Consonant Clusters and Syllabification in Passamaquoddy-Maliseet

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Introduction

0.1 History

Passamaquoddy-Maliseet is a member of the Algonquian family of Native American languages, which are spoken primarily in the Eastern United States; some of its relatives have existed throughout the Northwest, even as far as California and Oregon (Goddard, 1775). Passamaquoddy-Maliseet is spoken primarily in Northern Maine and New Brunswick. Historically speaking, Europeans arriving in the New World first came into contact with speakers of Algonquian languages, as speakers of these languages were at the time settled on the east coast of North America. Until this time, Passamaquoddy was, as were the other Algonquian languages, unwritten.

The Passamaquoddy and other peoples who inhabited the Maritime peninsula did not live in tribes, as is often thought, but bands. Despite traditional notions put forth by Frank Speck, the native bands were apparently not centred around rivers; it appears instead that they were primarily nomadic before the arrival of the Europeans (Bourque: 1989). West of the Kennebek river, the natives were farmers referred to by the French as “Almouchiquois”; east of the Kennebek, the natives were apparently hunter-gatherers, first referred to as “Etchemin.” Contact with neighboring bands was generally amicable and regular; thus, neither their languages nor their lifestyles were isolated from the others’.

With the arrival of the Europeans, much of this changed. On the maritime peninsula it was, at first, the French with whom many of the Algonquians allied themselves. For the most part, the French were less intrusive upon their lifestyle: they usually did not settle, only came to fish during the warmer months. Many missionaries lived amongst the people, but they did not initially cause great disturbances in the lifestyles of the Algonquian bands.

None of the Algonquians had ever considered land or game as belonging to anyone or thing but itself, as is apparent in their use of language regarding these things;
their two genders, for example, were animate and inanimate: anything living or life-sustaining was considered animate, and generally not able to be possessed. However, with the arrival of the English, who came to settle, competition grew for land and for food, and many bands were forced westward in search of game. This may account for the westward spread of the Algonquian languages. Those bands which remained became the victims of diseases brought by the Europeans. Their sickness and misfortune gradually caused the native peoples to convert to Christianity, in hopes that this new god would help their people (ME Indian Program, 1989). As a result, translations exist for many of the Christian, and particularly Catholic, rites and scriptures, not just in Passamaquoddy, but in many of the eastern Algonquian languages.

0.2 The Language

Many of the missionaries also worked hard to transcribe the speech of the Natives. Because it was a previously unwritten language, the missionaries adapted the Roman alphabet to transcribe the language. There were no unusual sounds in Passamaquoddy which were not part of the English inventory, however, each transcriber had his or her own interpretation of certain sounds, and additionally, many words varied in pronunciation between bands. Thus, there are few transcriptions which are decent representations of the language at the time. Piecing together the historical data for inconsistencies, though, is a rather large job, and one which will not be undertaken here.

The Passamaquoddy language is most closely related to Maliseet, and the two are often analyzed in conjunction. (Periodically in this paper they are referred to jointly as P-M.) The other languages closely related to these two are Penobscot, Micmac and Wabanaki, all of which were at one time spoken in Northern New England. Native speakers today number very few—none can be counted who speak Passamaquoddy on
a daily, functional basis, and all children are taught English as their first language. There has been a move in recent years, though, to teach the language in schools located on the reservations in Maine and New Brunswick. Much of the data used in this paper was taken from Philip LeSourd’s dictionary of the language which was published in conjunction with the Passamaquoddy/Maliseet Bilingual Program, as well as from cassettes put out by the same program.

Passamaquoddy itself is an incorporating language. Many of its words are long strings of morphemes, sometimes representing entire phrases or sentences. In some ways, this makes it a difficult language to learn, as the morphology is fairly complex (see Sherwood: 1986). There are also many fundamental differences in world view which make it a difficult language to translate. For instance, the Passamaquoddy word nipawset translates literally as “she walks at night,”, but actually refers to the moon (Leavitt: 1991). Due to this complexity, this paper will not attempt to account for morphology in any way.

0.3 Focus of This Paper

This paper will deal primarily with the syllable structure of Passamaquoddy. What makes it an interesting language is that it has many seemingly unusual consonant clusters, which are sometimes a challenge to traditional syllabification.

The first section presents the theory of Prosodic Phonology. This theory allows words to be organized into syllables in a predictable way, depending on language-specific constraints, and is a very logical way to approach the syllabification of a language. It incorporates the idea that a syllable must consist of a sonorous peak, surrounded by elements which decrease in sonority the farther they are from the nucleus, with the idea that every language has a template which dictates what combination of consonants and vowels are allowed by the language to be included in a syllable. Passamaquoddy is similar to English in that it allows both onsets and codas in
its syllables, with limited constraints on each.

The third section presents the consonant clusters allowed by the language. Some of these clusters seem wrong, as they are often not sonorous. For example, a number of clusters which may appear either at the beginning or the end of a word are comprised of two adjacent unvoiced stops:

\[ \text{p} \text{tihike} \quad \text{he catches fish} \]

Interestingly, restrictions on the coda allow \(-\text{tp#}/\), but not \(-\text{pt#}/\). To a non-native speaker, all of these clusters are awkward. Yet at the same time, the language disallows clusters which would seem less awkward, that is, ones which adhere more strictly to the sonority hierarchy.

The analysis around which this paper is centred appears in the fourth section. It requires a slightly different interpretation of sonority and of syllabification, but it makes use of the Prosodic Theory as its base. The final section presents words which are borrowed from both French and English, in the context of syllabification according to the rules established in the fourth section.

1. Syllable Theory

1.1 Introduction

Historically, the syllable has had a controversial role in phonological theory. Although the syllable is included in the teaching of traditional English grammar, there is no precise phonetic basis for how to develop a universal structure for the syllable. Languages seem to have different forms allowable for syllables, in addition to having many varied repertoires of phonological sounds. Thus, the structure of the syllable not only varies cross-linguistically, but is, as a result, open to interpretation with respect to its construction, its assignment, and its usefulness. This paper will not attempt to develop or to prove a particular theory, only to draw upon previous work in syllable theory to examine the syllabification of Passamaquoddy words and phrases.
The syllable being a difficult structure to define, it is necessary first to motivate its use. In so far as the definition of the syllable has been controversial, some have gone so far as to say it is merely “conceptual baggage” remaining from traditional grammar (Kenstowicz, 1994). However, the grouping of segments (consonants and vowels, for instance) in a word into some intermediate structure is an intuitively natural concept to speakers of most, if not all, languages. Linguistically speaking, the syllable serves as the domain for the application of many rules and processes, including affixation, and the assignment of stress and tone. Many common phenomena, such as vowel epenthesis and consonant deletion, are neatly explained through the tendency of words to be parsed into a string of successive syllables (Ito: 1988). Without the syllable, rules become complex, and many phenomena inexplicable.

Despite apparent differences cross-linguistically, a relatively widely accepted theory of universal syllable structure has emerged through the convergence of two approaches. The first approach relies solely on the relative sonority of adjacent phonological segments. The second relies instead upon the consonant or vowel designation of segments, and organizes them into a prescribed pattern for a syllable. The convergence of the approaches has led us to Prosodic Theory, which requires both a CV template, and conformity to principles of sonority. The following sections will describe these in more detail.

1.2 Development of a Universal Syllable Theory

1.2.1 Sonority Sequencing

This view treats words as groupings of segments which rise and fall in sonority. It does not group the segments into any particular structure based on their respective sonorities, it simply addresses the fact that across languages, there is a pattern showing that in words, sonority rises to a peak, then falls, rises again to the next peak, and so on. All phonological elements have assigned degrees of sonority, based on the size of the resonance chamber (generally the mouth) through which the air stream flows,
(Goldsmith, 1990). Thus, vowels are the most sonorous elements, and subsequently constitute the so-called *peaks* of sonority in the sequencing. Obstruents are the least sonorous elements, and approximants fall between; the relative sonorities of segments are listed in Figure 1 (Goldsmith, 1990):

**Figure 1.1. Sonority Hierarchy**

<table>
<thead>
<tr>
<th>hierarchy</th>
<th>segment</th>
<th>sonority index</th>
</tr>
</thead>
<tbody>
<tr>
<td>vowels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>low</td>
<td>a</td>
<td>10</td>
</tr>
<tr>
<td>mid</td>
<td>e, o</td>
<td>9</td>
</tr>
<tr>
<td>high</td>
<td>i, u</td>
<td>8</td>
</tr>
<tr>
<td>glides</td>
<td>y, w</td>
<td></td>
</tr>
<tr>
<td>liquids</td>
<td>r</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>l</td>
<td>6</td>
</tr>
<tr>
<td>nasals</td>
<td>m, n</td>
<td>5</td>
</tr>
<tr>
<td>obstruents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fricatives</td>
<td>s</td>
<td>4</td>
</tr>
<tr>
<td>affricates</td>
<td>v, z, ð</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>f, θ</td>
<td>2</td>
</tr>
<tr>
<td>voiced stops</td>
<td>b, d, g</td>
<td>1</td>
</tr>
<tr>
<td>voiceless stops</td>
<td>p, t, k</td>
<td>0.5</td>
</tr>
</tbody>
</table>
What this hierarchy tells us is that when there are clusters of consonants, the edgemost must be the least sonorous; those closest to the peak should be the most sonorous, as in the following example:

(1) \textit{drained} \rightarrow [d \ r \ v \ n \ d]

Natural language is not perfect, of course, and sonority surrounding peaks does not always fall away ideally according to the above chart, as in the following:

(2) \textit{sprouts} \rightarrow [s \ p \ r \ o \ y \ t \ s]

Kahn (1976) first mapped phonological segments onto syllables: each peak was dominated by a node (S) which constituted the syllable, and the intervening obstruents were mapped onto adjacent syllables on each side. The application of the "syllabification" would then look like this:

(3) \textit{holiday} \rightarrow [h \ i \ d \ i \ d \ e \ i]

Thus, there was no well-defined syllable boundary, nor was there any real distinction between marginal elements and peak elements (Clements & Keyser: 1983).

