earlier version of this work. I take full responsibility for any remaining errors.

Funding Information
This work was funded by a Postdoctoral Fellowship in the Department of Linguistics at the University of Toronto. An earlier version of this work was funded by an NSF Office of Polar Programs Postdoctoral Fellowship in Polar Regions Research (Award ID# ARC-1204171), Phonetics and Phonology of two Northern Athabaskan Languages.

Competing Interests
The author has no competing interests to declare.

References
Ackroyd, Lynda. 1976. Proto-Northeastern Athapaskan: Stem-Initial Consonants and Vowels. Ms. University of Toronto.
Ackroyd, Lynda. 1982. Dogrib Grammar. Ms. University of Toronto.
Anderson, Stephen. 2008. Phonologically Conditioned Allomorphy in the Morphology of Surmiran (Rumantsch). Word Structure 1(2). 109–134. DOI: https://doi.org/10.3366/E1750124508000184
Archangeli, Diana. 1988. Aspects of Underspecification Theory. Phonology 5(2). 183–207. DOI: https://doi.org/10.1017/S09526757000002268
Bermúdez-Otero, Ricardo. 2015. Amphichronic Explanation and the Life Cycle of Phonological Processes. In Patrick Honeybone & Joseph Salmons (eds.), The Oxford Handbook of Historical Phonology. Oxford: Oxford University Press. DOI: https://doi.org/10.1093/oxfordhb/9780199232819.001.0001
Chomsky, Noam & Morris Halle. 1968. The Sound Pattern of English. New York: Harper & Row.
Cook, Eung-Do. 1983. Chipewyan Vowels. International Journal of American Linguistics 49(4). 413–27. DOI: https://doi.org/10.1086/465803
Cook, Eung-Do. 2004. A Grammar of Dene Suliné (Chipewyan) (Algonquian and Iroquoian Linguistics Memoir 17). John D. Nichols & H. C. Wolfart (eds.). Winnipeg: Algonquian and Iroquoian Linguistics.
DeLacy, Paul. 2007. Freedom, Interpretability, and the Loop. In Sylvia Blaho, Patrik Bye, and Martin Krämer (eds.), Freedom of Analysis? (Studies in Generative Grammar #95), 175–202. New York: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110198591
Dresher, Elan. 2009. The contrastive hierarchy in phonology. Cambridge: Cambridge University Press. DOI: https://doi.org/10.1017/CBO9780511642005
Ghini, Mirco. 2001. Asymmetries in the Phonology of Miogliola. New York: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110873023
González, Carolina. 2003. The effect of stress and foot structure on consonantal processes. Los Angeles: University of Southern California dissertation.
Haas, Mary. 1968. Notes on a Chipewyan Dialect. International Journal of American Linguistics 34(3). 165–175. DOI: https://doi.org/10.1086/465010
Jaker: On the historical source of a ~ u alternations in Dëne Sųłíné optative paradigms

Hall, Daniel Currie. 2007. The role and representation of contrast in phonological theory. Toronto: University of Toronto dissertation.

Halpern, Aaron. 1992. Topics in the placement and morphology of clitics. Stanford: Stanford University dissertation.

Hargus, Sharon. 1988. The Lexical Phonology of Sekani. New York & London: Garland Publishing.

Hargus, Sharon. 2007. Witsuwit’en Grammar: Phonetics, Phonology, and Morphology. Vancouver: UBC Press.

Hayes, Bruce. 1995. Metrical Stress Theory. Chicago: University of Chicago Press.

Howren, Robert & Phyllis Coleman. 1971. Some problems in the syntax of the optative in a Northern Athapaskan language. In Daniel G. Hays & Donald M. Lance (eds.), From Soundstream to Discourse, 78–88. Columbia, Missouri: University of Missouri Publications.

Jaker, Alessandro. 2018. The Full ~ Reduced Vowel Contrast in Tetsǫ́t’iné. In Working Papers in Dene (Athabaskan) Languages 2018. Fairbanks: ANLC Publications.

Jaker, Alessandro & Emerence Cardinal. Under review. Tetsǫ́t’iné Verb Grammar/Tetsǫ́t’iné Yaté K’zé T’at’ú Henádhër Yaté velth’ı velaníílye. ANLC Publications.

Jaker, Alessandro & Paul Kiparsky. Under review. Conjugation Tone Mapping and Level Ordering in Tetsǫ́t’iné.

Kager, René. 1996. On Affix Allomorphy and Syllable Counting. In Ursula Kleinhenz (ed.), Interfaces in Phonology. Berlin: Akademie Verlag.

Kiparsky, Paul. 1982. Lexical Phonology and Morphology. In I. S. Yang (ed.), Linguistics in the Morning Calm. Seoul: Hanshin Publishers.

