The prosody of Cayuga particles

by

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Abstract

My thesis presents an analysis of the prosodic system governing the realization of particles in Cayuga (Northern Iroquoian). Traditionally words in Cayuga are divided into three categories: nouns, verbs, and particles. Nouns and verbs are typically longer than one syllable and are always accented; most particles are only one syllable and are not always accented in context. Particles can form prosodic groups with other particles or with nouns and verbs, and their accentuation depends on the words around them. My work is specifically concerned with identifying the principles behind the way particles are grouped and accented. Working within the framework of Prosodic Phonology (Nespor & Vogel 1986; Selkirk 1984, 2011) and Optimality Theory (Prince & Smolensky 1993/2004), specifically Match Theory (Selkirk 2009, 2011), I assume that syntactic and prosodic structure are required to be identical by Match constraints, but markedness constraints that require phonological well-formedness lead to mismatches between syntactic and prosodic structure. This results in, for example, a particle group that is comprised of several syntactic words, but is accented like one prosodic 'word'. As the basis for my analysis, I mark prosody-related phonological processes (shortening, loss of final segments, pitch-accent assignment, etc) and use statistical analysis of acoustic data (pitch and duration) to form an objective description of the prosodic properties of particles. I then use objectively-determined criteria to determine which particle forms are prosodically strong or weak in context. I use the resulting transcription to demonstrate how the interplay of Match and markedness constraints can account for the peculiar prosodic behaviour of particles. My work adds to the linguistic

literature on Cayuga and Cayuga phonology, as well as theories of the syntax-phonology interface. It also provides speakers and learners of Cayuga with a descriptive account of the prosodic behaviour of particles.

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Chapter 1: Background

1. Introduction

In this thesis, I examine the prosodic properties of Cayuga (Northern Iroquoian) particles using the generative framework proposed by Selkirk (1996; 2009; 2011) among others, concerning the relationship between syntax and sentence-level phonology.

Cayuga is a Northern Iroquoian language spoken by approximately 100 people at Six Nations, Ontario. It is most closely related to Seneca, as well as other Northern Iroquoian languages (Mohawk, Oneida, Onondaga, and Tuscarora) (Froman, Keye & Dyck 2002:xi).

In Cayuga, words fall into three categories: nouns, verbs, and particles. Particles differ from nouns and verbs syntactically and phonologically. Nouns and verbs are at least two syllables long, take pronominal prefixes, and are always accented. Particles are monosyllabic, cannot take prefixes, and occur with and without an accent. I aim to describe and explain the accentuation system of particles in Cayuga.

In Chapter 1 I give a description of Cayuga phonology, followed by a definition of particles based on their formal, functional, and syntactic characteristics observed in previous work on Cayuga and other Iroquoian languages. I then review the theoretical assumptions behind my work in Chapter 2, along with research questions and

hypotheses. In Chapter 3 I discuss the data and my methodology. I then present my results in Chapter 4 and discuss the implications of this research in Section 4.1.

2. Background

In this section I will describe some relevant aspects of Cayuga phonology based on previous research, followed by a review of the existing literature on Cayuga and other Northern Iroquoian languages concerning the definition of particles.

2.1. Cayuga phonology

The phonemic inventory of Cayuga is shown in Table 1. Orthographic symbols are shown in angle brackets and the phonemes that they represent are given on the right. Cayuga orthography will be used in examples throughout this thesis.

Table 1. Phoneme inventory of Cayuga

Consonants	Coronal		Dorsal	Laryngeal
Nasal	<n> /n/			
Stop	<d> /t, d/ <t> /t^h/		<g> /k, g/ <k> /k^h/	<ʔ> /ʔ/
Fricative	<s> /s/ <s, sh> /s^h/			<h> /h/
Affricate	<j> /tʃ, dʒ, ts, dʒ/ <ts> /ts^h/			
Approximant	<r> /ɹ/			
Vowels	<i> /i/		<u> /u/ (rare)	
	<e> /e/, <ę> /ɛ̃/		<o> /o/, <ǫ>/õ/	
		<a> /ɑ/		

Cayuga differentiates between short and long rhymes. Long rhymes contain a long vowel like [a:], or a short vowel plus a fully realized [h] or [ʔ], as in [ah] or [aʔ], optionally followed by a coda consonant other than [h] or [ʔ]. [h] and [ʔ] are moraic in long rhymes, meaning that they are produced like devoiced or laryngealized vowels respectively (Doherty 1993). Short rhymes consist of a short vowel like [a] and a non-moraic [h] or [ʔ] or an optional coda consonant other than [h] or [ʔ]. Short rhymes with non-moraic [h] or [ʔ] are devoiced or laryngealized, respectively (Doherty 1993; Dyck 1999).

A shortening process known as 'Laryngeal Metathesis' (Foster 1982:19) affects odd-numbered, non-final syllables within words. (Laryngeal Metathesis is shown in the orthography by underlining the vowel as in *a̲ʔ* or *a̲h*.) In shortened syllables like *a̲ʔ* and *a̲h*, the laryngeals are not fully realized; instead, the vowel in the rhyme is glottalized or devoiced respectively.

Cayuga is a pitch-accent language, and pitch is the acoustic variable most relevant to describing Cayuga accent (Williams 2013). Several accent-related phenomena in Cayuga are important in determining prominence and prosodic boundaries. These include the conditions of accent placement, Laryngeal Metathesis, and word-final euphonic [h]. These phenomena are discussed below.

There are two separate accentual patterns: accent is final for words that are utterance-medial, as in (1a) below; accent is non-final when words are utterance-final or in isolation, as in (1b).

(1)

a. aga:tǫ:déʔ...
   'I heard it...'
b. aga:tǫ́:deʔ
   'I heard it.'

(Dyck 2009)

Non-final accent placement refers to both edges of the word; it refers to the left edge through an even and odd syllable count, and to the right edge, with reference to the antepenult, penult, and final syllable (Foster 1982; Dyck 2009). When the penult is an even numbered syllable (counting from the left), it is always accented, while penults that are odd-numbered syllables are only accented if (a) they do not contain short [a]; (b) are closed; or (c) contain [h] or [ʔ] in the rhyme. Odd-numbered penults are only accented if they are not closed and do not contain a laryngeal. If any conditions on odd-numbered penults apply, the antepenult is accented instead. (Examples are provided throughout the text.)

As a consequence of the conditions outlined above, short nouns and verbs in isolation can end up without an accent. Some examples include *dagu:s* 'cat' (the penult is odd-numbered and contains [a]); *sekdǫ:* 'examine it!' (closed, odd-numbered penult); *ǫ'ʔnǫ:ʔ* 'it has been moved' (odd-numbered penult with a laryngeal in the rhyme).

In addition to final and non-final accent placement, verbs can sometimes occur with double accents (Williams 2013:19). Williams analyses the first accent as the word's normal pitch accent, and the second as part of a continuation-rise intonation pattern.

Since accentuation depends on the edges of the word, it can be assumed that an accent denotes a prosodic boundary. I will use this criterion in later chapters.

The presence of euphonic [h] also signals a boundary. The final syllable of utterance-final words and words in isolation ends with a long rhyme – either [V:], [V:ʔ], [Vʔ], or [Vh]. If such words have an underlyingly short final vowel, they gain a word final 'euphonic' [h] when in isolation or when final in a prosodic domain larger than the prosodic word (Dyck, p.c.).

For example, *shę́h* 'that' has a final [h] when in isolation (2a), but does not have this final [h] in other contexts, as in (2b) (repeated later as (5b).

(2)

a. shę́h
   'that'

b. shę niyó:weʔ
   that be.a.certain.distance
   'how much, how many'

(Dyck 2009)

The phenomena discussed above apply to all words; in contrast, particles have certain phonological properties that are unique to them. Particles in Cayuga and other Iroquoian languages can be defined by these formal and functional characteristics that distinguish them from verbs and nouns. These properties will be discussed in the following sections.

2.2. Particle form

Unlike verbs and most nouns, which require a pronominal prefix, Cayuga particles do not take prefixes. In (3a) below the particle *gi*ʔ appears without a prefix. In (3a-b) pronominal prefixes are shown in bold on the verb and noun:

(3)

a. Ne:ʔ giʔ **h**.ę́:dǫh.
   it.is just **he**.means.it
   'That's what he means'

b. **Ke**ʔ.nigǫhá:ʔ **o**.wí:yaʔ.
   I.someone.watch **it**.baby
   'I'm watching a baby'

(Dyck et al. 1997)

This is similar to Onondaga, for which Abrams (2006:9) proposes a distinction between morphologically simple and complex words. Abrams classifies particles as simple words that do not have identifiable parts. Similarly, Mohawk particles have no internal structure (Mithun 1996). Seneca particles usually consist of one morpheme as well (Chafe 1996:559).

In Cayuga, verbs and nouns contain at least two vowels, while most particles are only one syllable long. In addition, an extrasyllabic consonant can occur word-initially in nouns and verbs, while particles cannot support extrasyllabic consonants (Dyck 1999; 2009). While there are no specific mentions of particle length in the Iroquoian literature, Mohawk particles have been described as "a relatively short sequence of phonemes"

(Bonvillain 1973:26).

2.2.1. Particle accentuation and particle groups

Cayuga particles can be accented on their own, but usually their accentuation is somehow dependent on surrounding words. This patterning is similar to Mohawk, where some particles are not stressed, even though other Mohawk words typically contain one stressed syllable (Mithun 1996). Similarly in Seneca the lengthening and accentuation of particles is not the same as that of nouns and verbs; although the accentuation of particles mostly depends on discourse factors, certain particles seem to have an inherent accent in Seneca (Chafe 1996:559).

The accentuation of Cayuga particles is also different from the pattern for nouns and verbs. First, particles in isolation have an accent: in (4a) below, *tę́ʔ* is shown as an accented citation form. In context, particles can occur either with no accent, as in (4b), or with an accent, as in (4c):

(4)

a. tę́ʔ
‘no’

b. Neʔ gyę́:ʔ tęʔ deʔagashá:ʔs
it again no I.don’t.remember
‘Now, I don’t remember...’

c. Tę́ʔ deʔagohsdǫ́:ʔ
not she.didn’t.use.it
‘She never used...’

(Henry 2005)

This is different from the accentuation of nouns and verbs in that any noun or verb that can be accented, will be accented somehow. Non-utterance-final nouns and verbs have a final accent, and nouns and verbs that are utterance-final or in isolation generally have a non-final accent, except in certain conditions. (For example, when the noun or verb is only two syllables long, the penult cannot be accented due to the conditions described in Section 2.1.)

Unaccented particles appear as part of surrounding words or form part of a word with other particles. Particle groups exist in other Iroquoian languages as well. For example, the Mohawk particle *ne’* phonologically contracts with other functional elements and vowel-initial NPs (Bonvillain 1985). In addition, in Mohawk, *kʌ* (a cognate of Cayuga *gẹh* ‘yes-no question’) appears in groups and is analyzed as a second-position clitic by

Baker (1996).

Example (5) gives examples of particle groups in Cayuga. In (5a) the group is a verb followed by a particle. In (5b) the group is a particle followed by a verb. The groups in (5c-d) consist solely of particles. The second line shows how each word (in this case a verb or particle) would be accented if pronounced in isolation (or as a citation form).

(5) Particle groups

a.	hadadi̱ʔdréʔtsǫ:	'he was just riding'
	hadádi̱ʔdreʔ	tsǫ́:
	drag	just
b.	shęniyó:weʔ	'how much, how many, how far, until'
	shę́h	niyó:weʔ
	that	be.a.certain.distance
c.	gi̱ʔtsǫ́:	'just…'
	gíʔ	tsǫ́:
	'just, really'	'only, just'
d.	negi̱ʔtsǫ́:	'it's just that…'
	né:ʔ gíʔ	tsǫ́:
	'it is' 'just, really'	'only, just'

(Dyck 2009)

Particle groups consist of 'strong' and 'weak' versions of particles. Strong particles are prosodically prominent and weak ones are prosodically non-prominent. Prosodically prominent (strong) forms, such as citation forms in isolation, have a pitch-accent (for

example the citation form *tsǫ́:*). Prosodically non-prominent (weak) particles do not have an accent (i.e. their pitch is not higher than surrounding words in context). In addition, weak forms might have shortened vowels, as in (5d) above, where /ne:ʔ/ is produced as [ne]. As mentioned in 2.1, weak particles can have shortened rhymes that lack moraic [ʔ], as in *gi*ʔ in (5c-d) above. Finally, weak particles can be realized without 'euphonic' [h], like [shę] in (5b), whose strong form is [shę́h]. Accentuation, shortening, and euphonic [h] affect nouns and verbs as well, but in qualitatively different ways than in particles. Verbs and nouns are the domain of accentuation, as shown by processes such as Laryngeal Metathesis, while this does not affect particles in the same way. As well, euphonic [h] is added to underlyingly short vowels at the end of verbs and nouns but particles can appear without it.

2.2.2 Summary of particle characteristics

I have shown that particles have certain phonological and prosodic characteristics that distinguish them from nouns and verbs. A summary of particle characteristics is presented in Table 2.

Table 2. Properties of Cayuga particles (after (Dyck 2009)

	Pronominal prefix	Extraprosodic word-initial consonant	Minimally disyllabic	Always accented
Particles[1]				
Basic nouns	✓	✓	✓	✓
Other nouns[2]		✓	✓	✓
Verbs	✓	✓	✓	✓

As can be seen in Table 2, particles have few, if any, formal properties in common with any other classes of words. Unlike most nouns and verbs, particles are only one vowel long, do not take a pronominal prefix, cannot begin with an extraprosodic word-initial consonant, may combine with other words, and are not always accented.

In this section, I have provided a definition of particles based on formal (phonological) properties; in the next section I discuss the functional and syntactic properties of particles.

1 Some words classified as particles are longer than one syllable, and have extraprosodic consonants — for example *sgaho'dé:'ęh* 'something'. However, such words are only classified as particles because they are not nouns or verbs; and they may have been verbs historically (Dyck 2009:586).

2 Some nouns are like particles in that they lack pronominal prefixes (e.g., gwíhsgwihs 'pig'). Many animal names of this type do not take pronominal prefixes. In addition, some basic nouns can appear with or without the *o-* 'it' prefix: *hǫ́na'da'* or *ohǫ́na'da'* 'potato'. The vast majority of nouns, however, do take pronominal prefixes, and all nouns are at least two syllables long.