1.2.2 Segmental Theory

Until the publication of \textit{CV Phonology} (Clements and Keyser, 1983), little work had been done to establish a hierarchical structure through which strings of sonorous segments could be incorporated into words. Clements and Keyser, drawing upon work done by McCarthy (1979, 1981) on Semitic word formation, extended tier theory to include an intermediate level between segments and syllables: the CV tier. This level constitutes the template specified by the given language. Segments are mapped onto the CV tier according to their relative sonority. In other words, the most sonorous element, (usually a vowel), will be mapped onto V, and the less sonorant element or elements are onto C, as in example 4:
This theory goes on to distinguish functional elements within syllables. The peak described earlier as the most sonorous element of the syllable (and usually a vowel) is the core element of the syllable, known as the nucleus. Any preceding C or cluster of C's is mapped onto the onset of the syllable. Any following C or cluster of C's is mapped onto the coda. And where there is a diphthong, both elements will be mapped onto the nucleus. Using our first example of the rise and fall of sonority, the segments would be mapped as follows:

\[
\text{S} \quad \text{S} \quad \text{S} \\
\text{CV} \quad \text{CV} \quad \text{CV} \\
[\text{b a s} \quad \text{ket} \quad \text{b o l}]
\]

Further organization designates the nucleus and coda as the rhyme, and the onset and rhyme together are the elements comprising the syllable. The whole tree appears:

\[
\text{S} \\
\text{CV} \\
[\text{d r i n d}]
\]

While Clements and Keyser claim that the extra level between the CV tier and the syllable node is unnecessary to the hierarchy, it is important to keep in mind which elements belong to the peak, the onset, and the coda, as many languages have specific restrictions on each. This will be developed with respect to Passamaquoddy in the following section.
1.2.3 Prosodic Theory

CV Theory was the basis for what developed into an entire theory of templatic construction. The central notion is that languages have particular CV templates or patterns which define the simplest core syllables of the language. Any which deviate from this are not considered well-formed. The theory was developed to account for vowel infixation processes in Semitic languages (McCarthy: 1979, 1981), whose roots consist of consonants only. The theory says that for any particular language, words must be comprised of strings of well-formed core syllables; the definition of a core syllable is language specific. In general, it has been found that most languages utilize only the following core syllables, according to Clements and Keyser (1983):

Figure 3.

| Type 1: | CV only |
| Type 2: | CV and V |
| Type 3: | CV and CVC |
| Type 4: | CV, CVC, V, and VC |

The explanation for this lies in the following. All syllables must minimally consist of a nucleus, V, as we have established. Most languages prefer to have onsets over codas. While some languages may require an onset for a well-formed syllable, many also do not allow complex onsets, that is, more than one C preceding the nucleus. Many others forbid codas, and some merely restrict the class of segments which may appear in the coda. Thus, the core syllable V is allowed only in languages which do not require onsets, and CVC is allowed only by languages which permit codas.

In addition to the language-particular constraints on core syllables, most languages make use of the sonority hierarchy introduced in section 1.1.1. Thus, complex onsets and codas may be permitted as long as they follow a rise and fall in sonority surrounding the peak. As long as this and language particular constraints on the template are followed, every segment will be licensed to a syllable, and the syllables to a prosodic word. The full prosodic hierarchy is described by Figure 4.
In most languages (see Bagemihl, 1991), all segments must be licensed by the syllable in order to be realized. When this is not the case, that is, when a sequence either does not follow the graduation of sonority, or does not conform to the syllable template, it may be subject to extraprosody (Ito, 1988). In this case, one of several things may happen for proper syllabification to occur. Most simply, an epenthetic vowel may be inserted to create an extra syllable. Otherwise, the unlicensed segment is subject to deletion, referred to as Stray Erasure. Either of these processes will generally result in well-formed syllables.

Exceptions to these processes may occur only at word boundaries, in which case they may be considered Extraprosodic, which allows the segment, or segments, to surface without actually being syllabically licensed. Instead, the segment(s) may be licensed by the foot or by the word node (Ito: 1988). This also seems to occur cross-linguistically, but is usually a last resort, and some languages will attempt to syllabify even word edge elements before allowing them to go unlicensed.

One final component of Prosodic Theory is the notion of directionality. Ito proposes that every language syllabifies either in the left-to-right or in the right-to-left direction. The former results in a language which incorporates the maximum number of segments into the coda before syllabifying segments into the following onset. Although there are far fewer of this type of language, they do exist. Most languages supposedly syllabify in the right-to-left direction, thereby incorporating segments maximally into the onset to the left of the nucleus before allowing segments to syllabify
onto the coda of the preceding syllable. Directionality alone, though, cannot predict the exact form a syllable may take, only that a language may prefer onsets or codas.

To summarize, the principles of Prosodic theory are three (Itô, 1988). First, all segments must be licensed in the hierarchical structure. Second, the well-formedness of a syllable is determined only within the syllable, and not by any information outside the syllable. The same follows for a foot, word, or other prosodic structure: ultimately, the well-formedness of a word is dependent only on the segments within that word, irrelevant of the elements of adjacent words. Finally, languages syllabify directionally, and this plays an explanatory role in language-specific preferences for onsets or codas.

The following section will introduce the phonological elements of Passamaquoddy, and the remainder of the paper will utilize Prosodic Theory to analyze the syllable structure of the language.

2. Basic Elements of Passamaquoddy Syllable Structure

2.1 Phonological Elements

Because Passamaquoddy was for most of its history an unwritten language, words were first transcribed by missionaries in the seventeenth century using the Roman alphabet. Today, the same basic alphabet is used as the only writing system for the language. All linguistic analysis, too, has been done using this writing system for ease of interpretation by non-linguists attempting to learn something of the language. Unfortunately, although the obstruents are relatively simple and can be fairly accurately represented in this way (except for voicing, which will be addressed shortly), I think a great deal is lost in the vowel transcriptions in particular by not using a phonetic alphabet. The orthographic elements used in representation are as follows:

Figure 1

<table>
<thead>
<tr>
<th>stops</th>
<th>fricatives</th>
<th>nasals</th>
<th>liquids</th>
<th>glides</th>
<th>vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>p, t, k, q</td>
<td>c, s, h</td>
<td>m, n</td>
<td>l</td>
<td>y, w</td>
<td>o, i, u, e, a</td>
</tr>
</tbody>
</table>
There are no sounds in Passamaquoddy-Maliseet corresponding to \([f, v, \theta, \delta, r, \eta]\), nor are there any obstruents articulated further back than \([k]\). The segment \(c\) is palatalized, thus representing \([\check{c}]\), and the segment \(g\) is generally realized as \([k\check{w}]\). The vowels may be short or long, depending on their environment, except that \(o\) is nearly always realized as \([\varepsilon]\). The phonological sounds represented by the other letters are:

Figure 2

- \(a\rightarrow[\alpha]\) or \([\partial]\), \(e\rightarrow[\varepsilon]\) or \([\varepsilon]\), \(i\rightarrow[i]\) or \([i]\), and \(u\rightarrow[u]\) or \([u]\)

On the surface, it appears that there are no diphthongs in P-M, as no two true vowel ever appear adjacent to one another in the same word. However, any combination of a simple vowel with a glide is realized as a tautosyllabic diphthong:

Figure 3

- \(aw\rightarrow[ou]\), \(ew\rightarrow[eu]\), \(iw\rightarrow[iu]\), \(ay\rightarrow[ai]\), \(ey\rightarrow[ei]\)

According to LeSourd in his dictionary of P-M (1986), \([p, t, k, k\check{w}, \check{c}, s]\) alternate with \([b, d, g, gw, j, z]\), respectively, when found between vowels, or between the first-person prefix \([n-]\) and a vowel. In other words, the voiceless counterparts surface only when adjacent to another voiceless consonant.

