Contrast in Inuit Consonant Inventories

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Generals paper in phonology
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1 Introduction

1.1 Background

A number of authors have examined consonant alternations in Inuit (e.g. Thalbitzer (1904), Ulving (1953), Kaplan (1982), (1985)) and the related phenomena of fortition and lenition in Yupik. Voiceless stops and voiced continuants regularly alternate in Inuit dialects. For instance, compare the following forms from North Baffin which exemplify the alternation between /p/ and /v/ (Dorais, 2003, p. 102):

(1) taku-vuŋa
   see-INDIC.1SG
   ‘I see’

(2) sinik-puŋa
   sleep-INDIC.1SG
   ‘I sleep’

While most of these alternations, such as those between /p/ and /v/, could be explained as the spread or insertion of the features [VOICE] and [CONTINUANT], there exist some puzzling alternations, such as that between /t/ and /j/ in Eastern Inuit. Consider the following examples, also from North Baffin (ibid):

(3) taku-junga
   see-DEC.1SG
   ‘I see’

\* I would like to thank Elan Dresher for his support and insight, Keren Rice for her helpful comments and revisions, and Peter Avery for his questions and comments at my defence. I would also like to thank my partner, John Kennedy, for constantly asking me “How’s your generals paper?”,” which in fact was code for “Shouldn’t you be working?”.

I employ the following abbreviations: ABS=absolutive, CAY=Central Alaskan Yupik, CED=Comparative Eskimo Dictionary, COND=conditional, CONT=continuant, CSY=Central Siberian Yupik, DEC=declarative, FUT=future, INDIC=indicative, INTR=intransitive, INTERR=interrogative, LAT=lateral, N=noun, NEG=negation, PART=participial, PE=Proto-Eskimo, PL=plural, POSS=possessive, RTR=retracted tongue root, SDA=Successive Division Algorithm, SG=singular, TRANS=transitive, V=verb, WG=West Greenlandic.
This alternation appears to be more complicated than the mere addition of voicing and frication, which we would expect to yield [ð]. Why is there a change of place of articulation? It would be favourable if this /t/~ /j/ alternation could be explained as part of the larger pattern of stop-fricative alternations. However, it is difficult to imagine a single phonological rule that would subsume the /t/~ /j/ alternation.

Another question arising from these alternations is why there is so much variability in the form of /t/’s partner across dialects. While /t/ alternates with /j/ in a number of dialects, it also alternates with [a] in a number of dialects, with [z] in Cape Dorset, with [ɔ] in some areas of Itivimiut, with [ʃ] in West Greenlandic, with [l] in East Greenlandic, and with [h] in Thule (Polar Greenlandic). Given that these segments are the modern variants of *ð (as reconstructed in Fortescue, Jacobson, & Kaplan, 1994), it is curious that no dialect has chosen [d] or [ʤ] as the reflex of *ð. Arguably [d] would be phonetically closer to *ð than most of the modern exponents. Why is the form of this segment so variable across dialects?

Existing work on consonant gradation in Inuit and Yupik is either mostly descriptive (as is the case with Thalbitzer (1904) and Kaplan (1982)) or is concerned primarily with the prosodic and phonological environments in which lenition and fortition occur (especially in dialects where the conditioning factors are prosodic, as with
Kaplan (1985)). To my knowledge, no existing work attempts to unify these alternations with a single theoretical device, either within a particular dialect or across dialects.

1.2 Proposal

I propose that feature underspecification can be used to unify these alternations, both within individual dialects and across all dialects. In particular, I propose that Dresher (2002)’s Successive Division Algorithm can be used to create contrastive feature hierarchies to assign underspecified contrastive feature specifications to the phonemes in these dialects. Furthermore, I will argue that for all dialects these alternations center on the contrastive feature [CONTINUANT]; the feature [CONTINUANT] appears to be the underlying contrastive feature responsible for the (voiceless) stop – (voiced) continuant alternations across all dialects. While other (non-contrastive) approaches would need to specify different rules for the different alternations, particularly the /t/~/j/ alternation in Eastern dialects (and between /t/ and the other reflexes of Proto-Eskimo *ð in other dialects), my proposal can unify the alternations; stops alternate with their contrastively [+CONTINUANT] counterparts across all dialects. Conversely, I argue that in all dialects /t/ alternates with the least contrastively specified continuant (i.e. a continuant unmarked for place of articulation). Languages and dialects differ in terms of how they implement these underspecified representations.

1.3 Background on Contrast Theory

Dresher (2002) and (2004), based in part on earlier work in Dresher, Piggott, and Rice (1994) (inter alia), argue against other types of underspecification in favour of using the Successive Division Algorithm (SDA) to create a contrastive hierarchy of features. Dresher (2002) presents the following informal version of the SDA (p. 89):
Successive Division Algorithm (SDA) (informal version)

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

b) If the primordial allophonic soup 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. (With binary features, it becomes the Successive Binary Algorithm.)

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

In particular, Dresher advocates using features that are active in the phonology of the particular language under examination. Consequently, the hierarchies created by the SDA will be language-specific (or dialect-specific, as in the case of the present paper). Accordingly, and in contrast with theories that propose a single universal hierarchy of features, the contrastive feature hierarchies created using the SDA can be used to explain why the phonemes of different languages and dialects pattern in different ways.

Consider the following example of the SDA in action. Imagine a four-vowel system consisting of the vowels /i/, /u/, /a/, and /ə/. If, based on phonological activity, we conclude that the features [ROUND], [LOW], and [FRONT] are active in the system, we can successively apply these features to arrive at a contrastive hierarchy which uniquely specifies each phoneme. The order in which we apply the features will determine their contrastive feature specification. For instance, if we apply them in the order: [ROUND] > [LOW] > [FRONT], we will arrive at the following contrastive hierarchy

\[
\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
\]

\[
\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
\]

\[
\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
\]

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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
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\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
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\begin{array}{c}
\text{[ROUND]} \\
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\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
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\begin{array}{c}
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\begin{array}{c}
\text{[ROUND]} \\
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\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\[
\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
\]

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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\[
\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
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\text{[FRONT]}
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\begin{array}{c}
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\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
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\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
\]

\[
\begin{array}{c}
\text{[ROUND]} \\
\text{[LOW]} \\
\text{[FRONT]}
\end{array}
\]
Such a hierarchy will first divide the vowel space in (7) below along the dimension of roundness, differentiating /u/ as the unique [+ROUND] segment. Next, among the remaining [−ROUND] phonemes, [+LOW] uniquely describes /a/. Finally, between the two [−ROUND,−LOW] phonemes, [+FRONT] distinguishes /i/ from /ə/.

Conversely, if the features were applied in the opposite order: [FRONT] > [LOW] > [ROUND], we would arrive at the following hierarchy:

Now, /i/ is no longer contrastively [−LOW] and [−ROUND], only [+FRONT]. Furthermore, [+ROUND] /u/ is now also [−FRONT] and [−LOW]. This hierarchy would divide the vowel space as follows:
Other orders are also possible (four in this case) and would result in alternative feature specifications for the phonemes involved. In sum, the order of contrastive cuts determines which features are contrastive on a given phoneme in an inventory.

In addition to the contrastive features (those which are active in the phonology), redundant features provide the remaining (non-contrastive) phonetic information about individual phonemes. I will assume that redundancy rules take the contrastive feature specification of a phoneme as their input and yield the additional redundant features for that phoneme. For instance, a language where /i/ is only contrastively [+FRONT] could have the following rule:

\[(10) \quad [+\text{FRONT}] \Rightarrow [-\text{BACK}, +\text{HIGH}, -\text{LOW}, -\text{ROUND}, -\text{RTR}, …]\]

While these features are not active in the lexical phonology, redundant features such as [+HIGH] may play a more low-level phonetic role in the post-lexical phonology. For the purpose of this paper I will assume that there is no distinction between post-lexical phonology and low-level phonetic processes.

In addition, I will assume that for each contrastive feature one value of the feature is marked while the other is unmarked. In general, the unmarked values are assumed to
be defaults. I assume that only the marked values (of the contrastive features) are active in the phonology. Furthermore, I assume that there is cross-linguistic variation with respect to which values are marked (cf. Rice 2003).

2 Phonology and contrast across languages and dialects

In this section I examine the phonological activity across Eskimo languages and dialects and propose contrastive feature hierarchies for each language/dialect, based on that activity. We will explore the languages/dialects listed in the family tree below. For each dialect I show that the alternations between voiceless stops and voiced continuants are best characterized using the contrastive feature [+CONTINUANT].
Branches of Inuit and Yupik examined in this paper
2.1 Yupik

Although the Yupik languages do not appear to exhibit the same stop-continuant alternations as productively as the Inuit dialects which are the focus of this paper, I have chosen to include them in this section since they possess consonant inventories with similar structures to those found in Inuit (i.e. a voiceless stop series, a voiced continuant series, a uvular place of articulation, etc.) and the introduction of their systems now aids in the understanding of the Inuit systems to be introduced in section 2.2-2.5. Another reason for including Yupik languages in this section is that they exhibit fricative devoicing similar to that of Greenlandic (as well as the fricative devoicing sometimes observed in underlying /Cs/ and /Ch/ clusters in Western dialects), laying the groundwork for the discussion of Greenlandic in section 2.5. According to Leer (1985) “[t]here is in all Yupik a morphophonemic rule which devoices fricatives contiguous to voiceless consonants, and nasals following voiceless consonants” (p.102). We will see that this devoicing bears on our choice of contrastive feature to account for stop-continuant alternations in Inuit.

Furthermore, in terms of exposition, by beginning with Yupik we may proceed from West to East across the Arctic; from the more conservative Eskimoan languages and dialects to the more innovative ones, such as West and East Greenlandic.

2.1.1 Central Siberian Yupik (CSY)

2.1.1.1 The Sound System

On the surface, the consonant inventories of Yupik appear much more complex than those of Inuit (which will be examined in later sections). They include a series of voiceless nasals, a series of labialized velars and uvulars, and a series of voiceless
fricatives. The Central Siberian Yupik (CSY) inventory also includes what are referred to in de Reuse (1994) as retroflex apicals, /ɹ/ and /ɿ/. The following consonant inventory is presented in de Reuse (1994, pp. 18, modified to IPA):

(12) CSY consonant inventory

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k</th>
<th>kʷ</th>
<th>q</th>
<th>qʷ</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>l</td>
<td>ɾ</td>
<td>z</td>
<td>ʃ</td>
<td>ʒ</td>
</tr>
<tr>
<td>f</td>
<td>ɭ</td>
<td>s</td>
<td>x</td>
<td>xʷ</td>
<td>χ</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ɲ</td>
<td>ɲʷ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m̥</td>
<td>n̥</td>
<td>ŋ</td>
<td>ŋʷ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An analogous inventory is presented in Krauss (1975). However, it is not clear in much of the literature to what extent the voiceless and labialized sounds are in fact phonemic. The inventory in de Reuse (1994) is entitled “The Taxonomic Phonemes of CSY” and Krauss (1975) also bases his inventory and discussion on the “taxonomic phonemic level”, suggesting a level of representation somewhere between the underlying phonemes and surface allophones (see Dresher 2005 for a discussion of the taxonomic phonemic level).

For instance, all continuants (including nasals, normally considered to be non-continuant), devoice under certain conditions in CSY (see Jacobson 1979, p.13) but it is not fully clear if some instances of the voiceless counterparts might also be underlying. Similarly, the labialized velars and uvulars result from assimilation to a neighbouring /u/ (which neutralizes to an adjacent vowel, thereby obscuring its original presence).

² /h/ is very infrequent according to Jacobson (1990).
³ Similarly, Dorais (2003)’s inventory of CSY does not distinguish phonemes and allophones. Jacobson (1984)’s dictionary describes the environment for automatic devoicing of fricatives and nasals in CSY but again it is not clear if any voiceless segments are underlying elsewhere in the language. Jacobson (1990) also sheds little light on the issue of underlying segments, despite having sections entitled “Phonetics and Phonemics” and “Morphophonemics”. Instead, these sections of Jacobson (1990) deal primarily with differences between CSY and CAY.
However, once again, it is not clear whether this process is synchronic, in which case an underlying /u/ conditions the presence of the labial allophone, or diachronic, in which case the labialized sounds have become phonemes. Fortunately, Krauss’ discussion provides some clues about the underlying inventory.

Krauss (1975) states that [f] is “rare, late-derivative, or borrowed” (p.47). I take this to mean that [f] is a derived allophone of /v/, except perhaps in loanword phonology. Similarly he states that [ɹ], [ŋ], and [ŋʷ] are “mostly late-derivative” (p.48) and [m] is “late-derivative only, by ordered rules” (p.48). Furthermore, he notes that “/h/ is rare occurring only in exclamations, onomatopoeia, and other marginal forms”. Jacobson (1990) also states that /h/ is infrequent, occurring in interjections and Chukchi loans (p.277). Conversely, for /x/ and /xʷ/ Krauss states only that they are “fairly common” (p.48) and that /χ/, /χʷ/, and /ɬ/ are “common” (p.48), with no mention of derivation.

Later, though, he states the following (p.48):

The labialized velars arise etymologically or morphophonemically in probably every case (except certain instances of /xʷ/ and in loans) from the vowel /u/ between a velar and another vowel, to which the /u/ then becomes assimilated, after leaving the velar labialized.

Given that Krauss’ statements leave open the possibility that the labialized consonants are in fact allophones, I will assume this to be the case. Furthermore, I will assume, given his statements about derivation, that [f], [ɹ], [ŋ], and [ŋʷ] are also allophones of their voiced counterparts, leaving /x/, /χ/, and /ɬ/ as separate voiceless phonemes. Despite the fact that he describes [s] as “common”, the discussion in Krauss as well as Jacobson

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4 Krauss lists the near-minimal pair talliq [taliq] ‘arm’ and aliq [aliq] ‘sleeve’, suggesting the two laterals are separate phonemes, as in Inuit dialects discussed in sections 2.2-2.5.
(1979, p. 13) also suggests that [z] and [s] are in complementary distribution, with [s] appearing adjacent to voiceless segments.

Thus, taking these allophones into account, as well as the marginal status of /h/, I assume the following consonant inventory for CSY, with allophones in brackets:

<table>
<thead>
<tr>
<th>CSY consonant inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>p t k [kʷ] q [qʷ]</td>
</tr>
<tr>
<td>v z j γ [γʷ] ʁ [ʁʷ]</td>
</tr>
<tr>
<td>[f] [f̥] l [s] x [xʷ] χ [χʷ]</td>
</tr>
<tr>
<td>m n n̥ [ŋ̊] [ŋ̊ʷ]</td>
</tr>
<tr>
<td>[m̥] [n̥] [ŋ̊] [ŋ̊ʷ]</td>
</tr>
</tbody>
</table>

The set of remaining phonemes is very similar to the Inuit inventories examined below in subsections 2.2-2.5. Next I will examine the phonological activity in CSY in order to select an appropriate set of contrastive features for the language.

### 2.1.1.2 The Alternations

Although in Yupik we do not observe the regular and transparent consonant gradation seen in Inuit, as in (1)-(2) and (3)-(4) above, there are some instances of underlying voiced fricatives surfacing as voiceless stops. De Reuse (1994) notes that he differs from other authors in that he gives the underlying forms of the stem-final consonants /ɣ/ and /ʁ/ instead of the surface forms [k] and [q] (p.23). Here are two examples of this alternation (pp.22, 26):
In (14) an underlying final /ʁ/ surfaces as [q]. Similarly, in (15) an underlying final /ɣ/ in
[ŋu]- ‘person’ surfaces as [k]. I follow de Reuse’s assertion that the voiced continuants are underlying in these alternations.

2.1.1.3 The Account

How can we account for the phonological relationship between the fricatives and the stops? The alternants differ along two dimensions; continuancy and voicing. Under the assumptions of the SDA, one of these features must be chosen first (as the contrastive feature).

While the alternations themselves yield little evidence, phonotactic evidence is revealing. One argument for using [CONTINUANT] to distinguish the voiced continuants comes from Krauss (1975, p. 51). He discusses the phonotactic distribution of consonants in CSY. In particular, he notes that while /k/ and /q/ may freely occur word-initially, word-initial /ɣ/, /ʁ/, and /χ/ are at best “marginal”. Similarly, the latter set does not occur word-finally either, while once again both [k] and [q] frequently appear in this position. These facts point to the segments /ɣ/, /ʁ/, and /χ/ constituting a natural class of continuants. Conversely, there does not appear to be any evidence for voiced sounds as
a class. By using the feature [CONTINUANT] as discussed below (with [+CONTINUANT] as the marked value) to explain the alternation between stops and voiced continuants, we can employ a hierarchy that maintains the continuants as a natural class:

\[
\begin{array}{ccc}
([\text{CONT}]) & [\text{+CONT}] & ([\text{CONT}]) \\
/k/ & [\text{+CONT}] & /q/ \\
([\text{VOICE}]) & [\text{VOICE}] & ([\text{VOICE}]) \\
/ɣ/ & /x/ & /χ/ \\
\end{array}
\]

Notice that I have used the positive value of the feature [CONTINUANT] as marked while voicelessness is the marked value of the contrastive feature [VOICE] (with the unmarked value in parentheses).