2.3. Function

Particles form a closed class of words. According to the Iroquoian literature, particles are used for a variety of syntactic and discourse functions. Mohawk particles express spatial and temporal relationships between verbs and nouns (Bonvillain 1973). They also act as complementizers (Baker 1991). The functions of Onondaga particles include subordination, as well as forming appositive relative clauses (Woodbury 1974). Seneca particles are used as conjunctions, adverbs, determiners, and numerals, among others (Chafe 1996).

There is a lot of literature on the Iroquoian discourse particles that correspond with Cayuga *ne:ʔ* 'it is', and *neʔ* 'the (etc.)'. Cayuga *ne:ʔ* occurs in almost all syntactic and semantic environments and can be analyzed as a focus marker with variable scope (Keusen 1994). In Seneca the corresponding particle, *neh*, is used to link units of discourse. The Seneca amplification construction (which provides additional information about a preceding referent) is introduced by *neh* as well (Chafe 2012:28,30,36–37).

In Cayuga, *neʔ* introduces nouns in some contexts and has other functions. The corresponding Mohawk *neʔ* is used to introduce noun and pronoun phrases and to connect verbal constructions. It is also used to mark emphasis (Bonvillain 1985). Similarly, the Onondaga particle *ne* is used to mark specific NPs (Woodbury 1975:12).

Particles like *ne*ʔ give rise to the observation that the meaning of particles can be highly dependent on context (Froman, Keye & Dyck 2002:710–712). Similarly in Onondaga the meaning of particle groups is not always equivalent to the sum of their parts (Abrams 2006).

The Iroquoian literature does not provide much detail about the function of particles. However, Cayuga examples are provided in (6) below. The particles in (6b, c, f, g, i) are function words. The particle in (6a) is an adverb; (6d) is a discourse particle; (6e) is an emphatic pronoun; and (6h) is a WH-word (adverb). (Predictable accent marks were not recorded in these examples.)

(6) Functions of Cayuga particles (Dyck et al. 1997:19)

a. Adverbs

Hehshę:da:ge:ʔ **e:ʔ**.

he's.lying.over.there **again**

'He's lying over there **again**!'

b. Conditionals[3]

A:gahya:goʔ **gyę:gwaʔ** a:sgyena:wahs.

I.would.pick.fruit **if** you.would.help.me

3 *Gyę:gwa*ʔ is composed of two particles: *gyę:*ʔ and *gwa*ʔ. These particles tend to occur in combination with other particles and their individual meaning is difficult to determine.

‘I would pick fruit **if only** you would help me.’

c. Subordination

Agahsę: **tsęh** age:ji:yoh.

I'm.slow **that** I'm.lame

‘I’m slow **because** I’m lame.’

d. *ne*ʔ (discourse particle)

Neʔ ǫ:weh gaǫde:nǫhk.

neʔ really they.are.relatives

‘**It is that** they’re really related.’

e. Emphatic pronouns

I:ʔ tgegowa:nęh.

me I'm.the.oldest

‘***I’m*** the oldest (not someone else)’

f. Qualification (degree)

Giʔ gę:s **trehs** sheno:węʔ.

just usually **too.much** you.are.a.liar

‘Because you’re a liar.’

g. Conjunction

Dehęnadatnǫhwe^{ʔ}s Gwi:deh Ed **hni^{ʔ}** tsęh hona:dao^{ʔ}

they.males.like.each.other Peter Ed **and** that they.are.friends

‘Peter **and** Ed like each other because they’re friends.’

h. WH-words (adverb)

Do: nidihse:no:^{ʔ}?

what.amount you.singular.come.from.a.certain.place

‘**How** old are you (singular)?’

i. Yes-no qustions

Hǫgwe^{ʔ}di:yo: **gęh**?

he.is.a.nice.person **Q**

‘Is he a nice person?’

In summary, Cayuga particles have different syntactic and functional properties; they form a closed class and many, if not most, appear to be function words.

2.4. Conclusion

In this chapter I used previous research on particles in Cayuga and other Iroquoian

languages to define particles by the formal properties that distinguish them from nouns and verbs, as well as by providing a summary of their syntactic and discourse functions.

Particles are short, morphologically-simple words. They can carry their own accent but often somehow depend on surrounding elements for their accentuation. When unaccented, they appear in their weak forms, which means they might have shorter vowels, lack final laryngeals, or both. Particles can also join together to form larger prosodic units. However, while particles have phonological properties in common, they cannot be considered a syntactic class since they have a variety of functions and can be categorized as several parts of speech. However, most particles act as function words. In conclusion, syntactically, particles are morphologically-simple words (mostly function words). Prosodically, they are different from nouns and verbs in that they are smaller and have other unique properties related to accentuation and phrasing. This leads to my basic research question:

RQ: What determines how particles are grouped and accented?

In the next chapter I will discuss some theories regarding the relationship between prosodic and syntactic structure in order to formulate an answer to the research question.

Chapter 2. Theoretical approach

In this chapter I will discuss the theoretical assumptions that inform my work, starting with the prosodic hierarchy. I then review a theory of the syntax-phonology interface, and present the syntax of Cayuga particles as well as its relation to prosody.

1.1. The prosodic hierarchy

The basic assumption is that prosodic units are arranged in a hierarchy in which a constituent of category-level n dominates a constituent of category-level n-1 (Strict Layer Hypothesis) (Selkirk 2011:437). This hierarchy is shown in (7).

(7) Prosodic Hierarchy (after Selkirk 1978 and Nespor & Vogel 1986)

Utterance (υ)
Intonational Phrase (ι)
Phonological Phrase (φ)
Prosodic Word (ω)
Foot (F)
Syllable (σ)
Mora (μ)

Evidence for the existence of the prosodic units in (7) includes domain-span and domain-edge rules. Domain-span rules are irrelevant for the present discussion and will not be discussed further. Examples of domain-edge rules in Cayuga include main stress assignment, which refers to the edges of a word, and euphonic [h] insertion (see Section

2.1).

The Prosodic Word (Pwd), Phonological Phrase, and Intonational Phrase roughly correspond to the syntactic word, syntactic phrase (XP), and syntactic clause respectively (Selkirk 2011).

The basic constituents in the prosodic hierarchy are well-established. In addition, some researchers have extended the range of prosodic domains to account for language-specific phenomena (Grijzenhout & Kabak 2009:2). As particles do not always act as Pwds and form groups with other words, some of these units might be relevant to Cayuga. For example the Clitic Group has been proposed (Hayes 1989; Nespor & Vogel 1986) as a way of accounting for rules that only apply within clitic-word sequences and no other contexts, as well as rules that apply in the domain of Pwd but not across the boundary between a clitic and its host, as would be the case if they formed one Pwd (Nespor & Vogel 1986:145–146). The Clitic Group is below Phonological Phrase and directly dominating the Pwd, and consists of a Pwd and any adjacent clitics (Hayes 1989). It does not always have a syntactic counterpart. Cayuga particles sometimes display clitic-like behaviour: their accentuation is somehow dependent on surrounding words, and some particles do not occur alone. In addition, the relative prominence of a particle is not always predictable from syntactic structure. Based on these shared qualities with clitics, the Clitic Group might be a relevant category in Cayuga

phonology. Other additions to the Prosodic Hierarchy include proposed units that are between the Phonological Phrase and Intonational Phrase in the hierarchy (Grijzenhout & Kabak 2009:2–3).

Various prosodic constituents have been identified in Cayuga. The prosodic hierarchy as it applies to Cayuga is presented in (8).

(8) Prosodic hierarchy of Cayuga

a. Intonational Phrase (ι) – corresponds to the line (Foster 1982) or pause-delineated units or 'chunks' (Williams 2013) – This is the domain of intonation.

b. Phonological Phrase (φ) – many nouns and verbs can be analyzed as syntactic phrases, and therefore would correspond to prosodic phrases. The Phonological Phrase is the domain of pitch-accent assignment (Dyck 2009).

c. Prosodic Word (ω) – based on intonation and accentuation phenomena, single particles can be analyzed as Pwds (Dyck 2009). They are smaller than Phonological Phrases and correspond to syntactic words.

d. Foot (F) – the foot in Cayuga is an iamb (Foster 1982)

e. Syllable (σ) - syllables can be long or short (see 2.1).

The next section outlines the relationship between the units in the prosodic hierarchy and their syntactic counterparts.

1.2 The syntax-phonology interface

As already discussed, sometimes phonological and syntactic domains are isomorphic. However, while prosodic units often correspond to syntactic constituents, this is not always the case, as discussed above. As an example, English *I'll* consists of two syntactic words, but only one prosodic unit. Similarly, as shown in 2.2.1, Cayuga particle groups consist of more than one syntactic word, and are always accented, similar to Prosodic Phrases. Such mismatches between syntactic and prosodic units informs my eventual analysis of the prosodic characteristics of Cayuga particles.

To help propose my analysis of mismatches between syntactic and prosodic units in Cayuga, I will refer to Match theory (Selkirk 2009; 2011), which accounts for the relation between syntactic and prosodic constituents using the framework of Optimality Theory (Prince & Smolensky 1993/2004). It proposes a theory of the correspondence between syntactic and prosodic constituents by positing a set of universal Match correspondence constraints (Selkirk 2009; 2011). Match constraints are typically in the form of MATCH (α, π) and MATCH (π, α), where α is a syntactic constituent and π is its corresponding prosodic constituent. These constraints require that prosodic constituents in the phonological representation be identical to the corresponding types of syntactic constituents. Some examples are given below.

(9) MATCH (clause, ι): A clause in syntactic constituent structure must be matched by a corresponding Intonational Phrase (ι), in phonological representation

(10) MATCH (phrase, ϕ): A phrase in syntactic constituent structure must be matched by a corresponding Prosodic Phrase (ϕ), in phonological representation.

(11) MATCH (word, ω): A word in syntactic constituent structure must be matched by a corresponding Prosodic Word (ω), in phonological representation.

In general, mismatches in sentence-level prosodic structure in individual languages can be attributed to one of three factors: differences in constraint ranking, different syntactic structures (e.g. left- vs right-branching), and different types of language-specific phonological processes (Selkirk 2011). Within the framework of OT, the interaction of Match constraints and markedness constraints can also account for mismatches between syntactic and prosodic structure. (Such mismatches were formerly accounted for via processes of 'restructuring', a term that I will use informally to describe the phenomenon.)

Mismatches between syntactic and phonological units arise when markedness constraints are ranked above Match correspondence constraints (Selkirk 2011). In Japanese, for example, a noun phrase consisting of four lexical words in a recursive left-branching genitive structure prosodically consists of a sequence of two binary Phonological Phrases (instead of just one, as required by MATCH (phrase, ϕ)), as shown in (12) below.

(12) [[[N-no N-no] N-no] N-ga]$_{NP}$ → ((N-no N-no)$_{\phi}$ (N-no N-ga)$_{\phi}$)$_{\phi}$
(Selkirk 2009)

This mismatch can be analyzed as the effect of a markedness constraint BinMax (ϕ, ω) that requires a Phonological Phrase to be maximally two Pwds in size. Ranking this constraint above Match (phrase, ϕ) results in a mismatch between the single NP, and the two binary ϕ-phrases in the phonological structure (Selkirk 2011).

I hypothesize that the above framework can be used to account for the prosodic characteristics of Cayuga particles (discussed in 2.2). It can also explain why particles are different from nouns and verbs. Specifically, I hypothesize that differences between the prosodic behaviour of Cayuga particles, and nouns and verbs stem from the small size of particles, which ultimately results in mismatches between syntactic and prosodic units.

In Cayuga, well-formed Phonological Phrases satisfy the following markedness constraint:

(13) BinMin (φ, σ) Phonological phrases must be minimally disyllabic.

This can be seen in the process of 'prothesis': when a prosodic phrase is only one

syllable long, the vowel [i] is added to the unit (Michelson 1988:119), as in (14a) below:

(14)

a. /k-da:s/ → [ik-da:s]
   'I am stringing or draping it'
b. /kdakseʔ/ → [k-dakse-ʔ]
   'I am running'

In this case the form with the initial [i] is the candidate that does not violate BinMin (φ, σ). This process is not driven by syllable template motivation, as can be seen in (14b), where [k] forms a syllable on its own.

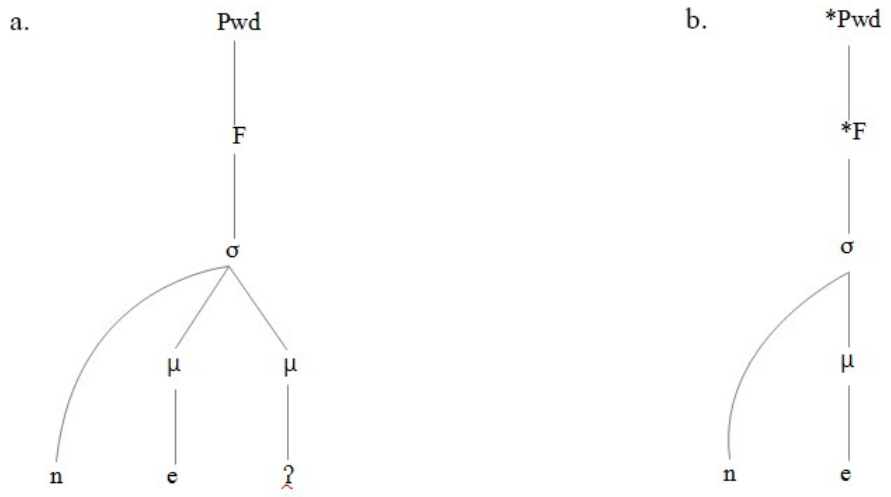
(13) does not apply to particles (ω) as they are only one syllable long. However, their accented ('strong') forms satisfy a constraint that requires feet to be minimally bimoraic (assuming iambic, quantity-sensitive feet):

(15) BinMin (F, μ) – Feet must contain at least two moras.

Strict Layering requires that Pwds contain at least one foot, which means well-formed Pwds are optimally bimoraic. For example, the strong form of the particle *neʔ* (with a moraic [ʔ] – see 2.1) is a well-formed prosodic word because it is bimoraic, as shown in (16a). In contrast, the weak form of this particle, *neʔ* (with a non-moraic [ʔ]), is not a

well-formed Prosodic word because it does not meet minimal size constraints for Pwds, as in the structure shown in (16b).

(16)



Unlike particles, Phonological Phrases meet the minimal size constraint in (13). So one possible explanation for the different prosodic behaviour of particles and nouns and verbs is based on the size of particles. Strict Layering and the Prosodic Hierarchy in (7) require that standalone Pwds also be Phonological Phrases, but particles do not meet this requirement because they are too small. Prosodic structures that represent single particles as ϕ-phrases will violate minimal size constraints like (13) BinMin (φ, σ).