(1) \(\text{nutapektuhusit} \rightarrow [\text{nu da bek tu hu zit}] \quad \text{one who plays fiddle}\)

Thus, any of the above segments that is a member of a medial cluster will be unvoiced, while any that are between vowels are voiced.

At the edges of words, the voicing alternation is not so predictable, as in the following examples:

(2) \(\text{pol kil} \rightarrow [\text{bal gil}] \quad \text{you first}\)

(3) \(\text{punkik} \rightarrow [\text{pun kik}] \quad \text{at the winterland (North Pole)}\)

This is suspicious, and may indicate one of two things: either the voiced and voiceless consonants are not actually allophones of each other, or there is an historical or morphological reason for the word-edge alternations.
Finally, it must be noted that the letter h has interesting properties. Whenever it precedes a vowel, as in /VhV/ or /ChV/, it is realized as [h]. But when followed by a consonant, /VhC/, the h is silent, and the following consonant will not be voiced. The realization of the h surfaces as a lengthening of the preceding vowel, resulting in the only long vowels of the language other than diphthongs.

2.2 Word Construction

Like other languages in the Algonquian family, Passamaquoddy-Maliseet is an incorporating language. This type of language generally shows a one-to-one mapping of morphemes to morphs. What this means is that each morph carries a single meaning, such as the prefix /n-/ which indicates the first person, or the suffix /-ak/, which expresses the animate plural. As a result, words may become quite long, particularly when they express a verb phrase, which includes subject, object, mood, and verbal enclitics (time frame). In addition to the subsequent complexity of the morphology, word construction and syntax, words themselves average a length of three or more morphemes. For the most part, the morphology of Passamaquoddy will not make a difference to the syllabification of the language. In a few cases, though, the behavior of the morphology results in exceptions to behaviors in phonological occurrences, as will be discussed in the Section 3.

2.3 Syllable Templates

Passamaquoddy appears to be what Clements and Keyser would have labelled a Type Four language, in that it makes use of all four syllable templates: CV, V, VC, and CVC. Further, any combination of these is permissable in words containing strings of morphemes. The following sets of data show that each of the syllable structures is possible, and in varying combinations. For this and all subsequent data, I have listed both the traditional orthographic representation, the meaning, and the phonetic representation. For purposes of syllabification, I will utilize the phonetic representations of words, so as to prevent any misinterpretations of pronunciation.
2.3.1 CV syllables

Syllables consisting of only an onset and a nucleus are able to occur anywhere in a word, and may constitute every syllable in the word.

(1) pipuwocu  *the ice is frozen thin*  (2) misimekopu  *it is wrinkled (cloth)*

\[\begin{array}{cccc}
S & S & S & S \\
\text{CV} & \text{CV} & \text{CV} & \text{CV} \\
\end{array}\]

\[\begin{array}{cccc}
S & S & S & S \\
\text{CV} & \text{CV} & \text{CV} & \text{CV} \\
\end{array}\]

2.3.2 VC syllables

Syllables which contain a nucleus and a coda, but which lack an onset, can occur only in initial position, as Passamaquoddy does not syllabify a medial consonant onto a coda where it can be syllabified onto the onset of a following syllable.

(3) alsawine  *(s)he has ulcers*  (4) eqtihike  *he stops pounding*

\[\begin{array}{cccc}
\wedge & \wedge & \wedge & \wedge \\
\text{VC} & \text{CV} & \text{CV} & \text{CV} \\
\end{array}\]

\[\begin{array}{cccc}
\wedge & \wedge & \wedge & \wedge \\
\text{VC} & \text{CV} & \text{CV} & \text{CV} \\
\end{array}\]

2.3.3 CVC syllables

Many Passamaquoddy words end with consonants, and thus have CVC syllables in word final position. However, core syllables of this nature may also appear word initially and/or word medially if, and only if, the coda consonant appears adjacent to another consonant which may be syllabified into the onset of the following syllable.

(5) metsoqsu  *he sleeps late*  (6) tuwiskut  *chamber pot, toilet*

\[\begin{array}{cccc}
\wedge & \wedge & \wedge & \wedge \\
\text{CVC} & \text{CVC} & \text{CV} \\
\end{array}\]

\[\begin{array}{cccc}
\wedge & \wedge & \wedge & \wedge \\
\text{CV} & \text{CVC} & \text{CVC} \\
\end{array}\]
2.3.4 V syllables

Syllables which consist only of a nucleus, V, occur word initially only. They do not occur word medially, as it will never happen that a consonant is syllabified into a coda of one syllable, leaving the following syllable without an onset. Two vowels never occur adjacent to one another word-medially; the only cases of diphthongs result from a vowel followed by a glide plus a consonant, in which case the vowel and glide are tautosyllabic. Long vowels result from a vowel followed by /hC/, as in the following examples:

(7) amuwyahsu  he acts a little crazy  (8) oposentu  sundog (A)

[ a. muw. ya:. su ]  [ a. bo. z e n. tu ]

2.4 Minimal Words

Although it will not be the focus of this paper, it is necessary here to talk briefly about the stress pattern of Passamaquoddy. This is, actually, one area where the language differs slightly from Maliseet. The stress pattern is fairly complex, but in brief, Passamaquoddy can be treated as a moraic trochee language. Primary stress falls on the head of the final foot, which is generally the penultimate syllable. Secondary stress is assigned at the head of the left-most foot, (the first mora), if the word contains two or more feet. After that, varying degrees of stress are assigned at the heads of feet from left to right. Thus, if there are any extrasyllabic mora, they will generally be found in the antepenultimate position.

There are, in Passamaquoddy, few words containing fewer than two syllables. Of those words that do, most seem to require a coda, making the one syllable heavy. This provides evidence that the language is indeed weight-sensitive, and dependent on
mora over syllables. Onsets are not requisite for a heavy syllable, and are often not present, as in the following examples.

(1) kat→[gat]  log (1)
(2) awt→[gut]  road, path (1)
(3) op→[əp]  would
(4) oc→[əj]  will, shall

(Note: op and oc alternate with -hp and -hc, respectively, where the latter forms are used only as suffixes to words comprised of strings of morphemes. When appearing independently, the forms listed in (3) and (4) are used.)

Not all minimal words do require a coda. In some cases, it is sufficient to have a long vowel or diphthong in the nucleus, again creating a heavy syllable:

(5) new→[nəu]  four [as in count]
(6) kuw→[ku:]  white pine
(7) 'ciw→[çi]  about, for [alternates with uhc]

All of the above data seems to indicate that there is a minimal word requirement in Passamaquoddy which would require a word to consist minimally of a heavy syllable, or two mora. However, there are a few words which have two allomorphs, one of which consists of only a single mora, and there is one word (the only one I have come across) which has no minimal word alternation.

(8) na, ona → [nə], [ə.nə]  also, besides
(9) te, ote → [də], [ə.də]  (emphatic)
(10) lu, olu → [lu], [ə.lu]  but, however
(11) cu → [ju]  yes, why yes (in answer to no-question)

Thus, except for cu, these few words may take an initial schwa in order to achieve two light syllables, or one moraic foot. The CV alternations seem to be used in environments where they can be syllabified together with other less than minimal
words, or grouped in such a way that they can be phonetically realized as a series of adjacent light syllables.

\[(12)\] \text{cu} \text{te} \text{lu} \rightarrow [\lambda_\text{d} \text{e} \lambda_\text{l}] / \text{yes, it is true} \\
\[(13)\] \text{ki} \text{l} \text{u} \text{tan}\text{?} \rightarrow [\text{g} \text{l} \lambda_\text{d} \text{an}] / \text{and you?} \\

A closer look at the assignment of metrical feet in this language might provide insight into this problem, but is beyond the scope of this paper.

3. Syllabification of Consonant Clusters

3.1 Introduction

Passamaquoddy-Maliseet words contain a number of consonant clusters, particularly as they grow in length due to the addition of various morphemes. Word medially, biconsonantal clusters will generally syllabify onto separate syllables. At the edges of words, however, clusters must be taken as they are (except in a few instances where consonants may resyllabify across a word boundary). In some cases, these clusters are acceptable under a strict interpretation of the sonority hierarchy. In other cases, the clusters are not. It should be noted, though, that most languages place varying degrees of importance on aspects of sonority, and Passamaquoddy is one. The exact inventory of “acceptable” clusters in Passamaquoddy is actually very limited, as we shall see. Even clusters allowed by the sonority hierarchy are often not by this language, despite the fact that some clusters violating the hierarchy are. Although this seems to imply a complete disregard for the hierarchy, I will show that Passamaquoddy does utilize a hierarchy of sonority, and that the violations which occur can be attributed to other constraints on the language.