Since /t/ does not appear to alternate with a continuant in CSY (as in Inuit dialects), the choice of contrastive features for the laterals /l/ and /ɬ/, the retroflex apical /ɹ/, and the palatal apical /z/ is made more difficult. Although de Reuse notes that “[t]he /tə/-/ ending of some bases changes into /l/ when followed by certain suffixes” (p.24, forward slashes added) this fact seems too sporadic to suggest that /t/ and /l/ are a contrastive pair. This alternation is illustrated in (17) below (p.47, modified to IPA):

\[
\text{ŋəŋəŋəŋkaŋa}^5 \\
\text{ŋəŋ-ŋətə-ka-(ŋ)a} \\
\text{eat-NEG-TRANS.PART-ABS.3SG.SG} \\
\text{‘the one he did not eat’}
\]

Instead, a more likely partner for /t/ is the retroflex apical /ɬ/. Although Jacobson (1990) states that the /ɬ/ phoneme in CSY does not appear to correspond in any systematic way

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5 The superscript ‘o’ in de Reuse’s gloss of the negation indicates that the /–tə/ ending of this morpheme alternates with /l/. Finally, the underlining of /k/ in this example is used by de Reuse to mark the phonological behaviour of velar-initial consonant-deleting postbases which assimilate to the place of the deleted consonant.
to segments in other Yupik languages, a comparison of his examples with their cognates in Fortescue et al (1994)’s Comparative Eskimo Dictionary (CED) shows that in fact /ɹ/ appears to be a reflex of Proto-Eskimo *ð, whose modern reflexes alternate with /t/ in Inuit dialects. Below are examples from Jacobson (1990, pp. 277, modified to IPA) for CSY and Central Alaskan Yupik (CAY) as well as the reconstructed protoforms from the CED demonstrating that /ɹ/ in CSY corresponds to PE *ð:

<table>
<thead>
<tr>
<th>(18)</th>
<th>CSY</th>
<th>CAY</th>
<th>Proto-Eskimo/Proto-Yupik</th>
</tr>
</thead>
<tbody>
<tr>
<td>ɹa̠a̚-</td>
<td>aab-</td>
<td>PE *að(ð)a(a) ‘to scream’ (p.4)</td>
<td></td>
</tr>
<tr>
<td>nəa̠q̚ə-</td>
<td>nalaq̚ə-/nataq̚ə-</td>
<td>PE *naðaq̚ə-‘to measure’ (p.206)</td>
<td></td>
</tr>
<tr>
<td>aq̚əyiiq</td>
<td>aq̚əyiq/aq̚əyiq</td>
<td>PE *aq̚əyiik ‘ptarmigan’ (p.39)</td>
<td></td>
</tr>
<tr>
<td>kuuv̚aəq</td>
<td>kuvjaq</td>
<td>PE *kuvðaə ‘net’ (p.183)</td>
<td></td>
</tr>
<tr>
<td>ɹ̥ak</td>
<td>ʧak</td>
<td>PY *kʃak ‘small N, thing like N’; cf. Aleut kða-X (p.402)</td>
<td></td>
</tr>
<tr>
<td>nən̚u̠g̚-</td>
<td>nənu̠g̚-</td>
<td>PY *nən̚u̠g̚- ‘to abrade’ (cf. nanuk- + ðu̠g̚?) (p.215)</td>
<td></td>
</tr>
<tr>
<td>ɹ̥iix̚uk</td>
<td>ʧaiix̚uk</td>
<td>PE *ʧaðø(i) ‘artemesia’ (p.63)</td>
<td></td>
</tr>
</tbody>
</table>

Notice that for each of the above instances of /ɹ/ in CSY, we find an *ð in the proto-form (even if only underlyingly, as with *nən̚u̠g̚-, which the authors suggest to be the product of *nanuk- and *ðu̠g̚). Notice also that while the reconstructed Proto-Yupik form of ‘small N, thing like N’ is *kʃak, the Aleut proto-form *kða-X contains *ð, possibly

6 The symbol ž appears to correspond to the voiced apical /ɹ/. The CED notes (p.xi) that the “degree of retroflexion varies with language and dialect. According to the CED, this is not a PE phoneme, further suggesting that /ɹ/~/ž/ are reflexes of *ð.

7 This symbol appears to correspond to the voiced apical /ɹ/. The CED notes (p.xi) that the “degree of retroflexion varies with language and dialect. This is not a PE phoneme, but rather a PY phoneme, according to the CED.
suggesting its presence either in Proto-Eskimo or earlier in Proto-Eskimo-Aleut.

However, not all of the examples containing /ɹ/ appear to correspond to PE *ð. The following words appear to be exceptions (ibid):

<table>
<thead>
<tr>
<th>(19)</th>
<th>CSY</th>
<th>CAY</th>
<th>Proto-Eskimo/Proto-Yupik</th>
</tr>
</thead>
<tbody>
<tr>
<td>tfoot</td>
<td>tʃʰtʊq</td>
<td>PE *tʊtəq ‘mark’ (p.344)</td>
<td></td>
</tr>
<tr>
<td>nawkək</td>
<td>naxʧik</td>
<td>PE *nəɣʧiy ‘gaff, hook’ (p.224)</td>
<td></td>
</tr>
<tr>
<td>iixta</td>
<td>ixta</td>
<td>PY *ʔiɣtə and *jɪɣtə ‘lair, den’ for which the CED suggests borrowing from Chukchi or Koryak (p.388)</td>
<td></td>
</tr>
</tbody>
</table>

If *t alternated with *ð in PE, as do their synchronic reflexes in Inuit dialects, the intervocalic /t/ in *tʊtəq could actually have been an alternate/allophone of *ð in the proto-language. Furthermore, the same alternation between *ð and *t along with the presence of an etymological /i/ in *nəɣʧiy might have caused affrication of /t/ to [ʧ] in this word. Finally, the CED attributes the remaining example *ʔiɣtə/*jɪɣtə to borrowing from Chukchi or Koryak. In sum, we may be able to explain these exceptions to the correspondence of /ɹ/ to *ð.

Thus it would seem that despite Jacobson’s claim that “it is hard to see a consistent pattern to what phoneme in CAY corresponds to ř in CSY”, a comparison with the Proto-Eskimo/Proto-Yupik forms in (18)-(19) demonstrates that /ɹ/ is indeed a reflex of *ð. (Instead, it is in fact the various synchronic reflexes of *ð in CAY that require explanation). Given the high degree of phonetic similarity of *ð and /t/, and the fact that the modern reflexes of *ð continue to alternate with /t/ in Inuit dialects, I propose that
/t/ in CSY differs from /ɹ/ by only the feature [CONTINUANT]. While it would be preferable to have synchronic evidence for /ɹ/ being the contrastive partner of /t/, given that CSY instances of /ɹ/ correspond to PE *ð and furthermore that the modern reflexes of *ð such as /j/ alternate with /t/ in Inuit dialects (as will be shown below), I believe this claim to be justified.

Assuming that /ɹ/ (and [ɹ̥]) along with /t/ will be contrastively unmarked for place of articulation, the laterals will be distinguished by the feature [LATERAL]. Although I have no evidence from phonological activity for this feature, I believe it is reasonable to assume it. Furthermore, I propose that the labials are contrastively specified as [LABIAL], since labialization is quite possibly synchronically active in generating labialized velars and uvulars from underlying instance of /u/. Moreover, given the four-vowel system of Yupik, the feature [LABIAL] most likely distinguishes /u/ from /ə/ which appears to be the least contentful vowel since it is unable to appear long or in underlying morpheme-internal diphthongs (Kaplan, 1990, p. 147).

To distinguish palatal /j/ from other [DORSAL] segments, I propose that both velars and uvulars are both contrastively specified as [BACK], and that uvulars are also [RTR] (or perhaps [LOW]). Although distinguishing palatal, velar, and uvular place using only two features would also be possible, a feature that included palatals and velars to
the exclusion of uvulars does not appear to be phonetically motivated. Also, velars and
uvulars pattern together in that they both have labialized allophones, unlike palatals.8
The feature [RTR] for uvulars is clearly motivated by the fact that only uvulars trigger
the lowering of /i/ and /u/ to [i] and [u], respectively.

Finally, we need to decide the contrastive feature specification for /j/. Although
de Reuse (1994, p. 18) lists both /j/ and /z/ as palatal (and thus [+DORSAL] in this
system), Krauss (1975, p. 46) lists /z/ (and [s]) in the same column as /t/, leaving /j/ as
the sole member of a separate column, suggesting it is the unique palatal segment.

Similarly, Dorais (2003, p. 22) lists /z/ with “apicals”. Since the focus of Krauss and
Dorais is phonology, as opposed to de Reuse who is focusing on syntax and
morphology, I follow Krauss’ and Dorais’ analysis, assuming /z/ to be coronal/apical,
and thus employ the feature [STRIDENT] to differentiate it from the retroflex continuant
/j/. Conversely, /j/ will be the sole [+DORSAL] segment which is not also [+BACK].

2.1.1.4 Contrastive feature hierarchy for CSY consonants

Based on the phonological activity discussed above, along with several
assumptions about natural classes (e.g. labials), I propose the following contrastive
hierarchy for CSY phonemes (with unmarked values in parentheses):

---

8 Yet another possibility would be to contrastively specify labials, velars, and uvulars as [PERIPHERAL].
However, I know of no process which targets labials and uvulars to the exclusion of other places of
articulation in either Yupik or Inuit.
(20) Contrastive feature hierarchy of CSY consonant phonemes

∅

([−DORSAL])

([−LABIAL]) [+LABIAL]

([−NASAL]) [+NASAL]

([−LAT]) [+LAT] ([−CONT]) [+CONT]

([−STRID]) [+STRID]

discussed above, the back dorsals do indeed seem to form a natural class in that only they have labialised allophones.\textsuperscript{11}

The marked contrastive feature specifications represented in this hierarchy are as follows for the phonemes of CSY:

\begin{equation}
\text{(22) Marked contrastive feature specifications for CSY phonemes}
\end{equation}

\begin{align*}
/t/ & : \emptyset \\
/s/ & : \ [+\text{CONTINUANT}] \\
/z/ & : \ [+\text{CONTINUANT}], [+\text{STRIDENT}] \\
/l/ & : \ [+\text{LATERAL}], \ [-\text{VOICE}] \\
/l/ & : \ [+\text{LATERAL}] \\
/n/ & : \ [+\text{NASAL}] \\
/p/ & : \ [+\text{LABIAL}] \\
/r/ & : \ [+\text{LABIAL}], [+\text{CONTINUANT}] \\
/m/ & : \ [+\text{LABIAL}], [+\text{NASAL}] \\
/j/ & : \ [+\text{DORSAL}] \\
/k/ & : \ [+\text{DORSAL}], [+\text{BACK}] \\
/x/ & : \ [+\text{DORSAL}], [+\text{BACK}], [+\text{CONTINUANT}], [-\text{VOICE}] \\
/y/ & : \ [+\text{DORSAL}], [+\text{BACK}], [+\text{CONTINUANT}] \\
/q/ & : \ [+\text{DORSAL}], [+\text{BACK}], [+\text{RTR}] \\
/\chi/ & : \ [+\text{DORSAL}], [+\text{BACK}], [+\text{RTR}], [+\text{CONTINUANT}], [-\text{VOICE}] \\
/\varepsilon/ & : \ [+\text{DORSAL}], [+\text{BACK}], [+\text{RTR}], [+\text{CONTINUANT}] \\
/\eta/ & : \ [+\text{DORSAL}], [+\text{BACK}], [+\text{NASAL}] \\
\end{align*}

Furthermore, the additional allophones of CSY would have the following features added to their specifications, in addition to their non-round or (redundantly) voiced counterparts. Notice that [+\text{VOICE}] is the default for continuants (including nasals) while [-\text{VOICE}] is the default on stops:\textsuperscript{12}

\footnotesize
\begin{itemize}
\item\textsuperscript{11} Krauss (1975) presents anecdotal evidence for a now defunct labialised palatal \textipa{/j\textsuperscript{w}/}.
\item\textsuperscript{12} There could conceivably also be a uvular nasal allophone as argued in Bobaljik (1996) for Inuit. If so, the uvular allophone would contain the feature [+\text{RTR}], in addition to the contrastive features of /\eta/.
\end{itemize}

Thus, dorsal segments will obtain the feature [+LABIAL] from an adjacent underlying /u/ while fricatives and nasals will obtain the feature [−VOICE] when adjacent to a segment that is marked voiceless (either contrastively or redundantly). However, this latter point presents us with a problem. Since I have assumed that only the marked values of contrastive features are active in the phonology, redundant [−VOICE] should not be able to spread to adjacent segments. However, I propose that this devoicing is a post-lexical rule requiring that adjacent consonants agree in voicing. Conversely, if it could be shown with further study that this devoicing rule is in fact part of the lexical phonology, this would constitute counterevidence to the present analysis.

### 2.1.2 Alutiiq (Pacific Yupik)

#### 2.1.2.1 The phonology of Alutiiq

Alutiiq, also known as Pacific Yupik, has a similar consonant inventory to CSY, although several of the CSY contrasts are collapsed in Alutiiq. Leer (1985) presents the following consonant chart (p.81, modified to IPA, title added):
Leer states that these are the “systematic Alutiiq consonant phonemes”. However, as with many other authors working on Yupik, he does not appear to be using the standard notion of phoneme. Instead, his discussion of the “morphophonemic level” (p.78) and “systematic […] phonemes” (p.81) suggests that he too is employing the Taxonomic Phonemic Level.

Leer’s own discussion and examples suggest that a number of these “phonemes” are in fact allophones. He notes that “there is in all Yupik a morphophonemic rule which devoices fricatives contiguous to voiceless consonants, and nasals following voiceless consonants” (p.102). Consider the following examples in which the voicing of laterals depends on the voicing of the adjacent segments (p.89, stress and syllable breaks omitted):

(25) a) naaqumaluuuku
   ‘apparently reading it’
 b) taqumaluni
   ‘apparently getting done’

(26) a) naq'luku
   ‘reading it’

---

13 Leer lists /w/ with /ɣʷ/, noting that the latter segment sometimes neutralizes to /w/ (p.81). However, some instances of /w/ seem to correspond directly to /v/ in Inuit, suggesting the two may remain separate underlyingly. For instance, the –wik ending on [qənawik] ‘hospital’ corresponds to the locative nominalizer –vik in Inuit.

14 According to Leer, [f] is only “systematic” in the Alaska Peninsula Koniag Alutiiq dialect (p.81).
b) taq̱uni
   ‘getting done’

In (25) both instances of /l/ are voiced because they occur intervocically, while in (26), when the morpheme meaning ‘apparently’ is dropped, the lateral is devoiced because it is adjacent to a voiceless segment.

In addition, Leer states that in several dialects of Alutiiq syllable-initial /l/ devoices to /ɬ/ and syllable-initial /j/ devoices to /s/. He gives the following examples (p.102; stress omitted, modified to IPA):

(27) [iɬ.ai] ‘his relatives’; abs. sg. (Perryville and Afognak Koniag Alutiiq)
    cf. [il.lai] (in other dialects)

(28) [nuʃ.sai] ‘her hair’; abs. sg. (Perryville and Afognak Koniag Alutiiq)
    cf. [nuʃ.jai] (in other dialects)

In general, the distribution of voiceless fricatives and nasals in Leer’s examples appears to be predictable, either via rules that refer to syllable structure or the voicing of adjacent consonants, although he never states this explicitly. As for the labialized velars, I will assume that the earlier analysis for CSY holds for Alutiiq; that they can be derived synchronically from instances of underlying /u/.

Thus, given the evidence for the voiceless fricatives and nasals as well as the labialized velars being allophones, we have the system below.\(^{15}\)

\(^{15}\) Leer also discusses a fortis/lenis distinction among consonants in Alutiiq, resulting in additional allophones. However, he does not clearly identify the set of allophones (and the situation is already made difficult by the use of a Taxonomic Phonemic paradigm which greatly obscures the phoneme/allophone contrast). Consequently, I have not included them in my analysis. Nevertheless, such a distinction could easily be incorporated into my analysis by using a feature such as [FORTIS] or [LENIS] on the appropriate allophones.
**Alutiiq consonant inventory**

<table>
<thead>
<tr>
<th>Stops:</th>
<th>p</th>
<th>t</th>
<th>ʧ</th>
<th>k</th>
<th>[kʷ]</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiced fricatives:</td>
<td>w</td>
<td>l</td>
<td>j</td>
<td>y</td>
<td>[ɣʷ]</td>
<td>ɣ</td>
</tr>
<tr>
<td>Voiceless fricatives:</td>
<td>([f])¹⁴</td>
<td>[h]</td>
<td>[s]</td>
<td>[ʃ]</td>
<td>[x⁸]</td>
<td>[ʁ]</td>
</tr>
<tr>
<td>Voiced nasals:</td>
<td>m</td>
<td>n</td>
<td>ŋ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiceless nasals:</td>
<td>[m̥]</td>
<td>[n̥]</td>
<td>[ŋ̊]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In comparison with CSY, Alutiiq lacks the voiceless lateral phoneme /ɭ/, retroflex apicals /ɭ/ and [ɭ], and the phonemes /x/ and /χ/, which are merely allophones in Alutiiq. Another difference is the lack of a labialized uvular stop and a labialized voiceless uvular fricative. Two elements not present in CSY are /w/ instead of /v/ and the affricate /ʧ/¹⁶ (which was present in Proto-Eskimo).

Given that Leer’s focus is stress and prosody, there is little discussion of the type of alternation between stops and voiced continuants seen earlier in de Reuse (1994) for CSY. However, in discussing a list of postbases in Koniag Alutiiq and the symbols he uses to indicate their morphological behaviour, Leer notes that base-final /ɣ/ and /ʁ/ appear word-finally as /k/ and /q/ (p.119, footnote 27). Furthermore, he notes that “postbases beginning with w/p have w following a vowel and p following a consonant or base-final te, which drops” (*ibid*, original emphasis).

---

¹⁶ Note that unlike in CSY, where [ʧ] was an allophone of /t/ triggered by /i/, /ʧ/ appears to be phonemic in this dialect, occurring on other positions and corresponding to PE *ʧ*.
2.1.2.2 Contrastive feature hierarchy for Alutiiq consonants

Based on the consonant inventory in (29) above and the alternations between stops and continuants mentioned in the preceding paragraph, I propose the following contrastive feature hierarchy for the consonant phonemes of Alutiiq:

(30) Contrastive feature hierarchy of Alutiiq consonant phonemes

Differences between this hierarchy and the earlier hierarchy for CSY include the lack of the features [STRIDENT], [LATERAL], and [VOICE] as well as the extension of [CONTINUANT] to differentiate /j/ and /ʧ/. The lack of [STRIDENT] is not unexpected since /s/ in many other dialects arose historically from *ʧ\textsuperscript{17} (possibly via reanalysis of a redundant [+STRIDENT] feature as contrastive). The absence of [LATERAL] is due to the absence of retroflex apicals and /s/, which necessitated a lateral contrast. Finally, the lack of /ɬ/, /x/, and /χ/ as phonemes means that [VOICE] is no longer necessary as a contrastive feature.

