DIMINUTIVE CONSONANT HARMONY IN SEVERAL DIALECTS OF CREE

BY

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A Thesis
Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements for the Degree of

MASTER OF ARTS

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Abstract

In Cree, the palatalization of coronal obstruents imparts a diminutive meaning through a process referred to as sound symbolism. It has been described as an optional process (Pentland, 1974), thus accounting for the observation that not all of the coronal obstruents are subject to the sound symbolism.

An acoustic examination of /s/ and /š/ attempted to discover whether there was a true phonological shift from /s/ to /š/ occurring in diminutives. A statistical procedure was used in the characterization of the fricative segments which determined that the diminutive fricative was unlike the control [s] segments measured in this study and not unlike the control [š] segments.

Since the acoustic examination of /s/ and /š/ established that there was a true phonological shift from /s/ to /š/ occurring in diminutives, it was therefore plausible to look at Cree diminutive consonant symbolism as a phonological process of consonant harmony. Within the framework provided by Optimality Theory, specifically using Optimal Domains Theory as proposed by Cole and Kisseberth (1994), I will show that this phonological process is governed by the interaction of several constraints regarding the spread of features within a specified domain.

The interaction of the universal constraints of Faithfulness, as well as the constraints Onset, NoCoda, and Coda-Cond serve to keep the input looking as much like the output as possible and to keep the syllable structure consistent across the language. Harmony results when the constraints for Basic Alignment (BA) and Wide-Scope Alignment (WSA) interact to extend a feature over a domain if ranked one way and

suppress the spread of the sound symbolism if ranked another way. The re-ranking of these constraints will also explain the patterns where the presence of the diminutive suffix is the sole indicator the diminutive and the leftward harmony is not occurring. It was also shown that a re-ranking of the constraints will result in the patterns shown in the Western Swampy and Plains Cree dialects.

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Finally, I wish to thank my family- especially my parents, my husband and my children Michael and Magdalena for their love and support while I was working on my thesis and for letting me "just get it done!"

Introduction

This thesis discusses a very interesting aspect of the Cree language which is widely known as diminutive sound symbolism. It is based on data I have analyzed phonetically in Eastern Swampy and Moose Cree and phonologically from four Cree dialects, Moose Cree, Eastern Swampy Cree, Western Swampy Cree and Plains Cree.

Many people do know what sound symbolism is but to my knowledge there have been no acoustic studies concerning sound symbolism. Neither am I aware of any phonological studies which attempt to demonstrate the sound symbolic processes of Cree. A few have briefly discussed the existence of this phenomenon in Cree including Teeter (1959) Nichols (1971), Wolfart (1973), and Pentland (1974). This study builds on their findings by showing that there is a true phonological process behind the sound symbolism and stating that process comprehensively.

I will begin by giving the reader a brief introduction to sound symbolism and the way it has been manifested in different languages. A discussion of diminutives follows, with a look at the many native North American languages which display this process. In chapter two, I will focus my discussion toward Cree, including background information and examples of sound symbolism for the various dialects I am presenting. Chapter three comprises the acoustic study in which I ultimately show the sound symbolism as a phonological process . Following that, chapter four focuses on the phonological basis of

diminutive sound symbolism and attempts to explicate the process within the framework of Optimality Theory. Finally, chapter 5 ties in both the phonetic and phonological studies and draws conclusions regarding diminutive consonant harmony in several dialects of Cree.

Chapter 1

Defining Diminutive Sound Symbolism

This chapter describes what diminutive sound symbolism is, drawing comparisons to harmony systems in general. First sound symbolism is defined, followed by descriptions of diminutive consonant symbolism patterns in various North American languages. Sound symbolism is then compared to harmony systems.

1.1 Sound Symbolism

An arbitrary link between the sound and meaning in human language is generally assumed in linguistic theory. However, cross-linguistically there has been an accumulation of data regarding *sound symbolism* which reflects a direct association between the form and meaning of language (Hinton et al, 1994).

Many languages have been shown to exhibit sound symbolism. Ojibwa exhibits a consonant symbolism in the pejorative (Nichols 1979). Wiyot exhibits both an augmentative and diminutive symbolism (Teeter 1959). Nez Perce (Aoki, 1994) also exhibits diminutive symbolism and in addition contains a number of imitative lexical items in its vocabulary. Japanese possesses an extensive mimetic vocabulary (Hamano, 1994). Childs (1994) discusses a wide array of African languages which contain ideophones (imitatives). The Nootkan languages (Jacobsen 1994) exhibit a vocative sound symbolism.

A variety of sound symbolic patterns are thus found in languages worldwide. It is not a phenomenon isolated to a handful of the world's languages.

1.1.1 Patterns of Sound Symbolism

The term *sound symbolism* reflects an array of associations between sound and meaning. There are varying degrees of sound symbolism which should be familiar to many English speakers. These include corporeal sound symbolism, imitative sound symbolism, conventional sound symbolism, and synesthetic sound symbolism (Hinton et al, 1994).

1.1.1.1 Corporeal Sound Symbolism

In corporeal sound symbolism sound and meaning are completely linked. This is evident in aspects of human utterances such as cries of pain or hiccups (Hinton et al, 1994). Expressive intonation, interjections and "vocatives"[1] are also included as part of this category. Common among these utterances is that they are directly symptomatic of the speaker. Intonation, interjections human cries and hiccups express the internal state of the speaker. Vocatives typically gain the attention of a hearer. These corporeal utterances are basic communicative functions which have many universal components.

1.1.1.2 Imitative Sound Symbolism

Imitative sound symbolism represent non-linguistic sounds from the environment, for example *meow*, *moo*, *knock*, and *swish*. These onomatopoeic words are directly shaped by the sound they represent such that there is a direct mapping of the acoustic features of

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[1]Vocatives are defined here as those parts of speech used to gain the attention of the hearer.(Jacobsen 1994)

the sound itself and the phonological features of the word labeling that sound (Rhodes 1994, Oswalt 1994). Bird names lend themselves well to imitative sound symbolism, often mimicking the call of the bird as shown in the following examples.

(1.1) English

whippoorwill, chickadee

Ojibwa

waahoonwenh 'whippoorwill'

jigjigaaneshiinh 'chickadee' (Rhodes 1994)

This class of symbolism is often represented in the language by phonemes acoustically close to the represented sound.

1.1.1.3 Conventional Sound Symbolism

The English language also has what is referred to as *conventional* sound symbolism in which certain phonemes and clusters of phonemes have become associated with certain meanings. For example the *gl* of ***glisten***, ***glimmer*** and ***glow*** has become associated with a concept of *gold* or *shine*. The conventional sound symbolism is more arbitrary and more language specific than the corporeal sound symbolism or imitative sound symbolism, but nonetheless, it is often claimed that sound and meaning are somehow linked.

1.1.1.4 Synesthetic Sound Symbolism

The type of sound symbolism important to my thesis is one which Hinton, Nichols and Ohala (1994) have termed synesthetic sound symbolism which is the acoustic symbolization of non-acoustic phenomena. It is a process "whereby certain vowels, consonants, and suprasegmentals[2] are chosen to represent visual, tactile, or proprioceptive properties of objects such as size or shape" (Hinton et al 1994: 4). Hinton et al describe this as one of the most interesting aspects of sound symbolism since the relation between sound and meaning is relatively indirect. It has been argued that there are cross-linguistic tendencies for languages, at least in the case of size-sound symbolism, to choose certain types of consonants over others. The diminutive tends to be represented by high front vowels[3] and in some languages, Cree for example, it is signified with palatalized[4] consonants.[5] The set of consonants involved in the symbolism is usually a small subset of the consonant inventory for the language (Nichols 1971; Pentland 1974; Ultan 1978).

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[2]These are features of speech which extend over more than one segment, for example, pitch and stress.

[3]Ultan (1978) found that 90% of the languages he sampled contained high front vowels in their diminutive marking.

[4]Palatalized consonants are those which have the front of the tongue (the portion of the tongue located behind the tip and the blade) articulating with or more toward the hard palate (behind the alveolar ridge). I will be using the term palatalization in reference to the process whereby a dental or alveolar consonant becomes palatal, such as [t]→[č] (Rogers 1991), and also for [t]→ [c] .

[5]Palatalized consonants are not always used to represent the diminutive. Ojibwa for example, represents the pejorative, not the diminutive, with [š] (Nichols 1979).

1.2 Diminutive Sound Symbolism

Diminutive is a term used in morphology to refer to an affix with the general meaning of "little". Usually the diminutive represents an affix concatenated to a root to denote an object of smaller size. In English we often represent the diminutive with the suffix *-y* which is very productive in child-directed speech. Examples are listed in (1.2) below.

(1.2) English child-directed speech

doll -> dolly

dog -> doggy

bird -> birdy

In English, the presence of this diminutive suffix typically does not alter any of the other consonants or vowels in the word. However, there are many languages in which diminutive shifting involves "the alternation, in point or manner of articulation, of consonants in verb or nouns roots - expressing the diminutive category and by extension, an attitude of endearment, affection, pity, or the like" (Nichols 1971: 826). In Cree, the diminutive suffix, concatenated to a root, typically conditions the alternation which Nichols (1971) discusses.

Ultan (1978) observed that the languages which exhibit these instances of consonant ablaut in the diminutive tend to be located in the west and Northwest coastal areas of North America and are American Indian languages by definition. Pentland (1974)

also noted the presence of sound symbolism in at least three language families of eastern north America. Rather than a universal of human language, this type of size sound symbolism may possibly be explained by areal diffusion. This phenomenon, nonetheless, is still an interesting subject to be studied among the languages which express the sound symbolism in such a manner.

1.3 Diminutive Consonant Symbolism in Western North America

Diminutive consonant symbolism is fairly widespread in the languages native to North America. It has been discussed by many others including Sapir (1911) for Wishram, Teeter (1959) for Wiyot and Nichols (1971) discussed consonant harmony processes for over 30 Amerindian languages. Also, Pentland (1974) examined sound symbolism in Algonquian languages, and Wolfart (1971) briefly mentioned Cree's sound symbolism.

The following are several examples of sound symbolism found in North America:

(1.3) a) Cree (Moose) t → č; s → š (Pentland 1974)[6]

b) Cree (Plains) t → c (Teeter, 1959)

c) Wiyot: t → c; s → š ; l → r (Teeter1959)

d) Nootka: s, š → ś (Sapir, 1915)[7]

e)Dakota: x → š (Nichols, 1973)

f) Nez Perce: k → q (Nichols, 1973)

Cree is listed twice as the dialects exhibit differences in sound symbolism. While all of the dialects have the affrication of /t/ occurring in the sound symbolism, the dialects that distinguish [s] and [š], also shift /s/ to [š] in the diminutive. Moose Cree, given as example (a), is representative of this shift. However the Plains Cree dialect, shown in (b), only affricates /t/ to [c] (the alveolar affricate) in the diminutive. In these dialects [s] and [š] are

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[6]The orthography used in the examples follow the conventions of the source and are typical of publications in Americanist linguistics:

č : postalveolar affricate (IPA [tʃ]),

š : postalveolar fricative (IPA [ʃ])

c : alveolar affricate (IPA [ts]).

ś: segment halfway between [s] and [ʃ]

[7]For Nootka, the symbolism is used only when speaking of small people or small birds. Nichols (1971:845) notes that it is "a personifying shift, semantically diminutive." The normal diminutive includes the addition of the suffix -*ʔis* but does not alter any other consonants within the word. Sapir (1915) does not state how productive this is in Nootka

not distinctive[8]. Nootka has both /s/ and /š/ blending to becoming a segment partway between the [s] and [š], which only appears in one type of the diminutive.

Nichols (1971) describes the diminutive shifts of the Western North American languages as those involving hardness (tenseness or obstruency) or involving tonality (anteriority) and those involving dental resonants. In a hardness shift, the point of articulation remains generally unchanged, however a more forceful manner of articulation will signal the diminutive. An example of this can be found in Kalispel and Coeur d'Alene in which the sonorant consonants become glottalized.

Tonality shifts involve the use of higher consonant tonality to convey the diminutive meaning achieved by consonant frequency raising or by palatalization. The first type of tonality shift involves the raising of the pitch of the consonant burst or fricative noise. The second type of tonality shifts include the hissing-to-hushing articulations or palatalization. Although the frequency of the consonant noise is itself lower in the postalveolar than in the alveolar, the locus of the second formant, the other basic perceptual cue for consonant point of articulation, is higher in the postalveolar, so this is also considered to be higher tonality. It is this tonality shift of palatalization which is the basis for the diminutive shifting in Cree.

The shifts involving dental resonants include languages such as Yurok and Karok which shift /l/ to /r/ and /r/ to /n/ in the diminutive respectively.

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[8]While the /s/ of Plains and Western Swampy Cree can vary to the postalveolar fricative [š], the two segments do not distinguish minimal pairs. In Moose and Eastern Swampy Cree, [s] and [š] are distinctive. Ellis (1995) illustrates this with minimal pairs such as *nakiskaw* 'a short while' versus *nakiškaw* 'meet him'

1.4 Sound Symbolism as Consonant Harmony

Shaw (1991) defines consonant harmony as "phonological assimilation or dissimilation between consonants that are not necessarily adjacent in the surface phonological string and where, crucially, other intervening vocalic or consonant segments do not interact with the harmony in any way." Within these parameters, diminutive consonant symbolism may be looked upon as a case of consonant harmony.

In Cree, diminutive consonant symbolism is regarded as the phonological assimilation of coronal obstruents. The coronal obstruents to the left of the diminutive suffix are palatalized, the intervening segments being irrelevant. This is, by definition, consonant harmony. Teeter (1959) also described the diminutive sound symbolism process in Cree as consonant harmony.

Described thus as consonant harmony, it may be compared to other languages displaying similar examples of consonant harmony. For example, Chumash displays a sibilant harmony in which any [s] or [š] harmonizes to the rightmost segment, so the harmony is also a regressive pattern. Russell (1993) describes the harmony process for this language as a gradient change, something that is more the result of a phonetic undershoot effect as opposed to a true phonological change. Ferrara (1988) also discusses consonant harmony processes in Navajo. Coronal harmony is afforded special status by Shaw (1991). Harmony among coronal consonants is much more frequently attested than labial, dorsal and pharyngeal harmony. Coronal harmony systems typically involve only a subset of the coronal segments in a language and typically ignore other coronal segments (Shaw 1991: 126)

1. 4 Summary

Sound symbolism is thus a phenomenon that has been discussed extensively in the literature and is shown to occur in a wide variety of languages native to North America. While the sound symbolism has been categorized into types, and compared across languages and language families, few actual in-depth studies of the phonological processes motivating sound symbolism have been published. This phonetic and phonological study of Cree diminutive harmony is unique in this respect.

Chapter 2

Cree Diminutive Consonant Harmony

This chapter focuses on the Cree language. First I discuss the language and its dialects, situating it within the language families of North America. Following that is an introduction to diminutive sound symbolism known to occur in the Cree language and a review of what is already known about the phenomenon. This chapter concludes with an examination of the available data.

2.1 The Cree Language

The Cree language is a widely spoken member of the Algonquian family. It is spoken across central Canada from Hudson Bay to the Rockies (Ahenakew 1987). While Cree shows dialect differences, it is recognizably the same language as spoken on the western plains, in the northern woodlands or on the shores of James Bay. (Ellis, 1983.).

Five regional dialects of the Cree language are traditionally recognized (Dahlstrom 1986; Ellis, 1983.; Wolfart and Carroll 1973), however four are still productive today. They are Moose Cree, Swampy Cree, Plains Cree, and Woods Cree.[9] These are illustrated on the map in figure (2.1). The dialects differ in some sounds and vocabulary.