There is another possible explanation for the different prosodic behaviour of particles vs. nouns and verbs. It involves recognizing that many Cayuga particles are function words. Cross-linguistically, function words are prosodically different from lexical words.

Function words can be realized as either a prosodic word, or as some type of prosodic clitic (Selkirk 1996). Function words may also have strong and weak forms, for example English *a* can be either [ˈʌ] [ˈeɪ] (strong), or [ə] (weak) (Ladefoged 2011:109). Strong forms constitute separate Pwds as in (17a), whereas weak forms do not. Weak forms can be represented in various ways, as shown in (17b-d). Essentially, they are clitic-like, or somehow dependent on, or part of, other prosodic units. (*Fnc* and *lex* represent function and lexical words, respectively)

(17)

a. $((\text{fnc})_{\omega} (\text{lex})_{\omega})_{\phi}$
b. $(\text{fnc} (\text{lex})_{\omega})_{\phi}$
c. $((\text{fnc lex})_{\omega})_{\phi}$
d. $((\text{fnc} (\text{lex})_{\omega})_{\omega})_{\phi}$

(Selkirk 1996)

Cayuga particles also have weak and strong forms, as described in 2.2.1. Prosodic structures that represent function words as prosodic clitics or weak forms of function words would violate Match constraints that require Pwds to correspond to syntactic words.

According to Selkirk (1996), function words can also have an anomalous prosodic structure because the Match constraints that govern the correspondence between syntactic and prosodic structures do not apply to functional categories, only to lexical categories and their phrasal projections. In contrast, the constraints that are more

relevant to the prosodic structure of function words are markedness constraints, since the latter determine the makeup of phonological units regardless of their status as lexical or function words.

In summary, we can analyze particles as words that are too small, or as function words. In either case, differences between the prosody of particles and nouns/verbs can be accounted for theoretically.

The next section outlines the syntactic structure of Cayuga particles and the consequences for prosodic structure.

1.3. Syntactic structure

Syntactic structure is relevant to Match constraints and consequently, phonological structure. In many languages, word order can be used to determine syntactic relations between constituents, however, this does not appear to be the case for Cayuga at first glance.

Word order in Cayuga and other Iroquoian languages has been described as 'free' (Mithun 1992; 1999). The order of Cayuga nouns is 'free' because subject and object NPs have no fixed, basic position (Mithun 1992:43–44). According to Baker (1996), this characteristic is a result of the position of NPs: overt subject and object NPs are base-

generated as adjuncts outside of IP rather than being in A-positions. This in turn is a consequence of the Polysynthetic Parameter: all *θ*-roles are expressed morphologically within the head word (14-15). Because verbs are inflected to show person and number features for their subject and object as well as tense, mood and aspect (often in portmanteu morphology that includes case), Cayuga does not need word order to establish syntactic relations, and NPs can be moved around relatively freely. The Cayuga verb template is given in Appendix II, and demonstrates the position of various suffixes as well as relevant phonological information.

Many aspects of Cayuga word-order are not 'free', but are governed by pragmatic principles instead (Mithun 1992). For example, new information tends to occur toward the beginning of the sentence or clause (29-30); newsworthy items occur before less newsworthy items (31-32); and new topics are introduced earlier in the sentence. In addition, indefinite NPs occur before definite NPs (which are optionally marked by *neˀ*) (27).

However, there are still some purely syntactic constraints on Iroquoian word order. In Mohawk, for example, question words are clause-initial and appear in Comp position (Baker 1996:68–71). In example (18) below, the overt subject *Sak* can occur before the verb (18a) or after it (18b) in acceptable sentences, but moving *oh nahótʌ* 'what' to a clause-final position results in an ungrammatical sentence:

(18)

a. Oh nahótʌ Sak wa-ha-hnínu-'?
what Sak FACT-MsS-buy-PUNC[4]
'What did Sak buy?'

b. Oh nahótʌ wa-ha-hnínu-' ne Sak?
what FACT-MsS-buy-PUNC ne Sak?

c. *Sak wa-ha-hnínu-' oh nahótʌ?
Sak FACT-MsS-buy-PUNC what

(Baker 1996:68)

Other examples of non-free word order include the Cayuga particle *ne'*, which is a nominal modifier that precedes NPs and marks them as specific. *Ne'* also precedes verbs to signal when they are being used as nominals. Numbers precede nominals as well (Mithun 1984). Similarly, Mohawk demonstratives precede the noun that they modify in a single constituent (Baker 1996:46). The Mohawk question particle *kʌ* (and its Cayuga cognate *gẹh*) is a second-position clitic that appears after the first major constituent of the clause. These are all instances of fixed word order.

To summarize, there is a relatively free word order among the major constituents that is possibly determined more by pragmatic than syntactic principles. However, some word order is fixed within major constituents. For example, WH-words that are not in-situ must appear to the left of the verb, in Comp position. In general, instances of fixed word

4 Abbreviations: FACT = factual; M = masculine; PUNC = punctual; s = singular; S = subject

order are a result of syntactic constraints on the position of words within the clause structure, while 'free' word order is pragmatically determined (but see further discussion of pragmatic word order below, where it is assumed that pragmatic word ordering is a consequence of the fixed placement of syntactic Functional Phrases).

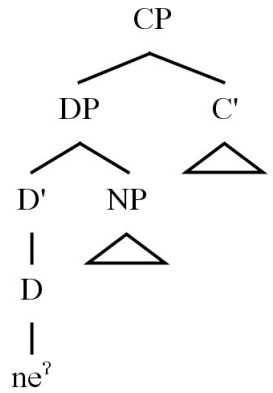
1.3.1. Prosodic consequences of Cayuga syntax

As mentioned in 2.3, particles are neither verbs nor nouns, but are a heterogeneous group of syntactic words, with diverse syntactic functions. Cayuga particles function as emphatic pronouns, adverbs, discourse particles, conditionals, WH-words, conjunctions, and subordinators.

Many particles display 'fixed' word order in context. Below, I show that the ordering for many particles can be described as syntactically determined. I also discuss the prosodic structures that would result from syntax-to-phonology mapping. Examples below are repeated from (6).

Nominal modifiers that occur before nouns, such as *ne'*, constitute a syntactic phrase (DP or determiner phrase) that is adjoined to the higher clause (Baker 1996), this structure is shown in (19) below:

(19)

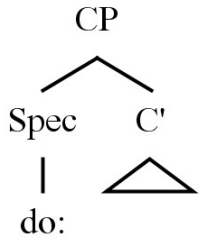


A syntactic phrase such as DP would optimally correspond to a phonological phrase according to Match constraints, and the particle within that unit is a syntactic and prosodic word.

Emphatic pronouns are overt subjects or objects, and occupy the same adjoined position as other NPs. Like other NPs, emphatic pronouns are syntactic words within a phrase and would therefore correspond to prosodic words.

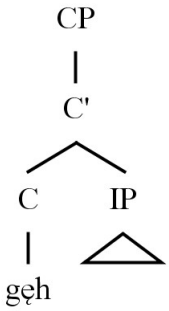
WH-words (e.g. *do:*) occur immediately before the verb. They are are either adverb or noun phrases that are generated inside the VP and move to the Spec position in CP. This structure is shown in (20) below. As syntactic phrases they would also be Phonological Phrases.

(20)



Second-position clitics (*gẹh*), relativizers, and conditionals (*gyẹ:gwaʔ*) are the head of the complimentizer phrase. As shown in (21) below. As such, they are at least prosodic words.

(21)



Adverbs occur in the spec of VP or in higher spec positions. Conjunctions are a special structure that joins two adjunct phrases together. Similar to heads of complimentizer phrases, adverbs and conjunctions are prosodic words.

In general, syntactic structures that include particles look like $((X)\ (XP))_{XP}$, which should have the prosodic structure (Pwd) (PPhrase). For example in ((do:) (V)), *do:* is expected to be a Pwd, and the particle + verb sequence should form a prosodic unit.

Discourse markers and particle groups can be analyzed as heads of functional projections (FP) with fixed positions in the CP layer (Munaro & Poletto 2002; 2003). This analysis may account for Keusen's (1994) observations about particle groups beginning with *ne:ʔ*, which have a template-like order. (Many other particle groups have similarly fixed orders.) In addition, most particle groups are clause-initial, which is consistent with assuming that they are in functional projections above CP. On this view, discourse particles like *ne:ʔ* are heads of special FPs, and particle groups are a series of FP heads. Both are located higher than CP, accounting for their initial position in most clauses. As FP heads, these particles should prosodically correspond to phonological phrases containing Pwds.

Fixed aspects of particle ordering can be accounted for based on the above analysis (particles occur in functional projections), and the assumption that particles are syntactic words. The prosodic consequences of this analysis, based on the assumptions of Match theory, is that particles must be prosodic words occurring within phonological phrases.

In the next chapter I discuss how I use the data to answer the research questions informed by the theoretical assumptions presented in this chapter.

Chapter 3. Methodology

In this chapter I will first introduce my data, and then discuss my methodology and the acoustic and statistical analyses I carried out to construct my methodology. Finally, I present a finalized methodology based on statistical analysis.

1.1. Data

The Marg Henry Story *Dę⁷ Ho⁷dę́⁷ Niyaw⁷ęǫ́h Ne⁷ Swé⁷geh* (MHS) is the main source of data for my thesis.[5] It is a description of the narrator's memories from childhood as well as a small part where she gives advice, and is not a ceremonial story. She composed the story as part of a field methods training session held at Six Nations on July 4, 2004 in the Woodland Cultural Centre Museum. The story was transcribed by Roronhiakehte Deer, a Cayuga speaker in his 20's at the time of the transcription. The transcription is divided into pause-delineated units, which appear to correspond to intonational phrases (Williams 2013). The transcription is in the form of a CLAN[6] file (MacWhinney 2000). In the work done by Williams (2013) the audio file of the story was separated into pause-delineated units. In addition, Williams annotated each audio file in Praat (Boersma 2001) to indicate vowels, words, and measurements of the intensity, and pitch of these units.

5 The late Marg Henry was a fluent speaker of Cayuga (and English) who taught Cayuga immersion classes at Six Nations in her later years.

6 "The acronym CLAN stands for Computerized Language ANalysis. It is a program that is designed specifically to analyze data transcribed in the format of the Child Language Data Exchange System (CHILDES)." (MacWhinney 2000:8)

1.2. Analysis

I reviewed the transcription to verify the placement of minor pauses within these units, and refined the transcription to reflect this knowledge. I also verified and refined Williams' 'words2' tier, which lists particle groups. I also divided particle groups into their component words in order to carry out acoustic and statistical analyses to verify the transcription.

Furthermore, I examined the pronunciation of particles and various particle combinations (discussed in 2.2.1) and marked instances where particles lack [ʔ] or [h] that are present in their citation form.

As discussed in 2.2.1, Cayuga particles are realized as strong or weak. My observations of MHS showed that the 'weak/strong' distinction can be realized phonologically in three ways: particles (a) are accented and have all of their segments (strong); (b) are not accented but have all of their segments (not weak); or (c) are not accented and are missing final laryngeals, vowel length, etc (weak).

To make the process of identifying strong and weak forms objective, I conducted a statistical analysis of Williams' (2013) acoustic data from MHS. In this chapter I describe the analysis and conclusions relevant to my methodology below. Then I present

my finalized methodology, followed by the results section.

1.3. Statistical analysis

1.3.1. Vowel duration

As discussed in 2.2.1, particles with long vowels in citation form are sometimes shortened when they are unaccented. In order to determine whether vowel duration can be used as a measure of prominence, I examined the effect of length, accent, and word type (particle, or noun or verb) on the dependent variable of vowel duration. 'Duration' is a phonetic feature (the amount of time taken up by a speech event), while 'length' is the phonological feature manifested by relative phonetic duration (Laver 1994:431–436). 'Vowel length' here refers to the way the vowel appears in its citation form. For example, *né:ʔ* 'it is', is classified as having a long vowel, and *néʔ* 'that, the' is classified as having a short vowel. For vowel duration, I used a ratio, calculated as A:B, where A is the duration of a vowel interval, and B is the average duration of all vowel intervals in the data (123.12ms). I use a ratio to ensure that the measurement is relative to the data, as opposed to absolute. I will call this variable VowelDuration.

Figure 1 shows that the distribution of VowelDuration for all vowels is a normal distribution. (For all figures, I removed some outliers to make the charts clearer. Outliers were not removed in the actual analysis. The number of tokens omitted is described for all figures. I removed 1 token from the 0.2-0.3 range, and 34 tokens from

the 2.7-6.3 range in Figure 1. The total number of tokens was 6472.)

Figure 1: VowelDuration for all vowels

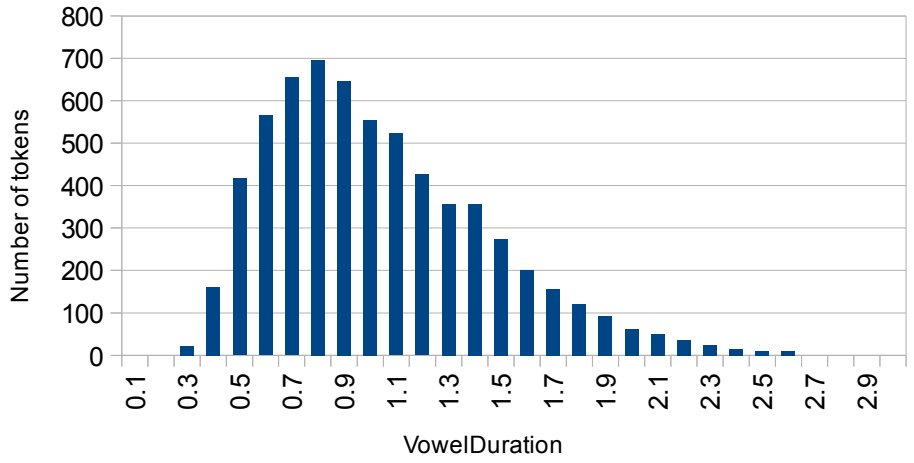


Table 3 gives the descriptive statistics for VowelDuration.

Table 3. Descriptive statistics for VowelDuration

N	Min	Max	Mean	SD
6472	0.19	6.15	1.00	0.46

To determine which factors (vowel length, accent, word type) affect duration, I conducted a one-way between subjects ANOVA with VowelDuration as the dependent variable.