The marked contrastive features are applied to the phoneme inventory in the following order to derive the hierarchy in (30) above:

\textsuperscript{17} See Comparative Eskimo Dictionary (Fortescue, Jacobson, & Kaplan, 1994) under č for examples.
(31) \([+\text{DORSAL}] > [+\text{BACK}], [+\text{LABIAL}] > [+\text{NASAL}] > [+\text{RTR}] > [+\text{CONTINUANT}]\)

In accord with the alternations mentioned above, this hierarchy differentiates /p/ and /w/, /k/ and /ɣ/, and /q/ and /ʁ/ with only the feature [+CONTINUANT]. While I have no direct evidence for /t/ alternating with /l/, I assume [+CONTINUANT] to differentiate them as well, solely on the basis of feature economy, unless the feature [+LATERAL] can be shown to be active in the phonology. In other words, /l/ is the least marked continuant, since its place of articulation is underspecified. The segments /ʧ/ and /j/ are differentiated only by the feature [+CONTINUANT] for the same reason.

Finally, below are the additional features required for the additional consonant allophones of Alutiiq:

(32) **Additional features on Alutiiq allophones**

\[
\begin{align*}
[k^w], [ɣ^w], [ʁ^w], \ldots, [+\text{LABIAL}] \\
[f], [s], [x], [χ], [ŋ], [ŋ], [ŋ] [h]^18, \ldots, [−\text{VOICE}] \\
[x^w], \ldots, [−\text{VOICE}], [+\text{LABIAL}] 
\end{align*}
\]

These allophones are arrived at by the spread of [+LABIAL] from an underlying /u/ or the spread of [−VOICE] from an adjacent segment (or due to prosodic or syllable-structure rules) or both, as in the case of [x^w]. As we might expect if devoicing is indeed a post-lexical rule, devoicing applies to all voiced phonemes without exception. Conversely, the spread of the marked contrastive feature [+LABIAL] does not extend to /ŋ/, /q/, or any of

---

18 However, if [l], [s], or other voiceless continuants are indeed phonemes in Alutiiq, as appears to be the case for [l] at least in CSY (as evidenced in footnote 4 above) such phonemic contrasts could be incorporated into this system by applying a phonemically contrastive [−VOICE] feature in the hierarchy, as was done for CSY.
the non-dorsal segments, as we might predict if this spread is dependent on the features of the target segment.

2.1.3 Central Alaskan Yupik (CAY)

2.1.3.1 The phonology of Central Alaskan Yupik

The consonant inventory of Central Alaskan Yupik (CAY) is more similar to that of CSY than Alutiiq. Jacobson (1990) notes that the only phoneme present in CAY that is lacking in CSY is /ʧ/ (p.277), however Dorais lists /z/ as well. Conversely, CAY lacks the labialized velar and uvular stops of CSY. Dorais (2003) summarises the inventory in the following table (p.22, modified to IPA and supplemented with information from Mithun 2001; see footnote 19):

(33)  CSY consonant inventory

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>ts/ʧ^{19}</th>
<th>k</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>l</td>
<td>z</td>
<td>j</td>
<td>y</td>
</tr>
<tr>
<td>f</td>
<td>ɬ</td>
<td>s</td>
<td>x</td>
<td>x^{w}</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ŋ</td>
<td>ŋ^{w}</td>
<td>ŋ</td>
</tr>
<tr>
<td>m̆</td>
<td>ŋ̆</td>
<td>ŋ̆</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However, as with CSY and Alutiiq, there is reason to believe that some of these segments are in fact allophones.

Once again for this Yupik language, it would appear that the labialized velars and uvulars are allophones of the plain velars and uvulars. Reed et al (1977) gives the following example of a word containing a labialized uvular, as in (34), which can

---
^{19} Mithun (2001) notes that the pronunciation of the segment represented in the orthography as ‘c’ can be either [ts] or [ʧ] (p.54).
alternatively be pronounced plain but with an overt /u/, as in (35) (p.6, with IPA added below the orthography):

(34) ‘uyaq\(\text{rr}\)ani’
    /ujaq\(\chi\)ani/
    ‘on his neck’

(35) ‘uyaq\(\text{rr}\)ani’
    /ujaq\(\chi\)ani/

The availability of (35) suggests that /u/ is present underlingly in words/morphemes that have labialized velars/uvulars on the surface. Thus, these labialized variants would appear to be allophones of the plain equivalents.

The voiceless nasals also appear to be allophones in CAY. After discussing the pronunciation of the voiced nasals in CAY, Reed et al (1977) state that “[v]oiceless nasals also occur in Yup’ik. This happens automatically when a nasal follows a stop or voiceless fricative” (p. 8). If interpreted exhaustively, this statement seems to suggest that this is the only environment in which voiceless nasals are found, and thus that they are allophones of the voiced nasals.

The status of the voiceless fricatives is more uncertain. As in the other Yupik languages, voiced fricatives routinely devoice when they are adjacent to voiceless segments. However, there are examples of single voiceless fricatives occurring intervocalically (Jacobson, 1995, pp. 2-3, 524, modified to IPA) (see also Jacobson 1984, p.6-7 for additional examples):

(36)

a) kuuf\(\text{i}\)aq
    ‘coffee’

cf. tuntu\(\text{v}\)ak
    ‘moose’

---

20 The apostrophe in the word ‘Yup’ik’ in the quote from Reed et al indicates (in the CAY orthography) that the ’p’ is geminate. This type of gemination does not occur in CSY.
b) afu-tuk
split-DEC.3DUAL
‘they two split up’
cf. avok
‘half’
c) asii-tuq
bad-DEC.3SG
‘it is bad’
cf. tfa-zit
do.what-INTERROG.2SG
‘what are you doing?’
d) maa-xun
this.(extended)-VIALIS.SG
‘this way’
(glossed using p. 82)
cf. iyq
‘letter’
e) atu-xu
use-2SG.3SG.IMPERATIVE
‘use it, wear it!’
(glossed using p.196-198)
cf. iʁuq
‘leg’
f) aɬa
‘other’
cf. ila
‘relative, part’
g) uɬuvak
‘cheek’
cf. uluaq
‘traditional woman’s knife’

While the [f] in a) above could be explained as being due to a separate loanword phonology, the remaining examples are problematic for the hypothesis that voiceless fricatives are allophones, since both voiced and voiceless fricatives routinely appear intervocally in similar environments. Unless the voiceless variants can be shown to be conditioned by specific prosodic environments or underlying segments at morpheme boundaries, they appear to be phonemic.

Finally, Reed et al (1977) note that [z] and [j] are “to a certain extent” (p. 318) in complementary distribution in CAY. They note that [z] occurs (i) before a consonant or schwa, (ii) when geminated inside a lexical base, (iii) after a morpheme boundary, (iv) when arising from geminate [t], and (v) “in a few lexical items where we would expect ‘j’” (p.318, modified to IPA). Conversely, [j] occurs (i) after a consonant, (ii) elsewhere
between vowels (i.e. when the second vowel is not schwa), and (iii) word-initially.

Despite the near complementary distribution of the two sounds, Reed et al insist that they are not allophones, focusing on the idiosyncratic cases. Jacobson (1985) and (1990) include this j/z alternation as part of a more general alternation between lenis and fortis segments in CAY. According to Jacobson, /v/ and [w] undergo similar alternations, as do /ʮ/ and [l]21 (1985, p. 32):

Each CY dialect in its own way alternates between “lenis” and “fortis” voiced fricatives, depending primarily upon phonological environment and secondarily upon morphological considerations. By “lenis” voiced fricatives is meant sonorant [w], [y], and [l], while the corresponding "fortis" voiced fricatives are [v], [z], and a lateral here represented [ʮ], which has a much stronger fricative rather than sonorant articulation than does lenis or sonorant [l].

While it could be the case that [z] and [j] are separate phonemes, each having the other sound as an allophone, given that Jacobson attributes this alternation to the same fortis/lenis distinction as [v]~[w] and [ʮ]~[l], whose pairs do not constitute separate phonemes, for the purposes of this paper I will set aside the exceptions mentioned by Reed et al and assume that [z] and [j] are allophones of a single phoneme. Their observations that the Hooper Bay – Chevak dialect collapses both sounds into [j] and that parts of the Yukon (Delta) dialect collapse both into [z] is further evidence that the contrast is not phonemic.

In addition, Jacobson (1985) notes that there is also a slight difference between fortis and lenis [y] and [k], which may suggest the existence of velar and uvular approximant allophones, given that the lenis variants above are all sonorant approximants.

21 A voiced lateral fricative.
Taking the above considerations into account, we have the following inventory of consonant phonemes and allophones:

\[
\text{(37) CAY consonant inventory}
\]

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{ts/ʧ} & \text{k} & \text{q} \\
\text{v} & \text{ʃ} & \text{z} & \text{ɣ} & \text{ɣʷ} & \text{ʁ} & \text{ʁʷ} \\
\text{[w]} & \text{[l]} & \text{[j]} & \text{[ɰ]} & \text{[ɹ]} \\
\text{f} & \text{ɬ} & \text{s} & \text{x} & \text{χ} & \text{χʷ} \\
\text{m} & \text{n} & \text{ŋ} & \text{[m]} & \text{[n]} & \text{[ŋ]} & \text{[ŋ̊]} & \text{[ŋ̥]} & \text{[n̥]} & \text{[ŋ̊]} & \text{[ŋ̥]} & \text{[ŋ̊]} & \text{[ŋ̥]}
\end{array}
\]

\[2.1.3.2 \text{Contrastive feature hierarchy for CAY consonants}\]

We will now examine which features should form part of the contrastive feature hierarchy for CAY consonants. As with CSY and Alutiiq, CAY also displays alternations between the stop series and voiced fricatives. Jacobson (1995) notes that nouns whose roots end in \[\text{ɣ} \text{ or } \text{ʁ}\] end in [k] and [q] in the “unpossesed absolutive singular” (p.29-30) which he terms their “citation form”. He gives the following examples (p.30, modified to IPA):

\[
\text{(38) } \text{kuiɣ} \rightarrow \text{kuik} \\
\text{river.ABS.SG} \\
\text{‘(the/a) river’}
\]

\[
\text{(39) } \text{nanvag} \rightarrow \text{nanvaq} \\
\text{lake.ABS.SG} \\
\text{‘(the/a) lake’}
\]

Reed et al (1977, p. 34) also note that [ɣ] or [ʁ] become stops word-finally, giving the following additional examples, among others (p.39-40, modified to IPA):

\[31\]
While neither Jacobson nor Reed et al discuss any \([p]\sim[v]\) alternations, this appears to be due to the fact that roots do not end in labials in CAY. In Reed et al.’s listing of root classes for nouns and verbs (pp. 21-22), the only possible root endings appear to be \([\gamma]\), \([\kappa]\), and vowels.

Once again, given that continuants appear to behave as a natural class in this and other dialects of Yupik, I will use the feature \([+\text{CONTINUANT}]\) to differentiate them from stops, while \([-\text{VOICE}]\) will distinguish the voiceless continuants.

Assuming that the labialized velars and uvulars in CAY are derived synchronically, as suggested by the examples from Reed et al in (34)-(35) above, we also have evidence for a \([\text{LABIAL}]\) feature. Given that this phenomenon only occurs on velars and uvulars, these two again appear to form a natural class, suggesting the feature \([+\text{BACK}]\).

In addition, since uvular consonants cause high vowels to become lowered or retracted (Jacobson, 1995, p. 5), we also have evidence that the feature \([\text{RTR}]\) (or an analogous feature) is active in CAY.
Given these features, the need to further differentiate the palatal and velar places of articulation from the others, and the overall similarity with CSY and Alutiiq inventories, I propose the following contrastive feature hierarchy for CAY consonant phonemes:

\[
\begin{array}{c}
\varnothing \\
([-\text{DORSAL}]) & [+\text{DORSAL}] \\
([-\text{LABIAL}]) & [+\text{LABIAL}] \\
([-\text{NASAL}])& [+\text{NASAL}] &([-\text{NASAL}])& [+\text{NASAL}] &([-\text{CONT}])& [+\text{CONT}] &([-\text{CONT}])& [+\text{CONT}] \\
/\text{n}/ & /\text{m}/ & /\text{ŋ}/ & /\text{ŋ}/ & /\text{ʃ}/ & /\text{s}/ & /\text{ʃ}/ & /\text{χ}/ & /\text{ʁ}/ & /\text{x}/ & /\text{ʁ}/ & /\text{χ}/ \\
/\text{t}/ & /\text{p}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ & /\text{ʔ}/ \\
\end{array}
\]

The main difference between this hierarchy and the preceding hierarchy for Alutiiq is the use of \([-\text{VOICE}]\) (as in CSY) to establish voicing contrasts. Like Alutiiq, CAY lacks the retroflex apical phoneme /\text{ɹ}/ of CSY. One further difference is that the redundant features of the phoneme contrastively marked as \([+\text{DORSAL}], [+\text{BACK}]\) yield /\text{z}/, instead of /\text{j}/ as in other dialects.

Notice that this hierarchy pairs /\text{t}/ with /\text{ɮ}/, the voiced lateral fricative, along with the other stop-continuant pairs, such as /\text{k}/\text{ʃ}/ and /\text{q}/\text{ʁ}/. Interestingly, in their introduction of the CAY sound system, Reed et al state that “[t]he fricative that corresponds to ‘t’ is ‘l’. It sounds like English ‘l’ except that the tongue is held flat and
higher in the mouth than in English” (p. 5). Furthermore, they note later that in at least one class of bases, “‘t’ changes to ‘l’” (p. 27) before three different classes of postbases. They give the following examples (ibid, IPA added on second line, glosses added on third line):

(42) ‘cukaite- + -ngaite-’ → ‘cukail-ngaite-’
   /tʃukaitə- + -ŋaitə-/ → [tʃukaɪɭ-ŋaitə-]
   be.slow-NEG
   ‘not be slow’

(43) ‘nallunrite- + (u)te-’ → ‘nallunril-ute-’
   /nəlunrɨtə- + (u)ʈə-/ → [nəlunɾiɭ-utə-]
   know-to.V.with
   ‘know each other’

(44) ‘agtunrite- + -gu’ → ‘agtu-nril-gu’
   /ɑxtunrɨtə- + -ɣu/ → [ɑxtʊ-nɾɪɭ-ɣu]
   touch-to.not.V-2 SG.3 SG.OPTATIVE23
   ‘don’t touch it!’

Given this alternation between /t/ and /ɭ/, their pairing in the contrastive feature hierarchy whereby they differ only in the feature [+CONTINUANT] seems justified. Notice that /t/ does not become /ɭ/ in this alternation since /ɭ/ is also contrastively marked as [−VOICE].

The following ordering of contrastive features was applied to the set of phonemes to derive the contrastive hierarchy:

---

22 Note that Reed et al does not make the distinction between [l] and [ɭ]. Based on the earlier discussion regarding the distribution of fortis [z] and lenis [j], and assuming [ɭ] and [l] to have a similar distribution, I have glossed Reed et al.’s “l” as [ɭ] in (42) and (44) where it occurs before a consonant and as [l] in (43) where it occurs between (non-schwa) vowels. However, Jacobson (1985, p. 32) notes that this phenomenon of lenition is conditioned by syllable structure and stress in the Norton Sound-Unaliq dialect of CAY.

This ordering differs from Alutiiq by adding [−VOICE]. Like Alutiiq, CAY lacks the features [±STRIDENT] and [±LATERAL] that were necessary for CSY. As with CSY and Alutiiq, additional variations of (45) are possible while maintaining the same contrastive feature specifications of the phonemes. Again, crucially, continuance is placed higher than voicing, so that the continuants will form a natural class. Also, while most contrastive features are positive, the negative value of the feature [VOICE] will be marked, again reflecting the fact that voicelessness is marked on those segments which exhibit a voicing contrast in CAY (i.e. voiceless fricatives).

In addition to differentiating the voiced and voiceless continuant phonemes, devoicing is again active at the post-lexical level. Miyaoka gives the following derivation which includes three examples of this devoicing (1985, pp. 61-63).

\[
\begin{array}{|c|c|}
\hline
\text{UR} & \text{ta.ŋəχ.tʃə.tɬ.aχ.tuq} \\
\hline
\text{Prosodic schwa deletion} & \text{ta.ŋəχ.tʃə.tɬ.aχ.tuq}^{24} \\
\text{Post-lexical devoicing} & \text{ta.ŋəχ.tʃə.tɬ.aχ.tuq} \\
\hline
\text{Surface form} & \text{ta.ŋəχ.tʃə.tɬ.aχ.tuq} \\
\hline
\end{array}
\]

In particular, the fact that the devoicing is ordered after the arguably late prosodically conditioned rule of schwa deletion by Miyaoka suggests that it is indeed post-lexical.

The sonorant/lenis allophones of the continuants, the voiceless nasal allophones, and the labialised velar allophones will have the following additional non-contrastive features:

\[24\text{ Miyaoka states that syncope is used to avoid an illicit (CV.Cɔ) foot.}\]
(47) **Additional non-contrastive features on CAY allophones**

\[
\begin{align*}
[w], [j], [l], [u̯], [r]: & \quad \ldots, [+\text{SONORANT}] \\
[m̥], [n̥], [ŋ]: & \quad \ldots, [-\text{VOICE}] \\
[y^w], [k^w], [x^w], [χ^w]: & \quad \ldots, [+\text{LABIAL}]
\end{align*}
\]

The sonorant/lenis allophones will arise in the environments described for [j] in Reed et al. earlier in this section, undergoing lenition via the insertion of the feature [+SONORANT]; the nasal allophones will occur after a voiceless consonant, arguably via the spread of [−VOICE]; and finally the labialised velars and uvulars result from an underlying /u/ which has spread its [+LABIAL] feature and then deleted.