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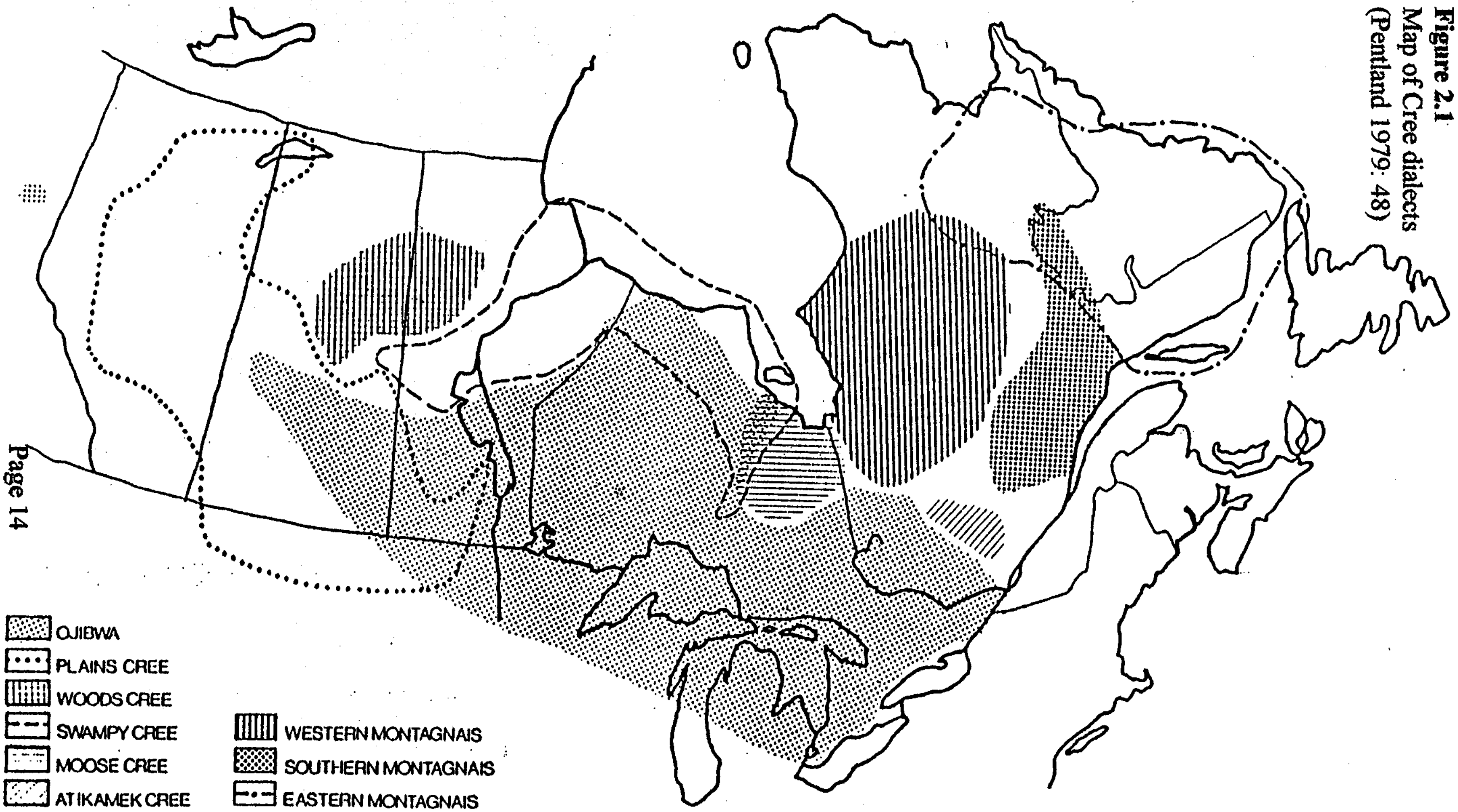
[9]The dialect referred to as "R"-Cree is no longer spoken and has actually been eliminated in the discussion in Wolfart and Carol (1973) revised edition published in 1981.

Figure 2.1
Map of Cree dialects
(Pentland 1979: 48)



MAP 1. Maximum extent of Cree dialects (and some neighbouring languages) in the twentieth century.

One obvious example of the regional variation among the dialects is in the word for 'I' of the Cree speakers:

Swampy Cree[10]	nîna
Plains Cree	nîya
Woods Cree	nîtha[11]
Moose Cree	nîla

Observe that the only difference between the words is a single sound: the *n, y, th* and *l*. These sounds are reflexes of Proto-Algonquian *l (Dahlstrom 1986). It is largely the representations of *l that differentiate the various regional dialects of Cree. Except for these small variations, the dialects share many common features and a Cree speaker from one dialect or community can generally understand a speaker from a neighbouring region (Wolfart and Carroll 1973).

The present thesis will mainly focus on the Eastern Swampy and Moose dialects of Cree. These dialects provide more phonologically interesting patterns in the diminutive than those of the Western dialects of Cree because there is palatalization of both /s/ and /t/. However, I will also be discussing the patterns in the diminutive sound symbolism of the

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[10]The n-dialect is separated into two distinct dialects of Swampy Cree for the purposes of this thesis. While they have the reflex of proto-Algonquian *l in common, they differ in the presence or absence of the phoneme /š/ which is very important in my analysis of Cree diminutives. The western dialect does not contain this phoneme, like the Plains Cree dialect, however Eastern Swampy Cree does contain this phoneme as does Moose Cree.

[11]The *th* denotes IPA [ð].

Plains and the Western Swampy Cree dialects in comparison to the Eastern dialects. The western dialects only have the palatalization of /t/.

2.2 The Dialects

In this section, I will give a brief overview of the dialects I will be discussing, examining the areas in which they are spoken and explaining the phonological system.

In the following sections, the phonological system is listed in a standard orthography commonly used for the Cree language.[13] The following symbols are translated into to IPA as follows (Ellis 1995):

2.2) č : palato-alveolar affricate [tʃ]

š : palato-alveolar fricative [ʃ]

c : alveolar affricate [ts]

i : high front unrounded vowel ranging from [ɪ] to [ɛ]

î: high front unrounded long vowel [i]

ê: mid-front unrounded long vowel [e]

o: mid to high back unrounded vowel ranging from [ɔ] to [ʊ]

ô: high back unrounded long vowel [o]

---

[13]In Ellis' texts (1983; 1995) he signifies the postalveolar affricate, [tʃ], with 'c'. In order to clarify the difference in sound symbolism between the dialects, it is important for this to be denoted by 'č' since the alveolar affricate is symbolized by 'c'. All of the data has been amended to reflect this distinction of alveolar affricates.

a: low to mid, central to front unrounded vowel ranging from [a] to [ʌ]

â: low, front to back unrounded long vowel ranging from [a] to [ɑ]

2.2.1 Moose Cree

This dialect has also been referred to as the l-dialect. It is spoken in the area to the south of James Bay and at Moose Factory. I have listed the phoneme inventory of Moose Cree below.

(2.3) Phoneme inventory of Moose Cree:

consonants:					vowels:		
p	t	č	k		i	î	
	s	š		h		ê	o ô
m	n					a â	
	l						
w		y					

The phonemes which take part in the sound symbolism are the coronal consonants /t/, /s/, /č/ and /š/. The data from this dialect mainly represents the community of Moose Factory, Ontario.

2.2.2 Eastern Swampy Cree

Swampy Cree, or the n-dialect, is spoken from Manitoba eastward through northern Ontario to the shores of Hudson and James Bay. Eastern Swampy Cree is spoken in northern Ontario. The data from this dialect primarily represents speakers of Fort Albany, Ontario, which is located at the east end of the Swampy Cree area about 5 miles from James Bay (Ellis, 1983).I have listed the phoneme inventory of Eastern Swampy Cree below.

(2.4) Phoneme inventory of Eastern Swampy Cree:

Consonants:				Vowels:			
p	t	č	k	i	î		
	s	š	h		ê		o ô
m	n					a â	
w		y					

The phonemes which take part in the sound symbolism are the coronal consonants /t/, /s/, /č/ and /š/.

2.2.3 Western Swampy Cree

Western Swampy Cree is spoken in northern Manitoba. The following is the phoneme inventory of Western Swampy Cree:

(2.5) consonants: vowels:

p	t	k	i î	
	c		ê	o ô
	s	h	a â	
m	n			
w	y			

The only phoneme which takes part in the sound symbolism is /t/, becoming the alveolar affricate /c/.

2.2.4 Plains Cree

This dialect has also been called the y-dialect. It is spoken in Southern Manitoba, Saskatchewan and much of Alberta. The data from this dialect has been from several written texts of speakers in central Saskatchewan.

The following is the phoneme inventory of Plains Cree:

(2.6) consonants: vowels:

p	t	k	i î	
	c		ê	o ô
	s	h	a â	
m	n			
w	y			

The /t/ is the only phoneme taking part in the sound symbolism, becoming the alveolar affricate /c/.

2.3 Cree Diminutive Consonant Symbolism

In Cree, the diminutive forms of words are commonly used to denote things that are a smaller size. However diminutive symbolism may also make a person sound pitiful and effeminate, for example the speech of the Cree cultural hero Wisahkecak (Wolfart 1973: 80), and is also often used when talking to babies. Cree expresses the diminutive sound symbolism through palatalization of the coronal obstruents. While it has been known that Cree is one of several North American languages expressing the diminutive sound symbolism, there has never been an in-depth study of this phenomenon nor a comparison across dialects.

Nichols (1971) discusses the diminutive consonant shifts of many North American languages, but only very briefly mentions the shift in Cree. In a footnote she describes the diminutive symbolism in Cree as shifting "t to č in forms taking the diminutive suffix" (Nichols,1971: 831).

Pentland (1974) states that diminutive consonant symbolism is traditionally viewed as "a process by which certain consonants may be replaced by other consonants to impart a diminutive meaning" (Pentland 1974: 238). Ferrara (1988) describes Navajo harmony as context sensitive because the harmony is determined by the presence or absence of the diminutive suffix. In Cree however, the presence of the diminutive suffix may, but does not always, trigger the shift. The symbolism is thus an optional rule and I would expect to see

words appearing with the diminutive suffix and without the regressive symbolism. It also is not always necessary for the diminutive suffix to be present for the shift to occur.[13] In this thesis, I consider only those diminutives where the diminutive suffix is present.

A preliminary study of Cree diminutive sound symbolism (Melnychuk 1996) determined some of the cross-dialect differences in the sound symbolic processes. It is hoped to further develop the phonological process of diminutive consonant harmony in the present thesis.

2.3.1 Description of the diminutive pattern

For all of the Cree dialects, a diminutive suffix is concatenated to a base, and being a derivational suffix, appears inside the inflectional morphology. This is not in itself phonologically interesting, but, the presence of this suffix may cause coronal obstruents in the base to become palatalized while the intervening segments are for the most part irrelevant. The harmony pattern is regressive; that is, it starts at the diminutive suffix and spreads leftward throughout the word. In example (2.7) below, (a) illustrates the harmony present on each /s/ in *sîpiy* to the left of the diminutive suffix after it has been added. The example illustrated in (b) however, has an /s/ to the right of the diminutive suffix which does not palatalize in the diminutive indicating that the harmony is in fact regressive.

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[13]Wolfart (1973) cites several examples of this for the Plains dialect: *yôtin* 'it is windy' versus *yôcin* 'it is a little windy'.

2.7 a) šîpîšišihk (sîpiy) 'in the creek' Ellis 1995 (45:1 MC)[14]

b) awâšišasâmak[15] 'child's snowshoes' Ellis 1995 (61:4 MC)

In Western Swampy and Plains Cree, the diminutive suffix is /is/ or /isis/ usually, but not always, dependent on the animacy of the root. Usually the /isis/ suffix is animate and the /is/ suffix is inanimate. In these dialects, /š/ is not a phoneme– /s/ may vary to /š/ in speech but the variation does not create a change in meaning. Therefore the sound symbolism is only evident in the alternation of /t/ to /c/ in the presence of the diminutive suffix. The examples below illustrate the diminutive:

2.8) a) nit̲êm + isis nic̲êmisis 'my little horse'

b) oskinîkiw +is oskinîkîs 'youth, boy'

In example (2.8a) The /t/ palatalizes to [c] upon the addition of the diminutive suffix, and in (2.8b) there is no indication of sound symbolism throughout the word because the /s/ does not palatalize in the diminutive in these dialects.

The dialects which exhibit the more interesting harmony patterns are the eastern dialects which distinguish /s/ and /š/. For these dialects, Moose Cree and Eastern Swampy

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[14]The references are given as *text number* : *paragraph number*. MC stands for Moose Cree and ES is for Eastern Swampy Cree.

[15]The harmony pattern is regressive so the *s* of *asâm* 'snowshoe' would not be expected to be palatalized.

Cree, the diminutive suffix is /iš/ or /išiš/. Again, the choice of morpheme is usually dependent on the animacy of the noun with the /išiš/ suffix being animate and the /iš/ suffix being inanimate. The example below illustrates the pattern:

2.9) wîht̲ikow + išiš wîhč̲ikôšiš 'little windigo' Ellis (53:4 MC)

2.3.2 Data of Moose Cree and Eastern Swampy Cree

In an earlier review of diminutive sound symbolism in Cree (Melnychuk 1996) I had divided the data into two categories, 1) words where the regressive harmony is present and 2) where the regressive harmony is not present. In fact, the data is much more complex. This section describes the data that has been found within the literature I have been studying and attempts to classify it into categories for purposes of phonological analysis. The data is also listed by source in Appendix 1 at the end of this thesis.

The first column lists the form as cited in the text. The non-diminutive form is given in the brackets. I have given the gloss in quotation marks. The source of the data is given on the right. The data from Ellis (1995) is listed as a number representing the text number followed by the paragraph number. The data from Pentland (1974) is listed as *P*. The final letters label the dialects, MC stands for Moose Cree and ES stands for Eastern Swampy Cree.

The first category in (2.10) is regressive harmony, simply that all of the coronals to the left of the diminutive suffix are palatalized. The first two words have been displayed in their component parts in order to better illustrate the morphemes.

2.10). Regressive Harmony:

a)šîpîšišihk (sîpiy) ' in the creek' 45:1 MC

sîpiy + išiš + ihk

river DIM LOC

b) awâšišasamak 'child's snowshoes' 53:4 MC

awâš + iš + asâm + ak

child DIM snowshoe Plural

c) očawâšimišiwâwa	'their children'	1:9 ES; 49:1; 51:2 MC
d) očawâšimiša	'his/her children'	9:17; 11:6 ES: 56:5; 64:3 MC
e) očawâšimiš'	'his/her/children'	11:3 ES
f) 'či-očawâšimišin'ci	'they had children'	11:2 ES
g) awâšiša	'child'	11:1,2; 9:5,19 ES 65:2 MC
h) awâšiš	'child'	9:3,5,19 ES;49:4; 51:1, 52:1,4; 65:8MC
i) 'wâšiša	'child'	9:20 ES
j) awâšišak	'children'	21:1 ES; 49:2,3; 51:1,2; 65:2 MC
k) awâš'šak	'children'	65:4 MC
l) 'wâšišak	'children'	65:2,5,7,8 MC
m) êy-awâšišîwiyân	'when I was a child'	64:1 MC
n) ê-'wâšišîwiyân	'when I was a child'	65:1 MC
o) ê-'wâšišîwiyân	'as a child'	50:6 MC

p) e-awâš'šîwiyân	'I was a child'	59:1 MC
q) 'wâš'šîwiyân	'when I was a child'	52:4 MC
r) k'-âwâš'šîwiyân	'while I was a child'	53:4 MC
s) wîči-'wâšišiwâwa	'their fellow-children'	21:1 ES
t) wîhčikôšiš (wîhtikôw)	'little windigo'	12:15 ES; 53:4 MC
u) očiškwacîšiš (očiskwačiw)	'little devil, windigo'	12:15 ES
v) iškwêšiš (iskwêw)	'girl'	P, 60:3 MC; 10:10 ES
w) iškwêšiš	'girl'	4:7; 10:10 ES; 64:3 MC
x) iškwêšiša	'girl'	6:2 ES
y) iškwêšišak	'girls'	64:2 MC
z) iškwêš'ša	'girl'	64:3 MC
aa) 'škwêšišak	'girls'	64:5 MC
ab) čapašîš (tapašîš)	'(down) below'	1:7 ES
ac) awiyâšîša	'animal'	1:7 ,18:3 ES
ad) awiyâšîšak	'animals, creatures'	18:2,3,6; 19:9; 22:4 ES
ae) awîyâšîšak	'animals'	55:1 MC
af) 'wiyâšîšak	'animal, creature'	18:1 ES
ag) tôwiy-awiyâšîšak	'every kind of animal'	19:9 ES
ah) awiyâšîši-pimiy	'animal grease'	23:3 ES
ai) 'wiyâšîš	'animal, beast'	46:1 MC
aj) 'wîyâšîš	'animal'	55:4 MC
ak) wêyâšîšak	'beasts'	47:1 MC

al) 'wiyâšîša	'animal, beast'	46:1 MC
am) k'-apišîš'šit[16]	'it is small'	3:8 ES
an) kây-apišîš'šit	'it is very small'	3:10 ES
ao) apišîš	'small, a little'	6:1; 7:3; 19:4 ES; 54:2, 55:2,3 MC
ap) êy-apišâšinińiki	'it is small'	8:5 ES
aq) kâ-apišîšišit	'it is little'	15:5 ES
ar) kâ-'pišîš'šit	'it is little'	15:5 ES
as) ê-'pišîš'iyan	'you are little'	46:1 MC
at) ê-apišîš'šičik	'they were small'	26:1 ES
au) âpikošîš	'mouse'	3:8,9,10 ES; 66:1,2,3 MC
av) âpikošîša	'mouse'	66:2 MC
aw) âpakošîš	'mouse'	66:3 MC
ax) wâpikošîš	'mouse'	15:5,26:3 ES
ay) wâpikošîšak	'mice'	26:3 ES
az) oški-'škîša	'new little fir trees'	7:8 ES
ba) miši-šîpîšišihkân	'creek'	11:8 ES
bb) šîpîšiša	'creek'	8:5 ES
bc) mîkiwâmišiš	'small wigwam'	9:8 ES

[16]The morphemes decompose into *kâ-apišîš-isi-t.* It appears that the diminutive sound symbolism is progressive in this word, and also the examples 2.10 am), an), aq), ar) and at). However, the spectrographic analysis of each of these words only showed two fricative segments in the diminutive suffix and to its right: the syllable /-is/ was not visible in the spectrogram and seemed to have been deleted. (See note 3 page 144)

bd) ačimošiša (atim)	'pup'	9:15 ES
be) ačimošiš	'pup'	9:16 ES
bf) aškîšiniw (askiy)	'a little bit of earth'	6:4 ES
bg) ačakâš (atakây)	'mink' [17]	Ellis (1995) 445
bh) ačičamôš	'squirrel'	46:1,2
bi) apišimaniyâpiy	'small netting line'	53:2 MC
bj) 'čayâniš	'his little thing'[18]	56:2 MC

The second set of data in (2.11) does not have the palatalization of the coronals /l, n/.These segments do not actually participate in the harmony so we do expect that they are not palatalized.