Kiparsky, Paul. 1985. Some consequences of Lexical Phonology. Phonology Yearbook 2. 85–138. DOI: https://doi.org/10.1017/S0952675700000397

Kiparsky, Paul. 2015. Phonologization. In Patrick Honeybone & Joseph Salmons (eds.), The Oxford Handbook of Historical Phonology. Oxford University Press. DOI: https://doi.org/10.1093/oxfordhb/9780199232819.013.017

Krauss, Michael. 1964. Proto-Athapaskan-Eyak and the Problem of Na-Dene: Phonology. International Journal of American Linguistics 30(2). 118–131. DOI: https://doi.org/10.1086/464766

Krauss, Michael. 1965. Proto-Athapaskan-Eyak and the Problem of Na-Dene II: Morphology. International Journal of American Linguistics 31(1). 18–28. DOI: https://doi.org/10.1086/464810

Krauss, Michael. 1969. On classification in the Athapascan, Eyak, and the Tlingit verb. Supplement to International Journal of American Linguistics 35(4). Bloomington: Indiana University Publications on Anthropology and Linguistics.

Krauss, Michael. 1977. Proto-Athabaskan-Eyak Fricatives and the First Person Singular. Available from ANLA: http://www.uaf.edu/anla/item.xml?id=CA961K1977a.

Krauss, Michael. 1982. Proto-Athapaskan *k in Chipewyan, 1742–1800: Philological Evidence. International Journal of American Linguistics 48(1). 73–82. DOI: https://doi.org/10.1086/465714

Krauss, Michael. 1983. Vowels in Saskatchewan Chipewyan: Mary Jane Kasyon. Ms. Alaska Native Language Center (Available at: http://www.uaf.edu/anla/item.xml?id=CA961K1983).

Krauss, Michael. 2005. Athabaskan Tone. In Keren Rice & Sharon Hargus (eds.), Athabaskan Prosody. Amsterdam and Philadelphia: John Benjamins. DOI: https://doi.org/10.1075/cilt.269.07kra

Krauss, Michael & Jeff Leer. 1981. Athabaskan, Eyak, and Tlingit Sonorants (Alaska Native Language Center Research Papers Number 5). Fairbanks: ANLC Publications.
Leer, Jeff. 1975. Studies of Proto-Athabaskan disjunct prefixes and choice of perfective conjugation marker. Ms. Alaska Native Language Center (Available at: http://www.uaf.edu/anla/item.xml?id=CA965L1975f).
Leer, Jeff. 2000. The Negative/Irrealis Category in Athabaskan-Eyak-Tlingit. In Theodore Fernald and Paul Platero (eds.), The Athabaskan Languages: Perspectives on a Language Family, 51–72. Oxford: Oxford University Press.
Leer, Jeff. 2005. How Stress Shapes the Stem-Suffix Complex in Athabaskan. In Keren Rice & Sharon Hargus (eds.), Athabaskan Prosody. Amsterdam and Philadelphia: John Benjamins. DOI: https://doi.org/10.1075/cilt.269.17lee
LeGoff, Laurent. 1889. Grammaire de la Langue Montagnaise ou Chippeweyane. Montréal: 50, Rue Cotte, 50. DOI: https://doi.org/10.5479/sil.1107331.39088005795463
Li, Fang-Kuei. 1933. A list of Chipewyan stems. International Journal of American Linguistics 7. 122–151. DOI: https://doi.org/10.1086/463801
Li, Fang-Kuei. 1946. Chipewyan. In Harry Hoijer et al. (eds.), Linguistic Structures of Native America (Viking Fund Publications in Anthropology vol. 6). New York: The Viking Fund.
Mandeville, François. 2009. This is What They Say: Stories by François Mandeville. Translated from Chipewyan by Ron Scollon. With a foreword by Robert Bringhurst. Seattle: University of Washington Press.
Marinakis, Aliki. 2004. Seeking Simplicity: The preference for minimal syllable structure in Dogrib. Victoria: University of Victoria master’s thesis.
Oxford, Will. 2015. Patterns of contrast in phonological change: Evidence from Algonquian vowel systems. Language 91(2). 308–358. DOI: https://doi.org/10.1353/lan.2015.0028
Padgett, Jaye & Máire Ní Chiosáin. 1993. Inherent VPlace. Ms. Linguistics Research Center, UC Santa Cruz.
Prince, Alan. 1990. Quantitative Consequences of Rhythmic Organization. Chicago Linguistic Society 26(2). 355–98.
Prince, Alan. 1991. Quantitative Consequences of Rhythmic Organization. Ms. Linguistics & Cognitive Science Porgram and Center for Complex Systems, Brandeis University.
Randoja, Tiina. 1990. The Phonology and Morphology of Halfway River Beaver. Ottawa: University of Ottawa dissertation.
Rice, Keren. 1989. A Grammar of Slave. Berlin and New York: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110861822
Rubach, Jerzy & Geert Booij. 2001. Allomorphy in Optimality Theory: Polish Iotation. Language 77(1). 22–60. DOI: https://doi.org/10.1353/lan.2001.0038
Spahr, Christopher. 2014. A contrastive hierarchical account of positional neutralization. The Linguistic Review 31(3–4). 551–585. DOI: https://doi.org/10.1515/tlr-2014-0008
Spahr, Christopher. 2016. Contrastive representations in non-segmental phonology. Toronto: University of Toronto dissertation.
Story, Gillian. 1989. The Athapaskan First Duoplural Subject Prefix. In Keren Rice & Eung-Do Cook (eds.), Athapaskan Linguistics: Current Perspectives on a Language Family, 487–531. Berlin: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110852394-014
Tuttle, Siri. 1998. Metrical and Tonal Structures in Tanana Athabaskan. Seattle: University of Washington dissertation.