### 2.2 Alaskan Inupiaq

Alaskan Inupiaq, part of the Inuit branch of Eskimo, and arguably a dialect of the Inuit language,\(^{25}\) is divided into two dialect groups; North Alaskan Inupiaq and Seward Peninsula Inupiaq, each of which consist of two subdialects. These subdialects can also be subdivided, as shown in the diagram below (Kaplan 1990, Dorais 2003):

---

\(^{25}\) See Kaplan (1990) and Dorais (2003) for arguments for an Inuit language consisting of the Inuit branch of Eskimo.
Glossing over the differences between the subdialects, Kaplan (1990) presents the following consonant system for Inupiaq (p.150, modified to IPA):

---

26 While Dorais (2003) includes Teller as part of Qawiiaraq, as reflected in the chart above, Kaplan (1990) includes it as part of the Bering Strait subdialect. Dorais also notes that the population of King Island has relocated to Nome, where the King Island dialect is now spoken. Finally, Dorais points out that while Uummarmiutun has been influenced by Malimiutun and Siglitun, it remains a North Slope variety, imported into the western Canadian arctic from Nunamiut by the migration of several families.
Kaplan notes that [z] and [w] are found only in Seward Peninsula dialects, while the palatal series (except [j]) are only found in the North Alaskan dialects.

Dorais (2003) presents a slightly smaller inventory, lacking [z], [w], and the voiceless velar and uvular fricatives, but with [v] and [f] added (p.42, modified to IPA and organized to mirror Kaplan’s inventory):

(50) Consonant Inventory from Dorais (2003)

| p | t | ɾ | k | q | ʔ |
| v | j | ɾ | l | ʎ | ʁ |
| f | s | ɾ | ɬ | ʃ | h |
| m | n | ɲ | ɳ |
| w | ɭ | j |

In order to identify the phonemes and allophones of the subdialects, see the differences in the use of contrastive features between the subdialects, and simplify the presentation of the relevant phenomena, I will examine the four subdialects separately in the following sections.

First, let us note that the stop-continuant alternations are also present in these dialects. Dorais gives the following examples from the Uummarmiutun subdialect of North Slope (pp. 48-50):

---

27 Dorais notes that [f] appears only in Uummarmiutun. However, Kaplan (1985) includes it as an allophone of /v/ in King Island Bering Strait.
Dorais notes that “except for differences due to the phonological characteristics of Inupiaq, these endings are generally almost the same as in other Inuit speech forms” (p. 47) suggesting the alternations are present in all Inupiaq.

28 Unfortunately, Dorais does not give any examples using the same inflectional ending in the two environments (after a consonant and after a vowel). However, in all Inuit dialects the declarative (‘participial’ in the literature) endings exhibit alternations between /t/ and the modern reflex of *ð. Furthermore, this initial t~*ð segment appears to be the declarative/participial exponent. Similarly, for the p~v alternation, Dorais’ examples do not contain two instances of the same inflectional ending, let alone the same ending in the two conditioning environments. However, once again, the p~v segment itself appears to be the indicative exponent, with the rest of the ending encoding transitivity, person, and number.
2.2.1 Bering Strait

2.2.1.1 The phonology of Bering Strait Inupiaq

As mentioned above by Kaplan (1990) (and in Dorais 2003) Bering Strait (along with Qawiaraq) lacks the palatalised coronals found in North Alaskan Inupiaq. However, Bering Strait instead possesses a complex system of consonant gradation in which certain segments are lenited after unstressed syllables. Kaplan (1990) gives the following examples of consonant gradation in Bering Strait Inupiaq (p.146, modified to IPA):

(55) \( \text{nir} \) \( \text{r} \) \( \text{i} \) cf. \( \text{nir} \) (in other dialects)

‘meat’

(56) \( \text{iwalu/ialu} \) cf. \( \text{iwalu} \) (in other dialects)

‘sinew’

Kaplan (1985) summarises the changes involved in consonant gradation in the King Island variety of Bering Strait as follows (p.196, modified to IPA):

(57) King Island consonants and alternants derived by Consonant Gradation

\[
\begin{array}{ccccccc}
\text{p} & \text{t} & \text{[f]} & \text{[l]} & \text{k} & \text{q} & \text{ʔ} \\
\text{v} & \text{l} & \text{s} & \text{[x]} & \text{[χ]} & \text{∅} & \text{∅} \\
\text{m} & \text{n} & \text{ŋ} & \text{[N]} & \text{∅} & \text{∅} & \text{∅}
\end{array}
\]

In sum, the stops /p/, /k/, and /q/ become their voiced fricative counterparts, [v], [ɣ], and [ʁ]; voiceless fricative phonemes /f/ and /s/ become voiced [l] and [z]; and voiced

\[\text{[w]}\] voiceless fricative phonemes /h/ and /s/ become voiced [l] and [z]; and voiced

\[\text{[w]}\]

---

29 Given the footnotes and discussion in Kaplan (1985) of [f], [w], [l], [z], [x], [χ], and [N] as either allophones ([f], [N], and [l]), solely the products of consonant gradation ([w] and [z]), or “rare” and occurring only in geminates or clusters ([x] and [χ]), I have placed these sounds in square brackets.

30 Kaplan’s statements suggest that, for instance, underlying /p/ would become [v] while underlying /v/ would become /w/. However, notice that in (62) below the final /q/ of the morpheme -qaq ‘have’ deletes as part of a consonant cluster. (See also footnote 31 below).
fricatives become their approximant counterpart (i.e. /v/ → [w]) or delete, as does the glottal stop. In addition to deleting, Dorais notes that [ɣ] and [ʁ] sometimes lenite to [j] (p. 46). Given this addition from Dorais, the changes can be summarised as follows:

\[
\begin{align*}
\text{(58)} & \quad \begin{cases}
q \to k \\
k \to \gamma \\
p \to v \\
s \to z \\
\ell \to l
\end{cases} / \sigma_{\text{unstressed}}
\end{align*}
\]

\[
\begin{align*}
\text{(59)} & \quad \begin{cases}
\gamma \\
\kappa
\end{cases} \to \begin{cases}
\emptyset \\
j
\end{cases} / \sigma_{\text{unstressed}}
\end{align*}
\]

\[
\text{(60)} & \quad \begin{cases}
v
\end{cases} \to \begin{cases}
\emptyset \\
\w
\end{cases} / \sigma_{\text{unstressed}}
\]

Dorais also cites the following examples to illustrate this alternation (p. 46), which were first observed in Krauss (1985, pp. 23, modified to IPA, stress marks added):

\[
\begin{align*}
\text{(61)} & \quad \text{mán.ník} + -qaq- + -tu \rightarrow \text{mán.ní-
\qquad \text{ráq-} - tūt} \rightarrow \text{egg have} \rightarrow \text{DEC.1PL} \rightarrow \text{egg-have-DEC.1PL} \rightarrow \text{‘we have eggs’}
\end{align*}
\]

\[
\begin{align*}
\text{(62)} & \quad \text{ma.ník} + -qaq- + -tu \rightarrow \text{má.ní-
\qquad \text{qā-tū} . yūt} \rightarrow \text{money have} \rightarrow \text{DEC.1PL} \rightarrow \text{money-have-DEC.1PL} \rightarrow \text{‘we have money’}
\end{align*}
\]

Thus, the difference in stress between \textit{mannik} ‘egg’ in (61) and \textit{manik} ‘money’ in (62) causes lenition to occur on different segments as stressed as unstressed syllables alternate across the two derived words beginning on different syllables.\footnote{The form /qaa/ in (62) further exemplifies that unstressed syllables can even lose their codas. Dorais notes that due to this phenomenon “[consonant] clusters may lose their first element” (p.46). Consonant cluster simplification is discussed in detail in Kaplan (1985).}

\footnote{Kaplan (1985, pp. 193-4) argues that alternating “strong” and “weak” (not stressed and unstressed) syllables determine the targets of consonant gradation and that stress is determined after gradation. See also Kaplan 1985 for a detailed discussion of the environments in which consonant gradation occurs, instances of dialectal variation, and its application to consonant clusters.}
Moving on to the topic of the phonemic inventory of Bering Strait, as discussed in Kaplan (1985), [z] and [w] “exist solely as the output of [consonant gradation]” (p. 197) suggesting that both are allophones of /s/ and /v/, respectively.

Furthermore, [ɹ̥] appears to be a voiceless allophone of /ɻ/. Dorais states that /ɻ/ surfaces as [ɹ̥] after voiceless stops (p. 44) and Kaplan (1985, p. 195), in his discussion of consonant gradation, observes that [ɹ̥] does not occur intervocally.

Kaplan also states that “[f] is an allophone of /v/ which occurs in clusters with voiceless stops” and that “[n] is an allophone of /ʁ/ which occurs in clusters with nasals” (ibid, modified to IPA, angled brackets added).

In addition, [x] and [χ] appear to be allophones of the phonemes /ɣ/ and /ʁ/.

Kaplan notes that the two voiceless sounds are “rare but may occur long or in clusters” (ibid) but a subsequent table of “surface consonant clusters” reveals that they only appear long or after [ɭ] (p. 197) and that the geminate sequences are labelled “rare”. Given the highly restricted distribution of the voiceless back fricatives, I contend that they too are allophones of their voiced counterparts. Moreover, it is interesting that these voiceless variants can only appear in (non-geminate) clusters after [ɭ], given that /ɭ/ is the only phoneme which differs from another phoneme in voicing alone. That only the voiceless lateral can spread [–VOICE] to a subsequent back continuant suggests that perhaps only the laterals are contrastively marked for voicing, while the devoicing of the other

---

34 Dorais also notes instances of [x] and [χ] from underlying /kh/ and /qh/ sequences in other Inupiaq dialects.
35 According to the table of consonant clusters in Kaplan (1985), neither /ɣ/ nor /ʁ/ occurs with /s/. The only clusters containing /s/ are /ps/, /ks/, /qs/, and /ss/.
continuants is governed by post-lexical rules requiring that adjacent consonants agree in voicing. Conversely, it may only be an accidental gap that /ɣ/ and /ʁ/ do not follow other voiceless consonants. Unfortunately, Kaplan lists only “surface clusters” so it is difficult to know whether sequences such as [lv] and [ll] could begin with an underlying /ɬ/.

Another problem posed by Kaplan’s table of consonant clusters is that in all of the attested surface clusters, the voicing of the first segment appears to determine the voicing of the entire cluster. It may be that the [lx] and [lχ] sequences are merely created by the same post-lexical rule as the other sequences.

Finally, the glottal stop does not appear to be a phoneme in this dialect, but rather some type of epenthetic device. Dorais states that it appears inside consonant clusters when the first consonant is a stop (p. 42):

(63) ikʔniq
     ‘fire’

Interestingly, Kaplan (1985) notes that the “only instance when members of a cluster differ in voicing is when a stop is followed by /j/ or a nasal. In such clusters, a glottal stop is present between the consonants” (p. 197, modified to IPA). Thus the glottal stop (or perhaps glottalization on the first member of the cluster) appears to either prevent or repair an otherwise illicit mixed-voicing cluster. Kaplan also discusses instances of intervocalic glottal stops but Dorais (for neighbouring dialects) categorizes these as allophones of /k/.
2.2.1.2 Contrastive feature hierarchy for Bering Strait

We must now decide which feature or set of features is responsible for consonant gradation in this dialect. While it may appear that the lenition pattern in (58) above whereby voiceless stops become voiced continuants and voiceless continuants become voiced could be explained solely with the feature [+VOICE], notice that it is only those alternations involving a change in continuance whose continuant counterparts are eligible to become approximants or undergo deletion (as in (59) and (60) above); [v], [ɣ], and [ʁ]. In other words, only those segments which appear to be contrastively [+CONTINUANT] undergo deletion when lenited. Rather, only the coronal segments are clearly becoming contrastively voiced. Furthermore, Kaplan observes that when [t] is in the appropriate environment for consonant gradation it “produces a lenis allophone, which is at least partly voiced” (p. 195). It would seem that lenition is expressed differently on coronal segments than on segments with contrastively marked (non-coronal) places of articulation. Coronal segments undergo voicing while non-coronals are made continuant or, if they are already continuant, are made approximant/sonorant or deleted. The fact that voiced coronal continuants such as [ɾ] and [l] do not undergo any type of lenition (e.g. deletion) is further evidence for a distinct treatment of coronals and non-coronals with respect to lenition. I propose that the two features involved in the first step of lenition are [+VOICE] for coronals and [+CONTINUANT] for other places of articulation, while the feature responsible for leniting [v] to [w] as well as [ɣ] and [ʁ] to [j] is [+SONORANT].

36 However, note that in the system that I am proposing [+SONORANT] is not part of the contrastive feature specification of /j/, but rather a feature of the allophone [j] of both /ɣ/ and /ʁ/. While it could be seen as problematic that a non-contrastive feature is being inserted to lenite [v] to [w] and [ɣ] and [ʁ] to [j], it could
As with other dialects of Inuktitut (and Yupik), uvulars cause lowering or retraction of high vowels which points to the feature [+RTR]. With regards to a feature with which to differentiate velars and uvulars, Kaplan (1985) observes that “back stops (velars and uvulars) never cluster with other back stops, even underlyingly” (p. 196), suggesting the two places of articulation share a similar set of features. I posit a common feature [+BACK] and a constraint against adjacent non-homorganic [+BACK] segments.

Once again, [+LABIAL] seems to be a sensible choice for distinguishing labials from coronals, leaving coronal as the unmarked/default place of articulation. Similarly, the feature [+NASAL] seems appropriate to distinguish the nasals.

Among the coronals, /t/ appears to alternate with /ɹ/ in certain environments, as in the following example from Kaplan (1985, p. 198; modified to IPA):

(64)  tiɣɪvɪk
      tiɣɪt+vik
      arrive-location
      ‘time or place of arrival’

Without any evidence of similar alternations between /t/ and /s/, /t/ and /ɬ/, or /t/ and /ɬ/, I will assume /ɹ/ to be the [+CONTINUANT] partner of /t/.

Finally, we will need features to distinguish /s/ and the two laterals from /ɹ/, as all are coronal continuants. I propose the features [+STRIDENT] and [+LATERAL].

---

37 We also could have used the feature [−VOICE] to differentiate /s/ from /ɬ/. However, this would mean that the allophone [z] of /s/ would have one of its contrastive features reversed by lenition. Furthermore, the table of surface consonant clusters in Kaplan does not include any examples of /s/ spreading voicelessness to a subsequent segment.
Using these features we can construct the following contrastive feature hierarchy for the phonemes of Bering Strait Inupiaq:

(65)  **Contrastive feature hierarchy of Bering Strait Inupiaq Phonemes**

\[ \varnothing \rightarrow \{ [−DORSAL] \rightarrow \{ [−LABIAL], [+LABIAL] \rightarrow \{ [−BACK], [+BACK] \rightarrow \{ [−NASAL], [+NASAL], [−NASAL], [+NASAL] \rightarrow \{ [−LAT], [+LAT], [−CONT], [+CONT] \rightarrow \{ [−RTR], [+RTR] \rightarrow \{ [−STRID], [+STRID] \rightarrow \{ /t/, /l/ \rightarrow /k/, /ɣ/ \rightarrow /q/, /ʁ/ \rightarrow /ɹ/, /s/ \rightarrow /n/, /m/ \rightarrow /j/, /y/ \rightarrow /i/, /u/ \rightarrow /ɪ/, /ʊ/ \} \} \} \} \] 

Notably, this feature hierarchy is quite similar to those constructed for the Yupik dialects. It is particularly similar to that of CSY, having only /s/ instead of /z/ as the realization of the sole strident phoneme. Furthermore, in Bering Strait voicing is not phonemically contrastive on the back continuants, as in CSY. Thus, by merely changing the redundant voicing feature on the [+CONT, +STRIDENT] segment and eliminating the voicing contrast on the back continuants, we arrive at the Bering Strait system from the CSY system. Furthermore, the very same ordering of contrastive features can be applied to Bering Strait as was done for CSY:

(66)  \([+DORSAL] > [+BACK], [+LABIAL] > [+NASAL], [+LATERAL] > [+RTR] > [+CONT] > [+STRIDENT] > [−VOICE].\]

As with the dialects of Yupik, some variation of the ordering of features is possible. For instance, [+LATERAL] could be applied after [+CONTINUANT] or [+STRIDENT] could be applied before either [+LATERAL] or [+CONTINUANT].
As in Yupik, we observe that the alternations in Bering Strait can best be characterized as being between the stops and their contrastively [+CONTINUANT] counterparts. Although the voicing/lenition of coronals which exists in this dialect and Qawiaq will require an additional rule, the morphophonemic alternations and prosodically-conditioned consonant gradation between stops and continuants can be explained as the insertion or deletion of the contrastive feature [+CONTINUANT].