2.11)	a) pilêšišak (pilêw)	'birds'	61:4 MC
	pilêw + išiš + ak		
	bird + DIM + Plural		
	b) pilêšiš	'bird'	61:4 MC
	c) olâkanišihk	'in a small dish	54:2 MC
	d) olâkan'šihk	'in a small dish	54:1 MC
	e) n'čawâšimišinân	'our child'	51:3 MC

[17]This was found in the glossary with no reference to a specific text. On the East Coast, James Bay region the gloss is 'mink.' In Moose Factory the referent is the diminutive of *atakay* 'penis.'

[18] *očayâniš,* euphemism for *wîtakay* 'his penis'

f) n'čawâšimišak	'my children'	65:9 MC
g) n'kî-'wâšišîwin	'I was a child'	65:6 MC
h) nîč'-iškwêšiš	'my girlfriend'	65:7 MC
i) mânišîš	'a little'	6:4;19:3 ES
j) mân'šîš	'brief'	49:1 MC
k) manšîš	'a little'	50:1 MC
l) ma'šîš	'a little'	54:1 MC
m) mîniša	'berries'	19:1,2,3,5 ES
n) nisto-minikošiš	'three minutes'	19:4 ES
o) wîskačâniš (wîskačân)	'little whiskey-jack'	14:5 ES, 56:3; 66:1,2,3 MC
p) wîskačâniši-wayân	'little whiskey-jack's skin'	14:4 ES
q) wîskačâniša	'little whiskey-jack'	66:3 MC
r) môs-'iyânšîš (môs-'iyân)	'small moose hide'	53:2 MC

The last five examples in this set also include an /s/ which does not display the sound symbolism as expected. The examples are included in this category solely because of the presence of the nasal or lateral segment within the word, but they are also included in (2.12).

The third set of data in (2.12) does not have palatalization of the coronals and the diminutive suffix is the only indication of the diminutive. The first word has been displayed in its component morphemes.

2.12) diminutive category expressed solely by the presence of the diminutive suffix:

a) askihkoš [19]	'little kettle'	9:9 ES
askihkw + iš		
kettle DIM		
b) nisto-minikošiš	'three minutes'	19:4 ES
c) wîskačâniš (wîskačân)	'little whiskey-jack'	14:5 ES, 56:3; 66:1,2,3 MC
d) wîskačâniši-wayân	'little whiskey-jack's skin'	14:4 ES
e) wîskačâniša	'little whiskey-jack'	66:3 MC
f) môs-'iyânšîš (môs-'iyân)	'small moose hide'	53:2 MC
g) môsošiš (môswa)	'small moose'	P (MC)
h) pôsikâciš (English loan)	'pussycat'	26:3 ES
i) piskwamiskošiš	'Little Piskwamisk' (lit. little hump')[20]	Ellis 1995 p 387
j) apisčililîš	'little person'	56:8 MC
k) amisko-wapikošiš	'beaver mouse'	3:7 ES
l) amiskošiši-wayâna	'pelt of a small beaver'	9:21 ES
m) amisk-wayânišiš	'small beaverskin'	9:21 ES
n) miskwayân'šiša	'little beaverskin'	9:21 ES

[19]The s prior to the k is expected to be palatalized by the diminutive symbolism, however it is not.

[20]This represents a place name, located on the west coast of James Bay. It is not part of the phonetic research in this thesis but is included in the phonological analysis of Cree DSS.

o) askihkoša	(askihk)	'small kettle'	9:9 ES
p) askihkoš	(askihk)	'small kettle'	9:9 ES
q) kiyâskošiša	(kiyâsk 'gull')	'terns'	11:3,5 ES
r) kiyâskošišak		'terns'	11:4 ES
s) kitapišîš'šin		'you are small'	46:1 MC

The fourth set of data shown below in (2.13) exhibits a variety of phenomena. Some of the coronals /s/ and /t/ within the word participate in the harmony, but others do not.

2.13)	a) 'sâčîš'šak	(asâtiy-)	'small poplars' [21]	55:9 MC
	b) apisčačimoš		'small dog, pet'	9:15 ES
	c) iskwêšiš	(iskwêw)	'girl'	4:5 ES; 61:1 MC
	d) paskwahčîwi-šîpîšiš		'Little White Top Creek' (lit. 'little stump creek')	
	e) otawâšimišwâwa [22]		'their children'	44:2 MC
	f) kîn'kisčiy-apikošîš		'pointed mouse'	3:8 ES

[21] In a note (Ellis 1995: 425, note 36) the form was given as ašâtîšišak. Palatalization of /t/ was not present and no comments were made on this 'corrected' word-form.

[22]The speaker was Andrew Faries, a younger Moose Cree speaker fluent in both English and Moose Cree. The data available for this speaker was very small as he only told one story, so this was not included in the phonetic analysis. However the spectrogram was inspected for the possible palatalization of /t/. The spectrogram definitely did not indicate the presence of the affriciate /č/ and this is included in the phonological analysis as an exception to the harmony.

g) n'tawâšimišak		'my children'	7:9 ES
h) atimošiša		'pup'[23]	9:16 ES
i) iskwêšiš		'girl'	4:5,6 ES; 61:1 MC
j) mištâpêškwêšiša	(mistâpêskwêw)	'giant girl'	56:1 MC
k) mistâpêskwêšiša		'giant girl'	56:2 MC
l) mistâpêskwêšišak		'giant girls'	56:3 MC
m) kîy-ati-očawâšimišiw		'he began to have children"	12:10 ES
n) apisčawâšiš		'small child'	46:6 MC
o) awâsiš		'child'	52:1 MC

Several examples cited in the previous category have a variation elsewhere in the texts where the expected diminutive form is produced. These sets of data are shown below in (2.14).

2.14)	a)	ačimošiša	(atim)	'pup'	9:15 ES
		ačimošiš		'pup'	9:16 ES
		atimošiša		'pup'	9:16 ES
	b)	iskwêšiš	(iskwêw)	'girl'	4:5,6 ES; 61:1 MC
		iskwêš'šak		'girls'	61:2 MC
		iskwêšišak		'girls'	61:2 MC

[23] note depalatalization of /c/ to /t/ (Ellis 1995: 396, n 23)

	iškwêšiš	'girl'	P, 60:3 MC; 10:10 ES
	iškwêšiš	'girl'	4:7; 10:10 ES; 64:3 MC
	iškwêšiša	'girl'	6:2 ES
	iškwêšišak	'girls'	64:2 MC
	iškwêš'ša	'girl'	64:3 MC
c)	mištâpêškwêšiša (mistâpêskwêwa)	'giant girl'	56:1 MC
	mistâpêskwêšiša	'giant girl'	56:2 MC
	mistâpêskwêšišak	'giant girls'	56:3 MC
d)	askihkos (askihk)	'small kettle'	9:10 ES
	askihkoša	'small kettle'	9:9 ES
	askihkoš	'small kettle'	9:9 ES
e)	n'čawâšimišinân	'my children'	51:3 MC
	n'čawâšimišak	'my children'	65:9 MC
	n'tawâšimišak	'my children'	7:9 ES

There are also a few examples in the texts of diminutives which did not have palatalization in the diminutive suffix.

2.15) a)	atipisihk	'fine mesh at end of snowshoe'	53:3 MC
b)	askihkos (askihk)	'small kettle'	9:10 ES

The following examples are noted here but are not included in the analysis. There is no way of knowing whether they are elicited from native speakers. Ellis's book *Spoken Cree: West Coast of James Bay* (1983) is presented as a teaching manual and is the result of research with native Cree speakers, but is not directly transcribed from speakers.

2.16)	sîpîšiš	'creek'
	iskwêšiš	'girl'
	wâskâhikanišiš	'little house'
	niskišiš	'little goose'
	maskwašiš	'little bear'
	ačimošiš	'puppy'
	maničôš	'insect, boil'
	masinahikaniš	'license'
	alikwačâsišiš [24]	

The data above shows evidence of sound symbolism with the palatalization of /t/, but the /s/ does not become palatalized. There is no way of knowing whether this data accurately represented the speakers' language.

[24]No gloss is given for this word, but the likely translation is 'little squirrel'.

2.3.3 Data of Plains Cree and Western Swampy Cree

There are many examples of diminutives in these dialects, however the sound symbolism is only evident in the affrication of /t/. The data is presented in a similar format to the Eastern Swampy and Moose Cree dialects. The first column consists of the form as cited in the text with the non-diminutive form of the word given in brackets beside it. The third column is the gloss and the fourth column lists the source. Words from Freda Ahenakew (personal communicaiton) are listed as FA, IB stands for Ida Bear (1995), WA represents data from Wolfart and Ahenakew (1993) and W represents data from Wolfart (1973). Ida Bear speaks Western Swampy Cree; all other data presented represents the Plains Cree dialect.

The following set of data presents some examples of diminutives where there is no evidence of sound symbolism because there are no *t*'s present in the word.

2.17)	a) oskinîkîs	(oskinîkiw)	'youth, boy'	WA
	b) pisiskisîs	(pisiskiw)	'little animal'	WA

Evidence of diminutive consonant symbolism is shown below. The harmony pattern is regressive.

2.18)	a) ocawâsimis	'his child'	FA
	b) ocawâsimisa	'his children (obv)'	IB
	c) nicawâsimisak	'my children'	FA

d) ocawâsimisiwâwa		'their children'	IB
e) ê-ocawâsimisiyit		'she had a child'	FA
f) acihkwayânisa	(atihkwayan)	'a little caribou hide (obv)'	IB
g) acihkosis	(atihk)	'little caribou'	FA
h) nicacihkosis	(nitatihk)	'my little caribou'	FA
i) ciscêmâs	(cistêmâw)	'tobacco'	WA
j) mêscakâs	(mêstakây)	'hair'	WA
k) niçêmisis	(nitêm)	'my little horse'	W
l) miscacimosis	(mistatim)	'pony'	FA
m) misacimosis	(misatim)	'pony'	FA
n) acimosis	(atim)	'puppy'	FA
o) nicacimosis	(nitatim)	'my puppy'	FA
p) pîhcwâhkanis	(pîhtwâ- 'smoke')	'cigarette'	WA

The following are examples where the diminutive sound symbolism is not evident in the word. A /t/ to the left of the diminutive suffix does not palatalize.

2.19)

a) mistikwânis (mistikwân)	'little head'	W
b) nitawâsimisak	'my children'	W
c) otawâsimisa	'his children (obv)'	W
d) otawâsimis	'his child'	FA

Chapter 3

A Phonetic Analysis

This chapter details the experimental aspect of this thesis. The phonetic study is based on data from six speakers originally recorded by Ellis (1995). The chapter begins with a description of the speakers followed by the data. Section 3 details the phonetic analysis of both the diminutive fricatives, and discusses the results. Section 4 discusses the phonetic analysis of affricates. The chapter is concluded by discussing the implications of this phonetic analysis.

The main purpose of the phonetic analysis has been to determine whether there was a true phonological change of /s/ to /š/ in the diminutive, in which case the change must be explained by the phonology. It is also possible that the sound symbolism might have created a non-phonemic segment between the [s] and the [š] as described in Nootka (Nichols 1971) or that the change could simply be gradient, a result more of phonetic assimilation rather than a true change in the phonology, such as that proposed by Russell (1993) for Chumash.

While there are no previous phonetic analyses of diminutive sound symbolism, Pentland (1983: 387) claimed that in "modern Moose Cree.... the [č] and [š] produced by diminutive consonant symbolism are phonetically exactly the same as (phonemic [č] and [š])." This study will be able to determine whether his assessment is valid.

A secondary reason for the phonetic analysis was to check the accuracy of some of the data.

3.1 The Speakers

All of the data I analyzed in this study originated from Ellis' *âtalôhkâna nêsta tipâcimowina: Cree Legends and Narratives* (1995). The availability of both the text and the tapes make this book a very valuable research tool for studying the Cree language. Ellis recorded the texts between 1955 and 1965. The recordings were carried out under varied conditions from the informal setting of the village to a sound laboratory in Toronto.

The analysis is based on data from six speakers, two Eastern Swampy and four Moose Cree speakers. They are listed below.

3.1) Eastern Swampy Cree:

Simeon Scott (texts 1-12): Native speaker of Eastern Swampy, spoke considerable English. He was close to retirement at the time of the recording.

Xavier Sutherland (texts 13-26) Fluent speaker of both Eastern Swampy Cree and English. He was in his late twenties at the time of the recording.

Moose Cree:

Gilbert Faries (texts 45-49): At ease in both English and Moose Cree. He was younger middle-aged at the time of the recording.

Willie Frenchman: (texts 58-62) First language was Moose Cree, but did have extensive exposure to English. He was 82 at the time of the recording.

Sophie Gunner: (texts 50-57) Essentially a monolingual speaker of Moose Cree. She was middle-aged at the time of the recording.

Hannah Loon (texts 63-67) A monolingual speaker of Moose Cree. She was an elderly (approximately 72) widow at the time of the recording.

These speakers were chosen because the data was sufficient to do statistical analyses on. Several of Ellis' speakers only had a couple of occurrences of the diminutive which was not enough to do any sort of statistical comparison. Those speakers were therefore not included in the present phonetic analysis.

3.2 The Data

Following the division in § 2.3.2, some of the data is displayed below. The first set of data in (3.2) displays the regressive harmony, where all of the coronals have palatalized. The second set of data in (3.3) is a cumulation of the three sets of data shown in examples (2.12), (2.13) and (2.15). This data does not indicate the palatalization of all of the coronals in the diminutive. In some cases, the diminutive suffix is the only indication of the diminutive. While the data here has been divided into the two categories, the listing is only to show what has been written in the text. In the actual phonetic analysis, all /s/ and /š/ segments have been grouped together in a category called 'diminutive fricative.'

3.2) Regressive Harmony:

a. awâšišasâmak	'child's snowshoes'	61:4 MC
b. očawâšimišwâwa	'his children'	1:9 ES
c. wîhčikôšiš (wîhtikôw)	'little windigo'	12:15 ES, 53:4 MC

d. očiškwačîšiš	(očiskwačiw)	'little devil'	12:15 ES
e. iškwêšiš	(iskwêw)	'girl'	Pentland, 60:3 MC;10:10 ES
f. mîkiwâmšiš		'small wigwam'	9:8 ES
g. čapašîš	(tapašîš)	'(down) below'	1:7 ES
h. âpakošîš		'mouse'	66:3 MC
i. wâpikošîš		'mouse'	15:5,26:3 ES
j. šîpîšiša		'creeks'	8:5 ES

3.3). Regressive harmony is not present through the entire word:

a. môs-'iyânšîš		'small moose-hide'	3:2 MC
b. môsošiš	(môswa)	'small moose'	Pentland (MC)
c.'sâčîš'šak	(asâtiy)	'small poplars'	55:9 MC
d. iskwêšiš	(iskwêw)	'girl'	4:5 ES; 61:1 MC
e. pôsikâčiš	(English loan)	'pussycat'	26:3 ES
f. wîskačâniš	(wîskačân)	'little whiskey-jack'	14:5 ES; 66:1 MC
g. apisčililîš		'little person'	56:8 MC
h. apisčawâšiš		'small child'	46:6 MC
i. amisko-wapikošiš		'beaver mouse'	3:7 ES
j. askihkoša	(askihk)	'small kettle'	9:9 ES
k. atipisihk		'fine mesh at end of snowshoe'	53:3 MC

The data presented here are just a sample of the total data analyzed in this study. For each of the six speakers I analyzed examples of the diminutive I found in their texts. The full listing of data is given in appendix 3 at the end of this thesis. For each [s] or [š] fricative in the diminutives, I looked for both a control [s] and a control [š] in non-diminutive words in similar environments.