Those consonant clusters which I will refer to as “acceptable” must follow the principles of sonority introduced in Section 1 of this paper. To recap, the nucleus of any syllable must correspond to a peak in sonority. Usually, the peak is a vowel. Any segment that is to be treated as part of the syllable must be less sonorous than the
designated peak. The nucleus is preceded by the onset, which may be complex only if it increases stepwise in sonority from the outermost segment to the established peak. If there are less sonorous segments following the nucleus which do not belong to the onset of the next syllable, they may be included in the coda only if they decrease stepwise in sonority.

Any clusters that cannot be syllabified without violating the sonority hierarchy theoretically present a challenge to the notion of prosodic licensure, also introduced in the first section of this paper. At the edges of words, problematic segments can be licensed by the word rather than the syllable. The problem with this approach is that there are too many problematic structures in Passamaquoddy, not all of which can be dealt with through extrasyllabicity.

There are two things that can be noted right away about Passamaquoddy syllabification of consonant clusters. The first is that the language prefers complex onsets over complex codas, as do most languages. However, there are instances where other priorities take precedence. This will become more apparent as we look at problematic clusters. The second thing we notice is that because the language allows all four syllable types, it does not at any time disallow a coda, thereby deleting a segment, or preferentially syllabifying it into a complex onset. However, there are definite constraints upon what segments can be licensed by the coda, as well as on which segments may be licensed by the onset. In most cases, the inventory of permissable codas is a subset of the set of permissable onsets, but this is not always the case.

3.2 Biconsonantal Clusters

Given the inventory of consonantal segments in Passamaquoddy, there are theoretically 144 possible biconsonantal clusters, including geminates, and ignoring restrictions placed on the clusters due to sonority or other rules. Many of these clusters, though, are not allowed by the language, even when they do follow the sonority hierarchy. Take, for example, the segment ʃ. While it does have a geminate form, ʃ
itself can appear in only one other biconsonantal cluster, and this cluster is licensed only by the coda. This is but one of a number of generalizations which can be made about consonant clusters in Passamaquoddy, which will be supported with data taken primarily from LeSourd’s dictionary.

To begin, I will restate the sonority hierarchy, including only those segments which belong to the Passamaquoddy inventory:

Figure 1. vowels: \( a > e, o > i, u \)

| glides: | \( y, w \) |
| liquids | \( l \) |
| nasals | \( m, n \) |
| obstruents |
| fricative | \( s \) |
| affricate | \( j > \mathbf{c} \) |
| stops | \( b, d, g > p, t, k \) |

The only segment missing from this inventory is \( q \). In the phonological description of any language, the sound here represented by the Roman alphabet \( q \) is generally transcribed as \([kw]\) or \([k\\'w]\). This is true, also, of other accounts of P-M (see Sherwood: 1986, Teeter: 1971, etc.) However, LeSourd has utilized the segment \( q \) to represent this combination of \([kw]\) or \([k\\'w]\), and it has been adopted into the writing system of the language. This convention will be kept throughout this paper, except in the case of a phonetic representation. It is necessary to keep in mind that while \(/q/\) is regarded as a single consonant, it is really a stop followed by a glide, and as a result, it may behave differently in clusters.

The generalizations made here refer primarily to word-edge clusters as, in most cases, word-medial clusters of two consonants are be syllabified onto separate syllables, as we saw in the previous section. In comparing the onsets and codas of syllables, there
are two ways to look at the combinations of consonants in clusters. The method which follows the sonority hierarchy has us look at what can be licensed by the onset, take its mirror image, and see if this can be licensed by the coda. According to Goldsmith (1989), any feature or series of features which are not licensed by the onset cannot be licensed by the coda. As we will see, this methodology is awkward for two reasons: first, a cluster may contain two consonants which have very similar features, but which can still be licensed by the same syllable. Second, there are a total of nine clusters which appear in the coda that never appear in the onset, if treated as the mirror image. This, of course, violates what Goldsmith says about coda licensure.

If, however, we choose an alternate method in which we examine each cluster as a linear string of segments from left to right, we will incur only four violations of this, three of which involve the segment g, which, as we have already established, does not behave as a single consonant. This approach will simplify the overall inventory of possible clusters available to P-M. In addition, there are at least four triconsonantal clusters in the language which may appear medially as well as at either edge of the word, but which always appear in the same linear order, never the reverse. This leads us to believe that the language may pay more attention to particular clusters than to the sonority hierarchy itself. The following generalizations, then, treat clusters as a linear pair which may appear at either edge of a word, as well as medially.

3.2.1 Voiceless stops

In a given sequence of consonants, the least sonorous segments available to the language, /p, t, k/, are generally not followed by any consonantal segment more sonorous than the fricative /s/.

(a) In an onset, the segment /p/ can be followed only by /s/ or segments less sonorous than /s/. Thus, the only possible word-initial biconsonantal clusters beginning with /p/ are as follows:
(1) pk- pkihkon  fish hook
(2) pk"- pqapit  beaver
(3) pt- ptihike  he catches fish
(4) pč- pčiliw  especially
(5) ps- psuwis  cat

Of these, only the last two abide by the sonority hierarchy as we have defined it for onsets. These same two are the worse violations when found in codas, yet they are the only two allowed:

(6) -pč a12c  again, else, next
(7) -ps si12s  bird

The question then becomes, how or why does the language allow this to happen? This is something we will not address until the next section. For now, we will continue to observe the patterns apparent in the language.

(b) The segment /t/ acts very much in the same way that /p/ does. It is worthy of note, here, that /t/ is a prefix meaning from, because. Thus, it is a morpheme which attaches to well-formed stems, where /#pC-/ is simply part of the root. In theory, this creates the possibility of a wider variety of combinations. However, /t/ can, in fact, appear before a smaller number of segments than can /p/. The cluster *[tč] is not allowed by the language, presumably because of the Obligatory Contour Principle (hereafter referred to as OCP), which requires that adjacent segments have a certain minimal difference in place features specified by the individual language. In Passamaquoddy-Maliseet, this difference in point of articulation allows only segments less sonorous than /t/ to follow /t/ in an onset cluster.

(1) tp- tpskutikon  letter of the alphabet
(2) tk- tkeyu  it is cold (weather)
(3) tk"- tqonke  he arrests
Goldsmith (1989) proposes that any segments or clusters allowed by the coda must be a subset of those allowed by the onset. We have already seen that this is true with /p/ as the initial segment, and we see here that the same is true of clusters beginning with /t/ in Passamaquoddy. Of the other obstruents, only the following are acceptable clusters:

(4) -tkʷ 'satq three hundred
(5) -tp tehsahqatp top of the head

Thus, we find that /t/ cannot be followed by either /s/ or /č/, and that in the coda /t/, like /p/, cannot be followed by /k/. This indicates, perhaps, that /k/ and /q/ may compliment each other. Further evidence of this appears when the occurrences of the two segments in initial position of clusters are examined.

(c) The segment /k/ can actually appear before a larger number of consonants than the other obstruents. The primary reason for this seems to be morphological: /k/ represents the second person prefix, which may attach to any verb stem or noun stem. What is interesting is that the language does not epenthesize a vowel in order to prevent /kC_{obs}/, where it seems to want to do this with both /p/ and /t/. The fact that *[kql] is prohibited can again be attributed to OCP. (Neither do geminates appear in initial position, so if *[kq] arises, it must either be reduced to [k], or a vowel must be epenthesized to form /KVq/.)

(1) kp- kpihikon lid, cover, dam
(2) kt- ktahkomiq land, ground, earth
(3) kč- kcihq woods, forest
(4) ks- ksinuhkewakon sickness, disease
(5) km- kmicuwakon your food
(6) kn- knemihton you see it
(7) kh- khakon door
(8) kw- kwassol his son
Note that in (8), the cluster is actually [kw], and is not represented as q. In the coda, the only cases where /k/ can appear as the initial consonant are the following, and its occurrences before /s/ are limited to a very few.

(9) kp- npotqocokp  I am soaked to the skin
(10) ks- luks  wolverine (?) (mythological)

So far, then, while /k/ is the most versatile onset, it is just as restricted in the coda as other consonant clusters.