The interaction of phonemic length status and accent had a significant effect on

VowelDuration ($F(1, 6464) = 48.282$, $p < .001$). The interaction of word type (particles vs. nouns and verbs) and phonemic vowel length was significant as well ($F(1, 6464) = 10.009$, $p = .002$). The distribution of VowelDuration in short and long vowels in nouns and verbs, and short and long vowels in particles is shown in Figure 2 and Figure 3, respectively. (I removed 6 tokens from the 3-4.8 range in Figure 2; and 10 tokens from the 0.2-0.4 range and 54 tokens from the 2.9-6.3 range in Figure 3.)

Figure 2: VowelDuration by phonemic length in nouns and verbs

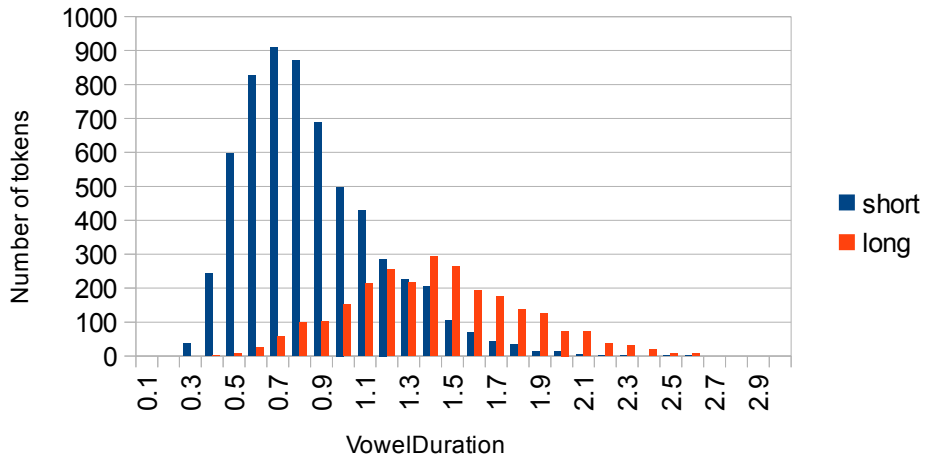
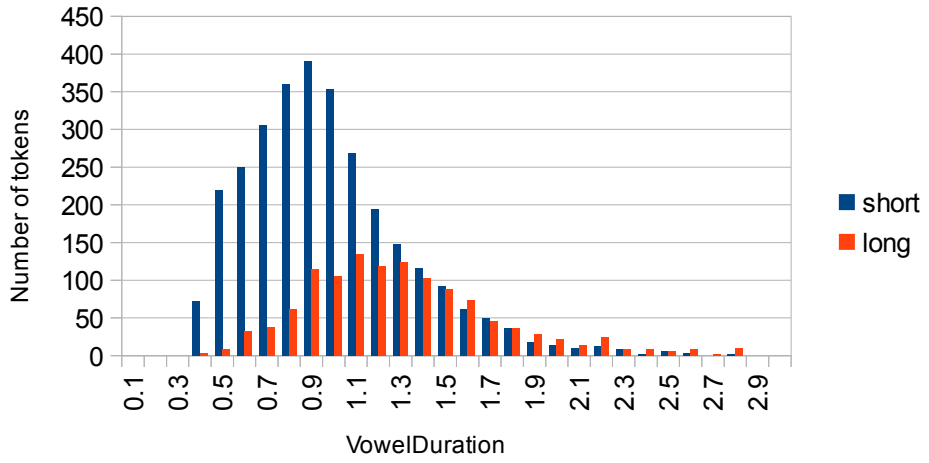


Figure 3: VowelDuration by phonemic length in particles



The interaction of word type and accent on VowelDuration was also found to be significant ($F(1, 6464) = 66.029$, $p < .001$). Within particles, phonemically long vowels (1.19) are longer than short vowels (.08), and accented vowels (1.20) are longer than unaccented vowels (.88).

Long accented vowels (1.39) in particles are longer than short accented vowels (.95), and long unaccented vowels (1.07) are longer than short unaccented vowels (.76).

The same is true in nouns and verbs, where long vowels (1.17) are longer than short vowels (.92), and accented vowels (1.09) are longer than unaccented vowels (1.03). In addition, in nouns and verbs, long accented vowels (1.28) are longer than short accented vowels (.88), and long unaccented vowels (1.12) are longer than short unaccented

vowels (.94). Short unaccented vowels are longer than short accented vowels; phonetic lengthening of accented syllables occurs only in phonemically long vowels.

Despite nouns and verbs having longer vowels than particles overall, short accented vowels in nouns and verbs (.88) are shorter than short accented vowels in particles (.95). Similarly, long accented vowels in nouns and verbs (1.28) are shorter than long accented vowels in particles (1.39). This is consistent with the observation in (Ladefoged 2011:101) that vowel duration is a function of word length – vowels in monosyllabic words are longer than vowels in longer, polysyllabic words.

In general, these findings show that (a) phonetic duration is a function of the interaction between phonemic length and the lengthening of accented syllables, and this can be seen most clearly in short unaccented syllables; (b) both particles and nouns/verbs maintain a phonemic length distinction; (c) both particles and nouns/verbs maintain a distinction between accented and unaccented vowels; and (d) the way in which the length/accent distinctions play out is different for nouns/verbs vs. particles. These findings are consistent with the findings with respect to pitch and prominence, discussed next.

1.3.2. Pitch

The perceived prominence of a syllable is based on its loudness, duration, and pitch. Pitch is a perceptual concept, correlating to the frequency of vibration of vocal folds

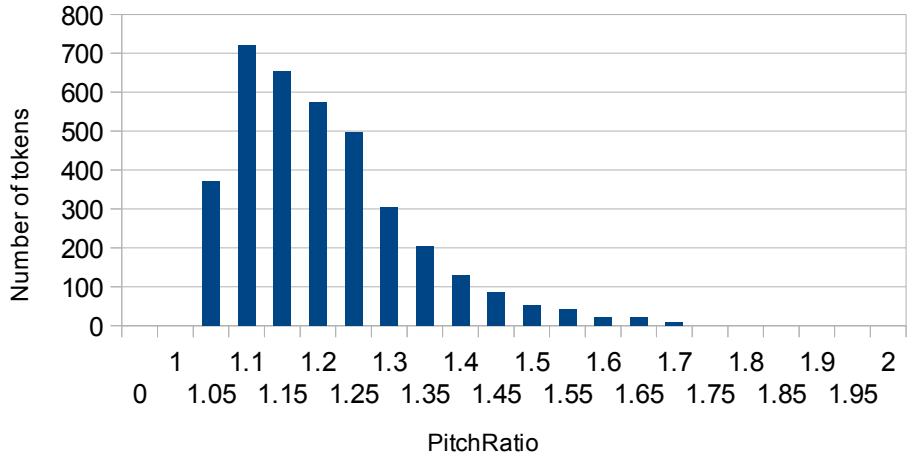
(Laver 1994:450). The acoustic correlate of pitch is fundamental frequency or F_0, measured in Hz. Pitch is a relative concept: regarding a single syllable as high or low in pitch is based on relative perceptual judgment, and, in connected speech, the pitch value of a syllable is judged relative to its immediate neighbours (Laver 1994:450–451).

To obtain the pitch measurement for words and vowels in the data, I used a script to measure the maximum, minimum, and average F_0 of word and vowel intervals in Praat. To reflect the relative nature of pitch, I use the measure PitchRatio, calculated as A:B where A is the maximum pitch of an interval and B is the average pitch of that interval.

I first examine the behaviour of PitchRatio at the word level. Words (and not vowels) are the relevant units here, because for nouns and verbs the maximum pitch is the maximum pitch of the entire word.

Figure 4 shows the distribution of PitchRatio for all words. The somewhat skewed distribution shows that words tend to have a pitch peak that is higher than the average pitch. (I removed 1 token from the 1-1.05 range and 23 tokens from the 1.75-2.2 range in Figure 4. The total number of tokens was 3707.)

Figure 4: Distribution of PitchRatio for all words



To determine whether word type has a significant effect on PitchRatio, I performed an independent samples T-test in SPSS. Table 4 gives the group statistics for this test.

Table 4: Word PitchRatio group statistics

Word type	N	Mean	SD	Std. error mean
Noun and verb	1671	1.2428	.1271	.0031
Particle	2036	1.1391	.1167	.0025

The results of the independent sample test are given in Table 5.

Table 5: Independent samples t-test for PitchRatio in different word types

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PitchRatio	Equal variances assumed	32.209	.000	25.855	3705	.000	.10370	.00401	.09584	.11157
	Equal variances not assumed			25.639	3432.405	.000	.10370	.00404	.09577	.11163

There is a statistically significant difference between the mean PitchRatio for particles vs nouns and verbs ($t(3705) = 25.85$, $p < .001$). Nouns and verbs had a higher PitchRatio than particles on average. This means that in context, particles are less prominent than nouns and verbs.

I performed an independent samples t-test using SPSS to examine the effect of accent on PitchRatio within particles. Because the citation form of all particles is accented, I designated particles as accented if they were transcribed by the speaker as such. It should be noted that the transcription may not always be accurate as it is based on the judgment of the transcriber. As particles are only one syllable long, they are either accented or not; in the case of nouns and verbs the accentuation can be verified based on

citation forms.

Table 6 gives the group statistics for accented and unaccented particles.

Table 6: PitchRatio of particles by accent

Accent	N	Mean	SD	Std. error mean
Accented	489	1.1488	.13741	.00621
Unaccented	1546	1.1360	.10927	.00278

There are fewer tokens of accented particles than unaccented particles, and accented particles have a higher PitchRatio mean than unaccented particles.

Table 7 gives the results of the t-test.

Table 7: PitchRatio independent samples t-test within particles

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PitchRatio	Equal variances assumed	9.126	.003	2.104	2033	.036	.01273	.00605	.0246	.00086
	Equal variances not assumed			1.871	693.945	.062	.01273	.00681	.02610	.00063

The difference in PitchRatio between accented and unaccented particles is statistically significant ($t(2033) = 2.104$, $p = .036$): even though particles are less prominent in context, they still display an accented/unaccented distinction.

To determine which factors (vowel length, accent, word type) affect PitchRatio at the vowel level, I conducted a one-way between-subjects ANOVA with PitchRatio as the dependent variable. It should be noted that for the majority of particles in MHS, word and vowel intervals are the same since most particles consist of only one syllable.

The interaction of all three factors had a significant effect on PitchRatio ($F(1, 6449) = 40.902$, $p < .001$). Table 8 below gives the descriptive statistics for all factors.

Table 8. ANOVA descriptive statistics for PitchRatio by word type, accent, and length

Word type	Accent	Length	Mean	Std. Deviation	N
N/V	Unaccented	Long	1.0827	.09474	716
		Short	1.0781	.09787	2365
		Total	1.0791	.09716	3080
	Accented	Long	1.1218	.10594	567
		Short	1.1254	.10469	675
		Total	1.1238	.10523	1242
	Total	Long	1.1000	.10169	1282
		Short	1.0886	.10134	3040
		Total	1.0920	.10156	4322
P	Unaccented	Long	1.0782	.08997	470
		Short	1.0990	.08659	1120
		Total	1.0929	.8809	1590
	Accented	Long	1.1257	.13587	163
		Short	1.0737	.09604	382
		Total	1.0893	.11192	545
	Total	Long	1.0905	.10569	633
		Short	1.0926	.08974	1502
		Total	1.0919	.09473	2135

As can be seen in the descriptive statistics, nouns and verbs differ from particles in the way the accented/unaccented distinction is manifested in relation to length. In nouns and verbs the accented/unaccented distinction is maintained regardless of length differences: short accented vowels (1.1254) have a higher PitchRatio than short unaccented vowels (1.0781), and long accented vowels (1.1218) have a higher PitchRatio than long unaccented vowels (1.0827).

In particles, however, while long accented vowels (1.1257) have a higher PitchRatio than long unaccented vowels (1.0782), short accented vowels (1.0737) have a lower PitchRatio than short unaccented vowels (1.0990). In fact, short unaccented vowels in particles have a higher PitchRatio than long and short unaccented vowels in N/V words, long unaccented vowels in particles, and short accented vowels in particles. Overall, accented vowels in nouns and verbs (1.1238) have a higher PitchRatio than accented vowels in particles (1.0893). However, long accented vowels in particles (1.1257) have a slightly higher PitchRatio than long accented vowels in nouns and verbs (1.1218). Furthermore, the difference between accented and unaccented vowels overall is much smaller in particles (.004) than in nouns and verbs (.05).

Based on the above, there are two different pitch systems for nouns and verbs vs. particles in Cayuga. In both cases, however, vowel length and pitch are cues to prominence. Table 9 and the following figures illustrate this point, which I discuss

further below.

Table 9: Average levels of prominence for N/V vs particles

	Short unaccented	**Short accented**	**Long unaccented**	**Long accented**
N/V vowel duration	.94 Figure 5	.88 Figure 5	1.12 Figure 6	1.28 Figure 6
P vowel duration	.76 Figure 7	.95 Figure 7	1.07 Figure 8	1.39 Figure 8
N/V vowel pitch level	1.0781 Figure 9	1.1254 Figure 9	1.0827 Figure 10	1.1218 Figure 10
P vowel pitch level	1.0990 Figure 11	1.0737 Figure 11	1.0782 Figure 12	1.1257 Figure 12

Figure 5 and Figure 6 show the duration of N/V vowels based on accent and phonemic length. (I removed 27 tokens from the 1.9-2.7 range in Figure 5; and 7 tokens from the 0.4-10 range; 18 tokens were removed from the 2.4-4.8 range in Figure 6.)