3.3 Analysis of the Diminutive Fricative

To reiterate, the main purpose of the phonetic analysis has been to determine whether there was a true phonological change of /s/ to /š/ in the diminutive, in which case the change must be explained by the phonology. A phonological change is evident if it is determined that the speaker intended to produce /š/ in the diminutive instead of /s/. However, if the speaker was trying to produce an /s/ and the tongue was just deviating to /š/ for purely articulatory reasons, a phonological change is not occurring.

Phonetic analysis does to some extent correlate with articulation. Nolan et al. (1996) and Zsiga (1994) looked at similar questions with regard to the relationship between articulation and phonetic analysis. In connected speech, articulations overlap and Articulatory Phonology (Browman and Goldstein 1990) explained many casual speech processes, including assimilation, as the result of gestural overlapping or blending. For Nolan et al (1996), electropalatography confirmed that there exists a close correlation between spectral change in the coronal fricatives and articulatory change. Their study also contradicts the prediction of Articulatory Phonology that gesture overlap will result in intermediate articulations and that gestures in underlying phonological representations are

always present. Zsiga (1994) examines gestural overlap of apparent consonant deletions in connected speech and provides acoustic evidence of the overlap using LPC (linear predictive coding) analysis routines.

The present analysis was designed to determine whether the acoustic properties of the diminutive [š] followed the same statistical distribution as those of non-diminutive /š/. If this is the case, then the diminutive fricative is an /š/. If they do not fall into the same distribution pattern, then they can not reliably (statistically) be said to be the same segment. The diminutive fricative then could not statistically be considered an /š/. This type of analysis is not necessarily reliable for specific occurrences, but the statistical results are significant for the purposes of this analysis.

The secondary reason for the analysis was to check the accuracy of some of the data. While there are several examples of /s/ that did not harmonize to /š/, there are also a couple of examples of /t/ not harmonizing to /č/ which will be discussed in (§3.4). These particular examples are easy to check by viewing the spectrogram.

All of the data in this study were analyzed using Kay Elemetrics Computerized Speech Lab (CSL) Model 4300B, software version 5.0, which is housed in the Linguistics laboratory at the University of Manitoba. The data was acquired into sound files on the computer from the collection of audiocassette tapes accompanying Ellis's *âtalôhkâna nêsta tipâcimowina: Cree Legends and Narratives* (1995). Each digitized sound file consisted typically of a word or phrase, either containing a diminutive or control fricative pertinent to

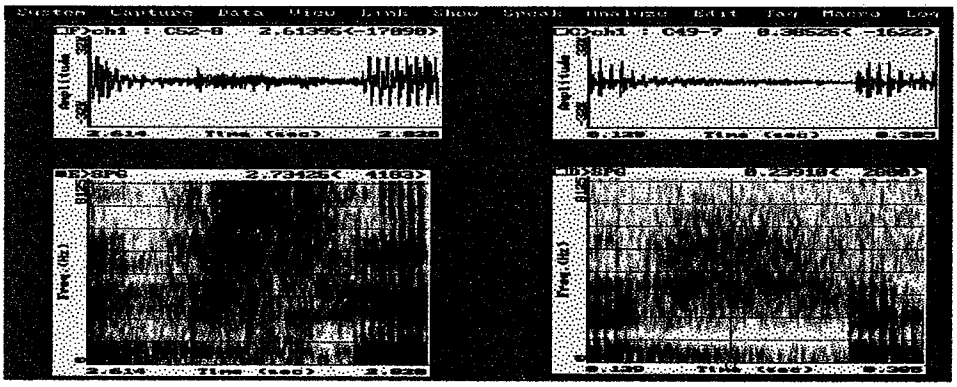
the present analysis. For the recording, I used a sampling rate of 20,000 Hz[25] since the frequencies of the fricatives for this present examination are between approximately 2000 and 8000 Hz.

3.3.1 Fricative Analysis

The fricatives [s] and [š] are central to my analysis in these Cree dialects. Fricatives produce a turbulent airstream characterized by random noise. In spectrograms, [s] and [š] appear as static noise with energy in the higher frequencies. Below, I have included spectrograms of one of the speakers, Sophie Gunner saying first [isi] and secondly [iši] .

Figure 3.1: Sophie Gunner [isi] versus [iši]

i s i i š i



[25]It has been suggested by D. Whalen (personal communication) that a higher sampling rate for fricatives may be used. However, it is highly likely that the equipment Ellis used for the recordings did not capture the full range of frequencies that the sibilants utilize, and a higher sampling rate would not be useful. This sampling rate did obtain results which distinguished the two sibilants.(for discussion see §3.3.3). This rate is also typical of many other studies involving the acoustic study of /s/ (Flipsen et. al. 1999).

In the left spectrogram shown in figure 3.1, the [s] has energy concentrated in the frequencies from approximately 2000 to above 8000 Hz . It is very clear that there is a lot of energy in the higher frequencies between 6000 and 8000 Hz. This area is quite a bit darker than the right spectrogram. Here the energy is concentrated between 3000 and 6000 Hz falling into the traditional range of the [š] in the lower frequencies from approximately 2000 to 6000 Hz .

3.3.2 The Centre Of Gravity

In order to characterize the fricatives, I used the centre-of-gravity[26] technique. Typically, fricatives have been analyzed by determining their spectral peaks. However, it is difficult to measure the acoustic characteristics of fricatives (particularly coronal fricatives) because there may be several spectral peaks and one or another of these peaks may have the greatest amplitude (Johnson 1997). There may also be substantial inter-speaker variability in the frequencies of the spectral peaks in these fricatives. This has led to the development of the centre-of-gravity technique. This procedure has been used very successfully in studies by Jassem (1979) who characterized fricatives based on their spectra and by Forrest et al. (1988) who applied the technique to initial voiceless obstruents.

For each [s] and [š], in both diminutive and control words, spectrograms were created to help determine where the beginnings and ends of segments were. The fricatives

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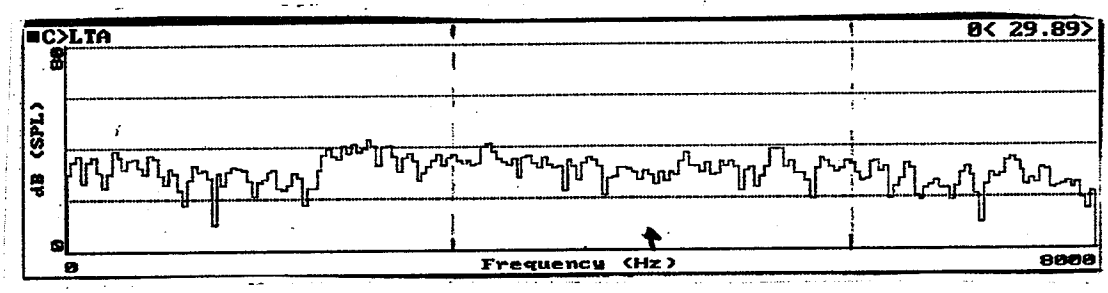
[26]The centre of gravity is just one of the possible spectral moments as mentioned by Jassem (1979) and Flipsen, et. al. (1999)

were then measured over their entire length using the Fast Fourier Transform (FFT)[27], with CSL's long term average spectrum command. An FFT power spectrum, an amplitude versus frequency plot of a acoustic energy present in the sine wave, was generated for each of the segments. An example FFT power spectrum is shown below in Figure 3.2.

Figure 3.2 Power Spectrum

example: Sophie Gunner [š]



Lower frequency cutoff: 3000 Hz

Higher Frequency cutoff: 6000 Hz

Centre of Gravity: 4452 Hz

The results of each FFT power spectrum were saved numerically and were entered into a centre of gravity program[28] created by Kevin Russell. The program was used to find the centres of gravity of all of the fricatives. The best lower and higher frequency cut-offs

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[27]Fourier's theorem states that any complex waveform can be decomposed into a set of sine waves that have particular frequencies, amplitudes and phase relations. The fast Fourier transform (FFT) is the computer's way of decomposing the wave into its component sine waves.

[28] A copy of the program is included in Appendix 2 at the end of this thesis.

for measuring the centre of gravity were determined using the control (non-diminutive) data. The upper frequency cut-off used was 6000Hz, and 3000Hz was the lower frequency cut-off. This combination gave the results in which the statistical analysis showed that the /s/ and /š/ were different ($p \leq .001$). This combination of frequencies was then used for analyzing the rest of the data.

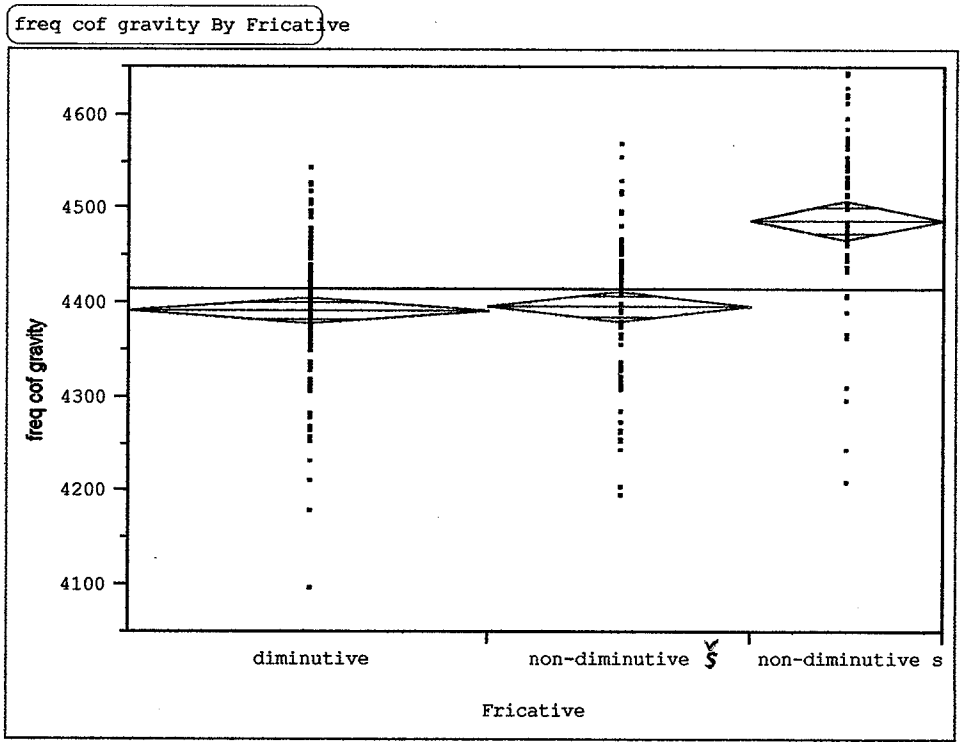
3.3.3 Results

In analyzing the results, all of the data from the diminutive fricatives were grouped together and compared statistically to non-diminutive [s] and to non-diminutive [š] using two-tailed t-tests. The statistical program used in the analysis was JMP IN version 3.1.5 for Windows by SAS Institute Inc.

The results for each of the speakers are graphed below. The graphs were created using a one-way analysis of variance and visually compare the means of the variables 1) diminutive fricative, 2) non-diminutive (or control) [s] and 3) non-diminutive [š]. The diamonds in the graph are a schematic of the mean and the standard error of the mean for each of the three sample groups. The line across each diamond represents the group mean. The height of each diamond represents the 95% confidence interval for each group, and the diamond width represents the group sample size. When the diamonds of the different samples are close together and overlap, the samples are similar and likely to be from the same population. If the diamonds of different samples do not overlap, the samples represent different populations.

The statistical data is included under each graph. Included is the number of tokens analyzed in the diminutive, the mean centre of gravity and standard deviation (sd) for each of the sample populations, and the results of the t-test comparing the diminutive fricative with each of the controls.

Figure3.4: **Simeon Scott** Frequency Centre of Gravity by Fricative Type



number of diminutives: 118

mean centre of gravity:

diminutive [š]:	4391	(sd =88.706)
non-diminutive [š]:	4397	(sd = 78.29)
non-diminutive [s]:	4488	(sd = 93.30)

Testing (diminutive [š] = non-diminutive [š]):

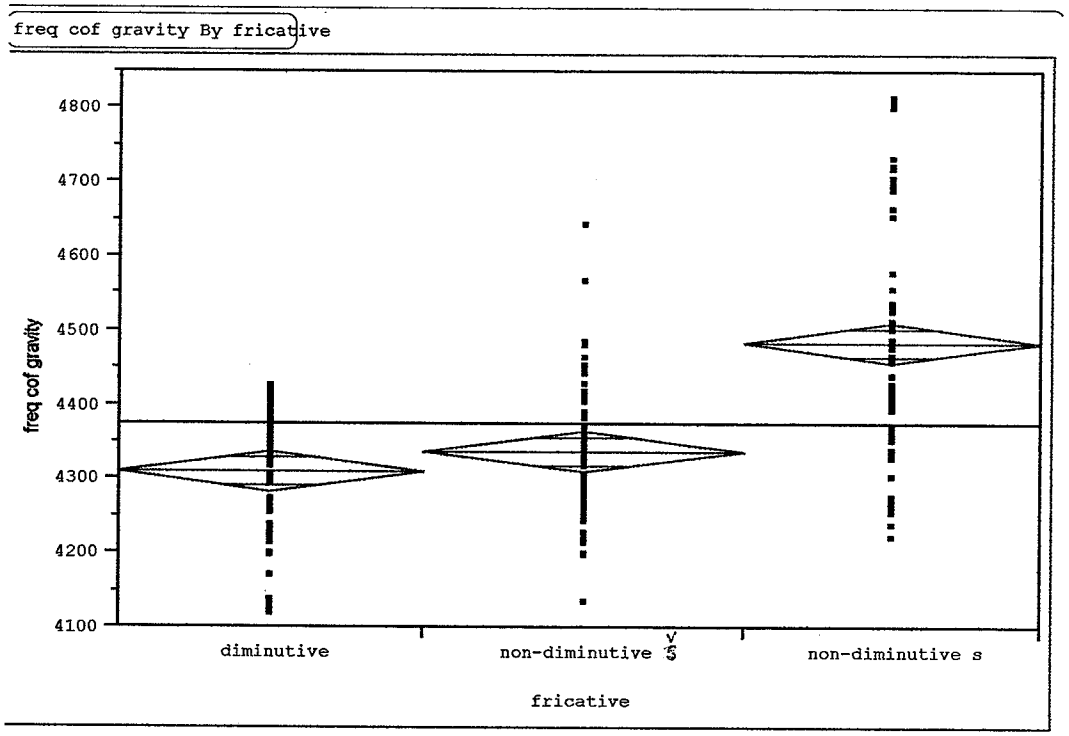
t = -0.375 p = 0.7081

Testing (diminutive [š] = non-diminutive [s]):

t = -6.635 p <0.001

The data definitely shows that for this speaker, the diminutive fricative is not significantly different from [s] (p=0.7081). Even just by looking at the means diamonds in Figure 3.4, it is obvious that the diminutive fricative and the non-diminutive /š/ follow the same distribution pattern because the ranges of the standard deviations overlap, but that of the /s/ is very different.