(d) The segment /q/, in contrast with /k/, does not appear as the initial segment in onset clusters except with /s/:

(1) k"s- gosokahsin  he lies across

However, it can precede other segments less sonorous than /s/, (not including /k/, of course), when in the coda position. Note that it cannot appear with /p/ as /k/ can:

(2) -k"t  neqt  one, once
(3) -k"č  toqc  without further delay
(4) -k"s  eniqs  ant

It is important to point out, here, that /-qt/ and /-qc/ have no corresponding clusters in the onsets of any word initial syllables. This would be in violation of the Firthian argument (Goldsmith: 1989) that segments not licensed by the onset cannot be licensed by the coda. But in this case, we know that /q/ and /k/ cannot both appear before the same consonant in either the coda or the onset, (barring /s/). This leads us to believe that the two consonants may be in complimentary distribution with one another. The only exception to this is /s/ itself, and as we shall see, /s/ presents a number of "special" cases in the language. From a linguistic standpoint, then, it is more insightful to treat /q/ as [kw], as it may lead us to a better understanding of which consonants may appear in clusters. We will look at this in more detail in the following section.
3.2.2 Affricates

The two more sonorous obstruents, /s/ and /c/, cannot precede any segment more sonorous than the voiceless stops. This compliments the pattern which was shown by generalization 1.

(a) First, if we take all the consonants less sonorous than /s/, we have only /p, t, k, q, c, s/. Of these, we know that /c/ will not appear with either /t/ or /s/, by OCP. It also seems probable, at this point, that /k/ and /q/ are in complimentary distribution; so we would expect that if /c/ may appear with one of the two, it is not likely to appear with the other. This does turn out to be the case, and as a result, only the following are possible in the onset:

(1) čp- **cpahkatom**
(2) čk- **ckuhqepu**

Neither combination appears in the coda, but /c/ may be followed by /q/ in word-final coda position:

(3) -čkw**eskucq**

This is particularly interesting because in the coda, both clusters would be allowed by a traditional view of the sonority hierarchy, while they would not be allowed in the onset. But, again, we could see this as an alternation between /k/ and /q/.

(b) The segment /s/ is found in the onset of a biconsonantal cluster more often than any other single segment. Again barring /c/ because of OCP, /s/ can precede any segment less sonorous than itself in the complex onset of a syllable.

(1) sk- **skitap**
(2) sp- **spomkik**
(3) st- **stahqon**
(4) skw- **sqotes**

While less frequently seen, /s/ may appear as the initial segment of a complex coda, and is also one of the few geminates which may appear in word final position:
(5) -st wast snow
(6) -sk posiyantsk window
(7) -skʷ sikusq pear
(8) -ss ngoss my son

The example in (8) shows that a geminate of /s/, at least, may appear in the coda. This is also true for some of the other consonants, but not all. This will not be dealt with in detail here, as it is not central to the argument for syllabification.

3.2.3 Nasals

Like the obstruents, nasals generally do not precede any consonant more sonorous than themselves in a complex onset or coda. Again, this makes sense in the coda position, but the coda is often more restricted than the onset, where this does not follow the sonority hierarchy.

(a) The segment /m/ has limited usage in consonant clusters. In fact, it only precedes /q, k, s/ in either the onset or the coda. However, for each word which occurs with /#mC-/ as its onset, there is a corresponding form which begins with /#pC-/:

(1) m k - mkikhon (also pkihikon) fish hook
(2) m kʷ - mqeyu (also pqeyu) he, it is red
(3) m s - msi, msiw (also psiw) all, every

Here, the onsets are in violation of the sonority hierarchy, but the corresponding codas, which do not have the same alternation between /m/ and /p/, are not. Interestingly, this is one of the only sets with a one to one correspondence between the pairs licensed by the onset and those licensed by the coda.
Recall, also, from section 3.2.1 (a) that [-pk#] and [-pq#] never occur. The above data is evidence that if we had treated the onset and coda clusters as mirror images of one another, we would have found no codas corresponding to the onsets in (1)-(3), and likewise, no onset corresponding to the codas in (5) and (6). So by treating the clusters as a linear series of segments, we have avoided violating the issue of licensing clusters in the coda which are not licensed in any onset. Thus, it appears that Passamaquoddy is more attentive to specific linear strings of consonants, as opposed to their relative sonorities. This idea will be developed further in subsequent sections.

(b) The segment /n/ may precede any segment equally or less sonorous than itself. In the onset, it may also precede /h/ and /w/, as /k/ may. This is also a result of morphological processes: the segment /n/ is the first person prefix, which may attach to verb or noun stem, as in the following:

(1) np- npisun (also 'pisun) medicine
(2) nt- ntelohkeps I must have been working
(3) nk- nkotuwapuwe I want to drink/eat something
(4) nk"- nqoss my son
(5) nč- ncepi I am separated
(6) ns- nsum my daughter-in-law
(7) nm- nmihtaqs my father
(8) nh- nthesis my younger brother
(9) nw- nwewitahama I remember...(something)

Like /m/, though, the usage of /n/ is very limited in the coda position, so much so that there are actually only two possible biconsonantal coda clusters containing /n/ in the entire inventory, as it never appears after another consonant in the coda, and can only precede /k/ and /s/:

(9) -nk knaci kotunk are you going hunting?
(10) -ns ktahkomons seed, pip
Here, again, there would have been a violation of licensure had we treated /-ns/ as the corresponding coda of */sn-/, which never appears. The two uses of /n/ in coda position are in accordance with the sonority hierarchy, however, of the eight clusters having /n/ as the initial segment, only two do not violate the hierarchy.

3.2.4 Sonorous segments

The remaining consonants, all more sonorous than the nasals, may precede only a segment less sonorant than themselves, and only in the coda. They may never precede another consonant in the onset.

This fact is not so surprising in terms of sonority. One would not expect to find a liquid or glide preceding an obstruent in word initial position. However, this does not correspond to the behavior of the other consonants we have looked at. If we treat all four of the remaining segments, /l, h, w, y/ as consonants, they are in direct violation of the rule of licensure on which this methodology has been based. If however, we look at the segments in terms of sonority, and expect to find them following a less sonorant consonant in an onset, we will again be disappointed, as only /h/ and /w/ are found in such a position, and only following /k/ and /n/, as we have seen. Thus, it may be necessary for us to look at these segments not as consonants in the way the obstruents and nasals are, but as more closely related to the vowel they follow.

(a) For the segments /h, w, y/ this is not difficult to imagine. We have already seen that /h/ is not pronounced in front of another consonant, but simply has the effect of lengthening the preceding vowel and preventing the consonant, if is an obstruent, from being voiced:

\[(1) \text{ /}V\text{hC/ sihpac } \Rightarrow [\text{si: bæt}] \text{ pail}\]

We have also seen that /w/ and /y/ have the effect of creating diphthongs when following vowels. While /w/ may be found between a true vowel and a consonant as well as between two vowels, /y/ may only be found intervocally, or between a
vowel and one of the other semi-vowels, /h, w/, thus /y/ is more likely to act as a consonant:

(2) /VyV/ \ amuwye → [a mu\textsuperscript{w} ye] \ he is crazy
(3) /VwC/ \ witawsumal → [wi d\textsuperscript{ou} zu mal] \ he is related to him

(b) The only liquid in the language, /l/, cannot be analyzed in any analogous way, as it has no direct effect on the shape or length of a preceding vowel. Again, it is never found in a complex onset (at least in any native words—we will look at one example of an English loanword in Section 5). However, a single example of /l/ preceding another consonant in the coda only, is /-lč/:

(1) -lč \ ptoqile \ fist

This is the only biconsonantal, word-edge cluster involving /l/ that I have been able to find. There is no corresponding onset to this coda cluster, neither /lč-/ nor /čl-./ Thus, it is a violation of the licensing principle even though it is not a violation of the sonority hierarchy. /l/ may occur as a geminate, but only word-medially, where, of course, it may be found with other consonants, but never in the same syllable.

3.3 Clusters of Three Consonants

Passamaquoddy also has clusters of maximally three consonants, as long as /q/ is counted as a single consonant. In most cases, one of the segments must be an /s/, but alternately, one of the segments may be an /h/. To find such clusters word-medially would not be surprising, as we know clusters of two consonants are permissable in both the onsets and codas of syllables, thus a triconsonantal cluster would be syllabified onto two adjacent syllables. What may be surprising, though, is the presence of these same clusters at both edges of words. Here I will simply show examples of both medial and edge clusters of three consonants, and in the following section, I will account for their syllabification.
3.3.1 Medial clusters of three consonants

(a) The first group of consonants consists of /psk/ and /psq/. In this situation, we know that both /ps/ and /sk/ are acceptable clusters, but also that the language prefers complex onsets to complex codas. Thus, the cluster is syllabified /-p. sk-/.