Figure 5: Duration of short N/V vowels by accent

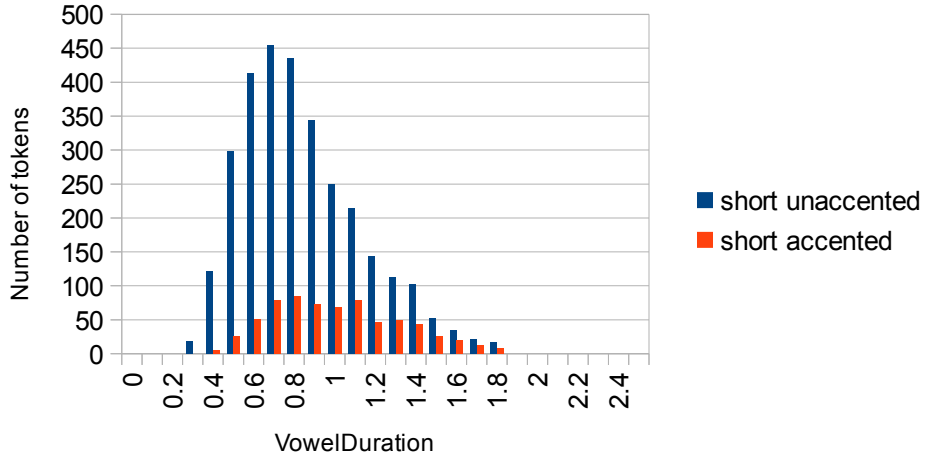


Figure 6: Duration of long N/V vowels by accent

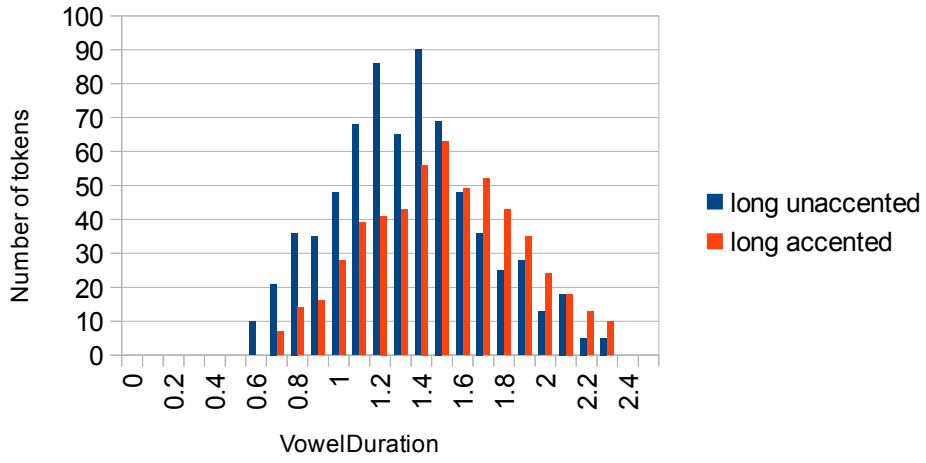


Figure 7 and Figure 8 show the duration of P vowels based on accent and phonemic length. (I removed 5 tokens from the 0.2-0.4 range, and 26 tokens from the 1.8-3.4 range in Figure 7; and 12 tokens from the 0.4-0.9 range, and 47 tokens from the 2.3-6.3

range in Figure 8.)

Figure 7: Duration of short P vowels by accent

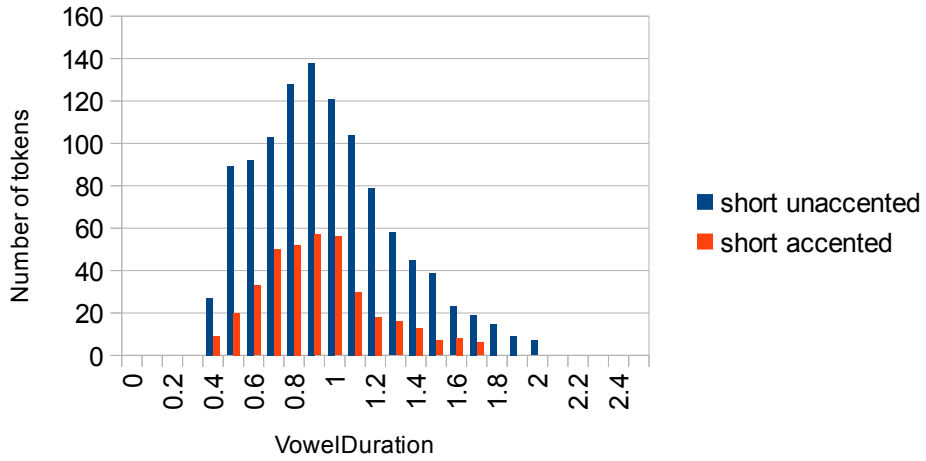


Figure 8: Duration of long P vowels by accent

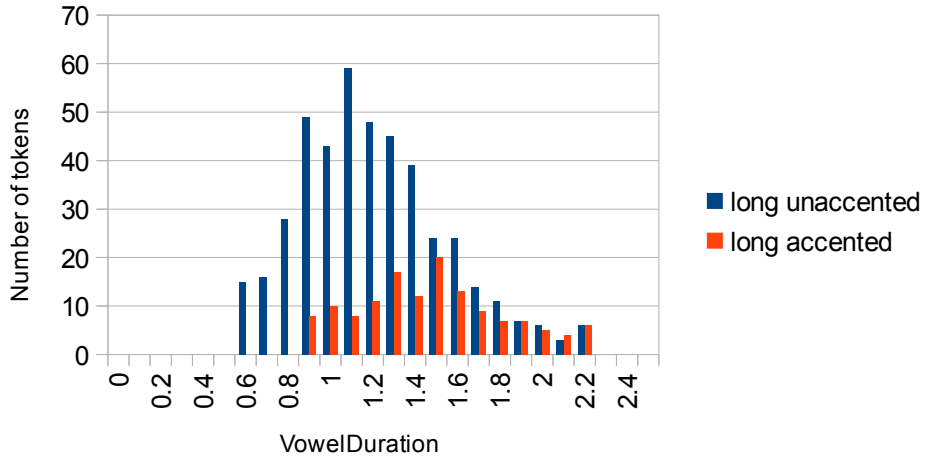


Figure 9 and Figure 10 show the pitch levels of N/V vowels based on accent and phonemic length. (I removed 7 tokens from the 1-1.1 range, and 41 tokens from the 1.6-2.3 range in Figure 9; and 7 tokens from the 1.7-2 range in Figure 10.)

Figure 9: Pitch of unaccented NV vowels by length

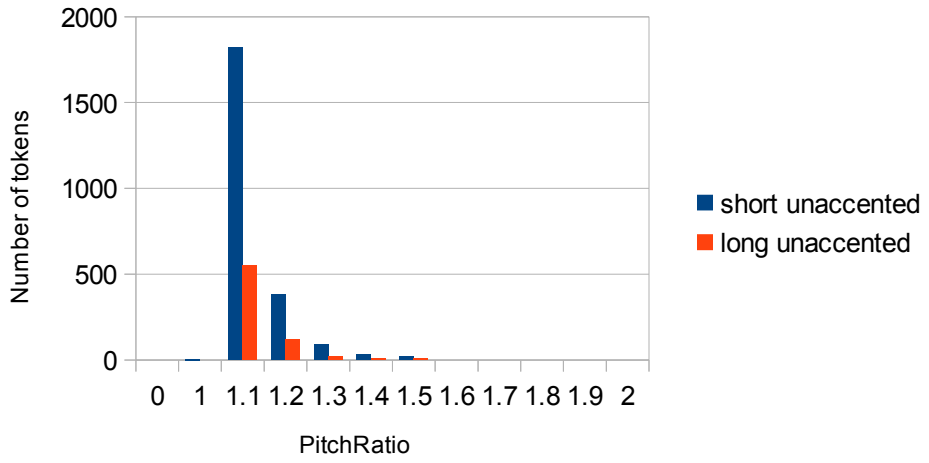


Figure 10: Pitch of accented NV vowels by length

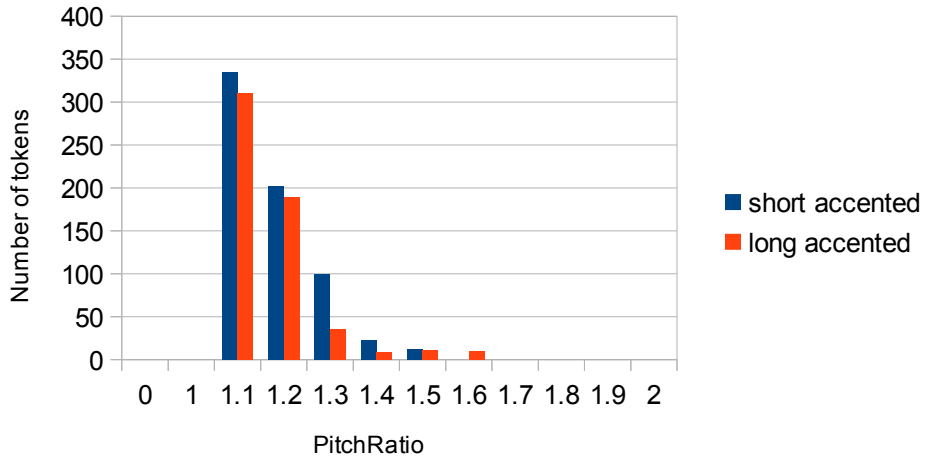


Figure 11 and Figure 12 show the pitch levels of P vowels based on accent and phonemic length. (I removed 1 token was removed from the 1-1.1 range, and 19 tokens from the 1.5-2.1 range in Figure 11; and 12 tokens from the 1.5-2.2 range in Figure 12.)

Figure 11: Pitch of unaccented P vowels by phonemic length

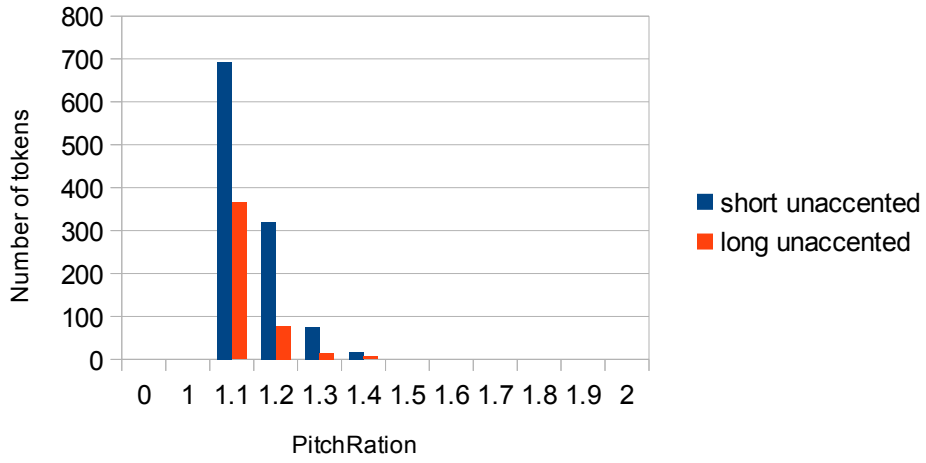
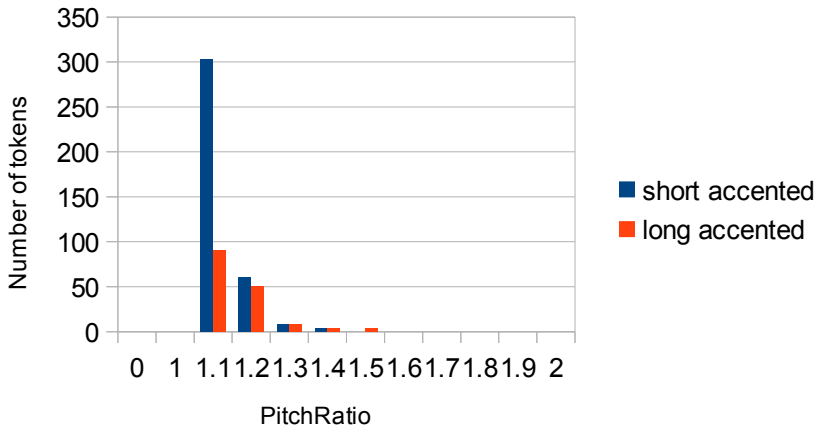


Figure 12: Pitch of accented P vowels by phonemic length



A summary of this section is given in Table 10. As can be seen, the system of prominence for nouns and verbs is different from the system for particles (Column A). For both systems (Column B), long vowels are longer than short vowels, and accented vowels in nouns and verbs have a higher pitch than unaccented vowels. Short unaccented vowels have a higher PitchRatio than short accented vowels. This is an unexpected finding, but overall, particles have less prominence than other words.

Table 10: Summary of N/V and P systems of prominence[7]

		A	B
Duration	N/V	l/a > l/u > s/u > s/a	long > short
	P	l/a > l/u > s/a > s/u	long > short
Pitch	N/V	s/a > l/a > l/u > s/u	accented > unaccented
	P	l/a > s/u > l/u > s/a	long accented particles are the most prominent

1.3.3. Conclusion

After examining the effects of various factors (word type, accent, length) on two variables that determine prominence (VowelDuration, PitchRatio), it is possible to say that there are two different prominence systems for nouns and verbs versus particles. While there is some overlap between unaccented nouns and verbs and accented particles, overall nouns and verbs are more prominent than particles. Within each system, there is a long/short and accented/unaccented distinction; long accented vowels are the most prominent, and short unaccented vowels are the least prominent.

The existence of different systems of prominence justified my subsequent decision to examine the pitch and duration of only particles to determine and label their prominence levels in the data. Previously, the duration and pitch ratios that I used in the statistical

7 L: long, s: short, a: accented, u: unaccented

analysis of vowels were ‘duration of vowel:average duration of all vowels’ and ‘pitch of vowels:average pitch of all vowels’. Later, however, for a more contextualized representation of the prominence system particular to particles, I adjusted the duration ratio to ‘duration of particle:average duration of all particles’ and the pitch ratio to ‘pitch of particle:average pitch of all particles’.

Based on their pitch and duration in relation to other particles, I marked particles for levels of prominence based on my acoustic measurements of their pitch and length. This resulted in an annotated transcription of particles based on acoustic data. Ultimately this enabled me to identify and describe the general principles of the prosody of Cayuga particles.

1.4. Finalized methodology

I divided particles into three prominence categories. Prominent particles, marked 2, have a pitch that is above the average pitch ratio for particles, and are longer than average. Particles with some prominence, marked 1, are above the average pitch ratio, and may be either shorter or longer than the average duration. Particles with long rhymes (e.g. with a distinct [h] or [ʔ]) may have shorter than average vowels, but are considered to be long because of the presence of a full (moraic) laryngeal. Non-prominent particles are marked 0 and are both shorter than the average duration for their citation form, and have a pitch ratio lower than the average. I then used the output of Praat scripts that

measured pitch and duration, along with the above criteria and the guiding principles in 1.2 to establish phonological phrase boundaries.

In establishing prosodic phrase boundaries, I also considered pitch reset and differences in discourse type. In some cases the speaker resets her pitch; the result is that the overall pitch level of the utterance is raised. In general, this means that all particles in the following phrase are more prominent than the average. In these cases, I look at the relative prominence of the particles in the utterance to mark boundaries based on accent.

While my focus was not on discourse, to determine whether a difference in subject matter has an effect on prosodic patterns, I did observe that the MH text consisted of at least two types of discourse, as described in 1.1. I therefore looked, in an informal way, for any differences the prosody of the two types of text. I looked at the first one hundred pause-delimited units, where the speaker recounted childhood memories, and the last ten pause-delimited units, in which the speaker is giving advice. I found no qualitative differences, and so will not discuss the effect of discourse type further.