Figure 3.5 **Xavier Sutherland** Frequency Centre of Gravity by Fricative Type



number of diminutives: 63

mean centre of gravity:

diminutive [š]:	4311	(sd =83.73)
non-diminutive [š]:	4341	(sd = 90.95)
non-diminutive [s]:	4484	(sd = 160.38)

Testing (diminutive [š]= non-diminutive [š]):

t = -1.954 p = 0.0529

Testing (diminutive [š]= non-diminutive [s]):

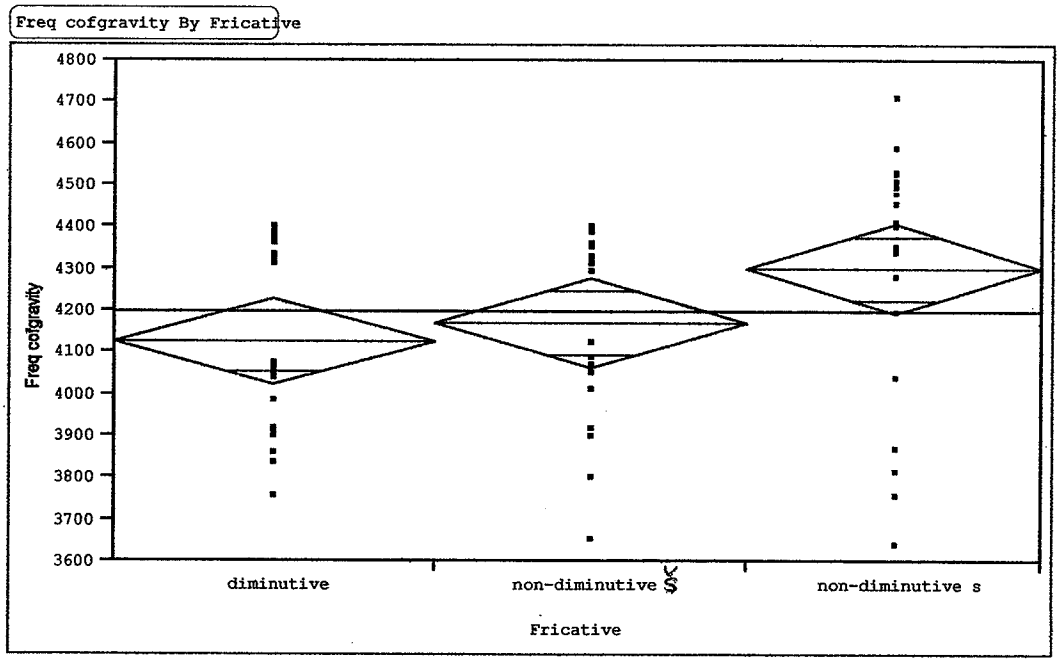
t = -7.432 p <0.001

This speaker is definitely not producing an [s] when in the diminutive: the p-value is low (p(diminutive [š]= non-diminutive [s]):<0.001). On the other hand the diminutive fricative and the non-diminutive /š/ cannot reliably said to be different. The diminutive fricative definitely is not intermediate.

These two speakers represented Eastern Swampy Cree. Their data has shown that the diminutive fricative in Eastern Swampy Cree does not pattern after the non-diminutive /s/ neither does it fall in between the non-diminutive /s/ and non-diminutive /š/. The diminutive fricative is statistically not an [s] nor is it intermediate between [s] and [š].

The next four speakers represent the Moose Cree dialect.

Figure 3.6 **Gilbert Faries** Frequency Centre of Gravity by Fricative Type



number of diminutives: 22

mean centre of gravity:

diminutive [š]:	4127	(sd =216.798)
non-diminutive [š]:	4341	(sd = 216.677)
non-diminutive [s]:	4484	(sd = 160.38)

Testing (diminutive [š]= non-diminutive [š]):

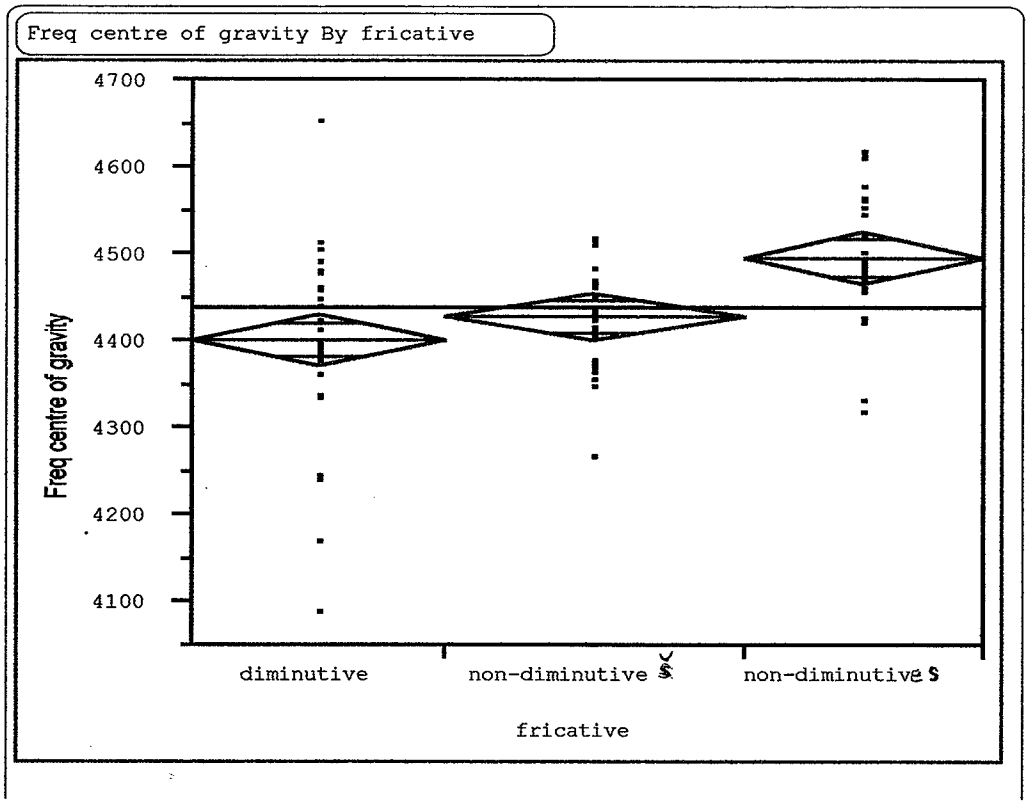
t = -0.640 p = 0.5255

Testing (diminutive [š]= non-diminutive [s]):

t = -2.103 p =0.0418

The non-diminutive [s] and non-diminutive [š] are quite close together and do overlap a bit, more than with any other speaker. Examining the relationship between these segments, they are not significantly different with a probability (non-diminutive [š]= non-diminutive [s])=0.1267. Also note that there are no tokens evident near the mean of this speaker's examples and this sort of non-normal distribution violates the assumptions of the t-test. Perhaps one of the reasons for the problems with this data set is the smaller sample size. Gilbert Faries had fewer tokens than for any other speaker. However the main point of the analysis is confirmed, that the diminutive fricative is different from the non-diminutive [s]; therefore the diminutive fricative is not intermediate.

Figure 3.7 **Willie Frenchman**: Frequency Centre of Gravity by Fricative Type



number of diminutives: 29

mean centre of gravity:

diminutive [š]:	4401	(sd =109.456)
non-diminutive [š]:	4429	(sd =54.843)
non-diminutive[s]:	4497	(sd = 74.722)

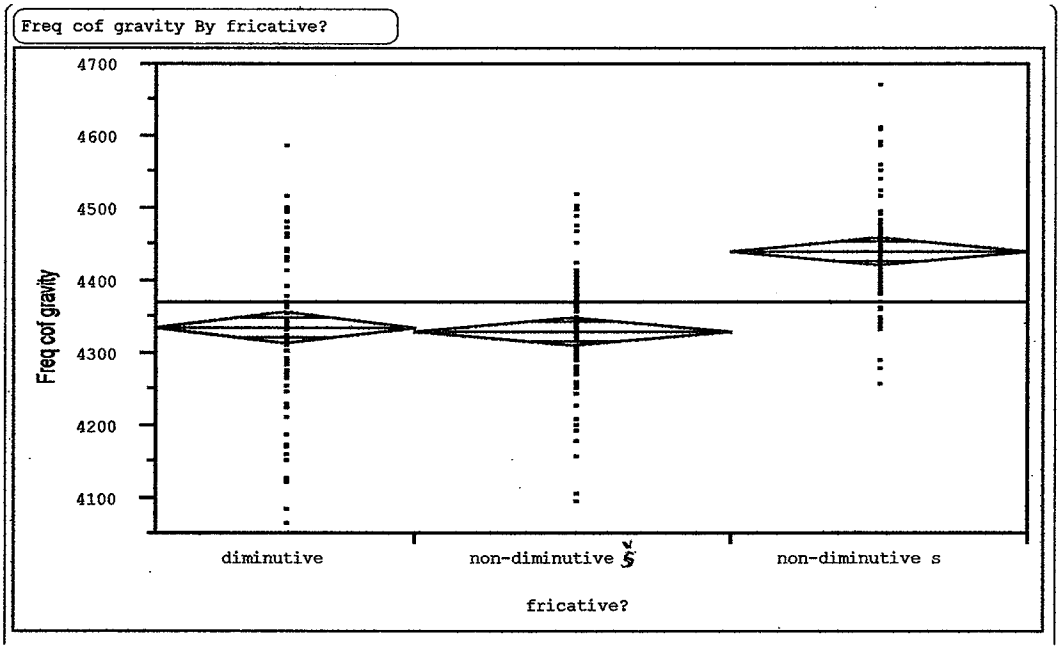
Testing (diminutive [š]= non-diminutive [š]):

t = -1.3 p = 0.1984

Testing (diminutive [š] = non-diminutive [s]):

t = -3.824 p <0.003

Figure 3.8 **Sophie Gunner**: Frequency Centre of Gravity by Fricative Type



number of diminutives: 67

mean centre of gravity:

diminutive [š]:	4336	(sd =118.624)
non-diminutive[š]:	4330	(sd = 84.305)
non-diminutive[s]:	4441	(sd = 78.085)

Testing (diminutive [š]= non-diminutive [š]):

t = 0.403 p = 0.6879

Testing (diminutive [š]= non-diminutive [s]):

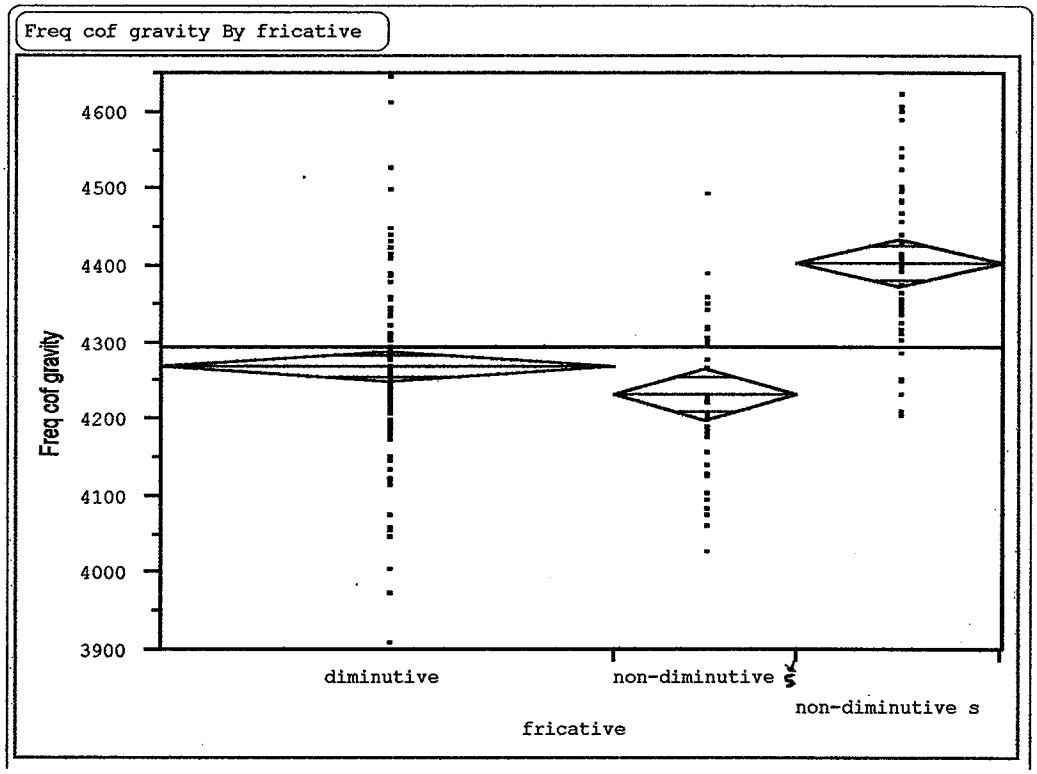
t = -6.312 p <0.001

This is an excellent example showing that the diminutive fricative for this speaker is an [š].

In the graph, the means diamond for the diminutive fricative overlaps with the non-

diminutive [š]. The diminutive fricative does not overlap at all with the non-diminutive [s] indicating that they are very different segments. This indicates that there is a true categorical shift of /s/ to /š/ in the diminutive. The resulting segment is not between [s] and [š] and neither is there a gradient shift.

Figure 3.9 **Hannah Loon**: Frequency Centre of Gravity by Fricative Type



number of diminutives: 102

mean centre of gravity:

diminutive [š]:	4269	(sd =122.894)
non-diminutive[š]:	4232	(sd = 102.174)
non-diminutive[s]:	4403	(sd = 106.807)

Testing (diminutive [š]= non-diminutive [š]):

t = 1.697 p = 0.0920

Testing (diminutive [š]= non-diminutive [s]):

t = -6.356 p <0.001

The diminutive fricative does not follow the same distribution pattern of the non-diminutive /s/ (p(diminutive[š] = non-diminutive [s]):<0.001). Hannah Loon is the only speaker for which the distribution of the diminutive fricative appears vaguely intermediate.

3.4 Analysis of the diminutive affricate

While the palatalization of /t/ is an important aspect of sound symbolism, it was very difficult to perform the same sort of analysis as used for the diminutive fricative. The fricative portion of the affricate was too short (i.e. produced too quickly) to get an accurate power spectrum. Many times when I tried to perform the analysis using CSL's long term average spectrum command, I received a message of insufficient data. There were a few tokens where I was able to measure the fricative portion of the affricate, but the sample size was too small for statistical analysis. The affricates which were measured are included in Appendix 3 with the data.

While these eastern dialects of Cree do have both /s/ and /š/, Ellis (1995) describes the affricate /č/ as the voiced or voiceless lamino-alveopalatal (as in cheer or jeer). There are not two distinct phonemes /c/ and /č/ in these dialects. Neither does Ellis discuss the possibility that there may be allophonic variation of [c] to [č], so the same sort of fricative analysis is not necessary. Therefore, the analysis of affricates was limited solely to viewing

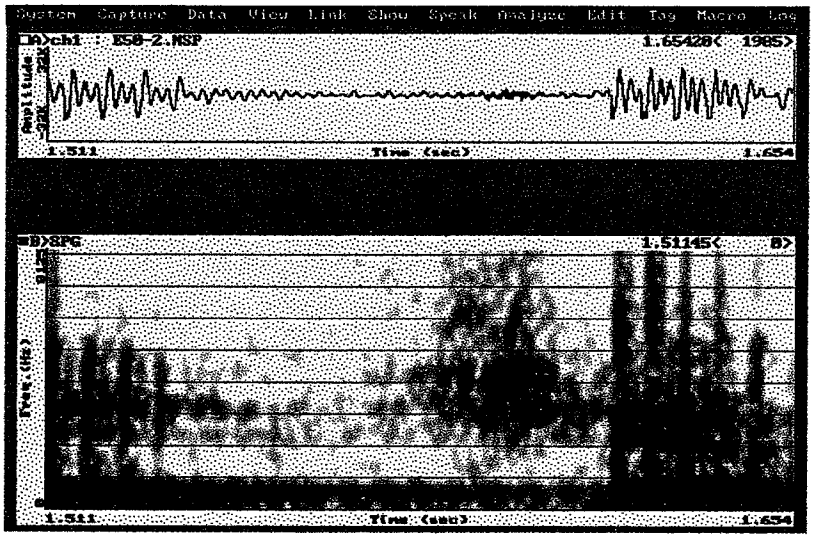
spectrograms and confirming that the sound symbolism had or had not taken place. The purpose is to check Ellis's transcription of words which did not exhibit diminutive harmony.

3.4.1 Affricates

An affricate is recognized by a gap for the stop followed by the noise of a fricative. Again Sophie Gunner's speech has provided the picture in which you can clearly see a space followed by noise which represents the fricative. The energy is also concentrated in the middle of the spectrogram, similar to that of [š] in [iši] (Figure 3.1 above).

Figure 3.10

Sophie Gunner ê t š i



gap | fricative noise

Determining whether a [t] written in the text was actually spoken as an affricate is a fairly easy task as it can be determined by simply viewing the spectrogram of the word.