2.2.2 Qawiaq

According to Dorais (2003, pp. 44, 46), Qawiaq has essentially the same system as Bering Strait, including the phenomena of consonant gradation. He even notes that some consider the two as “only forming one dialect” (p. 41). However, one notable difference is the realization of Proto-Eskimo *ʧ. While in Bering Strait *ʧ is realized as /s/ (or its allophone [z]), in Qawiaq it is realised as /ʧ/ (at least word-initially and intervocally). Dorais provides the following examples (p. 44; modified to IPA):

(67)  
Bering Strait: sawik uzuk iziq  
Qawiaq: tʧawik tʧuk tʧiq

Since /ʧ/ is clearly not [+CONTINUANT], we will need to amend the hierarchy in some way. In particular, I believe this difference between Qawiaq and Bering Strait can be accommodated if the contrastive feature hierarchy for Qawiaq distinguishes between [+CONTINUANT] and [−CONTINUANT] palatal (i.e. [+BACK]) consonants instead of employing the feature [STRIDENT], as in Bering Strait. Thus, the contrastive hierarchy for Qawiaq is as follows in (68) below:
Accordingly, the historical change from PE *ʧ to /s/ in other dialects (such as Bering Strait) can be seen in part as the change from the feature [STRIDENT] being a redundant feature of *ʧ to being a contrastive feature, along with the loss of [−BACK] (and possibly the addition of [+CONTINUANT], depending on the position of [+STRIDENT] in the hierarchy).

2.2.3 Malimiutun

Malimiutun lacks the system of consonant gradation found in Bering Strait and Qawiaraq. Instead, it possesses a series of palatal allophones that surface after Proto-Eskimo *i (Dorais, 2003, p. 46). The phonemes /t/, /l/, /ɬ/, and /n/ palatalize to [ʧ], [ɭ], [ɭ̥], and [ɲ] in this environment.

Dorais also notes that Proto-Eskimo *ʧ surfaces as [s] word-initially and after *i, as [ʧ] after /t/, and as [ɭ] elsewhere. He provides the following examples (p. 44; modified to IPA):

(68) Contrastive feature hierarchy of Qawiaraq Inupiaq Phonemes
Furthermore, Proto-Eskimo *ð is realised as [ɨ] intervocally and as [ʒ] in clusters.

Given that the contemporary realizations of *ʧ and *ð remain in complementary distribution, I assume these overlapping sets of allophones to belong to two phonemes; /s/ and /ʃ/ as follows.

\[
\begin{array}{c}
/s/^{38} \\
[ʃ]
\end{array}
\]

Despite the presence of these allophones, Malimiutun appears to have the same contrastive hierarchy of phonemes as Bering Strait, repeated below from (65) above, but now for Malimiutun:

\[
\begin{array}{c}
\text{Contrastive feature hierarchy of Malimiutun Phonemes} \\
\emptyset \\
(\neg[DORSAL]) \\
(\neg[LABIAL]) [+LABIAL] \\
(\neg[NASAL]) [+NASAL] \\
(\neg[LAT]) [+LAT] (\neg[CONT]) [+CONT] \\
(\neg[STRID]) [+STRID] \\
/s/ \\
\end{array}
\]

\[
\begin{array}{c}
\text{Contrastive feature hierarchy of Malimiutun Phonemes} \\
\emptyset \\
(\neg[DORSAL]) \\
(\neg[LABIAL]) [+LABIAL] \\
(\neg[NASAL]) [+NASAL] \\
(\neg[LAT]) [+LAT] (\neg[CONT]) [+CONT] \\
(\neg[STRID]) [+STRID] \\
/s/ \\
\end{array}
\]

38 It is also possible that the underlying phoneme corresponding to *ʧ is /ʧ/, with [ʃ] being produced through assimilation word-initially and after *i. In this case, the contrastive hierarchy for Malimiutun would be identical with Qawiaraq instead of Bering Strait.
The palatalized allophones also possess an additional feature which is spread from etymological *i; most likely the feature [+FRONT]. The features for the palatalized allophones using [+FRONT] are listed below:\(^{39}\)

(72) **Contrastive features of Malimiutun palatalized allophones**

- [ʧ]: [+FRONT]
- [ɬ]: [+LATERAL], [+FRONT]
- [ɭ]: [−VOICE], [+LATERAL], [+FRONT]
- [ɲ]: [+NASAL], [+FRONT]

If we assume that etymological /i/ is contrastively marked [+FRONT] (while /i/ arising from *ə is underspecified) (cf. Archangeli & Pulleyblank 1994), we can maintain the assumption that only contrastive features are active in the phonology. It may be that only coronals are susceptible to this palatalization given that the coronal place of articulation is unmarked in the hierarchy above.

### 2.2.4 North Slope

Like Malimiutun, North Slope lacks the consonant gradation of Bering Strait or Qawiaraq but possesses palatalization of alveolars after PE *i (Dorais, 2003, p. 46). The principal difference between the consonant systems of Malimiutun and North Slope appears to be the presence of [h] in the Uummarmiutun and Anaktuvuk Pass varieties of North Slope. Dorais provides the following examples of the distribution of [s] and [h] (pp. 44-45):

---

\(^{39}\) Note that there are no palatalized allophones of either /s/ or /ɹ/ since the former is already the result of assibilation of *ʧ* by *i* while /ɹ/, occurring elsewhere, does not arise after *i.*
However, as in Malimiutun, we also observe other reflexes of PE *ʧ after stops in both the s-dialects and h-dialects of North Slope (p. 45):

(74)  

natʧiq  ‘seal’
qaqʪauq  ‘red-throated loon’
sikʪik  ‘ground squirrel’

Given the limited distribution of these variants ([ʧ] after /t/ and [ʃ] after other stops), this data suggests virtually the same allophonic system as in Malimiutun, with the exception that [h] replaces [s] in Uummarmiutun and Anaktuvuk. On one hand, it may be that underlying /s/ undergoes synchronic debuccalization to [h] in all environments, while maintaining the contrastive feature [+STRIDENT]. Conversely, if /h/ is found to be underlying in this dialect, we would need to add a new feature to our hierarchy such as [+GLOTTAL].

One other minor difference between Uummarmiutun and other varieties of Alaskan Inupiaq is the presence of the allophone [f] which occurs when the clusters /ps/ and /vs/ coalesce into [ff] (p. 45). I assume this to be a post-lexical change.40

Otherwise, North Slope has the same set of phonemes the same contrastive hierarchy as Malimiutun and Bering Strait presented above.

---

40 However, if we were to use [−VOICE] to differentiate /s/ from /ʃ/ in this dialect, we could account for this coalescence in terms of contrastive features; [−VOICE] spreading from /s/ to /v/ and [+LABIAL] spreading from /v/ to /ʃ/.
2.3 Western Canadian

According to Dorais (1990, p. 214), all Canadian dialects of Inuit possess the same set of voiceless stops (/p/, /t/, /k/, and /q/) and nasals (/m/, /n/, and /ŋ/). Thus, the differences between these dialects are found among the remaining continuants. In the following subsections I examine these differences, beginning with the Western Canadian dialects.

2.3.1 Siglitun

2.3.1.1 The Sound System

Dorais gives the following consonant inventory for Siglitun (2003, p. 62; modified to IPA):

(75) Siglitun Consonant Inventory from Dorais (2003)

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>l</td>
<td>j/dʒ</td>
<td>y</td>
</tr>
<tr>
<td>ɬ</td>
<td>s/ʃ</td>
<td>m</td>
<td>n</td>
</tr>
</tbody>
</table>

His discussion of the sounds (as well as the discussion in Lowe 1985b) reveals that [dʒ] and [ʃ] are allophones of /j/ and /s/, respectively.

2.3.1.2 The Alternations

As in other dialects of Canadian Inuit, Siglitun stops alternate with their voiced continuant counterparts. The alternation between /ʁ/ and /q/ as well as /y/ and /k/ can be
seen in the stem-internal gemination that occurs in many dual and plural forms (Lowe, 1985b, pp. 40-41; modified to IPA): 41

(76) /ʁ/ ~ /q/:

a) amaʁuq amaqqu-k amaqqu-t
   wolf wolf-DUAL wolf-PL

b) nutaʁaq nutaqqa-k nutaqqa-t
   child child-DUAL child-PL

c) ujaʁak ujaqqu-k ujaqqu-t
   stone stone-DUAL stone-PL

(77) /ɣ/ ~ /k/:

a) putuɣuq putukku-k putukku-t
   big.toe big.toe-DUAL big.toe-PL

b) tuluɣaq tulukka-k tulukka-t
   raven raven-DUAL raven-PL

c) itiɣak itikka-k itikka-t
   foot foot-DUAL foot-PL

Notice that these changes are not merely due to phonotactic constraints, as geminate voiced continuants and single intervocalic voiceless stops are both present in the language, as exemplified below (p. 42):

(78) niɣaq niyya-k niyYa-t
   snare snare-DUAL snare-PL

(79) uɣaq uqqqa-k uqqqa-t
   tongue tongue-DUAL tongue-PL

41 It is not evident in these examples whether the voiced continuant is underlying, losing its [+CONTINUANT] feature and geminating in the dual and plural forms, or whether the stop is underlying and lenites in the singular ungeminated intervocalic environment.
Although there are no examples of /v/ and /p/ alternating within stems, we observe the two alternating in the interrogative inflectional morphemes, with /v/ forms occurring after vowels and /p/ forms after consonants (pp. 149-150):

(80) iluʁʁi-vit?
    be.right-INTERR.2SG
    ‘are you right?’

(81) nalaut-pit?
    guess.right-INTERR.2SG
    ‘did you guess right?’

Furthermore, we observe /v/~/p/ alternations in a number of other suffixes in the same environments, such as -valuk ‘be heard’:

(82) qia-valuk-tuaq
    cry-be.heard-DEC.3SG
    ‘he was heard crying’

(83) qamʁuq-paluk-tuaq
    snore-be.heard-DEC.3SG
    ‘he was heard snoring’

Finally, /j/ and /t/ alternate in the same environments in the declarative inflectional morphemes (p. 118):

(84) jaka-juana
    be.tired-DEC.3SG
    ‘he/she/it is tired’

(85) aullaq-tuaq
    leave-DEC.3SG
    ‘he/she/it left’

---

42 Lowe (1984)’s Siglit dictionary (which lists irregular dual and plural forms such as those in (76)-(77) above) contains no examples of a /v~/p/ alternation within roots. However, relevant inputs appear to exist. For instance, aiviq ‘walrus’ becomes aivvik ‘two walruses’ in the dual (although the plural aivrit ‘walruses’ is exceptional) (p. 1).

43 This is one of a small set of roots in Siglitun that begins with /j/. Such /j/-initial forms are unusual in Inuit, existing only due to borrowings in most dialects (see also Dorais 2003, p. 61).
As with the Inupiaq dialects discussed above, these alternations all involve stops and their corresponding continuants, again suggesting the feature [CONTINUANT] is responsible. Since the alternations are the same in the other Western Inuit dialects, they will not be repeated in the Innuinnaqtun and Natsilingmiutut sections below.

Interestingly, we also observe these stem-internal alternations between /s/ and [ʧ]
and between /j/ and [ʤ]:

(86) /s/ ~ [ʧ]:

a) kiasik     kiattʧi-k     kiattʧi-t
    shoulder.blade shoulder.blade-DUAL shoulder.blade-PL

b) tasiq      tattʧi-k     tattʧi-t
    lake         lake-DUAL     lake-PL

c) nasaq      natʧa-k      natʧa-t
    parka.hood   parka.hood-DUAL parka.hood-PL

(87) /j/ ~ [ʤ]:

a) qajaq      qaddʧa-k     qaddʧa-t\[44\]
    kayak        kayak-DUAL     kayak-PL

b) kanajuq    kanaddʧu-k    kanaddʧu-t
    sculpin     sculpin-DUAL   sculpin-PL

Although Dorais states that /s/ becomes [ʧ] after /t/, it’s not clear why /t/ would be inserted in the examples in (86) above, given that we expect gemination in this

\[44\] Although Lowe writes this geminate as ‘tdj’, in Lowe (1984, p. xxi) he states that [ʤ] “can also be found doubled or preceded by consonant /t/. In both these cases, it is written tdj.” I assume in these cases of stem-internal gemination, that the sequence is [dʤ], essentially a geminate [ʤ]. Further evidence for this is Dorais’ choice of ‘jj’ to represent the sequence (p. 63).
environment. Instead it appears that either /s/ has geminated to [ss]\(^{45}\) and then become [ttʃ] (a geminate [tʃ]), or, conversely, that /s/ has become [tʃ], which has then geminated to [ttʃ]. Similarly, the instances of [ddʒ] in (87) appear to be geminate [dʒ].\(^{46}\) It would be preferable if the feature [CONTINUANT] were to differentiate the members of these two pairs as well, however, given the alternation presented above between /j/ and /t/, it appears that another feature must be selected. I propose that the feature [DELAYED RELEASE] be used to distinguish /s/ and /j/ from their affricate allophones.\(^{47}\)

### 2.3.1.3 Analysis

Once again, I propose a similar set of features for Siglitun as was proposed for the Inupiaq dialects. The features [NASAL] and [LATERAL] seem reasonable, as do [LABIAL], [DORSAL], and [RTR] for the non-coronal places of articulation. The feature [VOICE] remains the only viable choice for distinguishing /ɬ/ and /l/. Once again I will use [STRIDENT] for /s/. However, we no longer need the feature [BACK]. While Inupiaq has maintained a distinction between the synchronic realisations of Proto-Eskimo *j and *ð, these have been collapsed together in Siglitun, arguably due to the loss of the feature

---

\(^{45}\) In Lowe (1984, p. xxi) the set of geminate consonants are listed with examples. Notably, /ss/ is not included.

\(^{46}\) However, there also exist instances of [ttʃ] and [ddʒ] which do not appear to be due to gemination. Lowe (1984, p. xxi; modified to IPA) gives the following examples of [ttʃ] where other Inuit dialects have /ts/: (i) iuytʃaq nattʃiq

- ‘bee’
- ‘seal’

Similarly, he provides examples of [ddʒ], although these may have been geminates etymologically (p. xxii): (ii) kidʒaun cf. P.E. *kiːðːiːs - ‘sweat’ (Fortescue, Jacobson, & Kaplan, 1994, p. 174)

- ‘fever’

\(^{47}\) Unfortunately, I am not able to provide a complete analysis of dual/plural formation. While some roots merely take –k and –t to form the dual and plural, others also geminate the penultimate consonant, while another set elongate the final vowel before the dual and plural suffixes. For some roots, the dual will follow one of these patterns while the plural follows another.
 Consequently, *j and *ð, merged as /j/, which has become the continuant counterpart of /t/, as illustrated below:

\[\text{Contrastive feature hierarchy for Siglitun consonant inventory}\]

As suggested above, [ʧ] and [ʤ] have the following contrastive feature specifications:

\[\text{ʧ}: [+STRIDENT], [+DELAYED RELEASE]\]
\[\text{ʤ}: [+DELAYED RELEASE]\]

Notice that the feature [+CONTINUANT] is not present in [ʤ]. It may be that the features [+CONTINUANT] and [+DELAYED RELEASE] are incompatible or contradictory, leading to the deletion of the former feature.

With very few changes to the contrastive feature hierarchies proposed for Inupiaq, we have arrived at a hierarchy for Siglitun which accounts for the differences between Inupiaq and Siglitun. Furthermore, as in Inupiaq, the stops all appear to alternate with a contrastively [+CONTINUANT] counterpart. Moreover, despite the different counterparts of /t/ in Siglitun and Inupiaq, both alternants share the feature [+CONTINUANT]; a trend that will continue in the other dialects of Inuit examined below.
2.3.2 Inuinnaqtun (Kangiryuarmiut)

Inuinnaqtun has essentially the same system of phonemes as Siglitun, except that both /l/ and /s/ have been replaced by /h/. Dorais give the following inventory Dorais (2003, pp. 63; modified to IPA, brackets added around allophone [f]):

(90) Inuinnaqtun Consonant Inventory from Dorais (2003)

\[
\begin{array}{cccccc}
 p & t & k & q \\
 v & l & j & \gamma & \emptyset \\
 [f] & h \\
m & n & \eta \\
\end{array}
\]

Since /h/ is not strident, another feature will be required to differentiate it from the other phonemes. Since /h/ has replaced both voiceless continuants, one possibility is \([-\text{VOICE}]\).

Assuming this to be the case, we arrive at the hierarchy below:\(^{48}\)

(91) Contrastive feature hierarchy for Inuinnaqtun consonant inventory

\[
\begin{array}{c}
\emptyset \\
(+\text{DORSAL}) \\
\(-\text{DORSAL}) \\
(+\text{LABIAL}) \\
\(-\text{LABIAL}) \\
(+\text{NASAL}) \\
\(-\text{NASAL}) \\
(+\text{LAT}) \\
\(-\text{LAT}) \\
(+\text{CONT}) \\
\(-\text{CONT}) \\
(+\text{VOICE}) \\
\end{array}
\]

Having /h/ marked only as \([+\text{CONTINUANT}]\) and \([-\text{VOICE}]\) without any contrastive place feature, we might predict that it will assimilate to other places of articulation. This turns out to be correct; the sequences /ph/, /kh/, and /qh/ become [ff], [xx], and [χχ].

\(^{48}\) This is perhaps more evidence that /s/ could in fact be \([-\text{VOICE}]\) in other dialects instead of \([+\text{STRIDENT}]\).
respectively, with /h/ assimilating to the place of articulation of the preceding consonant. Furthermore, these consonants take on the continuancy of /h/. Consider the following examples from Dorais (2003, p. 61; modified to IPA based on his descriptions):^49,50

(92) $\text{uχχuq}$ (cf. Siglitun: uqsuq) ‘blubber’

(93) $\text{utkuhixxaq}$ (cf. Siglitun: utkusiksaq) ‘soapstone’

(94) $\text{pitixxik}$ (cf. Siglitun: pitiksivialuk) ‘bow’

(95) $\text{pifi}$ (cf. Siglitun: pipsi) ‘dried fish’

Furthermore, the contrastive features on /h/ (and only those features) spread to the preceding consonant. Since /k/ and /q/ are already voiceless, the spread of $[-\text{VOICE}]$ does not affect them. However, when both $[+\text{CONTINUANT}]$ and $[-\text{VOICE}]$ spread to a preceding /p/, [f] is produced, instead of /v/, as we might predict. Notably, this is the only environment in which [f], [x], and [χ] surface in Inuinnaqtun, further confirming that voicelessness is contrastive on /h/.