(1) -psk- Pessikapskiyak Split Rock (at Pleasant Point)
(2) -pskw- ponapsqehs chub (fish)

(b) The next group of consonants is comprised of /ksk/, /qsk/, and /ksq/. This is the only group which seems to have clusters that are mirror images of each other. They are syllabified in the same way as the above cluster: the first stop onto the coda of the preceding syllable, and the /s/ plus following stop onto the onset of the subsequent syllable. Again, this is not shown here:

(1) -ksk- kakskus cedar tree
(2) -kskw- nteksqinen we (dual) sneeze
(3) -kskw- neqskiqessoss woodcock

(c) The next group of consonants with a medial /s/ has an initial nasal:

(1) -msk- nimskehe he drops by to visit
(2) -mskw- amsqahs first, at first
(3) -nsk- panskute there is a clearing

(d) There is a single example of a liquid followed by the /skw-/ cluster:

(1) -lskw- pilsqehsis girl

(e) There are two clusters in which /s/ is not the medial segment, but the initial, which are rarely seen. Unlike the other clusters we have seen, in the first two clusters /-sk/ constitutes a complex coda, and the following consonant, a simple onset.

(1) -skh- peskhan he shoots (something)
(2) -skt- nusktek skirt
There is one final cluster in which /s/ is both the initial and the final segment. The cluster /sks/ could be syllabified either way, but it is, of course, preferential to have a complex onset.

(3) -sks- lasksawakon scythe, sickle

3.3.2 Word edge clusters of three consonants

The same clusters which appear medially may also occur at either edge of a given word. Syllabification of these clusters is somewhat more complex, and I will not attempt to show it until the following section. Note that, with one exception, a linear sequence of segments may appear in both the onset and the coda, but in general, its mirror image cannot. This again invites the hypothesis that the linear order of segments takes precedence over their relative sonorities.

(a) The first clusters from above, /psk, pskw/, are common and may both be found at the left word edge, but only the latter may be found in the coda of the final syllable:

(1) #psk- pskihq blade of grass
(2) #pskw- psqentu he bursts into song
(3) -pskw# wapsq polar bear

The only exception to the linear sequence of the segments in these clusters of three consonants is this single word:

(4) #ksp- kspisun belt

(b) Of the clusters in (b) above, only /ksk/ may occur in an onset in word initial position, and /ksq/ in a coda in word final position:

(1) #ksk - kskomihike he takes a shortcut
(2) -ksk# naksq young woman
(c) The triconsonantal clusters with /n/ in initial position may both occur at either edge of a word:

(1) #nsk- nskawewintuwakon greeting song
(2) -nsk# nisinsk twenty
(3) -nskw# skolunsq bullet lead

However, /msk, mskw/ surface as /psk, pskw/, respectively, when found in any word edge position, (I will not go into the derivation here, this is a morphological process of shortening which results in the triconsonantal cluster, see Sherwood, 1986):

(4) moskuwal ~ pskuw (stem lb) he finds him

(d) There are two odd clusters of which there is only one occurrence of each to my knowledge. The first, /nhk/ is found only in this single onset position, and the one other cluster, /wsk/, occurs only in this word final coda position:

(1) nhk- nhkeyiw it is not soft
(2) -wsk ksiwsk hemlock tree

The fact that there are several clusters of three consonants which occur only once indicates that they are more marked than the biconsonantal clusters. We saw in the inventory of biconsonantal clusters that /sk/ could occur anywhere in a word, and, with only one exception, all of the clusters contain /-sk-/ at one or the other edge of the cluster. This implies that the /sk/ cluster may receive special treatment, perhaps something like that of /kw/.

This concludes the inventory of consonant clusters in Passamaquoddy. Following is a table summarizing the inventory of biconsonantal clusters, which should be kept in mind for the next section, in which we will approach the problem of syllabifying those word edge clusters of two and three consonants which grossly violate the sonority hierarchy.
Biconsonantal Cluster Inventory

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</tbody>
</table>

- KP-: KP, KP-, KP
- TP-: TP, TP-, TP
- CP-: CP, CP-, CP
- SP-: SP, SP-, SP
- NP-: NP, NP-, NP
- HP-: HP, HP-, HP
- WP-: WP, WP-, WP
- PK-: PK, PK-, PK
- TK-: TK, TK-, TK
- CK-: CK, CK-, CK
- SK-: SK, SK-, SK
- NK-: NK, NK-, NK
- MK-: MK, MK-, MK
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- PQ-: PQ, PQ-, PQ
- QP-: QP, QP-, QP
- TQ-: TQ, TQ-, TQ
- CQ-: CQ, CQ-, CQ
- SQ-: SQ, SQ-, SQ
- NQ-: NQ, NQ-, NQ
- MQ-: MQ, MQ-, MQ
- HQ-: HQ, HQ-, HQ
- QT-: QT, QT-, QT
- TT-: TT, TT-, TT
- NC-: NC, NC-, NC
- HC-: HC, HC-, HC
- WC-: WC, WC-, WC
- LC-: LC, LC-, LC
- KS-: KS, KS-, KS
- QS-: QS, QS-, QS
- SS-: SS, SS-, SS
- NS-: NS, NS-, NS
- MS-: MS, MS-, MS
- HS-: HS, HS-, HS
- WS-: WS, WS-, WS
- KN-: KN, KN-, KN
- NN-: NN, NN-, NN
- HM-: HM, HM-, HM
- WM-: WM, WM-, WM
- NH-: NH, NH-, NH
- HH-: HH, HH-, HH
- NW-: NW, NW-, NW
- WW-: WW, WW-, WW
- YY-: YY, YY-, YY
- LL-: LL, LL-, LL

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4. Syllabification Involving Consonant Clusters

4.1 Word Edge Clusters of Two Consonants

In the previous section, we took an inventory of the biconsonant clusters allowed to appear in both the onset of the first syllable of a word, and the coda of the final syllable. This section will examine these word edge clusters in more detail to see how they are allowed to syllabify in Passamaquoddy. I will begin by dividing the clusters into three groups: those which satisfy the sonority hierarchy without question; those clusters which may be borderline, depending on the interpretation of the constraints placed on clusters by the hierarchy; and finally, those clusters which are in direct violation of the hierarchy. For each word I will give a syllabification based on the sonority hierarchy. For those clusters which do not satisfy the hierarchy, the syllabification will not appear to be satisfactory. In all, this approach will be of value only in that it will point out the gaps left by the traditional view of the sonority hierarchy. I will therefore propose an alternate interpretation of the data which places a lesser priority on sonority in order to properly account for syllabification.

4.1.1 Clusters in compliance with sonority

The first group of consonant clusters involves a voiceless obstruent outside of a segment that is higher in sonority, such as an affricate or a nasal. These clusters follow the sonority hierarchy as it has been presented, and thus do not present a problem to syllabification. The following examples show this (glosses appeared in the previous section):

(1) **pciliw** → [pči. liu]
(2) **wast** → [wast]
(3) **kmicuwakon** → [kmi. ču. wa. gən.]
(4) **qsokaviw** → [k”sə. ga. jiu]
(5) **tahkomons** → [tə: kə. mans]
(6) **’potqilc** → [pət. k” ilč]
The second group of clusters which comply with the sonority hierarchy involves a nasal followed by a more sonorous segment:

(7) *nhesis* → [nhe. zis]
(8) *wahkesipon* → [nwaː. ke. zi. bən]

4.1.2 Clusters in violation of sonority

These clusters may occur in either the onset or the coda, and must consist of a segment of greater sonority outside of a segment of lesser sonority. Here, I will give two possible syllabifications, based on the following: that these clusters appear at all in the language indicates that they must be licensed at some level of the prosodic hierarchy (Ito: 1988). Either the violating segment is allowed to syllabify by itself according to some rule in the language, or else the segment is extrasyllabic and must be licensed at the word level. The problem with the latter analysis is that, as we shall see farther on, there are word-medial clusters for which this is not an option.

The first group of problematic clusters involves the nasals with one of the obstruents. Below are possible syllabifications based on what we know of prosodic theory so far:

(1) *npison* → [<n>bi. zən] or [n. bi. zən]
(2) *mgeyu* → [<m>kʰɛ. ju] or [m. kʰɛ. ju]
(3) *nsum* → [<n>zum] or [n. zum]

The second set involves either of the more sonorant obstruents with one of the set of stops. Again, possible syllabifications are shown:

(4) *sips* → [zip<s>] or [zi. pʃ]
(5) *skicin* → [<s>ki.ˈlin] or [ʃ. ki. ˈlin]
(6) *ckuwye* → [<c>kuʰ. je] or [cʰ. kuʰ. je]
(7) *togs* → [takʰ<č>] or [takʰ. č] but *[ township]
4.1.3 Clusters not (quite) violating sonority

These clusters involve two consonants of equal sonority. They appear primarily in the onset, but may also be found in a coda. Here, again, we must be able to license both segments of the cluster at some level in the prosodic structure, so I have again offered two possible syllabifications.