Chapter 4 Results

This chapter discusses the prosodic structure of Cayuga sentences that include various particles and particle combinations. The status of particles as accented or unaccented within the structures was determined based on criteria developed in the previous chapter.

I determined phonological phrase boundaries by establishing the right edge (end) of a phrase. Right boundaries of phonological phrases coincide with accents, pauses, and the presence of euphonic [h]. I then placed a left (beginning) boundary automatically placed after the right edge where possible. The results are presented in Appendix I, and illustrative examples are discussed below.

In Cayuga in general, accent falls on the final syllable (penult), or on a non-final (antepenultimate or preantepenultimate) syllable (see 2.1). Because of this, it is not possible to establish left boundaries independently. Left edge boundaries are predictable from the location of right edge boundaries. For verbs or nouns, if the word has non-final accent, the right-edge phrase boundary is placed after the final syllable of the verb or noun, under the assumption that the final syllable is extrametrical when accent is non-final (Dyck 2009).

Example (22) below shows instances of boundary placement after prosodic phrases that

have final (22a) and non-final (22b) accent. A ‘)’ marks the end of the phonological boundary, which is at least a Pwd and in case of nouns and verbs a Phonological Phrase.

(22)

a. Do:gę́hs)[8] gi^{ʔ} a^{ʔ}aknihsá:k) dę^{ʔ} gwa^{ʔ} hó^{ʔ}dę^{ʔ} (MHS_30)
p p p p
‘It is true the both of us looked what’

b. Ne^{ʔ} gi^{ʔ} agása:^{ʔ}s) shęh (MHS_23)
p p p
‘That I remember that’

For particles, the boundary is after the accented syllable as well; e.g., a boundary occurs after prominent particles, as shown in (23) for *gę́:s*. (As discussed in 1.4, I determined whether a particle was prominent based on acoustic measurements.)

(23) Do: gwa^{ʔ} gę́:s) na^{ʔ}onishé^{ʔ}) ... (MHS_4)
p p p
‘For a long time it took I say’

Right boundaries of phonological phrases also occur before pauses; any word before a pause is at the right edge. (24) gives examples of verbs before minor (|) and major pauses (‖). Minor and major pauses were determined impressionistically, with major pauses being longer.

8 For all examples from the Marg Henry Story particles are indicated and a word by word translation is given.

(24) … ęga:tro:wí^{ʔ}) | … ękniho:wí^{ʔ}) ‖ (MHS_1)
‘I will speak of this’ ‘I will tell you both’

Right boundaries of phonological phrases also occur wherever there is a euphonic [h], the kind which is only present at boundaries but not within phrases (See 2.1). (25a) is an instance where euphonic [h] (capitalized in the example), is realized before a pause. In contrast, in (25b) [h] is not present between *to* and *né:^{ʔ}*. (The citation form for [to] is [tóh].)

(25)

a. Jadohsw^{ʔ}edá:nih **gę́H**) ‖ O: | ... (MHS_28)
p p
‘Are you both hungry?’

b. Swe^{ʔ}géh gyę:^{ʔ} **to né:^{ʔ}**) tó:gyę́h ne^{ʔ} (MHS_301)
p p p p
‘At that time long ago that time that’

False starts and hesitations also delimit boundaries; however, I have excluded the former from consideration as my study is concerned with regular prosodic phrase formation.

In summary, I placed boundaries as follows:

(26) Right-edge boundary placement: place a right-edge boundary

a. after every accented word

b. after euphonic [h]

c. before a pause

(27) Left-edge boundary placement: place a left-edge boundary

a. immediately after a right-edge prosodic boundary

b. after a pause.

(28) below shows some examples of the resulting structures:

(28)

a. (Do: gwaʔ gę́:s)(nʔaonishéʔ) ... (MHS_4)
p p p
'For a long time it took I say'

b. (Jadohswʔedá:nih) (gę́H) ‖ (Ó:) | ... (MHS_28)

c. (Neʔ giʔ agásha:ʔs) (shęh) (MHS_23)

d. (Néʔ) (ni:ʔ ahí:ʔ) (ęga:tro:wíʔ) (MHS_1)
p p p
'That I think I will speak of this'

This algorithm creates a particle group (a Phonological Phrase) (do: gwaʔ gę́:s) in (28a); a very small prosodic phrase comprised of one particle (gę́H) in (28b); an ill-formed, unaccented prosodic phrase in the form of a particle group (shęh) in (28c); and a P + V particle group (also a well-formed prosodic phrase) (ni:ʔ ahí:ʔ) in (28d). Some of these structures require adjustments, which will be described next. As was discussed before, a well-formed prosodic phrase in Cayuga is minimally disyllabic and has an accent.

As was discussed in 1.2, syntax to phonology mapping creates basic phonological units (phonological phrases). However, such units often need to be adjusted in order to be prosodically well-formed. In particular, the following Markedness constraint applies to Phonological phrases in Cayuga:

(29) BinMin (φ, σ) Phonological phrases must be minimally disyllabic

I will now describe how I resolved ill-formed phrases resulting from (26) and (27).

Example (30) below shows an instance of a particle (*ni:ʔ*) that does not form its own prosodic phrase. /ni:ʔ/ (strong form) is the input.

(30) MHS_1

a.	Néʔ)	**ni:ʔ [ni]**	ahí:ʔ)	ęga:tro:wíʔ)	Right-edge boundary placement (23)
	2	0			
b.	(néʔ)	(ni	ahí:ʔ)	(ęga:tro:wíʔ)	Left-edge boundary placement (24)

As shown in (30a), *ni:ʔ* has the reduced/shortened form of [ni]: based on acoustic data, it has a vowel shorter than the average for particles, has a pitch lower than the average for particles, and lacks a glottal stop. Therefore it is shortened and unaccented. It cannot form a unit of its own, and I assume that it is incorporated into a higher level prosodic unit. It could theoretically form a particle group with *néʔ*. However, there is already a

boundary after *né*ʔ (right-edge boundary placement (23) based on accent), while there is none between [ni] and *ahí:*ʔ. I conclude that it forms a particle group with *ahí:*ʔ. Later, I will argue that the prosodic structure needed for this type of example is a clitic structure, as in (ni (ahí:ʔ)).

Ideally the division of constituents into prosodic units results in prosodic words and phonological phrases that satisfy the minimal binary constraints outlined in 1.2. However, because of the small size of particles, this is not always possible.

In some cases, a particle at the beginning of a line (i.e., at the beginning of a 'chunk' or Intonational Phrase) is accented, and so should also be marked as occurring at the end of a phrase. In such cases, I mark the particles as constituting a phrase despite their size, like the initial *ne*ʔ in MHS_1, repeated below as (31):

(31) (Néʔ) (ni ahí:ʔ) (ęga:tro:wíʔ) | (MHS_1)

In this example, the P-Phrase is too small; Cayuga P-phrases must be minimally disyllabic. This phrasing violates minimal size constraints (26). This would indicate that in Cayuga Parse >> BinMin. This ordering results in a sub-optimal prosodic phrase.

Sometimes a prosodic phrase only contains a non-prominent particle, as shown in example (32).

(32) MHS_2

a.	(dę^{ʔ}	ho^{ʔ}dé^{ʔ})	(niyaw<u>e</u>^{ʔ}ǫ́h)	(ne^{ʔ})	|	**(swé^{ʔ}geh)**	**(hne:^{ʔ})**	‖	Right- and left-edge boundary placement (23, 24)
	p			p			p		
	‘what happened a long time ago’								
	0	2		1			1		
b.	(dę^{ʔ} ho^{ʔ}dé^{ʔ})		(niyaw<u>e</u>^{ʔ}ǫ́h ne^{ʔ})			**(swé^{ʔ}geh hne:^{ʔ})**			Adjustment due to (26)

In the above example *ne^{ʔ}* and *hne:^{ʔ}* are big enough to be Pwds, but are not accented. They are too small to be a phonological phrase (phonological phrases need to be minimally binary (29)). This is resolved by restructuring or adjustment. In this case, *ne^{ʔ}* and *hne:^{ʔ}* are simply incorporated into adjacent phonological phrases. In (32), the only available phrases are the preceding ones. The particles cannot be incorporated into the following phrase because there are pause boundaries present. This results in the restructured prosodic units in (32b).

It was mentioned in 2.2.1 that particle groups are similar to nouns and verbs in that they are always accented; however, the resulting prosodic phrases in the above examples have accentual patterns that are not always like the ones normally seen for Phonological Phrases. This is the case in (32b), for example, where the final prosodic structure contains *niyaw<u>e</u>^{ʔ}ǫ́h ne^{ʔ}* (V + P) as a phrase. If this sequence constituted one ‘word’ (and therefore a P-phrase), *niyaw<u>e</u>^{ʔ}ǫ́h ne^{ʔ}* would have a final accent (since it is utterance-

medial) according to the accentuation patterns of Cayuga. A possible solution is to assume cliticization, and that *neʔ* does not affect the accentuation of the phrase because accent placement only refers to the innermost brackets. This analysis is represented as ((niyawe̲ʔǫ́h) neʔ).

(33) is an example of a phrase with a P + V combination:

(33) dęʔ niyǫgye̲háʔ (MHS_87)
p
'what she's doing our grandma'

Here, if *dęʔ* is analyzed as part of the same unit as the verb, Laryngeal Metathesis would no longer apply to the penult, which would now be even-numbered. The resulting structure, *(dęʔ niyǫgyeháʔ), wrongly predicts that [gye] is even-numbered, and therefore not subject to Laryngeal Metathesis. Again, this can be resolved by assuming that the particle is a prosodic clitic and only the innermost brackets are the domain of accent placement, which *dęʔ* is not part of: (dęʔ (niyǫgye̲háʔ)), as with the previous example.

To summarize, non-prominent particles are incorporated into an available accented unit. This sometimes results in P + V or V + P combinations, which display accentuation and Laryngeal Metathesis only within the unit corresponding to V.

In some instances, the initial bracketing (input) based on accents created two sub-minimally-sized prosodic phrases for two prominent particles, as in (34) below.

(34) (gwahs ǫ́:weh) (onaˀnawę́:) **(néˀ) (ásdeh)** ‖ (MHS_24)
p p p p
'I believe that it was wet outside'
(after right- and left-edge boundary placement (23, 24))

The initial phrasing (input) would be: (néˀ) (ásdeh). As in (32), *néˀ* is too short to be a P-phrase. In such cases it is possible that the two prominent particles constitute one phrase, and result in a prosodic unit with two accents, which is attested in Phonological Phrases as a kind of intonational pattern (See 2.1). Both particles receive an accent mark but constitute one phrase, resulting in the following structure:

(35) (gwahs ǫ́:weh) (onaˀnawę́:) (**néˀ ásdeh**) ‖ (MHS_24)

In general, I assume that subminimal structures like (néˀ) in (32) and (34) are avoided where possible (as they violate the minimal binary constraint given in (29)).

There are some occurrences of phrases with no prominent syllable, such as *neˀ kso:t* in (36). *Kso:t* is a single syllable noun, not a particle; it has no prominence or pitch accent, because the regular rules that apply to utterance-final words fail to assign an accent to

such words, as discussed in 2.2.1. *Kso:t* is also a kinship term; however, unlike other verbs, it has no prothetic [i] (this apparent exception has not been noted in the Iroquoian literature before). According to the accentuation rules of Cayuga, this word cannot be accented when in citation form or when utterance-final (See 2.1).

(36) (aʔakiyenawáʔs) (**neʔ kso:t**) ‖ (MHS_8)
p
'we helped our grandma'
(after right- and left-edge boundary placement)

My algorithm for phrase formation would leave *neʔ kso:t* as a phrase without an accent, and phrases are, by definition, accented units. However, the two words together are long enough to form a disyllabic P-phrase. I assume that they either form a non-ideal, headless (unaccented) P-phrase on their own (37a), or they are both incorporated into the previous P-phrase (37b), which results in a P-phrase with an accent.

(37)

a. (aʔakiyenawáʔs) (neʔ (kso:t)) ‖
b. ((aʔakiyenawáʔs) (neʔ (kso:t)) ‖

Phrases containing only particles are another possible structure. (38) is an example of one such particle group.

(38) (**dę^{ʔ} di^{ʔ} ho^{ʔ}dę́^{ʔ}**) (niyǫgyę́há^{ʔ} ne^{ʔ} kso:t) ‖MHS_86
p p p p
'what is it that she's doing my grandma?'

Because *ho^{ʔ}dę́^{ʔ}* is prominent (accented), a P-phrase boundary is placed after it. *ho^{ʔ}dę́^{ʔ}* is also at the end of a WH-phrase. As discussed in 1.3.1, Cayuga WH-words are in the Comp of VP (as evidenced by their position immediately before the verb), which, based on Match constraints, would require them to be outside VP prosodically, and therefore occupying a different P-phrase from the verb.

I analyze the non-prominent particles as clitics to *ho^{ʔ}dę́^{ʔ}*, resulting in the following structure for the particle group:

(39) (dę^{ʔ} (di^{ʔ} (ho^{ʔ}dę́^{ʔ})))

If the structure were (dę^{ʔ} di^{ʔ} ho^{ʔ}dę́^{ʔ}) then the even-numbered *di^{ʔ}* would be accented (or shortened to [di^{ʔ}] or [di]) according to the rules for Phonological Phrases discussed in 2.1, which is not the case.

In all the examples discussed, an analysis of non-prominent particles as prosodic clitics accounts for their prosodic behaviour.

1 Conclusion

As was demonstrated in Chapter 5, the prosodic structure of Cayuga particles and particle groups does not mirror the syntactic structure. In contrast, syntactic verbs and nouns correspond to Phonological Phrases, for the most part. Minimally, particles are smaller prosodic units than Phonological Phrases.

It was shown that non-prominent particles can prosodically attach to preceding or following words (see examples (32) and (33)), depending on the context. Non-prominent particles can attach to a prominent particle to form groups, again, depending on the context (see example (39). In particle-verb sequences, the resulting unit does not always follow the expected patterns of accentuation and other accent-related processes (such as Laryngeal Metathesis) for a Phonological Phrase. This can be explained by assuming particles act as clitics to the prosodic units they attach to. Therefore the structure of a particle-verb sequence, for example, would look like (P(V)), with accentuation rules only applying to the innermost brackets.