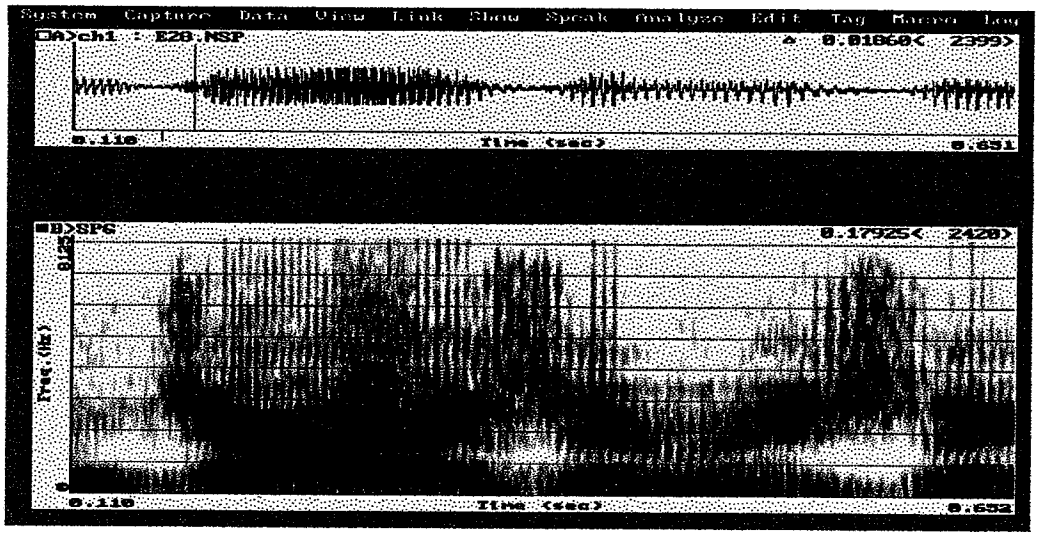
3.4.2 Analysis

There were two examples of /t/ in the texts which did not exhibit sound symbolism, both in the speech of Simeon Scott. For one of the examples, *atimošiša* 'puppy', Ellis noted the depalatalization of /č/ to /t/. The spectrogram supported this transcription. Whether this can be shown to be a true exception in the phonology is disputable. This speaker did produce the diminutive in its palatalized form (ačimošiš) several times earlier in the same text. Also, the puppy the speaker was talking about was referred to as *atim* 'dog' and as *otêma* 'that dog' in this same text. The referent may not have been a 'puppy' and this word may be presented as a semantic exception to the diminutive harmony.

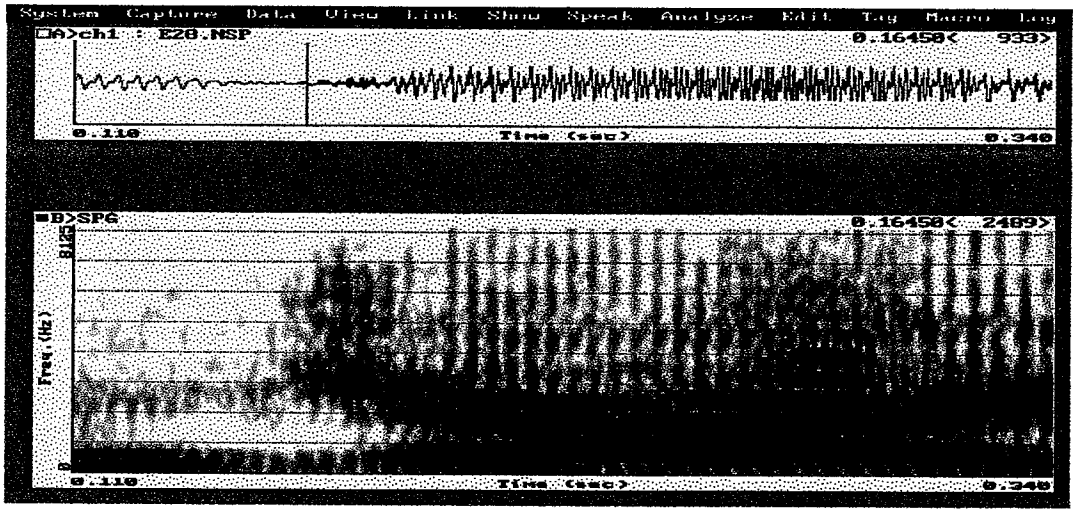
The second example was transcribed by Ellis (1995) as *n'tawâšimišak* 'my children.' Simeon Scott's actual speech shows that an affricate is present, as shown by the spectrogram in Figure 3.11.

Figure 3.11 speaker: Simeon Scott: n'tawa:šimišak

a) n' t š a w a: š i m i š a k



b) n' t š a w a:



The first picture under (a) shows the spectrogram of the entire word. Under (b), I give a closeup of the beginning of the word where the affricate is present. A gap, followed by the noise representing the fricative, is very obvious in this picture and it can be compared the example from Sophie Gunner's speech given in Figure 3.2.

3.5 Conclusion

While only a few of the speakers had extremely high probabilities for the test p(diminutive [š]= non-diminutive [š]), they all had low probability in the test p(diminutive[š] = non-diminutive [s]): <0.05. From this analysis, it appears that the fricative of the diminutive is not different from the control [š] found in non-diminutive segments. There is in fact a true phonological change from /s/ to /š/ in the diminutive; it is not a gradient change to be dealt with by a phonetic model of articulation, but must be governed by the phonology of the language, and the phonological analysis of this phenomenon is

possible. The analysis of affricates also supports the diminutive harmony in Cree as there were no true exceptions evident in the sample of data analyzed for these speakers.

While Pentland (1974) described the sound symbolism as an "optional rule," the rule appears to be applied more often than not. All of the six speakers included in the analysis representing two different dialects of Cree displayed a strong preference for the diminutive fricative to be an [š]. Perhaps the variability of the fricative in the diminutive as transcribed in Ellis (1995) may be owing to other reasons such as articulation errors, phonetic assimilation or dissimilation, semantic blocking of harmony when the referent is large, or perhaps even some errors might have occurred in the transcribing and retyping of the texts.

Chapter 4

A Phonological Analysis

The phonetic analysis showed statistically that there was a true categorical change occurring in the diminutive, not simply a gradient change. Therefore a phonological process is evident and we should be able to define that phonological process empirically. Statistically, the data indicated that the fricative in the diminutive was not /s/ nor was it intermediate between /s/ and /š/. For the purposes of the phonetic study, all of the diminutive fricative segments were grouped together and the statistical analysis did not indicate that they could be distinguished from /š/. While the exceptions to the harmony failed to influence the distributions to change the results of the t-test, the method used does not determine whether any individual segment fits the phonetic pattern. There may still be exceptions to the consonant harmony – Pentland (1974) does point out that the rule is optional. This chapter, while not disregarding what was shown in the previous chapter in the phonetic analysis, will assume that there are still exceptions to the consonant harmony and will attempt to represent them in the phonological analysis. I also intend to provide evidence that the exceptions to the phonological diminutive harmony can to some extent be predicted.

To date, while there have been no specific phonological analyses of Cree diminutive consonant symbolism, there have been phonological analyses of consonant harmony in several other languages (Shaw 1991, Ferrara 1988, McDonough 1991). This section aims to discuss several analyses of consonant harmony systems and discuss the

Cree data. I will begin by discussing the rule-based approach to harmony, followed by a discussion of Autosegmental Phonology. I will also discuss Optimality Theory as a way of analyzing harmony. Ultimately, I will assume Optimal Domains Theory to discuss the consonant harmony of Cree in depth.

In any harmony system there is a feature, or set of features, which seems to be spreading to other segments within the word. I will begin my discussion here with an examination of the harmonizing feature(s) in these dialects of Cree and then continue discussing the theoretical approaches to harmony.

4.1 The Features of Cree Diminutive Harmony

It has been determined in the previous chapter that Cree diminutive sound symbolism is categorical as opposed to gradient change. The purpose here is to determine exactly which feature or group of features are responsible for the diminutive sound symbolism.

Chomsky and Halle (1991: 4) concern themselves with the theory of "universal phonetics," and define a universal set of phonetic features which are properties of all segments. The set of features they define describe the segments with respect to position and manner of articulation. In this discussion, I will largely be using the set of features as they have defined, with the exception of the affrication of /t/ in Western Swampy and Plain's Cree.

I will begin by discussing the features in the Moose and Eastern Swampy Cree dialects. Following that I will be discussing the differences between these dialects and the Western Swampy and Plains Cree dialects.

4.1.1 Moose and Eastern Swampy Cree

For Moose and Eastern Swampy Cree, the consonants which participate in the harmony are the coronal obstruents (which appear in bold below). In the presence of the diminutive suffix, /t/ will become [č] and /s/ will become [š]. The phoneme inventories are basically the same for these two dialects, given below.

4.1) Phoneme inventory of Moose and Eastern Swampy Cree:

p	**t**	**č**	k			i	î	
	s	**š**		h			ê	o ô
m	n							a â
	l*							
w			y					

* Moose Cree contains the coronal lateral /l/, but Eastern Swampy Cree does not.

To begin by defining the segments participating in the harmony in terms of their features, they would be described as coronals to differentiate between these segments and the "non-coronal" segments (p, m, k, w, y and h).

There is one other coronal segment in Eastern Swampy, /n/, and two other coronal segments in Moose Cree, /l, n/, which do not participate in the harmony and must be differentiated from the coronals participating in the harmony. The feature [-nasal] would exclude the nasal in both dialects, and the addition of the feature [-lateral] would also exclude the possibility of a lateral harmonizing in Moose Cree. However, the nasal and lateral segments have the feature [+sonorant] in common while the coronals participating in the harmony are [-sonorant]; I will therefore be using this feature because it is more economical.

Now that the harmonizing segments are distinguished from the non-harmonizing segments, the segments must be distinguished in terms of the diminutive and non-diminutive segments. The non-diminutive segments are /s/ and /t/ which become [š] and [č] respectively in the diminutive. Within the SPE feature system, these segments differ in terms of two features, [distributed] and [anterior].

While Ferrara (1988) has chosen to use the feature [distributed] for her analysis of Karok diminutive consonant harmony, I have chosen not to use that feature for this analysis. In Cree, there is no evidence to suggest that this feature is appropriate to describe the coronal segments. The feature [distributed] describes sounds which are "produced with a constriction that extends for a considerable distance along the direction of the air flow; non-distributed sounds are produced with a constriction that extends only for a short distance in this direction." (Chomsky and Halle 1968: 312). This feature

describes the difference between laminal ([+distributed]) and apical articulations. There is not any evidence to suggest that Cree speakers produce the coronals [t] and [s] apically.[29]

The feature [anterior], however does distinguish the non-diminutive segments from the diminutive segments, being [+anterior] and [-anterior] respectively.

In summary, a chart of relevant features of the segments involved in the harmony is given below.

4.2)	t	č	s	š
coronal	+	+	+	+
anterior	+	-	+	-
continuant	-	-	+	+

From the above chart, it is obvious that the harmonic feature is [anterior] as the pairs of consonants only differ in this feature.

4.1.2 Plains Cree and Western Swampy Cree

The harmony in these dialects is not the same as for the Moose and Eastern Swampy Cree dialects. There is no phoneme /š/ in everyday speech as in the eastern dialects. There are only three coronal obstruents which are /t/, /s/ and /c/. In harmony, the diminutive /s/ does not change but /t/ becomes the coronal alveolar affricate /c/.

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[29]Where laminals and apicals contrast, the [+anterior] laminal coronals are produced in the dental region. The feature [distributed] distinguishes the sounds in the denti-alveolar region, distinguishing the dentals from the alveolars, which are both [+anterior] and [+coronal]. In Cree, there is no need for this distinction as the language does not have both dentals and alveolars.

The phoneme inventory of the Plains and Western Swampy Cree dialects is slightly different from that of the Moose and Eastern Swampy dialects as previously discussed in 2.2. Listed below in (4.3) is the phoneme inventory of Plains Cree and Western Swampy Cree.

4.3) Phoneme inventory of Plains Cree and Western Swampy Cree.

consonants:				vowels:		
p	t	c	k	i	î	
	s		h	ê		o ô
m	n				a â	
w		y				

Only the segments /t/ and /c/ participate in the sound symbolism. The segment /s/ does not change. Since there are only three coronal obstruents, /t/, /s/ and /c/, they are distinguished from all of the other segments in the language by the features [+coronal] and [-sonorant] . Using the same set of distinguishing features as used for the Moose Cree and Eastern Swampy Cree dialects, the segments are characterized below.

4.4)	t	c	s
coronal	+	+	+
anterior	+	+	+
continuant	-	-	+

The same set of features used in Moose Cree and Eastern Swampy Cree will not distinguish the harmonizing feature in Plains Cree and Western Swampy Cree. The feature [anterior] is not the harmonizing feature of these dialects. Here, I will be analyzing the harmonizing feature as [+continuant]. Following the analyses of affricates as contour segments (Sagey 1986), the affricate [c] is analyzed as [-continuant] /t/ and [+continuant] /s/, and the combination of these two will realize the affricate [c].[30] With the interaction of other constraints relevant to this harmony pattern, the /t/ optimally becomes the coronal alveolar affricate /c/.

4.2 Phonological analyses of consonant harmony

A systematic distinction exists between phonological representation and phonetic representation. Phonological analysis consists of defining the correspondences between the input or underlying representation and the actual surface or output representation. Different analyses exist each with their own unique properties, abilities and problems. In this section, I will be discussing three possible approaches to analyzing harmony systems: an SPE-style generative rule-based approach, Autosegmental Phonology, and Optimality Theory, specifically Optimal Domains Theory. I will be discussing possible ways of analyzing harmony patterns within these frameworks, trying to show both how they would

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[30]While Chomsky and Halle (1991) offer the feature [delayed release] as a feature to distinguish the alveolar stop from the alveolar affricate, I find that there is no motivation for the spread of this feature in this environment. The harmonizing feature is contained within the diminutive suffix /is/ or /isis/, which does not contain the feature [delayed release], but does contain the feature [+continuant] which, in the forthcoming analysis will account for the diminutive harmony.

be successful and where they would not be so successful. Ultimately I will discuss how Cree diminutive harmony is analyzed within the framework of Optimal Domains Theory.

4.2.1 SPE Style-Rules

The phonetic representation is derived from the phonological representation by applying a series of rules. A rule is a formal statement which relates an underlying representation to the corresponding output/surface representation. Harmony, an assimilatory process, is characterized by feature copying– a rule would be postulated to copy or insert the harmonizing feature onto the segments which exhibit the harmony. The rule below in (4.5) is an example of regressive assimilation where a segment with feature A would change to have feature B if it is after a segment with feature B.

4.5) A → B/ B___

This rule would account for the assimilatory process as seen in the English plural. The plural suffix /s/, assimilates to the voicing of the final consonant of the stem so we have *cat* + [s] and *dog* + [z]. A rule exemplifying this assimilation is shown below in 4.2.

4.6) /s/ –> [+ voice] / [+voice] +_____#

Alpha notation simplifies rules by introducing a variable. The variable may stand for either the positive or negative value of a particular feature thus allowing for fewer

redundant rules in the explanation of assimilation. An alpha rule would account for nasal place assimilation in English as shown in the example below. The negative forms of the words below are created with the prefixes *in* or *im* (and *iŋ* in informal speech).

4.7 a) possible impossible

balance imbalance

tolerable intolerable

satiable insatiable

considerate inconsiderate[31]

b) *rule for place assimilation*: [+nasal] → $\begin{bmatrix} \alpha \text{ coronal} \\ \beta \text{ anterior} \end{bmatrix}$ / ____ $\begin{bmatrix} \alpha \text{ coronal} \\ \beta \text{ anterior} \end{bmatrix}$

The rule allows the nasal segment to assimilate to the place of articulation of the following segment.

For Cree, a rule may also be postulated to account for the sound symbolism occurring in the diminutive. The rule would copy the feature [-anterior] to coronal obstruents as illustrated in (4.8) below. The X stands for any irrelevant intervening segments. The rule would have to apply iteratively until the word is exhausted.

---

[31]For many speakers this is pronounced as i(ŋ)considerate in normal speech.

4.8) Diminutive Harmony Rule

$$\begin{bmatrix}+\text{coronal} \\ -\text{sonorant}\end{bmatrix} \quad \text{---}> \quad [\text{-ant}] \; / \; \underline{\quad\quad} \; X \; + \quad \begin{bmatrix}+\text{coronal} \\ +\text{cont} \\ -\text{son} \\ -\text{ant}\end{bmatrix}$$

Assimilation rules as shown above in (4.6) and (4.7b) do not include any intervening segments because the assimilation happens locally between adjacent segments. The diminutive harmony rule for Cree as shown above in (4.8) necessitates the addition of an unknown element X representing any intervening segment. The diminutive sound symbolism does not necessarily happen to segments that are adjacent, but can even occur across morpheme boundaries. The basic facts of the harmony can be captured linearly by the rule, but rules do not explain or motivate the exclusion of certain types of segments from the assimilatory process . It would theoretically be possible to postulate a rule to copy any feature onto any segment, regardless of whether a particular segment is phonetically realizable. Constraints and universals are used to govern what types of features may combine, how they combine and how rules may operate. Consider a constraint on locality. Phonological rules are constrained to operate under conditions of strict adjacency (Shaw 1991) which allows for assimilation to take place between adjacent segments, but certainly does not capture the harmony processes such as Cree diminutive sound symbolism which operate at a distance.

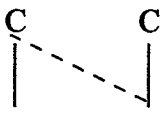
4.2.2 Autosegmental Phonology

Autosegmental phonology revolutionized the way harmony processes were thought of. The explanation as to why certain types of segments were irrelevant in harmony processes became clearer. Feature geometry illustrated clearly why certain features clustered together and why other features never appeared together at all. Articulator nodes, being privative, define natural classes of segments.