The first set of clusters of equal sonority consists of two voiceless stops, which may occur in either the onset or the coda:

1. \textit{ptahma} $\rightarrow$ [\textit{p}ta: . ma] or [\textit{p}. ta: . ma]
2. \textit{keyu} $\rightarrow$ [\textit{t}ke. ju] or [\textit{t}. ke. ju]
3. \textit{wikp} $\rightarrow$ [\textit{wik}<\textit{p}>] or [\textit{wik}. p]

The second set is comprised of clusters of two nasals. These do not occur in coda position:

4. \textit{nmossis} $\rightarrow$ [\textit{n}m\textit{e}. sis] or [\textit{n}. m\textit{e}. sis]

The problem with leaving open the possibility of segments being licensed not by the syllable but by the word is that for word edge clusters of three consonants, we would often have to allow two segments to be extrasyllabic. As well, it does not allow us to syllabify word medial clusters of three consonants. The fact that these clusters usually contain an /s/, which is known to be problematic in sonority structures across languages, does allow us to pass it off as an exception to sonority. However, this is, again, not an insightful treatment of the language.

On the other hand, if we attach every segment which violates the traditional sonority structure to a separate syllable node, we will have a large number of extra syllables at the edges of words, often formed of non-sonorous, non-syllabic segments, which do not really constitute true syllables in their phonetic realizations. Therefore, I believe the treatment of sonority itself in this language needs to be reexamined.
4.2 An Alternate Interpretation of Sonority

Thus far in this analysis, we have simply taken on faith that the sonority hierarchy is a relevant part of syllable structure assignment. As a result, many of the clusters of this language, which are neither uncommon nor particularly avoided, appear to be both awkward and problematic. No matter how closely we might examine the distribution of word edge consonant clusters, we will find only that we cannot predict which combinations of consonants may appear together, nor can we account for the gaps in the inventory discussed earlier. But by changing our perspective, we may be able to reduce the violations, both against sonority, and against licensure.

4.2.1 Non-continuant segments

The first observation that could be made is that all of the onset clusters observed have as their initial segment either an obstruent /p, t, k, kʷ, č, s/ or a nasal /m, n/. Some of these occur more frequently than others, but no other consonants may occupy the initial position of an onset cluster. If we set aside /s/ for a moment, we will notice that the remaining consonants have a single feature in common: they are all considered [-continuant]. Although nasals do not at first seem to be in the same category with the stops, they do not fit the definition of continuant, which requires that airflow in the oral cavity be continuous. A segment cannot technically be continuant if there is no airflow in the oral cavity, even if there is airflow in the nasal cavity.

This is a very important distinction in Passamaquoddy, and may account for the fact that no nasalization of segments surrounding /n/ or /m/ ever occurs: they are essentially stops, and thus cannot spread a [-continuant] feature onto a [+continuant] segment. This suggests that a word-initial cluster must have as its onset a [-continuant], and may explain why a cluster such as /#lc-/ is not seen in the onset, though /-lc#/ is allowed in the coda.
What is interesting about this analysis, though, is that if we take continuance to be the first determiner of the sonority of a segment, we will see that most of the clusters in Passamaquoddy consist of two adjacent [-continuant] consonants. It has been argued that at a word edge, two consonants of equal sonority force the outer one to be extrasyllabic (Everett, 1995). However, this would cause a great number of extrasyllabic segments in Passamaquoddy, at both edges of words.

I have two arguments against using extrasyllabicity in these instances. The first is the phenomenon of the voicing alternation in Passamaquoddy. If an edgemost consonant is mapped onto the word level, it cannot have an effect on the voicing of the adjacent consonant. For example, consonants become voiced either when they are sandwiched between two vowels, or when they follow the first person prefix /n-/ and precede a vowel, as in the following:

(1) ncepi → /njɛ. bi/  I am separated

The second argument is that if we choose to map an edgemost segment which violates sonority onto the word level, this will provide no insight into how to cope with medial clusters of three consonants in which the combination of at least two of the consonants violates sonority.

As we have only the surface forms of the words here, it is clear that neither Stray Epenthesis nor Stray Erasure are applied to prevent the consonant clusters which form. Therefore, it seems that in this language the hierarchy is not violated as long as the level of sonority of the outermost segment is of equal or lesser value than that of the inner segment. In pronunciation, the outer segment is sometimes reduced, but it is not lost. (The exception to this is the third person prefix /w-/ which is a violation of the rules we have established, and which has for the most part been lost from the phonetic realizations of words. See example 7 below.) Thus, a phonetic representation of the syllabification might look like the following:
4.2.2 The problem of /s/

It is well known by now that /s/ is problematic to sonority in many languages, especially those of Indo-European descent. As far as we know at this point, there is no relation between the Algonquian family of languages and the Indo-European languages, yet /s/ still stands apart from the rest of the consonant inventory. This indicates that /s/ may have some phonetic properties which allows it to easily violate the sonority hierarchy again and again. Whether or not it does is beyond the scope of this paper.

Thus, for whatever phonetic reason, /s/ is able to be syllabified when it is in the edgemost position of a cluster, even if it is more sonorous that the segment between it and the vowel. In fact, in Passamaquoddy, /s/ never appears at the edge of a cluster in the onset position of the syllable if the segment inside it is more sonorous than a [-continuant]. Thus, if /s/ appears at the edge of a complex onset, it is always in violation of sonority. In most cases, this is true in the coda position also. The only exceptions are when the complex coda is comprised of either /-hs/ or /-ws/. And yet there is no question that /s/ is phonetically still part of the syllable.

\[
\begin{align*}
(1) \text{ptahma} & \rightarrow [\text{Pt}\alpha\, .\, \text{ma}] \\
(2) \text{tkeyu} & \rightarrow [\text{\'ke}.\, \text{ju}] \\
(3) \text{wikp} & \rightarrow [\text{wikp}] \\
(4) \text{npison} & \rightarrow [\text{nbi}.\, \text{zan}] \\
(5) \text{mqeyu} & \rightarrow [\text{mkwe}.\, \text{ju}] \\
(6) \text{nsum} & \rightarrow [\text{nzum}] \\
(7) \text{wtepon} & \rightarrow [\text{de}.\, \text{B\'an}] 
\end{align*}
\]
4.3 Syllabification of Clusters of Three Consonants

4.3.1 Word-Medially

When triconsonantal clusters were presented in Section Three, syllabification of these clusters in medial position was stated very briefly, and that was prior to discussion of /s/. The fact that Passamaquoddy allows /s/ to occur at the edges of clusters is the very fact that allows for syllabification of the clusters when they occur medially. Thus the examples presented in 3.3 can be syllabified as follows:

(a)(1) -psk- Pessikapskiyak [pes. si. kap. ski. yak]
(2) -pskw- ponapsqehs [pa. nap. skw: e: s]

(b) (1) -ksk- kakskus [kak. skus]
(2) -kskw- nteksqinen [ntek. skwi. nen]
(3) -kskw- neqskiqessoss [nekw: . ski. kwes. ses]

(c) (1) -msk- nimskehe [nm. skw: e: he]
(2) -mskw- amsqahs [am. skwa: s]
(3) -mskw- panskute [pan. sku. de]

(d) (1) -lskw- pilsqeheis [pl. skwe: . sis]

(e)(1) -skh- peskhan [pesk. han]
(2) -sktw- nusktek [nusk. tek]
(3) -sksw- laskawahon [lask. sa. wa. gan]

Note that in (e) we see complex codas in the place of complex onsets. The reasons for this could be that in (1), /h/ will not be realized if syllabified onto a complex onset. In (2), this syllabification is less problematic for sonority. (3) could actually be syllabified equally either way. But the more important factor here is the retention of the /sk/ cluster which has appeared repeatedly, and which may act as a unit.
4.3.2 Word edge clusters

In the Section Three, where the following data was presented, no account of syllabification was given, as no theory had yet been developed. We have established that /s/ may appear at the edge of a cluster in spite of the level of sonority of the inside segment, and this allowed us to syllabify the medial clusters above. In a few cases, the cluster actually follows the sonority hierarchy, in which case syllabification is not a problem, as in the example here:

(1) -wsk ksiwsk [ksiusk]

However, under no circumstances can we allow an onset or a coda of three syllables if it is not sonorous. Notice that in each of the clusters in the inventory of three consonant clusters, the medial segment is generally /s/. At the edges of words, this is always the case, with a single exception, in which the medial segment is /h/. The outer segments of the cluster are always less sonorous. Even in the case of /-nsk/, which does follow the traditional sonority hierarchy, our analysis shows that Passamaquoddy simply sees /n/ as [-continuant], and the cluster therefore violates our established hierarchy.