^49 See also Lowe (1985a, pp. 232-233).
^50 While Dorais does not specifically address the issue of whether these sequences are being derived synchronically, forms such as [utkuhixxaq] ‘soapstone’ and [upirnraaq] ‘springtime’ both appear to contain the nominalizer $-\text{haq}$. Spalding (1998)’s dictionary of the Aivilik dialect lists both /ukusik/ ‘big soapstone kettle’ and /ukusiksaaq/ ‘soapstone’ as well as /upirnraaq/ ‘arctic spring, late spring’ and /upirngaksaqq/ ‘late spring’, suggesting the this nominalizer may still be productive and hence the phonological alternation synchronic.
2.3.3 Natsilingmiutut

Although very similar to Siglitun and Inuinnaqtun, Natsilingmiutut maintains the Proto-Eskimo distinction between *j* and *ð*, as in Inupiaq, with the latter realised as /ɹ/.

Dorais gives the following consonant inventory (2003, p. 63; modified to IPA):

(96) **Natsilingmiutut consonant inventory**

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>l</td>
<td>j</td>
<td>ɣ</td>
</tr>
<tr>
<td>ɬ</td>
<td>(s)</td>
<td>(ɮ)</td>
<td>h</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>η</td>
<td></td>
</tr>
</tbody>
</table>

As in other dialects, this modern reflex of *ð* alternates with /t/ (p. 67):

(97) nixi-tna
    eat-DEC.1SG
    ‘I eat’

(98) tuhaq-tunja
    hear-DEC.1SG
    ‘I hear’

Despite having /h/ as a phoneme, [s] still occurs after /t/ and, unlike in Inuinnaqtun, /ɬ/ has not been subsumed by /h/. Dorais gives the following examples of the distribution of /h/ and [s] (pp. 61-62):

(99) havik
    ‘knife’

(100) ihuk
    ‘end’

(101) natsiq
    ‘seal’

(102) igutsaq
    ‘bee’
As in Inuinnaqtun, the sequences /kh/ and /qh/ become [xx] and [xχ], respectively, however /ph/ in Natsilingmiutut remains unchanged. The persistence of /ph/, along with the persistence of the [s] allophone may indicate that the shift from *s to /h/ in this dialect is incomplete.51

According to Dorais, some speakers also distinguish between /ɹ/ and [ɻ̥], with the latter occurring “in clusters starting with /k/ or /q/” (p. 61). I assume this low-level phonetic change to be post-lexical.

With the distinction maintained between *j and *ð, we will once again require the feature [BACK]. Otherwise, the contrastive hierarchy for Natsilingmiutut is rather similar to those of the other Western dialects discussed above:

\[
\begin{align*}
\text{(103) Contrastive hierarchy for Natsilingmiutut consonants} \\
\begin{array}{c}
\emptyset \\
\hspace{1cm} (-\text{DORSAL}) & (+\text{DORSAL}) \\
\hspace{2cm} (-\text{LABIAL}) & (+\text{LABIAL}) \\
\hspace{3cm} (-\text{BACK}) & (+\text{BACK}) \\
\hspace{4cm} \text{ /j/} & \text{ /y/} \\
\hspace{5cm} \text{ /n/} & \text{ /m/} \\
\hspace{6cm} \text{ /p/} & \text{ /v/} \\
\hspace{7cm} \text{ /k/} & \text{ /q/} & \text{ /ʁ/} & \text{ /ɣ/} \\
\end{array}
\end{align*}
\]

Once again, I assume the change from /ɹ/ to [ɻ̥] to be post-lexical, since otherwise we would expect the contrastively voiceless /h/ to surface. The [s] allophone of /h/ will have the same contrastive features as /h/ plus the feature [+STRIDENT]. As discussed earlier for

51 Dorais also points out that “some Natsilik speakers tend to shift between h and s” (p. 61)
Inuinnaqtun, the spread of continuance from /h/ to create [x] and [χ] after /k/ and /q/ points to /h/ being [+CONTINUANT].

2.4 Eastern Canadian

Next I will examine the Eastern Canadian dialects of Inuktitut. As stated above, Dorais observes that the set of voiceless stops and nasals are consistent throughout the Canadian dialects. In fact, the only phonemic differences among the Eastern dialects are found in the continuants whose place of articulation appears to be unmarked; those that are neither labial, nor velar, nor uvular (i.e. coronals). Accordingly, in the following subsections I focus on these continuants.

2.4.1 Kivalliq

More than other Eastern dialects, Kivalliq displays some of the characteristics of Western dialects, including the shift from *s to /h/. Dorais gives the following inventory of Kivalliq consonants (p. 80; modified to IPA):

\[(104) \quad \text{Kivalliq consonant inventory} \]

\[
\begin{array}{cccc}
  p & t & k & q \\
  v & l & j & y & r \\
  \hat{t} & (s) & h \\
  m & n & \eta \\
\end{array}
\]

As in Natsilingmiutut, the phoneme /h/ surfaces as [s] after a /t/. Dorais provides the following examples of the distribution of /h/ and [s] (p. 79):

---

52 On the other hand, it may be that surface [h] is actually underlingly /s/, yet still with the contrastive features [+CONT] and −VOICE. If this were the case, the instances of surface [h] would be due to debuccalization word-initially, intervocically, and after /p/. The sequences [xx] and [χχ] could still be derived from /ks/ and /qs/ if [+CONT] spread to the stop and the place features spread to /s/. Thus, regardless of which variant we assume to be underlying, [s] or [h], the hierarchy can account for its behaviour.

62
Interestingly, in cases of stem-internal consonant gemination, a single [h] will geminate to [ts] (p. 80; modified to IPA):

\[
\begin{align*}
(106) & \quad \text{uqauhiq} \quad \text{uqautsi-k} \quad \text{uqautsi-t} \\
\text{word} & \quad \text{word-DUAL} \quad \text{word-PL}
\end{align*}
\]

While this might suggest that /s/ is in fact underlying and is debuccalized to [h] intervocally, it is equally possible that the /ts/ cluster is an artefact of an earlier form of the language. Furthermore, taking a somewhat more functional point of view, it may be that /h/ is indeed underlying but that the surface sequence [th] is avoided as the [s] in [ts] is easier to perceive; the [h] in this environment otherwise has essentially the same phonetic cues as would aspiration on /t/. In any case, I assume /h/ to be underlying with [s] as an allophone since /h/ surfaces is more positions.
As with earlier dialects, we continue to observe alternations between the voiceless stops and their homorganic voiced continuant counterparts. Once again, /ɣ/ and /ʁ/ geminate to /k/ and /q/ stem-internally in some lexemes (p. 80; modified to IPA):

(107) tuluyaq  tulukka-k  tulukka-t
     raven       raven-DUAL  raven-PL

(108) amaʁuq  amaqqu-k  amaqqu-t
     wolf       wolf-DUAL  wolf-PL

As expected, we also observe alternations between /p/ and /v/ as well as between /t/ and /j/, with the stops appearing after consonants and the continuants appearing after vowels (p. 84):

(109) taku-junga  sinik-tunga
      see-DEC.1SG  sleep-DEC.1SG
      ‘I see’       ‘I sleep’

(110) taku-vunga  sinik-punga
      see-INDIC.1SG  sleep-INDIC.1SG
      ‘I see’       ‘I sleep’

Other than the presence of /ɬ/ and the lack of /ɹ/ Kivalliq is very similar to the Inuinnaqtun dialect examined above. Consequently, the only differences between the Kivalliq contrastive hierarchy and that of Inuinnaqtun are the lack of the feature [BACK] and the use of [VOICE] to differentiate the two laterals:
Once again, with very little modification from previous hierarchies, we have arrived at a hierarchy for yet another dialect. Furthermore, the alternations in this dialect can once again be attributed to the contrastive feature [+CONTINUANT]; the voiced continuant alternants all appear to be the [+CONTINUANT] counterparts of the stops.

### 2.4.2 Aivilik (and Old Qairnirmiut)

Other than the lack of /h/, Aivilik has essentially the same consonant inventory as the Kivalliq dialect, including the stop-continuant alternations. Instead of /h/, Aivilik has /s/ in all positions, except when geminate, where it becomes /t/ (p. 80):

![Contrastive hierarchy for Kivalliq consonants](image)

Another difference between Kivalliq and Aivilik noted in Dorais is that in the latter dialect /j/ becomes [ʤ] as the second member of a cluster:

- (113) **uɣʤuk** (cf. Kivalliq: /uɣjuk/)  
  ‘bearded seal’
As proposed for Siglit above, it may be that the feature [+DELAYED RELEASE] distinguishes this allophone of /j/ which appears to be undergoing fortition. Once again, the incompatibility of [+DELAYED RELEASE] and the sole contrastive feature of /j/, [+CONTINUANT], may cause this feature to be deleted:

(114) /j/: [+CONTINUANT]  
     [ʤ]: [+DELAYED RELEASE]

With only these differences between the two dialects, the only difference between the contrastive hierarchies of Kivalliq and Aivilik appears to be the use of [STRIDENT] for the phoneme /s/:

(115) **Contrastive hierarchy for Aivilik consonants**

Interestingly, the gemination of /s/ to /tt/ can now be seen as the loss of the feature [+STRIDENT] on /s/, resulting in the emergence of the unmarked /t/. Yet again, stop and continuant pairs are differentiated by the feature [CONTINUANT], as in other dialects.

---

53 The feature [STRIDENT] could also be placed lower than continuant to different between /j/ and /s/. However, this arrangement of the feature hierarchy would make the gemination of /s/ to /tt/ more difficult to explain, since the loss of [+STRIDENT] would result in /j/, not /l/, as both /j/ and /s/ are [+CONTINUANT].
### 2.4.3 North Baffin

North Baffin has the same inventory of phonemes and alternations as the preceding Aivilik dialect. Consequently, most of the differences between Aivilik and North Baffin phonology involve differences in the extent of regressive place assimilation.

While in Kivalliq and Siglitun dialects coronal-initial clusters are maintained, these have been the first to undergo regressive place assimilation in Aivilik and Baffin (p. 78).

(116) | Kivalliq | Siglitun | Aivilik/Baffin |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>tikitpat</td>
<td>tikitpan</td>
<td>tikippat</td>
</tr>
<tr>
<td>utkuhik</td>
<td>utkusik</td>
<td>ukkusik</td>
</tr>
<tr>
<td>tatqiq</td>
<td>tatqiq</td>
<td>taqqiq</td>
</tr>
</tbody>
</table>

Yet while Aivilik maintains sequences of labial consonants followed by coronal, velar, or uvular consonants, these clusters have undergone assimilation in North Baffin (and South Baffin). Dorais gives the following examples (p. 94; modified to IPA):

(117) | Aivilik | North Baffin | South Baffin |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>tusapta</td>
<td>tusatta</td>
<td>tusatta</td>
</tr>
<tr>
<td>takuyapku</td>
<td>takuyakk</td>
<td>takuyakk</td>
</tr>
<tr>
<td>aqqut(i)</td>
<td>aqqut(i)</td>
<td>aqqut(i)</td>
</tr>
<tr>
<td>taipsuman</td>
<td>taissumani</td>
<td>taitsumani</td>
</tr>
<tr>
<td>ilipsi</td>
<td>ilissi</td>
<td>ilitsi</td>
</tr>
<tr>
<td>tavlu</td>
<td>tallu</td>
<td>tallu</td>
</tr>
<tr>
<td>ivjuq</td>
<td>iju(q)</td>
<td>iju(q)</td>
</tr>
<tr>
<td>takuyannuk</td>
<td>takuyann</td>
<td>takuyannuq</td>
</tr>
<tr>
<td>ingjiqtuq</td>
<td>ingjiqtuq</td>
<td>ingjiqtuq</td>
</tr>
<tr>
<td>paaŋŋuqtuq</td>
<td>paaŋŋuqtuq</td>
<td>paaŋŋuqtuq</td>
</tr>
</tbody>
</table>

54 Dorais writes this word as tablu, suggesting that [b] or [β] is an allophone of /v/ at the start of some clusters. I suspect this to be a post-lexical change.

55 See footnote 54.
Arguably, coronals are the most susceptible to assimilation due to their contrastively unmarked place of articulation (i.e. there is no [+CORONAL] feature in the system).

However, it is odd that an unmarked place of articulation such as coronal can spread onto a segment already contrastively marked as [+LABIAL], [+DORSAL], or [+RTR]. If [+CORONAL] is merely a redundant feature on coronals, it should not be able to spread to adjacent segments. One possibility is that the phenomenon of regressive place assimilation described in Dorais and elsewhere is instead a set of constraints on consonant clusters. Thus, it would not be the case that [+CORONAL] (or any other place feature) is spreading to preceding consonants, but rather that certain place features are not permitted cluster-initially, causing those segments to obtain their place specifications from the second element of the cluster. Such an account might explain the /ts/ sequences in the South Baffin data above from earlier sequences of *ps. In this dialect it may be that the feature [+LABIAL] cannot stand on the first consonant of a cluster but that the features [−CONTINUANT] and [−STRIDENT] still can.

Another difference exemplified in the data above between Aivilik and Baffin dialects is the existence of a uvular nasal allophone; [N]. Although Dorais writes the sequence as ‘rng’, suggesting the sequence /ɾŋ/, Bobaljik (1996) argues for the existence of this uvular nasal allophone in Eastern Inuit. He notes that in addition to regressive place assimilation there are instances of progressive manner assimilation in Inuit dialects, explaining the emergence of geminate [NN] sequences from /mรส/ as uvular place spreading leftward and nasality spreading rightward.
Despite these differences between North Baffin and Aivilik phonology, the same feature hierarchy can be used for both (repeated from (115) above):

(118) **Contrastive hierarchy for North Baffin consonants**

We can posit that the uvular nasal allophone consists of the following features since it appears to be formed by the coalescence of nasals and the uvular fricative:

(119) \[N\]: [+NASAL], [+RTR], [+DORSAL]

It may simultaneously be an allophone of the uvular fricative as well as the nasals in Eastern Inuit dialects (including Greenlandic).

### 2.4.4 South Baffin

The only phonemic difference between South Baffin and North Baffin appears to be the lack of a voiceless lateral in South Baffin. According to Dorais, the two subdialects of South Baffin have dealt with this loss in different ways. In the south-western subdialect, /l/ has merged with /s/ in all positions while in the south-eastern
subdialect /t/ surfaces in clusters and either /s/ or /l/ intervocalically.\textsuperscript{56} Dorais gives the following examples (p. 96):

\begin{center}
\begin{tabular}{llll}
\textbf{North Baffin} & \textbf{Southeast Baffin} & \textbf{Southwest Baffin} \\
\textit{ihu\-aqtuq} & \textit{ihu\-aqtuq/isuaqtuq} & \textit{isuaqtuq} & \text{‘is all right’} \\
\textit{ti\-ki\-ttuni} & \textit{ti\-ki\-ttuni} & \textit{tiki\-tsuni} & \text{‘while arriving (s/he)’} \\
\textit{ak\-\-u\-na\-a\-q} & \textit{att\-u\-na\-a\-q} & \textit{ats\-u\-na\-a\-q} & \text{‘rope, thong’} \\
\textit{ka\-ni\-q\-tuk} & \textit{ka\-ni\-q\-tuk} & \textit{ka\-ni\-q\-s\-uk} & \text{‘bay, inlet’} \\
\end{tabular}
\end{center}

Assuming a similar hierarchy to North Baffin as a starting point, it may be that Southeast Baffin speakers have simply lost the contrastive [VOICE] feature, causing /l/ and /l/ to collapse into a single phoneme /l/. For those speakers who have collapsed /l/ into /s/, it could be that /l/ has lost the feature [+LATERAL] but kept the feature [−VOICE]. Although voicelessness is only redundant on /s/ and not contrastive, /s/ would still be the best match for segments whose sole contrastive feature was [−VOICE]. Since stop-/l/ clusters appear to be illicit in Southeast Baffin,\textsuperscript{57} the emergence of /t/ in clusters may be some type of repair strategy whereby the offending features (e.g. [+LATERAL] or [−VOICE]) are deleted, yielding the unmarked /t/. These two options are summarized in the diagrams below:

\begin{center}
\begin{tabular}{ll}
\textbf{(121) Option 1} & \textbf{Option 2} \\
\text{[+LAT]} & \text{[+LAT]} \\
\text{[−VOICE]} & \text{[+STRID]} \\
\end{tabular}
\end{center}

\begin{center}
\begin{tabular}{ll}
\text{/l/} & \text{\textrightarrow /t/ in clusters} \\
\text{+/s/} & \text{\textrightarrow /t/ in clusters} \\
\end{tabular}
\end{center}

\textsuperscript{56} Dorais gives no explanation of the distribution of /s/ and /l/ in these cases so I assume it to be a matter of free variation.

\textsuperscript{57} For instance, the first person plural imperative/optative ending –\textit{ta} on the verb \textit{tusaq} - ‘to hear’, yields \textit{tusa\-qta}, while adding the first person singular –\textit{langa} yields \textit{tusa\-q\-langa}.
Similarly for the Southwest Baffin subdialect, a loss of the feature [+LATERAL] could have caused /ɬ/ to merge with /s/, with the contrastive voicelessness of the /ɬ/ becoming a redundant feature on /s/.  

Assuming, then, that the loss of the contrastive feature [VOICE] is responsible for the loss of /ɬ/ in South Baffin, we arrive at the following feature hierarchy:

(122) Contrastive hierarchy for South Baffin consonants

Once again, by making a very minor change to the hierarchy we have arrived at the correct phoneme inventory for yet another dialect.  

---

58 Yet another possibility is that the feature [+STRIDENT] was perhaps redundant on /ɬ/ and has become contrastive, along with the loss of [+LATERAL]. However, it is not evident that /ɬ/ possesses the acoustic properties normally attributed to the feature [STRIDENT].