Autosegmental phonology was adept at explaining assimilation phenomena where intervening segments do not matter. Assimilation would occur between elements that are next to each other when features sit on their own autosegmental tiers and thus acts locally.

Rules are still necessary to spread the features within the framework of autosegmental phonology, as are conditions on locality. The English nasal assimilation example above in (4.7) may also be illustrated within the framework of autosegmental phonology as shown below in (4.9). The rule is postulated in (4.9b) showing that nasals must agree in position to the following consonant. They do this by not by copying the features, but by linking to the place node of the following segment.

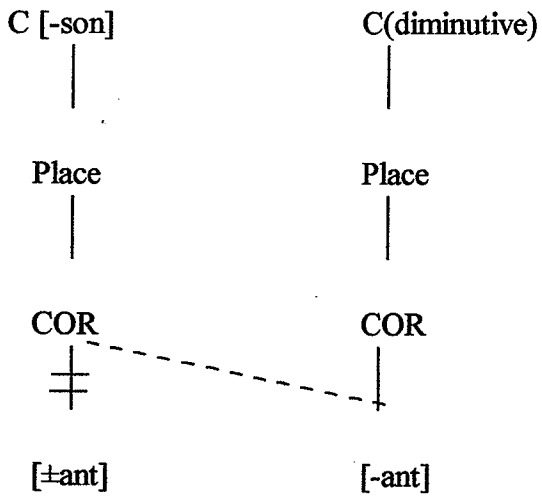
4.9)



[+nasal] PL

Using autosegmental phonology to explain the diminutive consonant harmony systems of the Moose and Eastern Swampy Cree dialects, a rule would be postulated to spread the feature [-anterior] to other coronal nodes on the tier. This is shown below in (4.10). The C is specified for [-sonorant] to exclude the possibility of a coronal nasal or lateral harmonizing. The *C(diminutive)* in the illustration represents the diminutive morphology which contains the harmonizing feature [-anterior]. The rule represents that the feature [-anterior] is spread from *C(diminutive)* onto the target which is a coronal obstruent. The [anterior] specification of the coronal obstruent is at the same time de-linked so that only the new [-anterior] specification is evident in the surface representation of the target segment.

4.10) Autosegmental Cree Diminutive Harmony Rule



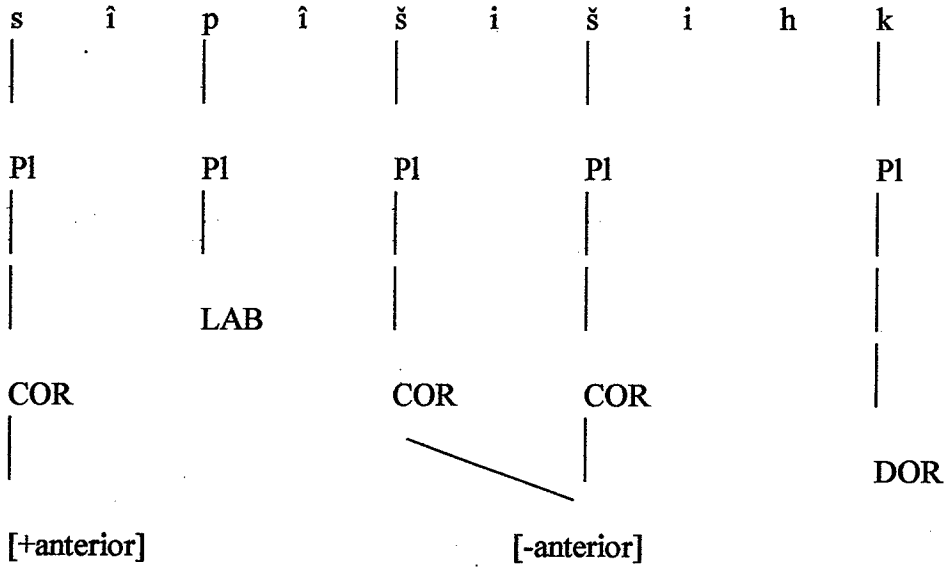
The harmony pattern in Moose Cree can be shown by the autosegmental representation below shown in (4.11).

4.11) šîpîšišihk (sîpîy 'river')

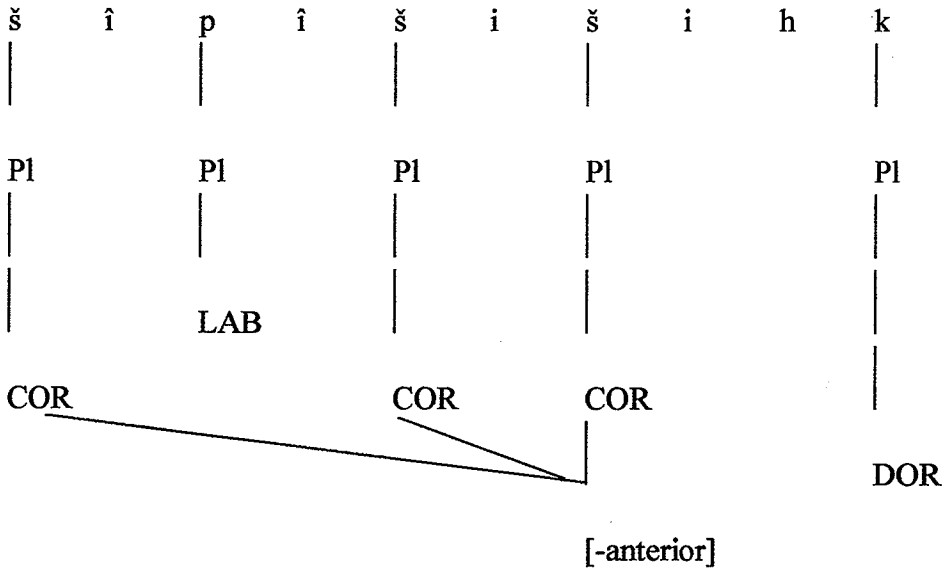
river-DIM

'in the creek'

a) apply diminutive harmony rule: spread [-anterior] and de-link [+anterior]



b) resulting feature geometry:



There is a problem in the cases of transparent harmony where the coronal consonants such as / l, n/ do not participate in the harmony, but they do not block the harmony either. These segments, having a coronal node in their feature geometry, should block harmony. They would not be able to participate in the harmony because they are [+sonorant], and the diminutive harmony rule only applies to [-sonorant] coronals. As shown below in (4.12), the [+anterior] of /l/ and /n/ reside on the same tier as [-anterior] of *C(diminutive)*. This would preclude any spreading of [-anterior] due to a 'No Crossing' constraint on association lines.

4.12) olâkanišihk (olâkan) 'in a small dish' Ellis (54:3 MC)

o l â k a n i š ihk

C	C	C
[+son]	[+son]	[-son]
Place	Place	Place
COR	COR	COR
[+ant]	[+ant]	[-ant]

However, these segments do not block harmony and are in fact transparent to the harmony. The following example in (4.13) shows that in fact harmony does spread in Cree past the coronal sonorants.

4.13) *očayâniš,* euphemism for *wîtakay* 'his penis' Ellis (56:2 MC)

o č	ayâ	n	i	š,
C		C		C
[-son]		[-son]		[+son]
|		|		|
Place		Place		Place
|		|		|
COR		COR		COR
|		|		|
[-ant]		[+ant]		[-ant]

The consonant harmony systems of Tahltan (Shaw 1991), Navajo (Ferrara 1988; McDonough 1991), and Karok (Ferrara 1988) each contain issues such as this where harmony may be blocked by other segments. Underspecification has been proposed in order to deal with such issues. With underspecification, the coronal sonorants (n and l) would be unspecified for place in the underlying representation, thus allowing the spread of the feature [-ant] rightward through the word. At some point after this harmony rule was executed, a rule would apply to specify the unspecified segments as coronals. Karok (Ferrara 1988) displays consonant harmony in the presence of its diminutive suffix *-ič* where /r/ changes to /n/ and /θ/ changes to /č/. Ferrara defines the harmony as a distributed harmony, with the coronal continuants becoming more distributed in the presence of the diminutive suffix. Central to the analysis is a claim that the coronal

continuants are underlyingly unspecified with respect to [distributed]. The diminutive harmony would take place if induced by the diminutive morphology. If this did not apply, default rules would associate [-distributed] to any underspecified segments. This is illustrated below with an example of a noun and its corresponding diminutive.

4.14) Ferrara (1988:59)

	Noun	Diminutive
		[+D]
a) UR	θufkirik	θufkirik + i č
		[+D]
b) Spreading	---------	θufkirik + i č
	[-D]	
c) Default	θufkirik	----------
d) PR	θufkirik 'great horned owl'	čufkinikič 'little owl'

The common feature between the SPE style rules and autosegmental theory is that both rely on rules, rule ordering and constraints to some degree in order to restrict the harmony processes. Whether there are constraints on strict adjacency or simply constraints on which segments may co-exist, constraints exist in all languages. Optimality Theory has

simply followed through with these constraints and has allowed them to operate a language's phonological system.

4.2.3 Optimality Theory

Optimality Theory (OT) is a theory of linguistics which has had great impact in phonology. It proposes that universal grammar contains a set of violable constraints which spell out universal properties of language. The constraints are highly conflicting. OT relies on constraint interaction where one constraint may have absolute priority over another. This is accomplished by ranking the constraints in a "strict-dominance hierarchy" (Prince and Smolensky 1993) in which lower ranked constraints are violated if doing so avoids violation of constraints which are ranked higher in the constraint hierarchy. Languages differ in how they resolve the constraint conflicts, and thus differ in how the individual constraints are ranked. The actual output associated to any given input is the one which best satisfies the individual language's constraint hierarchy and as such is the optimal representation.

4.2.3.1 The Principles of Optimality Theory

There are four basic principles of OT which are Violability, Ranking, Inclusiveness and Parallelism.. They are explained here in order.

4.2.3.1.1. Violability:

Constraints may be violated, but violation is minimal. Because many of the constraints make contrasting claims about languages, some constraints will inevitably be violated. The violation is minimal in that the actual output associated to any given input least violates the more dominant of conflicting constraints in the grammar of a particular language.

4.2.3.1.2. Ranking:

A fundamental claim of OT is that languages differ principally in the ranking they impose on the constraints. The minimal violation is determined by this ranking. The candidate set is analyzed by the constraint hierarchy, which includes faithfulness constraints prohibiting the insertion and underparsing of phonological material, and the optimal candidate is the one best satisfying this hierarchy.

For example, if a language ranks a constraint desiring onsets (Onset) higher than a constraint requiring prefixes to be at the left edge of the word (Align prefix-left, word-left), there will be some conflict in situations where a prefix beginning with a vowel (eg. vc) combines with a root that begins with a consonant (CVCV) such as shown below:

vc + CVCV = vcCVCV

This violates the constraint *Onset*, but doesn't violate *Align prefix-left, word-left*. However, since *Onset* ranks above *Align prefix-left, word-left* this output does not satisfy the constraint hierarchy. The output which would satisfy the hierarchy is one where there

is an onset, even if it means violating the constraint *Align prefix-left, word-left* such as shown below:

vc + CVCV = CvcVCV

The hierarchy could also be satisfied by the output CVCvcV, but this is not the minimal violation of the constraint *Align prefix-left, word-left*. Minimal violation would have the prefix as close to the left edge of the word as possible.

4.2.3.1.3. Inclusiveness:

A set of candidate analyses admitted by very general considerations of structural well-formedness are evaluated by the constraint hierarchy. No specific rules or repair strategies exist. A candidate set which is evaluated by the hierarchy is generated by the function Gen(erator). This function takes the input underlying representation and maps it to a seemingly infinite set of candidate surface forms by freely inserting features, parsing or failing to parse material, and generating all possible types of domain structures. It is assumed that the necessary morphemes are put into Gen although the process has not been made clear in McCarthy and Prince (1993) or Prince and Smolensky (1993).

4.2.3.1.4. Parallelism:

Best satisfaction of the constraint hierarchy is calculated over the whole hierarchy and candidate set. In considering the optimal candidate, the entire possible list of candidates is considered over the entire constraint hierarchy, and the optimal candidate is the one which best satisfies the constraint hierarchy.

4.2.3.2 Constraints

A constraint provides a restriction on the output representation of a language by allowing or disallowing specific patterns or representations. In the rule-based and autosegmental approaches discussed, there was a need for constraints in order to restrict the application of rules or sequences of features. Constraints in the grammar were necessary in order to explain why certain things did not or could not happen. There were also situations where languages adhered to some constraints to a greater degree than other languages.

Traditional constraints differ from those constraints found in Optimality Theory in that the constraints in Optimality Theory do not necessarily agree with each other, that is they can conflict. The constraints are therefore violable in Optimality Theory -- a representation may satisfy one set of constraints while violating others. Archangeli (1997:10) succinctly describes the role of constraints within Optimality theory: "Constraints characterize universals. Constraint violations characterize markedness, patterns, and variation."

OT bases its principles on the fact that all languages adhere to the same universal constraints, but not all to the same degree. By allowing constraints to be violable, variability is permitted among the grammars of various languages without departing from the idea that there is a universal grammar. Not every language adheres to the same constraints to the same degree and even dialects will have slight differences in their grammars as evidenced in the following analysis of Cree diminutive harmony. The optimal

forms are associated to their underlying representations with respect to the entire grammar, not only to one specific constraint.

4.2.3.3 The Constraint System

The constraint system of any given language is made up of a universal set of constraints. Several families of constraints important in my analysis of the Cree data are given here in summary form. For a more detailed explanation of each of these constraints, see McCarthy and Prince (1993a, b) or Prince and Smolensky (1993).

4.2.3.3.1 Alignment Constraints

The alignment constraints refer to how the morphemes are concatenated. The necessary morphemes are placed into Gen, and then Gen will join them together in an infinite number of ways. The constraint system deletes the non-optimal concatenations and leaves ones with the proper morpheme order for the rest of the constraint hierarchy to evaluate. Every morpheme is subject to an alignment constraint based on whether it is at the left or right edge of the prosodic word or whether it is aligned with the left or right edge of another morpheme.

The family of constraints termed "generalized alignment" (McCarthy and Prince 1993b) is the schema for formulating these constraints, which are ranked in any given language and determine the optimal ordering of morphemes. When appropriately filled in, these exist to organize both morphological and phonological material.

4.15) Align(Cat1,Edge1; Cat2,Edge2)

where Cat1, Cat2 correspond to either a phonological or grammatical category and Edge1, Edge2 correspond to left or right.

This family of constraints requires that the designated edge of each Cat1 prosodic or morphological constituent coincides with the designated edge of some other prosodic or morphological constituent Cat2. This general schema can be used to align morphemes, feet, and any other such morphological or prosodic constituent.

For example, suppose a language had a prefix *P* to attach to a root *R*. Assume that the root is aligned at the left edge of the Prosodic word. To fill in the generalized alignment schema, we would end up with the constraint:

4.16) Align (R, left; Prosodic word, left)

"Align the left edge of the root with the left edge of the prosodic word."

The prefix will also align with the left edge of the prosodic word and will follow the alignment constraint below:

4.17) Align (P, left; Prosodic word, left)

"Align the left edge of the prefix to the left edge of the prosodic word."

There is a conflict between these constraints. Each of the constraints wants its *Cat1* to be at the left edge of the prosodic word, however there is only one left edge of the prosodic word and only one of these *Cat1*s can be at the left edge. The constraints are ranked in the language's hierarchy to determine the optimal outcome of the input representation. For *P* to be prefixed to the root *R*, the optimal ranking would be to have *Align (P, left; Prosodic word, left)* dominating *Align (R, left; Prosodic word, left)* . This ranking is illustrated in the following tableau:[32]

4.18 Align (P, left; Prosodic word, left) >> Align (R, left; Prosodic word, left)

candidate[33]	**Align (P, left; Prosodic word, Left)**	**Align (R, left; Prosodic word, Left)**
☞ $_{Pwd}$(PR		*
$_{Pwd}$(PR	*!	

From the table, it is more obvious how the rankings work.

---

[32]The tableaux are used simply as concrete, visual illustrations depicting how the hierarchy chooses the optimal representation corresponding to an underlying representation. A dotted dividing line illustrates that the constraints are equal and neither is dominant. The solid dividing line represents strict dominance of one constraint over another, but the dominance is only relevant where the constraints conflict over a particular representation. The candidate to be evaluated is listed in the first column, the constraints are listed in the top row. The asterisk (*) indicates a violation of the constraint. The exclamation point (!) following an asterisk indicates the violation is fatal and the candidate is no longer eligible to be evaluated by lower ranking constraints. The pointer (☞) indicates the candidate that optimally satisfies the constraint hierarchy.