But if we look at this more closely, what we find is that in the three consonants of the cluster, there is a rise and then a fall in sonority. This is how we have defined a syllable. Though the peak is not a vowel, /s/ constitutes the most sonorous segment available in the sequence, and may thus be designated the nucleus of the syllable:

Figure 1.

\[
\begin{array}{cccc}
S & S & S & S \\
C & V & C & V \\
\text{pskelute} \rightarrow & p & s & k & \varepsilon \\
& & u & t & \varepsilon \\
& & & & [ps. k\varepsilon. lu. \text{te}] \\
\end{array}
\]

Recall that the first syllable of a word does generally carry secondary stress. If /s/ were not syllabified, we would expect to find this stress over the /\varepsilon/, but we do
not. Because /s/ cannot carry vocalic stress, the stress [ps.] receives is not immediately obvious, but it is enough to see that [pskε.] does not receive stress.

It can also be argued that because Passamaquoddy is weight-sensitive (moraic trochees), [pskε] can only be regarded as a foot, and stress will fall on the head of the moraic trochee, or over the [ps.]. Therefore, the problematic word-edge triconsonantal clusters common to Passamaquoddy can be neatly syllabified in the following way:

(a)(1) #psk- pskihq [pš. ki:kʷ]
(2) #pskʷ- psqentu [pš. kwɛn. tu]
(3) -pskʷ# wapsq [wa. pskʷ]
(4) #ksp- kspisun [kš. pi. zăn]

(b) (1) #ksk- kskomihike [kš. ko. m. hi. ge]
(2) -kskʷ# naskq [nak. škʷ]

(c) (1) #nsk- nskawewintuwakon [ns. ka. we. win. tu. wa. gən]
(2) -nsk# nisinsk [ni. zin. šk]
(3) -nskʷ# skolunsq [ska. lun. škʷ]

(d) (1) nhk- nhkeyiw [nʰ. ke. jiu]

In this section, two things of importance have been shown about Passamaquoddy syllabification. The first is that the language has a sonority hierarchy based on the feature of continuance, which permits biconsonantal clusters in which both segments are of equal sonority, to be tautosyllabic. Extrasyllabicity has not been ruled out, but it is certainly not the optimal way to deal with the difficulty of syllabifying these segments for reasons already mentioned. The second thing of importance is that Passamaquoddy allows syllables to form over segments other than vowels, in particular, over an /s/ which falls between two less sonorous elements. This establishes yet another instance of /s/ not behaving as one would expect.
5. Loanwords

Interaction between the Passamaquoddy Indians and both the French and English settlers since the seventeenth century has resulted in a fair amount of exchange of terms from each language. The English word "moose," for example, comes from the Passamaquoddy word mus, pronounced /muz/. What is interesting about loanwords is that they are rarely adopted into a language without some degree of distortion, and this distortion is often dependant upon the established rules of the language into which the word is being taken.

Passamaquoddy shows two types of loanwords. The obvious are those which are somewhat semblant of the original word from which they were derived. The less obvious could be referred to as loan ideas, that is, Passamaquoddy morphology is used to compose a word that is based on an concept that is new to the speakers. These are an interesting phenomenon in and of themselves, but are really beyond the scope of this paper. Here, loanwords will be used to demonstrate that rules of syllabification apply to words of foreign origin.

It has been shown in this paper that there are a number of consonant clusters which Passamaquoddy forbids, in addition to phonological segments which are not part of the inventory. Below are listed the phonological alternations in translation.

**Figure 1.**

<table>
<thead>
<tr>
<th>English</th>
<th>Passamaquoddy</th>
</tr>
</thead>
<tbody>
<tr>
<td>f, v</td>
<td>p, b</td>
</tr>
<tr>
<td>r</td>
<td>l</td>
</tr>
<tr>
<td>ŋ / ŋ</td>
<td>ċ / ĭ</td>
</tr>
<tr>
<td>ŋ</td>
<td>g</td>
</tr>
</tbody>
</table>

Because of the different restrictions Passamaquoddy places on syllabification, when an English or French word is borrowed, adjustments may or may not be made in the syllable structure of the word depending on whether it conforms to the
Passamaquoddy rules of syllabification. Therefore, the data will be presented in two parts: those words which resyllabify, and those which do not.

5.1 Resyllabified Loanwords

5.1.1 Clusters containing a liquid

The chart at the end of section three reviews the clusters of two consonants permitted in Passamaquoddy. Notice that there is only one cluster involving the segment /l/. Alone, this is not an infrequently used segment in Passamaquoddy, but for some reason, the language prefers not to use it in clusters. When it does appear with another consonant, it is usually word-medially, and the two are syllabified onto separate syllables. The only tautosyllabic cluster involving /l/ is /-lč#/ . For this reason, many of the French and English words borrowed, if they involve either /l/ or /r/, must be resyllabified to prevent a cluster between /l/ and another consonant.

The following words show that resyllabification of a cluster involving /l/ usually occurs through epenthesis of a short vowel, /o/, between it and the adjacent consonant. Keep in mind the British or French pronunciations of many of the words borrowed; the original word is listed on the left, the Passamaquoddy on the right:

(1) “clock” [klb:k] → kalak [ka. lak]
(2) “milk” [milk] → molaqs [ma. lak"s]
(3) “Claire (Fr.)” [kler] → kolel [ka. lel]
(4) “prune” [pru:n] → poluns [pa. luns]

Resyllabification does not occur only where there is an /l/ involved. Other clusters cause epenthesis to occur, such as the following:

(6) “five cents” [fəv sənts] → pavipsens [pa. jip. sənz]
5.1.2 Minimal words

Some of the words borrowed from either French or English take an epenthetic initial vowel when transposed into Passamaquoddy. This suggests that there may, indeed, be a preferential minimal length for a word, as in the following:

(1) “skirt (Br.)” [skɔt] → askat [as. kat]
(2) “horse” [hɔs] → ahahs [ə. hə:s]
(3) “pain (Fr.: bread) [pæ] → opan [ə. pən]

Notice that each of these words is essentially CVC to begin with, except that the final C is barely realized in the pronunciations (apologies for the difficulty in transcribing foreign words). It seems likely, then, that the initial schwa is inserted to prevent there from such a short word.

Finally, there are a few words which, in their original form, began with an initial light vowel, but which when transposed, lost the syllable:

(4) “American” [ə. me. ri. kan] → malikin [ma. li:. km]

5.2 Loanwords which retain syllabification

These words are far less interesting than those listed above, as they simply syllabify in the same way they exist in the original language (so to speak). However, it should be noted that these words often have no clusters, or clusters which involve an /s/, which we saw in Section 3 can syllabify with most consonants.

(1) “mustard” [mə. təd] → mastot [mas. təd]
(2) “ketchup” [kə. čəp] → kehcpap [kə:. čəp]
(3) “socks” [sɔks] → saks [saks]
(4) “allspice” [ɔl. spəs] → alspays [ɔl. spəz]

Notice in the last example the presence of the medial cluster of three consonants /-sp-/.

Although this is not one of those we saw in Section 3, it is known that /l/ may be in a coda by itself, and that /sp-/ is a satisfactory onset. Thus, though /l/ is
resyllabified when it occurs in a tautosyllabic cluster, it need not when it can be syllaibified by itself. This confirms the theory that Passamaquoddy prefers not to involve /l/ in clusters, but that many other clusters are perfectly acceptable. Thus, epenthesis takes place neither in Passamaquoddy words nor borrowed words to prevent clusters involving /s/, for example.

The above data has been presented to reinforce the points made in this paper. There are many more loanwords in the Passamaquoddy vocabulary, of which only a portion are significant to this particular study. Some do, however, provide interesting clues about other aspects of the language which have not been addressed here.
6. Conclusion

In this paper, I have tried to present an interpretation of Prosodic Theory which can account for the process of syllabification which takes place in Passamaquoddy. The consonant clusters which seem at first daunting, can be handled relatively easily if we allow the language to have complex onsets and codas in which the sonority does not necessarily have to fall away from the nucleus, as long as it does not rise. In other words, the language allows tautosyllabic clusters of consonants with an identical sonority index. A caveat to this is that Passamaquoddy also seems to regard nasals in the same class with other stops. In sum, a word-edge consonant is usually one that is [-continuant]; if any segment lies between it and the nucleus onto which it is syllabified, it may be of equal or lesser sonority.

The exception to this, of course, is /s/. This segment may appear on either side of a [-continuant] in a word-edge cluster. This is not a feature unique to Passamaquoddy; many languages of the Indo-European family exhibit this same behavior. The fact that it can be seen in a non-Indo-European language indicates that /s/ may have unusual phonetic qualities, but they have not been addressed here.

The other environment where /s/ acts strangely is between two other non-sonorous elements, all found at a word edge. Here, the only option for the language, without completely violating sonority, is to create a syllable over the most sonorous element, which in most cases is the /s/.

These same behaviors can be seen when borrowed French and English words are transposed into Passamaquoddy. Epenthesis, of which very little was apparent in the words containing the clusters examined, became very prominent in words whose original form was known to be foreign to anything allowed by the language up to that point. Thus resyllabification occurred in environments where it would be expected according to the theory developed.

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