59 Another complication within the Southwest subdialect is the presence of /z/ instead of /j/ in the community of Cape Dorset. This is problematic for the hierarchy presented in (122) above since /z/ and /s/ cannot be differentiated using the feature [STRIDENT]. Furthermore, /z/ and /t/ alternate as in other dialects. Instead, this subdialect will need to use the feature [−VOICE] instead of [STRIDENT] on /s/ as follows:

(−LAT)

(−CONT)[+CONT]

/+VOICE/[−VOICE]

With [−VOICE] as the marked value of the voicing feature, the only marked contrastive feature differentiating /t/ and /z/ continues to be [CONTINUANT].
2.4.5 Nunavik (Arctic Quebec)

The Nunavik dialect has essentially the same consonant inventory as South Baffin, having lost /ɬ/ as a separate phoneme, collapsing it together with /s/ as seen above in the Southwest Baffin subdialect. One difference between the two dialects is the presence of /ɹ/ instead of /j/ in part of the Itivimiut subdialect of Nunavik and /ʒ/ in another. While /ɹ/ will require no special treatment, the areas with /ʒ/ will need the same modification to their contrastive hierarchies as was introduced above (see footnote 59) for Cape Dorset.

Another difference between Nunavik and Baffin is the progress of regressive place assimilation. While Baffin maintains both velar-initial and uvular-initial clusters, Nunavik velar-initial clusters have assimilated to the place of articulation of the second member of the cluster (p. 113; modified to IPA):

(123)    Nunavik         North Baffin
  a) appaq       akpa        ‘murre’
  tuttu        tuktu        ‘caribou’
  savvik       sayvik       ‘chest’
  illu         ilulu        ‘house’
  ijjuk         ijju        ‘testicle’
  pititsi      pitiksi      ‘bow’
  inniq        iniqiq       ‘fire, spark’
  imminik     injiminik    ‘itself’

Conversely, uvular-initial clusters persist in the Nunavik dialect. Below are some of the examples provided by Dorais (ibid):

(124)    a) taaqpat  
          ‘if it is dark’
    b) aɣvik      
          ‘whale’
c) uqšuk  
‘blubber’

The resistance of uvular-initial clusters to regressive place assimilation may be further evidence for the contrastive feature [RTR] in the proposed system. It may be that having two marked contrastive features, [+DORSAL] and [+RTR], makes uvulars more resistant to assimilation than other places of articulation.60

Despite the differences in the degree of regressive place assimilation and the presence of /ɹ/ instead of /j/ in the Itivimiut subdialect, we can use the same contrastive hierarchy for Nunavik as was presented above for South Baffin (repeated from (122) above):

---

60 The resilience of the uvular place of articulation may be evidence of [RTR] being a more fundamental contrast in our system. It may be that the contrastive cut of [RTR] applies before [DORSAL] in Inuktitut. However, while this would result in a rearrangement of the dorsal and uvular segments in the proposed hierarchies, removing [+DORSAL] from the contrastive feature specifications of the uvulars and adding [−RTR] to the velars, there is no evidence that such a change would lead to any different predictions.
While the contrastive features for /ɻ/ and /j/ in the two subdialects are the same, the redundant features are distinct. However, in the /ʒ/-areas of Itivimiut, the lower portion of the hierarchy will need to be amended as follows so that the alternation between /t/ and /ʒ/ is not complicated by the presence of the contrastive feature [STRIDENT]:

(126) \[ ([−LAT]) \]
(126) \[ ([−CONT]+CONT] \]
(126) \[ /t/ \]
(126) \[ ([+VOICE]−VOICE] \]
(126) \[ /ʒ/ \]
(126) \[ /s/ \]

As with Cape Dorset, if we assume that [−VOICE] is the marked value of the feature [VOICE], /t/ and /ʒ/ will continue to alternate according to the presence or absence of the feature [+CONTINUANT] with voicing being redundant on continuants, except /s/ which is contrastively voiceless in this subdialect.

61 Dorais notes (p.113) that “many young Nunavik speakers do not discriminate […] between /ɻɻ/ and /kk/ [or between] /ʁʁ/ and /qq/”, with both becoming geminate voiceless stops. It may be that the feature [+CONTINUANT] is merely deleted on geminate velars and uvulars.
2.4.6 Labrador

Dorais presents the following consonant inventory for the Labrador dialect (p. 117; modified to IPA; brackets added to allophones):

(127) Labrador consonant inventory

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>k</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>l</td>
<td>j</td>
<td>ɣ</td>
</tr>
<tr>
<td>[f]</td>
<td>ɬ</td>
<td>s</td>
<td>[x]</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>ŋ</td>
<td></td>
</tr>
</tbody>
</table>

While he presents [f] and [x] along with the other consonants, his discussion reveals that they are allophones; both surfacing from underlying geminate continuants (p. 114):

(128)

a) saffik (cf. /savvik/ in Nunavik)
   ‘chest’

   b) axxait (cf. /ayyaɪt/ in Nunavik)
   ‘hand’

Dorais notes that this devoicing is part of a wider phenomenon whereby geminate fricatives become voiceless. He states that it also affects ‘jj’ [dʒ] (or perhaps [d˛ʒ]), resulting in [tʃ]. Curiously, this devoicing phenomenon does not affect geminate /l/ (p. 112):

(129)

a) allak
   ‘indian’

   b) allak
   ‘black bear’

While this could simply be because /l/ is an approximant (i.e. not /l̪/), it may be that /l/ is not targeted for devoicing because it is not contrastively marked [+CONTINUANT], unlike

---

62 Dorais’ discussion suggests that this devoicing would also affect geminate uvular fricatives however his examples are from the North Labrador dialect where /ʁ/ has merged with /ɣ/.
the other voiced continuants. Further evidence that the laterals are not contrastively 
\([+\text{CONTINUANT}]\) is that they do not participate in the pattern of stop-continuant 
alternations; as in other dialects /t/ alternates with /j/ (p. 122):

\[(130)\]
\[
\begin{align*}
a) & \text{taku-}juk \\
& \text{see-DEC.3SG} \\
& \text{‘he/she sees’} \\
\text{b) qai-niak-}tuk \\
& \text{come-FUT-DEC.3SG} \\
& \text{‘he/she comes’}
\end{align*}
\]

Another feature of Labrador is that /q/ and /k/ are neutralized to /k/ word-finally.\textsuperscript{63}

The North Labrador subdialect is further distinguished by having merged /ʁ/ with /ɣ/ in all positions. Dorais also notes that “the pronunciation of q is weaker than it is usually elsewhere” (p. 114). Such changes may point to the gradual loss of the contrastive feature [RTR] in the Labrador dialect.\textsuperscript{64}

Except for the North Labrador subdialect, Labrador has the same inventory of phonemes as North Baffin, having retained /ɬ/. Accordingly, we can use the contrastive feature hierarchy from North Baffin again for Labrador, noting that for the North Labrador subdialect does not possess a \([\pm\text{CONTINUANT}]\) distinction on \([+\text{RTR}]\) segments (repeated from (118) above):

---

\textsuperscript{63} See also Dorais (1990).

\textsuperscript{64} Dresher & Johns (1996) “the velar/uvular phonemic distinction has been neutralized in syllable-final position” (p. 116) in the Rigolet subdialect of Labrador and now exist as allophones, with [k] appearing after /i/ and [q] after /u/ and /a/. This is further evidence of the gradual loss of the contrastive feature \([\text{RTR}]\) in Labrador.
(131) **Contrastive hierarchy for Labrador consonants**

\[
\begin{array}{c}
\emptyset \\
([-\text{DORSAL}]) \\
([-\text{LABIAL}]) \\
([-\text{NASAL}]) \\
([+\text{NASAL}]) \\
([−\text{RTR}]) \\
([+\text{RTR}]) \\
([−\text{LAT}]) \\
([+\text{LAT}]) \\
([−\text{CONT}]) \\
([+\text{CONT}]) \\
([−\text{STRID}]) \\
([+\text{STRID}]) \\
([−\text{VOICE}]) \\
([+\text{VOICE}]) \\
\end{array}
\]

Once again, stops and voiced fricatives are differentiated using the contrastive feature [\text{CONTINUANT}], reflecting the fact that they alternate as in other dialects (p. 123):

(132) \(/\gamma/\sim/k/\):  
   a) taku-\text{yuma}  
      see-COND.\text{1SG}  
      ‘if/when I see’  
   b) tikik-\text{kuma}  
      arrive-COND.\text{1SG}  
      ‘if/when I arrive’

(133) \(/p/\sim/v/\):  
   a) nuna-\text{vuk}  
      land-\text{SG.POSS.2DUAL}  
      ‘our land’  
   b) nuna-\text{appuk}  
      land-\text{DUAL.POSS.2DUAL}  
      ‘our lands’

The hierarchy for Labrador continues to account for these various alternations using the feature [\text{CONTINUANT}].

### 2.5 Greenlandic

I will begin by examining West Greenlandic. The subsequent sections on East Greenlandic and Polar Greenlandic (Thule) will deal primarily with the differences...
between those dialects and the Western dialect. The West Greenlandic section has benefitted greatly from the detailed phonological observations in Rischel (1974).

### 2.5.1 West Greenlandic

#### 2.5.1.1 The phonology of West Greenlandic

On the surface, the following phonemes\(^65\) can be distinguished in West Greenlandic (WG) using near-minimal pairs (Rischel, 1974, p. 163 modified to IPA):

\[
\begin{array}{ll}
/p/: & /qapappuq/ \quad \text{‘is emaciated’} \\
/t/: & /ataasiq/ \quad \text{‘one’} \\
/k/: & /nakasuk/ \quad \text{‘urinary bladder’} \\
/q/: & /aqayu/ \quad \text{‘tomorrow’} \\
/m/: & /amakuyq/ \quad \text{‘arctic wolf’} \\
/n/: & /amaana(q)/ \quad \text{‘mother’} \\
/n/: & /apalavuq/ \quad \text{‘is travelling’} \\
/v/: & /avannaq/ \quad \text{‘north wind’} \\
/l/: & /alaŋŋaa'ppaa/ \quad \text{‘knows it by heart’} \\
/s/: & /asavai/ \quad \text{‘loves them’} \\
/j/: & /aja/ \quad \text{‘aunt’} \\
/ʁ/: & /taʁatutsi/ \quad \text{‘salt’}
\end{array}
\]

All of the above phonemes can appear between two low vowels. Stating that /γ/ regularly surfaces as /ŋ/ in this environment, Rischel provides the following pair to distinguish these two segments as well (p.166):\(^66\)

---

\(^65\) Rischel notes that previous work on West Greenlandic has also posited /h/ as a marginal phoneme since it appears in interjections (p.23). For the purposes of this paper, I ignore the possibility that /h/ exists as a separate phoneme.

\(^66\) As discussed above, Bobaljik (1996) argues for a uvular nasal allophone [N] of the velar nasal /γ/ (and arguably of uvular continuant /ʁ/) in Eastern Inuit, arguing that the clusters represented as ‘rng’ and ‘rŋ’ in Dorais’s work and ‘rŋ’ in Fortescue et al. (1994) are better analysed as [NN], created from an underlying sequence of a nasal and uvular with regressive place assimilation and progressive manner assimilation.
Furthermore, Rischel observes that in central WG speakers occasionally distinguish /ʃ/ (which corresponds to *δ in Proto-Eskimo) from /s/ (which corresponds to a “palatal affricate” in the proto-language, Fortescue et al. 1994)\textsuperscript{67}. However, he notes that this contrast has almost disappeared and suggests that the Greenlanders who claim to maintain the distinction may merely be influenced by the orthography in older texts (pp. 173, 176).

Thus, including /ʃ/ which is in the process of neutralizing with /s/, WG appears to have the following inventory of consonant phonemes:

(136) **West Greenlandic consonant inventory**

\[
\begin{array}{cccc}
p & t & k & q \\
v & s & f & y \\
m & n & \eta & \eta \\
l & j & \\
\end{array}
\]

We will now examine the assimilatory phenomena of WG in order to shed more light on the inventory of consonants and the contrastive features involved in distinguishing them.

The phenomenon of regressive consonant assimilation is particularly prolific in WG. According to Rischel, regressive assimilation routinely transforms all consonant clusters into geminates with only two exceptions: (1) the cluster /tt/ (which contrasts with both /ss/ and /tt/ clusters in the language) and (2) what Dorais (2003) refers to as “pharyngealized geminates”; clusters whose initial member was uvular before regressive assimilation. Though frequently written as ‘rC’ in the standard orthography and described

\textsuperscript{67} See also Dorais (2003) p.139 on the neutralization of /ʃ/ and /s/.
in Dorais (2003) as “geminates produced at the back of the throat” (p.137), Bobaljik (1996) argues convincingly (following Rischel) that these clusters are indeed fully assimilated geminates and that the “pharyngealization” is merely “an effect on the quality of the preceding vowel triggered by the underlying [uvular]” (p.329). I will assume that Bobaljik’s analysis of pharyngealization is correct. We will return to the topic of the exceptional /tts/ cluster below during the discussion of consonant alternations below.

In WG we observe alternations between stops and their corresponding continuants. Rischel observes that at morpheme boundaries stops appear after stems ending in consonants while continuants appear after stems ending in vowels. He also notes that stem-internal gemination of a continuant can result in a pair of corresponding stops (since the second consonant will be in the environment where stops surface, after a stop, and the first consonant will undergo regressive assimilation). Consider the following examples:

(137) /v~p/:
/aki + vuq/ \rightarrow [akivuq] ‘answers’ (p.242, 247)
/sinik + vuq/ \rightarrow [sinippuq] ‘sleeps’
/pivuq/ ‘does, gets, etc.’ (sg); /pipput/ ‘do, get (plural)’ (gemination)

(138) /ɣ~k/:
/aki + ţama/ \rightarrow [akiyama] ‘because I answered’ (p.242)
/sinik + ţama/ \rightarrow [sinikkama] ‘because I slept’
/iiyaq/ ‘wall’; /iikkat/ ‘walls’ (gemination)

See also Massenet (1986) on pharyngealized consonants in the Resolute Bay dialect.
The conditioning environment for continuant \rightarrow stop gemination (versus continuant \rightarrow voiceless continuant gemination) is in part prosodically determined. See Rischel pp.246-7.
While the preceding alternations are relatively straightforward in terms of description, the following ones are somewhat more complicated. Although according to Rischel and Dorais (2003) /ʃ/ has essentially neutralized with /s/ in WG, the two continue to exhibit distinct alternation patterns. While original /ʃ/ alternates with /t/ after roots, as in (141), it does not undergo gemination, as shown in (142). Conversely, original /s/ appears when gemination results in the aforementioned exceptional cluster /tts/, as in (143) (p.243):

(141) /ʃ~/~t/:  
/aki + ŋuq/ → [akiʃuq] ‘answering’  
/sinik + ŋuq/ → [sinittuq] ‘sleeping’

(142) /aaʃaq/ ‘summer’;  /aaʃat/ ‘summers’ (no gemination)

(143) /s~/~ts/:  
/nasaq/ ‘cap’;  /nattsat/ ‘caps’  
/tasiq/ ‘sea’;  /tattsit/ ‘seas’

Furthermore, Rischel demonstrates that this cluster sometimes surfaces at morphological boundaries where /t/ precedes /s/ (pp.61-2, modified):

70 Rischel observes that there are no suffix-initial alternations for this pair in WG since all uvular-initial suffixes are truncating (p. 243).
71 Despite the fact that [ɬ] is not a stop, /l/ and [ɬ] alternate in the same environments as the continuant-stop alternations. Note also that according to Rischel, “/l/ behaves in several respects like a fricative” (p.21). It could be the case that ‘l’ in WG is in fact alveolar lateral fricative /ɮ/ instead of an alveolar lateral approximant /l/.
72 Intervocalic /v/ in this form has been reduced to /w/, however, the latter is not necessarily an allophone of the former in WG since the transition between /u/ and /a/ is rather close to /w/.
Conversely, when other consonants precede /s/ at a morphological boundary, normal regressive assimilation occurs (p.62, modified):

\[ (145) \quad /\text{kunik} + s + vuq/ \rightarrow [\text{kunissivuq}] \]

To account for the distinct behaviours of original /s/ and neutralized /ʃ/ in gemination, as well as the instances of /…t+s…/ becoming /…ts…/ at morphological boundaries, Rischel suggests that “the most interesting possibility is that only the formatives which [do not result in /tts/] have /s/ underlyingly, whereas all the others have an affricate /ts/ instead.” Under such an analysis, underlying /ts/ only surfaces after /t/ or when geminated, and in all other contexts is neutralized to /s/. Thus, (144) and (145) can be restated as follows:

\[ (146) \quad /\text{tuqut} + tsivuq/ \rightarrow [\text{tuquttsivuq}] \]
\[ (147) \quad /\text{kunik} + tsivuq/ \rightarrow /\text{kunik} + sivuq/ \rightarrow [\text{kunissivuq}] \]

(by neutralization) (by regressive assimilation)

Such an analysis also captures the gemination data in (143), since geminating an underlying /ts/ will most likely result in /tts/ (with a long closure and a single release), as illustrated in the derivation below:

\[ (148) \quad /…ts…/ \rightarrow (\text{gemination})/…ts.ts…/ \rightarrow (\text{cluster simplification})/…t.ts…/ \]

To further complicate the picture, /j/ also geminates to /tts/, as in (149), but also “sporadically” geminates to /ss/, as in (150), and undergoes stem-conditioned alternations with /t/, as in (151) (p.244):

\[ (149) \quad /j/~ts/: \]
\[ /\text{pujuq}/ ‘\text{smoke}’; \quad /\text{puttsut}/ ‘\text{clouds}’ \quad (\text{gemination}) \]
While various authors describe these alternations in terms of voice (e.g. Bobaljik, 1996), notice that the alternations between /ʃ/ and /t/ as well as between /s/ and /ts/ cannot be attributed to voicing. Instead, I argue that the contrastive feature [CONTINUANT] can explain all the stop-continuant alternations in WG. Furthermore, based on (1) the alternations between /j/ and /ts/ and between /s/ and /ts/, (2) Rischel’s suggestion of an underlying /ts/ that neutralizes to /s/ intervocally, and (3) the reconstructed evidence in Fortescue et al. (1994) for a proto-Eskimo “palatal affricate”, I claim that WG maintains a palatal place of articulation, as in (152) below:

(152)  
<table>
<thead>
<tr>
<th></th>
<th>p</th>
<th>t</th>
<th>ʧ/</th>
<th>ts/s</th>
<th>k</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>j/s</td>
<td>j</td>
<td>y</td>
<td>arrière</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>j</td>
<td>η</td>
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<tr>
<td>l</td>
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</tbody>
</table>

In order to explain the alternation between /j/ and /ts/ as well as /s/ and /ts/ I suggest that an underlying palatal stop /c/ or affricate /ʧ/ neutralizes to /ts/ in clusters and to /s/ intervocally. This would explain why /s/ appears on the surface to geminate as [tts] since a single underlying /c/ will surface as [s] but when in a cluster (i.e. when geminate) will surface as two instances of /ts/; [tts]. Furthermore, the gemination of palatal /j/ to [tts] parallels the other stop-continuant alternations if [ts] is underlyingly a palatal stop or affricate.