The resulting structure can be analyzed in two ways: as a Phonological Phrase with extraprosodic syllables (which would correspond to a P-phrase); or as a prosodic unit that is between the P-phrase and the Intonational Phrase in the prosodic hierarchy of Cayuga. This second interpretation is analogous to Beck's (1999) observations for Lushootseed (a polysynthetic Coast Salish language), where syntactically free elements

are incorporated into phrases which resemble but are not identical to Pwds. Future research will determine whether this constituent can be justified as a domain in Cayuga. If this is the case, the prosodic hierarchy of Cayuga would have to include an additional unit between Pwd and Intonational Phrase, possibly higher than the Phonological Phrase if nouns and verbs are analyzed as phrases.

My work is an addition to the body of research on Cayuga phonology, and the first that looks specifically at Cayuga particles and their prosody and syntax. I have shown that the accentuation system of particles is different from that of nouns and verbs, and that prosodic context (and not always syntax) determines whether particles act as clitics or Pwds. In addition, I have provided an objective description of the prosody of particles in MHS based on acoustic data, which can be a resource for Cayuga speakers and learners.

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Appendix I – Revised transcription and analysis of the prosody of particles in MHS

A transcription of particles in the Marg Henry story based on acoustic data and the guidelines discussed in 1.4 is presented in this appendix. The first fifty, and last ten pause-delineated units are shown. For every example, the first line shows the transcription (including pauses) and the application of right- and left-edge boundary placement based on the prominence levels of particles, given in the second line. Then the assumed prosodic structure is presented.

MHS_1

(né^{ʔ})	(ni:^{ʔ} [ni]	ahí:^{ʔ})	(ęga:tro:wí^{ʔ})	|	(nę:	gyę́h	ękniho:wí^{7})	‖
2	0				1	2		

(né^{ʔ}) (ni (ahí:^{ʔ})) (ęga:tro:wí^{ʔ}) (nę: (gyę́h))

‘That I think I will speak of this. I will tell you both.’

MHS_2

(dę^{7} [dę]	ho^{7}dę́^{ʔ}) [ho^{7}dę́]	(niyaw^{7}ęǫ́h)	(ne^{ʔ})	|	(swé^{7}geh)	(hne:^{7}) [hne:]	‖
0	1		1			1	

(dę (ho^{7}dę́)) ((niyaw^{7}ęǫ́h) ne^{ʔ}) ((swé^{7}geh) hne:)

‘what happened a long time ago’

MHS_3

(ǫgyáʔse:ʔ)	|	(gę:s	agyadewayęstháʔ)	(haʔdé:yǫ́:)	‖
		0			

(Ǫgyáʔse:ʔ) (gę:s (agyadewayęstháʔ)) (haʔdé:yǫ́:)

‘My cousin and I used to learn many different things’

MHS_4

(Do:	gwaʔ	gę́:s)	(nʔaonisheʔ)	(to:	néʔ) [ne]	‖
1	1	1		1	2	

(Do: (gwaʔ (gę:s))) (nʔaonisheʔ) (to: (né))

‘for a long time it took I say’

MHS_5

(kso:tgéH)	(hǫ:	haʔa:kné:ʔ)	‖
	1		

(kso:tgéh) (hǫ: (haʔa:kné:ʔ))

‘our grandpa's place we used to go’

MHS_6

(aʔagyagyǫʔsehaʔ)	‖

(aʔagyagyǫʔsehaʔ)

‘we went to visit’

MHS_7

(haʔdé:yǫ:)	gę:s)	|	(naʔagyagyé:ʔ)	‖
	1			

((haʔdé:yǫ:) gę:s) (naʔagyagyé:ʔ)

‘Many different things we used to do’

MHS_8

(aʔakiyenawáʔs)	(neʔ	kso:t)	‖
	1		

(((aʔakiyenawáʔs) (neʔ (kso:t))

‘we helped our grandma’

MHS_9

(neʔ [ne]	giʔ [gi]	nę:	gyę́h)	(sǫgása:ʔ)	‖
1	1	2	2		

(Ne (gi (nę: (gyę́h)))) (sǫgása:ʔ)

‘This is what I remember’

MHS_10

ayę́:ʔ)	(gę:s	tgǫháǫgyeʔ)	(neʔ [ne]	tęʔ [tę]	gwáhs)	|	(dʔeakniksaʔdí:yo:)	‖
	1		1	1	1			

(ayę́:ʔ) (gę:s (tgǫháǫgyeʔ)) (ne (tę (gwáhs))) (dʔeakniksaʔdí:yo:)

‘I think sometime that not always were we good children’

MHS_11

(haʔde:yǫ́:)	(niyagyagyé:haʔ)	‖

(Haʔdeːyǫ́ː) (niyagyagyéːhaʔ)

‘A lot of things we used to do’

MHS_12

(neʔ [ne]	giʔ [gi]	agasáːʔs)	(nęː	gyęh	ahíːʔ)	(tgáːgǫːt)	‖
0	0		0	0			

(Ne (gi (agasáːʔs))) (nęː (gyęh (ahíːʔ))) (tgáːgǫːt)

‘that is what I remember I thought that it's important’

MHS_13

(sǫgwaʔnoht)	(oːyáʔ)	(ękehoːwíʔ)	shęh)	‖
			1	

(sǫgwaʔnoht) (oːyáʔ) ((ękehoːwíʔ) shęh)

‘someone else should be told that’

MHS_14

(gyotgǫ́:t)	(gę:s	ayę́:ʔ)	(neʔ)	|	(i:ʔ [i:]	tsǫ:	(akhwa:ji:yáʔ)	‖
	1		1		0	1		

(gyotgǫ́:t) ((gę:s (ayę́:ʔ)) neʔ) (i:ʔ (tsǫ: (akhwa:ji:yáʔ)))

‘all the time I think only my family’

MHS_15

(gakeho:wíh)	(nę:	gyęh [gyę]	dęʔ	gwaʔ	hoʔdę́ʔ)	‖
	1	0	1	0		

(gakeho:wíh) (nę: (gyęh (dęʔ (gwaʔ (hoʔdę́ʔ)))))

‘I tell them this what’

MHS_16

(gę:s	nigagyehá̱ʔ)	(neʔ	(swéʔgeh)	‖
0		1		

(gę:s (nigagyehá̱ʔ)) (neʔ (swéʔgeh))

‘I used to do a long time ago’

MHS_17

(néʔ)	giʔ	nę́:)	(gyę́h	neʔ) [ne]	|	(ksotgę̲hę́:ʔ)	(haʔa:kné:ʔ)	(neʔ	ǫgyaʔsé:ʔ)	(aʔagyagyǫ́ʔse:ʔ)	‖
2	0	2	1	1				0			

(neʔ) (((giʔ (nę́:)) ((gyę́h (ne)[9] (ksotgę̲hę́:ʔ) (haʔa:kné:ʔ) (neʔ (ǫgyaʔsé:ʔ)) (aʔagyagyǫ́ʔse:ʔ)

'This is what my late grandma we went to my cousin and I used to visit'

MHS_18

(a:yę́:ʔ)	|	(sedjí:hah)	(toh	haʔǫkihá:ʔ)	(neʔ	knó:haʔ)	|	(neʔ	hniʔ	neʔ	kno:há:ʔah)	‖
			1		1			0	0	1		

(a:yę́:ʔ) (sedjí:hah) (toh (haʔǫkihá:ʔ)) (neʔ (knó:haʔ)) (neʔ (hniʔ (neʔ (kno:há:ʔah))))

'I believe early in the morning where she took us my mother and also my aunt'

MHS_19

(toh	giʔ [gi]	hęʔ	hne:ʔ	haʔgaeyǫ́ʔ)	|	(haʔgaǫgyǫʔsé:ʔ)	(dají:hah)	‖
1	1	1	1					

(toh (giʔ (hęʔ (hne:ʔ (haʔgaeyǫ́ʔ)))) (haʔgaǫgyǫʔsé:ʔ) (dají:hah)

'also at the time they arrived they visited for a little while'

9 In cases like this where two or more consecutive particles in a unit have the same prominence, I assumed that the one with a higher pitch was accented.

MHS_20

(tę̀ʔ	giʔ	gwáhs)	(ayę́:ʔ)	(dʔeswagasá:ʔs)	‖
1	1	2			

(tę̀ʔ (giʔ (gwáhs))) (ayę́:ʔ) (dʔeswagasá:ʔs)

‘This it seems I don't really remember.’

MHS_21

(gyę́:)	(gwaʔ	neʔ [ne]	gagwedjí:hah)		
2	1	0			

(gyę́:) (gwaʔ (neʔ (gagwedjí:hah)))

‘Maybe in the spring’

MHS_22

(neʔ [ne]	gʔi	shęh	néʔ)	(ganęnʔagéhneh)	‖
1	1	1	2		

(neʔ (gʔi (shę́h (neʔ)))) (ganęnʔagéhneh)

‘or also the fall’

MHS_23

(neʔ [ne]	giʔ [gi]	agásaʔs)	(shęh)	‖
1	1		1	

((ne (gi (agásaʔs))) shęh)

‘That I remember that’

MHS_24

(gwahs	ǫ́:weh	onaʔnawę́:)	(néʔ)	(ásdeh)	‖
1	1		2	2	

(gwahs (ǫ́: (weh (onaʔnawę́:)))) (néʔ) (ásdeh)

‘I believe that it was wet outside’

MHS_25

(gaha:gǫ́:)	(hníʔ)	(tęʔ [tę]	dʔaǫ́)	(wá:dǫʔ)	(néʔ)	|	(tę́ʔ)	(da:sataháhk)	(ęhsyaʔdó:daʔ)	‖
	2	1			2		2			

(gaha:gǫ́:) (hniʔ) (tę (dʔaǫ́)) (wá:dǫʔ) (néʔ) (tę́ʔ (da:sataháhk))[10] (ęhsyaʔdó:daʔ)

‘In the bush not able to not for you to walk. You will get stuck’

MHS_26

(tréhs)	|	(do:géhs)	(i:sóʔ)	(ohné:goʔ)	‖
2			2		

(tréhs) (do:géhs) (i:sóʔ) (ohné:goʔ)

‘because there's too much water all over’

10 This is similar to a noun or verb with two accents, discussed in 2.1 and Chapter 4.

MHS_27

(neʔ	giʔ [gi]	to:	néʔ)	|	(onę́h)	|	(aʔa:gę́ʔ)	(neʔ	kso:t)	‖
1	0	2	2		2			1		

(neʔ (giʔ (to: (néʔ)))) (onę́h) (aʔa:gę́ʔ) (neʔ (kso:t))

‘I think then now she used to say that our grandma’

MHS_28

(jadohswʔedá:nih)	(gę́h)	|
	2	

(jadohswʔedá:nih) (gę́h)

‘Are you both hungry?’

MHS_29

(ó:)	|	(gyotgǫ́:t)	(ayę́:ʔ)	(ǫgyadohswéʔdanih)	‖
2					

(ó:) (gyotgǫ́:t) (ayę́:ʔ) (ǫgyadohswéʔdanih)

‘Always it seemed we were hungry!’

MHS_30

(do:gę́hs)	(giʔ)	|	(aʔaknihsá:k)	|	(dęʔ	gwaʔ	hóʔdęʔ)	‖
	2				0	1	2	

(do:gę́hs) (giʔ) (aʔaknihsá:k) (dęʔ (gwaʔ (hóʔdęʔ)))

‘It is true the both of us looked what’

MHS_31

(neˀ	giˀ) [gi]	|	(agásaːˀs)	(néˀ)	|	(dyotgǫ́ːt)	(gę́ːs)	(gonaˀdaę́ˀ)	(neˀ)	|	(ksotgę̲hę́ːˀ)	(neˀ)	|	(gotnaˀdaǫ́daˀk)	‖
1	0			2			2		1			1			

((néˀ) gi)) (agásaːˀs) (néˀ) (dyotgǫ́ːt) (gę́ːs) ((gonaˀdaę́ˀ) neˀ) ((ksotgę̲hę́ːˀ) neˀ) (gotnaˀdaǫ́daˀk)

‘is that what I remember that is always that she has bread that late grandma that she had made bread.’

MHS_32

(néːˀ)	(giˀ	toːgyę́h)	(gę:s	doːs	ogáˀǫh)	‖
2	1	2	0	0		

(néːˀ) (giˀ (toːgyę́h)) (gę:s (doːs (ogáˀǫh)))

‘that the one that was really good!’

MHS_33

(aˀaknikwę:dáˀ)	(giˀ [gi]	onę́h)	(asdéh)	(haˀaːknéːˀ)	(aˀagyatgahnyéːˀ)	|	(haˀdéːyǫː)	‖
	1	2	2					

(aˀaknikwę:dáˀ) (gi (onę́h)) (asdéh) (haˀaːknéːˀ) (aˀagyatgahnyéːˀ) (haˀdéːyǫː)

‘when we finished eating then more outside we went we played all different things’

MHS_34

(neʔ	hniʔ [hni]	aʔakniya:tęʔ)	(neʔ)	|	(grahé:t)	‖
0	0		1			

((neʔ (hni (aʔakniya:tęʔ))) (neʔ)) (grahé:t)

‘And that we also climbed the tree’

MHS_35

(aʔonishéʔ)	(giʔ	toh [to]	hǫ:	heyaknitsgó:t)	‖
	0	0	1		

(aʔonishéʔ) (giʔ (to (hǫ: (heyaknitsgó:t))))

‘a long time we sat up there’

MHS_36

(o:nęh)	|	(aʔa:gęʔ)	|	(jʔasnęht)	(to:gyęh)	(waʔjíh)	(neʔ [ne]	sǫ:gwaʔnóht)	(ęyagonǫhnyaʔk)	‖
2					2	2	1			

(o:nęh) (aʔa:gęʔ) (jʔasnęht) (to:gyęh) (waʔjíh) (ne (sǫ:gwaʔnóht)) (ęyagonǫhnyaʔk)

‘Now she said both of you get down before somebody who gets hurt.’

MHS_37

(ó:)	(hao:ʔ)	‖
2		

(ó:) (hao:ʔ)

‘OK’

MHS_38

(nęh [ne]	gi^{ʔ})			(ganǫhsó:t)	(hǫsa:kné:^{ʔ})	‖
0	1					

(ne (gi^{ʔ})) (ganǫhsó:t) (hǫsa:kné:^{ʔ})

‘Now then to the house we went back to’

MHS_39

(toh	gę́:s)	(ni:yóht)	(to:)		(dekní:)	(deganhogáhę:t)	‖
0	1		1				

(toh (gę:s)) ((ni:yóht) to:) (dekní:) (deganhogáhę:t)

‘that's how it was that two doors.’