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73 The /l~/-[l] alternation will be dealt with separately, along with the voiced-voiceless continuant alternations.
WG is unique among Greenlandic dialects in that it also exhibits alternations between the voiced continuants and geminate voiceless continuant allophones. According to Rischel “[the] general rule is that certain continuants (non-sibilant fricatives and /l/) are voiced if they are short, but voiceless if they are long (=geminate)” (p.122):

(153) \( /vv/ \rightarrow /ff/ \), \( /\gamma\gamma/ \rightarrow /xx/ \), \( /\beta\beta/ \rightarrow /\chi\chi/ \), \( /ll/ \rightarrow /H/ \)

Dorais (p.140, modified to IPA) gives the following examples of these alternations:

(154) \([savik] \) ‘knife’
\([saff\text{i}u'ppuq] \) ‘works with metal’

(155) \([iyavuq] \) ‘he/she cooks’
\([ixxavik] \) ‘kitchen’

(156) \([tawu'ppuq] \) ‘it wears away’
\([ta\chi\chi\text{uppaa}] \) ‘darkness is covering it’

(157) \([i\text{lu}] \) ‘its inside’
\([i\text{Hua}] \) ‘his/her house’

Rischel considers the possibility that these continuants could actually be voiceless underlyingly, automatically becoming voiced intervocally. However, he points out that voiceless /s/ regularly occurs as a singleton without any indication of voicing, suggesting that the non-sibilant continuants (and /l/) are indeed voiced underlying (p.127). These alternations (as well as the alternations presented above between the voiced and voiceless lateral) can be accounted for using an allophonic voicing contrast.

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74 Rischel includes the /l/–[l] alternation with both the stop continuant alternations, since it participates in the stem-conditioned alternations (see (140) above), as well as with the voiced-voiceless continuant alternations, since the change is mainly one of voicing and it also occurs in the geminate environment.
There are also alternations between continuants and zero in WG, however Rischel states that “[it] is a general characteristic of these alternations that the conditions for occurrence of the zero alternant are NOT entirely statable in phonological terms” (p.250, original emphasis). He states further that these alternations are often dependant on particular stems and that the alternations “have no well-defined connection with the position of the segments in question after a formative boundary” (p.251). I suspect that such instances of deletion/lenition may be related to lexical frequency, speech rate, prosody, or a combination of the three. I leave an analysis of the continuant-zero alternations to further research.

Somewhat opposite to the continuant-zero alternation, are the instances in which epenthetic consonants are inserted to break up prohibited sequences of three vowels. Rischel presents the following situations of hiatus and epenthesis of either /v/ or /j/ (p.101):

\[
\begin{align*}
158) & /\ldots ii+i\ldots/ \rightarrow /\ldots iiivi\ldots/ \\
& /\ldots uu+u\ldots/ \rightarrow /\ldots uuju\ldots/ \\
& /\ldots aa+i\ldots/ \rightarrow /\ldots aaivi\ldots/ \\
& /\ldots aa+u\ldots/ \rightarrow /\ldots aaj\ldots/ \\
& /\ldots aa+a\ldots/ \rightarrow /\ldots aava\ldots/ \quad \text{(or /\ldots aaja\ldots/ with enclitics)}
\end{align*}
\]

Rischel notes that the choice of continuant is complementary with respect to place of articulation with the surrounding vowels, with labial /v/ appearing between two coronal /i/ vowels or between neutral /a/ and coronal /i/; and coronal /j/ intervening between two labial vowels or neutral /a/ and labial /u/. Between, two neutral /a/ vowels, both consonants are possible (in different morphological environments).\textsuperscript{75}

\textsuperscript{75} Rischel also states that another solution to three-vowel hiatus is to delete one of the vowels. Furthermore, he also observes that homorganic glides are inserted between the following pairs of vowels, which surface as bi-syllabic (p.107-8): /iu/ \rightarrow /i\textsuperscript{a}u/; /ua/ \rightarrow /u\textsuperscript{a}a/; /iu/ \rightarrow /i\textsuperscript{a}u/; and /ui/ \rightarrow /u\textsuperscript{a}i/. He describes this process as
In addition to conditioning the place of articulation of epenthetic consonants, there is further evidence that the vowels in WG are active in the phonology. Rischel states that /j/ and /v/ are regularly reduced after homorganic vowels, as illustrated in (159) (p.118):

(159)  /iHul+u ut/ → [iHu wut]  ‘our houses’

Rischel posits the following explanation for these reductions:

Since the regular reduction of nonsyllabic continuants to glides in intervocalic position specifically affects /j/ after /i/, and /v/ after /u/, rather than other sequences, there is a strong reason to assume that /i/ and /j/ share some classificatory feature not shared by, say, /g/, and that this is likewise true of /u/ and /v/. (p.120)

He assumes these common features to be [+FRONT] and [+LABIAL]. I assume these to be the contrastive features for /i/ and /u/.

The feature(s) of the vowel /a/ also appear active in the phonology, regularly causing assimilation of a subsequent vowel. The sequence /a+u/ never appears on the surface and the sequence /a+i/ only appears word-finally (p.388). Both sequences are regularly assimilated to [aa]. The most likely candidate for a contrastive feature to differentiate /a/ from weak [i] (possibly /ə/ underlyingly) is [+LOW].

The vowel /i/ is also active in WG, causing affrication\(^76\) of a preceding /t/ to /ts/, as shown in (160) (p.66):

(160)  /itivuq/ → [itsivuq]  ‘it is deep’

---

\(^76\) The /i/-reflex of *ə also appears to cause affrication.

---

a “phonetic universal”, and thus not part of the phonology of WG, per se. Sequences of geminate vowels and /aV/ sequences are mono-syllabic, with the latter undergoing assimilation.
Furthermore, etymological /i/ causes assimilation/palatalization of a subsequent /t/ (or even /ts/) to /s/, as shown in (161), as long as the target consonant precedes a vowel, as shown in (162) (p.261):

(161) /kaffi tuq puq/ → [kaffisuʻppuq] ‘consumes coffee’

(162) /kisittsit/ ‘figure (digit)’
    /kisittsisit/ ‘figures (digits)’

However, the [i]-reflex of etymological /ə/ does not participate in this phenomenon, as evidence by the root /niqi/ (*/nəqə/ in Fortescue et al 1994, p.230) (Rischel, p.261, modified):

(163) /niqi tuq puq/ → [niqituʻppuq] ‘consumes meat’

Thus, although an etymological /ə/ that has been neutralized to [i] participates in the affrication of a preceding /t/, only etymological /i/ causes assimilation/palatalization of a subsequent /t/. This phenomenon is evidence for /i/ having some contrastive feature that /ə/ does not possess.

2.5.1.2 Contrastive hierarchy for WG consonant phonemes

To account for the phonological activity in WG, including the stop-continuant alternations and the voiced-voiceless continuant alternations, I propose the contrastive hierarchy below:
The contrastive features in this hierarchy are applied in the following order:

\[
[+\text{DORSAL}] > [+\text{LABIAL}], [+\text{BACK}] > [+\text{NASAL}] > [+\text{RTR}] > [+\text{LATERAL}],
\]

\[
[+\text{CONT}]
\]

The hierarchy for WG is essentially the same as that used for Western dialects which use the feature [+BACK] to maintain the distinction between the exponent *j and *ð.

### 2.5.2 East Greenlandic

Dorais (2003) presents the following consonant inventory for East Greenlandic (EG) (p. 137; modified to IPA).

\[
(166) \quad \text{p} \quad \text{t} \quad \text{k} \quad \text{q} \\
\quad \text{v} \quad \text{l} \quad \text{j} \quad \text{ɣ} \quad \text{s} \\
\quad \text{m} \quad \text{n} \quad \text{ŋ}
\]

EG lacks the voiceless fricative allophones found in West Greenlandic. Instead, underlying geminate voiced fricatives become voiceless stops in this dialect. Below are several examples from Dorais (p. 141):

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77 It may be that the contrastive feature [−BACK] from the consonant inventory and [+FRONT] from the vowel inventory should be collapsed into a single contrastive feature.

78 Dorais also includes the uvular nasal allophone [ŋ] in the EG inventory, which he writes ‘Rn’. I have omitted it here as Bobaljik argues that it is an allophone of /ŋ/ in all Eastern Inuit dialects.
This is essentially the same stop-continuant alternation seen in other dialects occurring in another environment. Furthermore, there exists a process of intervocalic lenition in EG in which the same stop-continuant alternations occur:

(168) **uyaliq** (cf. /u`kaliq/ in other dialects)
‘rabbit’

(169) **uqapuq** (cf. /uqaqpuq/ in other dialects)
‘he/she speaks’

In sum, we see the same pattern of stop-continuant alternations in EG as in other Inuit dialects.

One difference between the EG alternations and those of other dialects is that /t/ partners with /l/ (Robbe & Dorais, 1986, p. 13):79

(170) **tayi-luut**
see-PART.1PL
‘we seeing’

(171) **tivi-tuut**
arrive-PART.1PL
‘we coming’

This appears to be due to the fact that Proto-Eskimo *δ has merged with /l/ in this dialect.

Dorais also notes that words containing Proto-Eskimo *δ now exhibit /l/ (p. 139):

---

79 However, Dorais describes /l/ as a “‘flap-l’, (i.e. halfway between l and d).” It may be that while the phoneme is indeed /l/ underlying, it surfaces as [ɾ] intervocally. However, if the phoneme is underlyingly a flap, this could be taken as counter-evidence for the feature [CONTINUANT] being responsible for alternations, instead suggesting that the alternations have been reanalysed in terms of voice.
Given that EG possesses the same stop-continuant alternation as other dialects and given the pairing of /t/ and /l/, I posit the following contrastive features hierarchy:

The main difference between this hierarchy and those proposed for other dialects is the use of the feature [+CONTINUANT] to distinguish /t/ and /l/ instead of the feature [+lateral]. Otherwise, the hierarchy is very similar to those presented for WG and Baffin dialects.

2.5.3 Polar Greenlandic (Thule)

Dorais presents the following consonant inventory for Polar Greenlandic (which is also called Thule) (p. 136; modified to IPA):

Dorais’ discussion reveals that [s] and [h] are actually allophones of a single phoneme, with [h] appearing intervocally and initially and [s] appearing as a geminate or after /t/ (pp. 137-138).
Although the distribution of [h] is less restricted, suggesting that it could be the underlying phoneme, it’s more likely that [s] is underlying and undergoes debuccalization in the environments specified above. Interestingly, in Polar Greenlandic it is this phoneme which appears to alternate with /t/ (Fortescue, 1991, p. 56):

(179) **nilliq-tuq**
utter/cry-PART.3SG
‘utters a sound, a cry’

(180) **nillis-huq**
utter/cry-PART.3SG
‘utters a sound, a cry’

(181) **turaaq-tuq**
straight-PART.3SG
‘is straight’

(182) **niuja-huq**
bend-PART.3SG
‘is bent’

Fortescue also gives the following examples of suffixes that alternate between [h]-forms and [t]-forms (1991, pp. 144-147):

(183) **-haqtuq/-taqtuq**
‘fetches, gathers’ (the first form after a vowel)

(184) **-hauhuq/-tauhuq**
‘PASSIVE’
The pairing of /t/ and [h] (i.e. /s/) appears to be due to the fact the latter phoneme has merged with Proto-Eskimo *ð, as evidenced by the realization of ‘eye’ in Polar Greenlandic (Dorais, 2003, p. 139) when compared to the proto-form from the CED (Fortescue, Jacobson, & Kaplan, 1994):

\[(189) \text{ihi} \quad (\text{cf. PE: } *\partial\partial)\]

‘eye’

Once again, it appears that we can use the feature [+CONTINUANT] to distinguish the two alternants.80

Given the alternation between /t/ and /s/, and given that the other alternations between stops and continuants also exist in this dialect, I posit the following contrastive feature hierarchy for Polar Greenlandic.

---

80 There also exist two voiceless continuant allophones which appear when /s/ follows /ɣ/ or /ʁ/. Although these sequences are written as ‘gh’ and ‘qh’ in Dorais’ examples, he states that are in fact [x] and [χ]. A similar situation was seen above in the section on Kivalliq.
Once again, with a very small change to previous hierarchies (i.e. the use of [+LATERAL] instead of [+STRIDENT]), we can continue to explain the alternations between stops and continuants in terms of the feature [CONTINUANT].

3 Diachronic Evidence for Contrast

In addition to the synchronic alternations in each dialect, we have diachronic evidence based on the reconstructed inventory of Proto-Eskimo. Fortescue et al (1994, pp. xi, modified to IPA)'s Comparative Eskimo Dictionary (CED) presents the following consonant inventory of Proto-Eskimo:

(191) **PE Phonemes**

\[
\begin{array}{cccccc}
\text{p} & \text{t} & \text{ʧ} & \text{k} & \text{q} \\
\text{v} & \text{ð} & \text{l} & \text{j} & \text{ɣ} \\
\text{m} & \text{n} & \text{ŋ} \\
\end{array}
\]

In particular, reconstructed postbases listed in the CED suggest that the same stop-continuant alternations were present, such as those between *t and *ð.
What is interesting about this alternation is that along with all the alternants of /t/ in all dialects, *ð is once again [+CONTINUANT] (and arguably unmarked for place).

Furthermore, while we might predict that many of the modern reflexes of *ð should also be continuant, it is notable that not even one dialect has replaced *ð with a non-continuant phoneme such as /d/ or /ʤ/. This diachronic gap is predicted if the only contrastive feature of *ð was [+CONTINUANT]. In fact, the only feature common to *ð and all of its modern reflexes is [+CONTINUANT]. I believe this is because, as evidenced by the alternations exemplified in (192)-(195), the feature [+CONTINUANT] was already active and responsible for the alternation with /t/ in PE.

Thus, in addition to the synchronic alternations in modern dialects, the diachronic evolution of *ð to its modern exponents offers further evidence for the contrastive feature [+CONTINUANT] in the system.

4 Conclusion

Despite variation in phonetic implementation, particularly among the coronal continuants, in all dialects the alternations between voiceless stops and voiced
continuants can be described as the addition or loss of the contrastive feature [+CONTINUANT]. Using contrastive features we are thus able to treat the stop-continuant alternations as a single unified phenomenon and not a set of separate rules, as would be required if full feature specification were used. In particular, using the contrastive feature [+CONTINUANT] explains why /t/ alternates with /j/ in many dialects. Although /t/ and /j/ have distinct places of articulation (when the features are fully specified), both are contrastively unmarked for place in the dialects where they alternate.

Furthermore, this analysis explains the range of variation across dialects; despite the fact that the alternant of /t/ varies across dialects, it is consistently continuant and contrastively unmarked for place. Moreover, the realisation of the coronal continuants (and other segments) is accommodated in this analysis via redundant features that complement the contrastive feature specifications.

Moreover, it is noteworthy that the only feature common to *ð and all of its modern reflexes is [+CONTINUANT]. All dialects appear to have kept this feature as the underlying feature responsible for this contrast. This analysis also offers an explanation to a diachronic gap in the evolution of *ð to its modern variants. In no dialect has /d/ or /ð/ emerged, arguably due to the [+CONTINUANT] contrastive specification of *ð.

By using the contrastive feature [+CONTINUANT] we can thus unify the alternations examined in this paper; within each dialect (as [+CONTINUANT] applies to the various places of articulation where alternations occur), across all dialects (where it seems to unify the alternants of /t/ in each dialect), and historically (showing dialects appear to have maintained the underlying contrast between *t and *ð).
In addition, the analysis presented herein explains the behaviour of /h/ in Inuinnaqtun and Natsilingmiutut. Positing that /h/ is specified as [+CONTINUANT, −VOICE] and unmarked for place in Inuinnaqtun explains its behaviour in assimilation. Dorais notes that sequences of /ph/, /kh/ and /qh/ in neighbouring dialects surface as [ff], [xx], and [χχ] in Inuinnaqtun (and in Natsilingmiutut, except for [ff]). We would expect /h/ to always assimilate in place to an adjacent consonant if it were underspecified for place. Similarly, the adjacent consonant in such situations receives the contrastive feature [+CONTINUANT] from /h/.

In conclusion, by using a contrastive approach to specification we can offer a unified analysis to the alternation phenomenon (both synchronically and diachronically) that would be difficult to achieve using full feature specification. Furthermore, we can offer an explanation for the degree of variation that exists in the alternants of /t/ across dialects as the contrastively unmarked coronal continuant varies across dialects; though all are modern exponents of PE *δ and are contrastively [+CONTINUANT], their redundant features have shifted, possibly due to gaps in the inventories, increased ease of articulation, or borrowing from neighbouring languages such as Chukchi.
Works Cited