MHS_40

(onę́h)	gwa^{ʔ})		(né	gwa^{ʔ})		(ahsha:kni:gę́^{ʔ})	ne^{ʔ})	‖
1	0		1	1			1	

((onę́h) gwa^{ʔ}) (né (gwa^{ʔ})) ((ahsha:kni:gę́^{ʔ}) ne^{ʔ})

‘Now that now also we seen him that’

MHS_41

(hagehsotgẹhẹ́:ʔ)	(togyẹ́h)	(dahayagẹ́ʔ)	‖
	2		

(hagehsotgẹhẹ́:ʔ) (togyẹ́h) (dahayagẹ́ʔ)

‘my late grandfather who he seemed to sit down I think’

MHS_42

(a:yẹ́:ʔ)	(hogya:ha:gyéʔ)	(giʔ	gẹ:s	to:gyẹ́)	(neʔ	gayá:ʔ)	‖
		0	1	2	0		

(a:yẹ́:ʔ) (hogya:ha:gyéʔ) (giʔ (gẹ:s (to:gyẹ́))) (neʔ (gayá:ʔ))

‘It seems he always had a sack over his shoulder. There it was the bag.’

MHS_43

(gyotgǫ́:t)	(gẹ:s	neʔ)	|	tgá:gǫ:t	hẹháha:ʔ)	neʔ	gaẹgwaʔ	hǫ́:	hẹhé:ʔ	‖
	1	1				0				

gyotgǫ́:t gẹ:s neʔ tgá:gǫ:t hẹháha:ʔ neʔ gaẹgwaʔ hǫ́: hẹhé:ʔ

‘all that time that he had to take when someplace he went’

MHS_44

neʔ	giʔ	aʔa:gẹ́ʔ	|	neʔ	ksó:t	aʔa:gẹ́ʔ	‖
1							

neʔ giʔ aʔa:gẹ́ʔ neʔ ksó:t aʔa:gẹ́ʔ

‘Well that's what she said and that's what our grandma said’

MHS_45

(ęhsnigǫ́há:k)	(gwaʔ)	(to:gyę́h)	(ahgwí)	(ęhsahdǫ́:)	(neʔ)	(gayá:ʔ)	‖
	1	2	2		1		

(ęhsnigǫ́há:k) (gwaʔ (to:gyę́h)) (ahgwí) (ęhsahdǫ́:) (neʔ (gayá:ʔ))

‘You be careful that don't you lose that bag.’

MHS_46

(ó:)	(haó:ʔ)	|	(onę́h)	(giʔ)	|	(dashagó:yǫʔ)	(neʔ)	|	(to:gyę́)	(gayá:ʔ)	‖
2			2	0			1		2		

(ó:) (haó:ʔ) ((onę́h) giʔ) ((dashagó:yǫʔ) neʔ) (to:gyę́) (gayá:ʔ)

‘OK. Now that he gave it to her that bag’

MHS_47

(hǫsaeyǫ́ʔ)	(ó:)	(gǫdagyéʔ)	(hęʔ	ni:ʔ	haʔa:kni:yǫ́ʔ)	‖
	2		1	1		

(hǫsaeyǫ́ʔ) (ó:) (gǫdagyéʔ) (hęʔ (ni:ʔ (haʔa:kni:yǫ́ʔ)))

‘when she went in. Oh right away we both went in’

MHS_48

(aʔagyatgęʔsé:ʔ)	(dęʔ	diʔ	gwahs	hoʔdęʔ)	|	(nęha:gyé:ʔ)	(to:gyę́h)	‖
	0	0	1	2			2	

(aʔagyatgęʔsé:ʔ) (dęʔ (diʔ (gwahs (hoʔdęʔ)))) (nęha:gyé:ʔ) (to:gyę́h)

‘We got up what was he going to do that one?’

MHS_49

(dęʔ	diʔ	hoʔdę́ʔ)	(nęyǫgyé:ʔ)	(dęʔ	hoʔdę́ʔ)	(ni:yóht)	(tga:gǫ́:t)	|	(hęyehá:ʔ)	(neʔ	gáya:ʔ)	‖
1	1	2		1	2					1		

(dęʔ (diʔ (hoʔdę́ʔ))) (nęyǫgyé:ʔ) (dęʔ (hoʔdę́ʔ)) (ni:yóht) (tga:gǫ́:t) (hęyehá:ʔ) (neʔ (gáya:ʔ))

‘What will she do what's the reason that she thinks she wants the bag to take the bag?’

MHS_50

(neʔ	giʔ	tó:)	(neʔ [ne]	onaʔdá:ʔ)	(gahsrǫ:ní:)	|	(adyeyʔaksǫ́:ʔ)	(to:	aʔewidrá:)	(onę́h)	(aʔehwʔenǫ:níʔ)	‖
1	0	1	1					1		2		

(neʔ (giʔ (tó:))) (ne (onaʔdá:ʔ)) (gahsrǫ:ní:) (adyeyʔaksǫ́:ʔ) (to: (aʔewidrá:)) (onę́h)

(aʔehwʔenǫ:níʔ)

‘This is the road/trail that's made she broke up put butter/ice on it and wrapped it’

MHS_301

(gyę́:gwaʔ [gyę:gwa])	(neʔ)	|	(gyo̲hdǫ́:)	(gʔishę́h)	(niwago̲hsríyʔagǫ́h)	(neʔ	tohgéh)	(hǫ́:weh)	‖
2	1			2		1	2	2	

((gyę́:gwa) neʔ) (gyo̲hdǫ́:) (gʔishę́h) (niwago̲hsríyʔagǫ́h) (neʔ (tohgéh)) (hǫ́:weh)

‘maybe that I maybe that's how many days’

MHS_302

(sweʔgéh)	(gyę:ʔ	tohné:ʔ)	(tó:gyęh)	(neʔ)	‖
	1	2	2	1	

(sweʔgéh) (gyę:ʔ (tohné:ʔ)) ((tó:gyęh) neʔ)

‘at that time long ago that time that’

MHS_303

(hona:tro:wí:)	(dęyǫkidé:niʔ)	‖

(hona:tro:wí:) (dęyǫkidé:niʔ)

‘they spoke of they'll change us’

MHS_304

(ahsǫ́h)	(gyę:ʔ [gyę:]	nęné:ʔ)	(neʔ	waʔ́neʔ:)	|	(neʔ	ahsǫ́h)	(hęná:dǫh)	(hwę:dǫ́h)	(gwaʔ	tga:gǫ́:t)	(ędwaganyáʔk)	|
2	1	2	1	2		1			2	0			

(ahsǫ́h) (gyę: (nęné:ʔ)) (neʔ (waʔ́neʔ:)) (neʔ (ahsǫ́h)) (hęná:dǫh) (hwę:dǫ́h) (gwaʔ

(tga:gǫ́:t)) (ędwaganyáʔk)

‘still that to this day that they still say so sometimes it becomes we'll pay for that’

(to:gyę́h)	(neʔ)	|	(ohwihsdáʔ)	(neʔ)	|	(shęh	ǫgwánǫhso:t)	‖
2	1			1		0		

((to:gyę́h) neʔ) ((ohwihsdáʔ) neʔ) (shęh (ǫgwánǫhso:t))

‘that money because we have a house’

MHS_305

(tę́ʔ)	(giʔ	gyę:ʔ	toh	dʔeawʔę́h)	(neʔ)	|	(tohgéh)	(hǫ́:weh)	|	(gyę:gwáʔ)	(gʔishę́h)	(hwaʔ	dó:gęhs)	‖
2	0	0	0		1		2	2		2	2	1		

(tę́ʔ) (giʔ (gyę:ʔ (toh ((dʔeawʔę́h) neʔ)))) (tohgéh) (hǫ́:weh) (gyę:gwáʔ) (gʔishę́h) (hwaʔ

(dó:gęhs))

‘It didn't happen all the place. Maybe because it could be true.’

MHS_306

(hwę:dǫ́h)	(gwáʔ	neʔ)	|	(shę́h)	(nidwa:gé:nǫ:)	(ęgé:gęʔ)	(hęʔ	ni:ʔ	tó:neʔ)	(tga:gǫ́:t)	(ęgéganyaʔk)	‖
2	2	1		2			1	1	2			

(hwę:dǫ́h) ((gwáʔ) neʔ) (shę́h nidwa:gé:nǫ:) (ęgé:gęʔ) (hęʔ (ni:ʔ (to:neʔ))) (tga:gǫ́:t)

(ęgéganyaʔk)

‘maybe sometimes how old I am now I'll see that also that's the time I'll have to pay’

MHS_307

(shęh	hǫ:wéh)	|	(gʔidrǫ́ʔ)	(gyę:gwáʔ)	(tęʔ)	|	(néʔ	giʔ	neʔ)	|	(gakeyadreʔshǫ́ʔǫh)	|	(neʔ	ęha:dí:gęʔ)	‖
1	2			2	1		1	1	1				1		

(shęh (hǫ:wéh)) (gʔidrǫʔ) ((gyę:gwáʔ) tęʔ) (((néʔ) giʔ) neʔ) (gakeyadreʔshǫ́ʔǫh) (neʔ

(ęha:dí:gęʔ))

‘since it belongs to him I live maybe if not that this is my grandchildren that they will

see’

MHS_308

(tga:gǫ́:t)	(gʔishę́h)	(hwaʔ)	|	(gyę:gwáʔ)	(ędiswadewaihǫ́hs)	|	(dyotgǫ́:t)	(ęwa:dǫ́ʔ)	‖
	2	1		2					

(tga:gǫ́:t) ((gʔishę́h) hwaʔ) (gyę:gwaʔ) (ędiswadewaihǫ́hs) [dropped word] (dyotgǫ́:t)

(ęwa:dǫ́ʔ)

‘has to maybe that if maybe you will carry it through the right way you say it in Indian

always it will be done’

MHS_309

(tę^{ʔ}	g^{ʔ}ishę́h)	(hwa^{ʔ} [hwa]	d^{ʔ}aǫ́:)	(toh	na:yá:węh)	|	(ne^{ʔ}	gyę:^{ʔ}	nę	dyotgǫ́:t)	hęná:dǫh)	|
1	2	1		0			0	0	1			

(tę^{ʔ} (g^{ʔ}ishę́h)) (hwa (d^{ʔ}aǫ́:)) (toh (na:yá:węh)) (ne^{ʔ} (gyę:^{ʔ} (nę (dyotgǫ́:t)))) (hęná:dǫh)

‘Maybe not this time that will happen. That's the one that they always lose’

(shęh [shę]	(niyónishé^{ʔ})	(ǫgwehǫ:wéh)	(nihswęn^{ʔ}odę́:)	‖
0				

(shęh (niyónishé^{ʔ})) (ǫgwehǫ:wéh) (nihswęn^{ʔ}odę́:)

‘since it's been that Indians are slow to the way you speak’

MHS_310

(toh [to]	gi^{ʔ}	niyonishé^{ʔ})	|	(ǫgwehǫ:wéh)	|	(tga:gǫ́:t)	(ęhsí^{ʔ})	(ne^{ʔ}	ni:^{ʔ}	ho^{ʔ}dę́^{ʔ})	(n^{ʔ}agyá^{ʔ}dodę^{ʔ})	|	(ǫgwehǫ́:weh)	‖
1	1							1	1	2				

(toh (gi^{ʔ} (niyonishé^{ʔ}))) (ǫgwehǫ:wéh) (tga:gǫ́:t) (ęhsí^{ʔ}) (ne^{ʔ} (ni:^{ʔ} (ho^{ʔ}dę́^{ʔ})))

(n^{ʔ}agyá^{ʔ}dodę^{ʔ}) (ǫgwehǫ́:weh)

‘that's how slow Indians you have to say that kind that I am as an Indian’

MHS_311

(né:ʔ)	(to:gyę́h)	(i:só:)	|	(ę̨hswayena:wáʔs)	|	(nę:gyę́h)	(neʔ)	|	jǫgwéʔdase:ʔ)	‖
2	2	2				2	1			

(né:ʔ (to:gyę́h)) (i:só:) (ę̨hswayena:wáʔs) ((nę:gyę́h) neʔ) (jǫgwéʔdase:ʔ)

‘that one a lot you will help that's why the young people’

Appendix II – Cayuga verb template (Dyck et al. 2014)

	prepronominal prefixes		pronominal	semi / reflexive		noun + verb stem	derivational	purposive, progressive	aspect	tense
	modal	non-modal								
	a^{ʔ}- factual ę- future a:- optative or indefinite	d- cislocative ti- contrastive ts- coincident de- dualic de^{ʔ}- negative ni- partitive s- repetitive ha^{ʔ}- translocative		ad- semireflexive adad- reflexive			-hd / -ht causative -hs, -nih datives or benefactives -hsǫ:^{ʔ}, -nyǫ:^{ʔ}, hnǫ:^{ʔ}, -ǫnyǫ:^{ʔ} distributives -s^{ʔ} eventuative -^{ʔ}d / -^{ʔ}t, -nhe^{ʔ} inchoatives -go^{ʔ}, -gwęh, -ahsih reversives -hn -^{ʔ}n, -dr dislocative			
									-hs, -(^{ʔ})s habituals	-gęhę:^{ʔ} past -e:k continuative or modalizer

	prepronominal prefixes		pronominal	semi / reflexive		noun + verb stem	derivational	purposive, progressive	aspect	tense
	modal	non-modal								
									-ha$^{?}$ habituals	-hk former -a:k continuative or modalizer
									-ǫh, -ęh, -: statives	-hne:$^{?}$ remote -a:k or -a$^{?}$k continuative or modalizer
									imperative (no aspect suffix underlyingly)	
							-hn -$^{?}$n, -dr dislocative	-e purposive -e: purposive past	-$^{?}$ punctual -$^{?}$s habitual	
								-agye$^{?}$, -ǫgye$^{?}$, -ęgye$^{?}$ progressive-stative	-ø stative	-e:k continuative or modalizer

	prepronominal prefixes		pronominal	semi / reflexive		noun + verb stem	derivational	purposive, progressive	aspect	tense
	modal	non-modal								
								-agye^{ʔ}, -ǫgye^{ʔ}, -ęgye^{ʔ} progressive	-s habitual	-gęhę:^{ʔ} past -e:k continuative or modalizer
I-PROTHESIS[11]			E-EPENTHESIS [e]			JOINER VOWEL [a]				
	NON-TEMPLATIC ORDERING[12]									
					SANDHI (vowel coalescence, glide insertion)					
EXTRA-PROSODIC					EXTRA-PROSODIC					

11 I-prothesis occurs when -*hah* and -*ʔah* (diminutives) are added to the word.

12 The order of modal and non-modal prepronominal prefixes varies in ways that cannot be captured within a template.