In every table that follows, the candidates used to illustrate the hierarchical rankings of the constraints will have already been processed by the alignment constraints regarding morpheme ordering. Only those candidates with the optimal morphological alignment will be admitted for inspection by the lower ranking constraints.

4.2.3.3.2 Faithfulness Constraints

Faithfulness constraints serve to maintain the input representation.[34] This family of constraints includes the following constraints which will be demonstrated in the analysis of Cree diminutive sound symbolism

FILL: Syllable positions are filled with segmental material.

*INSERT[F] : Do not insert the feature [F].

PARSE: a family of constraints that require a given element to be dominated by an appropriate node in the prosodic tree. Segments that are not dominated by the appropriate node will not be pronounced.

Parse-σ: Syllables belong to feet.

Parse-μ: A mora (μ) is dominated by the syllable node (σ).

Parse-seg: segments belong to syllabic or moraic structure.

Parse[F]: Do not delete the feature [F]

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[34]Here I am following the style of faithfulness of McCarthy and Prince (1993), and Prince and Smolensky (1993), not the more recent Correspondence Theory (Itô and Mester 1996). The difference will not be important to the present analysis.

If these constraints dominated all other constraints, the output would look exactly like the input. However there are regular phonological changes occurring in most of the world's languages resulting from the interaction of other constraints with these faithfulness constraints

4.2.3.3.3 Syllable structure constraints

Within Optimality Theory, the structure of syllables is also governed by a set of constraints. These constraints serve to keep the syllable structure of a languages consistent. These include:

ONSET: Every syllable has an onset.

NOCODA: Syllables are open.

CODA-COND: Coda consonants are restricted to certain specific consonants.

4.2.3.4 Optimal Domains Theory[35]

The Optimal Domains Theory (ODT) of harmony was proposed by Cole and Kisseberth (1994) as an alternative to the autosegmental view of harmony. The

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[35]Within Optimality Theory, there are other methods of analyzing harmony patterns in languages (Kaun 1996); however, Optimal Domains Theory is the one that has been most developed. I have therefore chosen to model my analysis of Cree diminutives after this theory as opposed to other harmony analyses within OT.

information presented in their paper is important in my analysis of Cree diminutive consonant symbolism as consonant harmony.

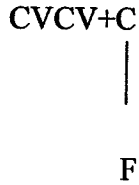
The following assumptions are adopted by ODT (Cole and Kisseberth,1994):

1. Features are privative; they only have one value specified[36]
2. Segments are fully specified in underlying representation (to the extent that there is any evidence for an underlying underspecification)
3. Feature geometry is not explicitly encoded in the representations but it may exist as a passive part of the theory. A corrollary of this is that only terminal features harmonize.
4. Features are anchored in prosodic units of timing for example the X-slot or μ.

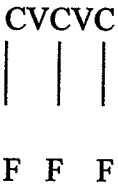
ODT explains harmony as a feature [F] being uniformly realized on anchors within a specified domain. Consider that a specified domain is a word (CVCVC) and that the consonants (C) are the anchors. For there to be harmony the feature [F] must be associated with every (C) within that word. Within that domain, a sponsoring anchor containing the feature [F] triggers the harmony. An anchor is the sponsor of [F] if it is affiliated with [F] in the underlying representation. In this example, assume the final (C) is the sponsoring anchor of the feature [F] such as shown below:

---

[36]Some models of feature organization specify that only articulator nodes are privative because their negative values (eg [-coronal]) do not specify natural classes (Shaw 1991). I will be incorporating this in my analysis and adopt that only articulator nodes are privative.



The non-sponsoring anchors of [F] (all the other consonants (C) within the word) come to be affiliated with [F] in the mapping from underlying to surface form through the operations of Gen. This results in the following :



Within the harmony domain, all of the consonants (C) have become affiliated with the feature [F].

Feature-domains (F-domains) are explicit aspects of phonological structure having the same status as structures for syllable, word and foot (Cole and Kisseberth 1994). These domains are generated by Gen, and the constraint system chooses the most optimal representation of the domains.

The generalized alignment schema given in the previous section provides the basis for creating the constraints which evaluate the harmony domains created by Gen. The set of constraints termed Basic Alignment (BA) given in (4.19) aligns the sponsoring anchor of the feature [F] with the edge of an F-domain.

(4.19) a) Basic Alignment (BA): every sponsoring anchor of the feature [F] is aligned with an edge of a feature-domain (abbreviated F-domain). The sponsoring anchor is the anchor to which the feature attaches in the UR.

This family is subdivided into two parts, BA-left and BA-right; these are listed below with an example of the job they would do.

4.20) BA-left Align (Sponsoring Anchor, L; F-domain, L)

This is a schema for creating the constraint. The sponsoring anchor and the domain are specified by the language just as the alignment schema was specified. BA-left specifies that the sponsoring anchor must be at the left edge of the harmony domain. A candidate which violates this constraint would not have the left edge of the sponsoring anchor at the left edge of the harmony domain. This is illustrated in (4.21) below.

4.21 a) (CVAVC

b) CV(AVC[37]

The example in (a) violates the constraint because the left edge of the harmony domain does not coincide with the sponsoring anchor, *A*. Example (b) satisfies the

[37]The sponsoring anchor is represented by the segment *A*. The parentheses represent the harmony domain.

constraint because the left edge of the harmony domain coincides with the sponsoring anchor.

4.22). BA-right Align(Sponsoring Anchor, R; F-domain, R)

This is also a schema for creating the constraint. BA-right specifies that the sponsoring anchor be at the right edge of the harmony domain. A candidate would violate this constraint if the harmony domain extends to the right edge of the word.

4.23 a) CVAVC)

b) CVA)VC

The example in (a) violates the constraint because the right edge of the harmony domain does not coincide with the sponsoring anchor, *A*. Example (b) satisfies the constraint because the right edge of the harmony domain coincides with the sponsoring anchor.

Harmony will occur when BA is violated in favour of constraints dictating a larger F-domain. Features perceptibility and articulator stability have been suggested as reasons motivating the existence of large F-domains (Cole and Kisseberth 1994). The principle of Extension given in (4.24) incorporates both of these reasons to allow a feature to be realized over a relatively long span.

(4.24) Extension: Extend a feature over long stretches of sound in order to maximize perceptibility and articulator stability (Cole and Kisseberth 1994).

Extension competes with the functional role of features to mark contrasts. Within a F-domain, the contrast between the presence and absence of the feature [F] is removed. It is believed that languages resolve the competition through the ranking of Faithfulness constraints preserving underlying contrasts with the harmony inducing constraints on F-domains (Cole and Kisseberth 1994).

Extension is realized in the constraint grammar by a family of constraints termed Wide Scope Alignment (WSA) which is also based on the generalized alignment schema given previously. This family, given in (4.25), extends the edge of the F-domain to the edge of a morphological or phonological constituent.

(4.25) Wide-Scope Alignment (WSA): This family of constraints extend a F-domain to the edge of a morphological or prosodic constituent. This family of constraints conflicts with the Basic Alignment constraints to license F-domains larger than just the sponsoring anchor. These constraints are also a schema which the language fills in to evaluate the extent of the harmony created by Gen.

This family of constraints is further divided into WSA-left and WSA-right. WSA-left allows for the extension of the F-domain to the left edge of the word. A candidate

would violate this constraint if the left edge of the F-domain does not align with the left edge of the word.

4.26 a) WSA-left Align(F-domain, L; Word, L)

b i) CV(AVC

ii) (CVAVC

The example in (i) violates the constraint because the right edge of the harmony domain does not coincide with the edge of the word. Example (ii) satisfies the constraint because the right edge of the harmony domain coincides with the edge of the word.

WSA-right allows for the extension of the F-domain to the right edge of edge of a morphological or prosodic constituent, for example the right edge of a word. A candidate would violate this constraint if the F-domain only extends to the edge of the sponsoring anchor, not to the word edge.

4.27 a) WSA-right Align(F-domain, R; Word, R)

b) i) CVA)VC

ii) CVAVC)

The example in (i) violates the constraint because the right edge of the harmony domain does not coincide with the edge of the word. Example (ii) satisfies the constraint because the right edge of the harmony domain coincides with the edge of the word.

For harmony to occur, at least one of these WSA constraints must dominate the corresponding BA constraint. These constraints conflict and want opposing domains. Ranking these two sets of constraints in different ways can result in the different harmony patterns as illustrated below in (4.28) and (4.29). Harmony could proceed leftward, rightward, bidirectionally or not at all depending upon the ranking of these sets of constraints. With the ranking system in (4.28 a), BA-left dominates WSA-left, the optimal candidate would be the first one where the left edge of the anchor aligns with the left edge of the F-domain. However, if the constraints are re-ranked so that WSA-left dominates BA-left, as illustrated in (4.28 b), the second candidate becomes the optimal candidate since its F-domain aligns with the edge of the word.

4.28 a) BA-left >> WSA-left

candidate	BA-left	WSA-left
☞ CV(A)VC		*
(CVA)VC	*!	

b) WSA-left >> BA-left

candidate	WSA-left	BA-left
CV(A)VC	*!	
☞ (CVA)VC		*

Below in (4.29), the various patterns of harmony emerge by the ranking of the BA and WSA constraints:

4.29 a) Leftward harmony

WSA-left >> BA-left; BA-right >> WSA-right

candidate	**WSA-left**	**BA-right**	**BA-left**	**WSA-right**
CV(AVC)	*!	*!		
(CVAVC)		*!	*	
CV(A)VC	*!			*
☞ (CVA)VC			*	*

b) Rightward harmony

WSA-right >> BA-right; BA-left >> WSA-left

candidate	**WSA-right**	**BA-left**	**BA-right**	**WSA-left**
☞ CV(AVC)			*	*
(CVAVC)		*!	*	
CV(A)VC	*!			*
(CVA)VC	*!	*!		

c) Bidirectional harmony

WSA-left >> BA-left; WSA-right >> BA-right

candidate	**WSA-left**	**WSA-right**	**BA-left**	**BA-right**
CV(AVC)	*!			*
☞ (CVAVC)			*	*
CV(A)VC	*!	*!		
(CVA)VC		*!	*	

Having these harmony domains does not necessarily mean that the harmonizing feature will be realized within the domain. In order for the feature [F] to be affiliated with every anchor in the domain, the constraint given in (4.30) is also necessary.

(4.30) EXPRESSION:[F] must be affiliated with every anchor in an F-domain.

This constraint forces the realization of the harmonic feature within the F-domain. Ideally it would like every segment within the domain to express the harmonic feature. A violation of this constraint would be a segment which is not affiliated with the harmonic feature. When EXPRESSION dominates *INSERT[F], harmony will occur. With the opposite ranking, EXPRESSION will be violated even if the domains are constructed as shown below in (4.31).

4.31 a) EXPRESS [F] >> *INSERT [F]

candidate	**EXPRESS[F]**	***INSERT[F]**
☞ (CVA)VC [F]		*
(CVA)VC	*!	

b) *INSERT [F]>> EXPRESS [F]

candidate	***INSERT[F]**	**EXPRESS[F]**
(CVA)VC [F]	*!	
☞ (CVA)VC		*

EXPRESSION may also be violated by feature occurrence and feature co-occurrence constraints. Feature occurrence constraints state that certain features occur together. The feature occurrence constraints in (4.31) defines the anchors to which the harmonic feature can attach. It restricts the distribution of the harmonic feature within the F-domain.

4.31) FEATURE OCCURRENCE: [Feature1]-->[Feature2]

The feature co-occurrence constraints are also called CLASH constraints by Cole and Kisseberth (1994). These constraints mark certain feature combinations as ill-formed

4.32) CLASH: *[feature1, -feature2] - Feature1 may not co-occur with Feature2

4.3 The Analysis of Cree Diminutive Consonant Symbolism

The previous section discussed the principles behind Optimality Theory and Optimal Domains Theory, demonstrating very generally how it operates. This present section focuses on the constraint hierarchy of Cree with respect to the diminutive sound symbolism.

I will begin by discussing the consonant harmony pattern in Cree, focusing on the harmony occurring in Moose Cree and Eastern Swampy Cree. Following that, I will show how small changes in the constraint system will ultimately reveal the pattern of consonant harmony found in Plains Cree and Western Swampy Cree.

4.3.1 The Consonant Harmony pattern of Cree Diminutive Sound Symbolism

Cree expresses diminutive sound symbolism through palatalization or affrication of coronal obstruents. The harmony pattern is regressive; that is, it starts at the diminutive suffix and spreads leftward throughout the word. In the example (4.32) below, a) illustrates the harmony present on each /s/ in *sîpiy* to the left of the diminutive suffix after it has been added. The example illustrated in (b) however, has an /s/ to the right of the diminutive suffix which does not palatalize in the diminutive indicating that the harmony is in fact regressive.

4.32) a) šîpîšišihk (sîpiy) 'in the creek' Ellis 1995(45:1 MC)

b) awâšišasâmak 'child's snowshoes' Ellis 1995 (61:4 MC)

For the Moose and Eastern Swampy Cree dialects, the feature [-anterior] is responsible for the palatalization. In Plains Cree and Western Swampy Cree, the harmonizing feature is presumed to be [+continuant].

The following sections briefly describe the syllable structure and the alignment of the diminutive suffix. Then the constraint interactions of the diminutive consonant symbolism will be illustrated first for Moose and Eastern Swampy Cree, then followed by Plains and Western Swampy Cree.

4.3.1.1 Syllable structure constraints

Cree has been viewed as a CV language, allowing onsets and nuclei in syllables, but fewer codas. To account for the syllable structure, I propose that ONSET would be highly ranked in the constraint hierarchy. The coda position in Cree does seem to be marked and can be accounted for with a constraint CODA-COND . In Cree the segments /s/, /š/[38] and /h/ appear in coda position other than word-finally. In the Moose and Eastern Swampy Cree dialects the /s/ is the preferred segment in the coda. Even though Moose and Eastern Swampy Cree do allow /š/ in a coda, this position seems much more marked for /š/ than for /s/. In a random sample of pages from each of the six speakers analyzed in the phonetic study (Ellis 1995), there were approximately three times as many /s/'s as /š/'s in coda position.[39] In onset position, from the same sampling of data, there were twice as many /š/'s as /s/'s. From this sampling, there does seem to be a preference of /s/ over /š/ in the coda position.

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[38]Occurring in the dialects which include the phoneme /š/ in their inventory

[39]Other evidence that the coda position is marked can be found in data elicited by Kevin Russell from a Western Swampy Cree speaker. Baby talk in WSC is characterized by all [s] becoming palatal affricates, phonetically [tɕ].

E.g. 'dog' atim –> atɕimotɕitɕ

In words where the palatal affricate would surface in a coda, we have opaque harmony, the harmony is blocked.

E.g. 'little bear' maskos –> maskotɕitɕ

More data of WSC baby talk can be found in the appendix at the end of this thesis.

While a constraint NoCoda rules out all codas in a language, the constraint CODA-COND reflects that languages may place restrictions on codas, only allowing specific types of segments into this position. The constraint CODA-COND represents a family of constraints that allow /s/, /h/ and /š/'s in codas, as shown below in (4.33 a). I also propose that since there are more /*s*/'s in coda position than /š/'s, there is a ranking of these two constraints such as shown in (4.33 b)

4.33 a) CODA-COND { CODA-COND[s]; CODA-COND[h]; CODA-COND [š] }: s, h and š are allowed in coda position

b) CODA-COND[s] >>CODA-COND [š]

This constraint will be important for the analysis of the variability between s-k and š-k sequences in the diminutive later on in the analysis.

4.3.1.2 Alignment of diminutive suffix

The alignment constraints refer to how the morphemes are concatenated. In all of the Cree dialects, a diminutive suffix is concatenated to a base and, being a derivational suffix, usually appears inside the inflectional morphology.

4.34 a) šîpîšišihk 'in the creek' 45:1 MC

sipiy + išiš + ihk

river DIM LOC

b) pilêšišak 'birds' 61:4 MC

pilêw + išiš + ak

bird + DIM + Plural

In every table that follows, the candidates used to illustrate the hierarchical rankings of the constraints will have already been processed by the alignment constraints. Only those candidates with the optimal alignment will be admitted for inspection by the lower ranking constraints.

4.3.2 Harmony Constraints and Interactions of Moose and Eastern Swampy Cree

Optimal Domains Theory explains harmony as a feature F being uniformly realized on the anchors within a specified domain. This is accomplished via the ranking of constraints evaluating wide-scope alignment, basic alignment of the harmony domains as well as the interaction of EXPRESS, FEATURE OCCURRENCE, and CLASH.

For the analysis of Moose and Eastern Swampy Cree, the diminutive harmony which I will be discussing will be contained within the prosodic word level. The necessary constraints to define the harmony domain are Basic Alignment and Wide Scope Alignment. To reiterate, Basic Alignment creates the domain around the sponsoring anchor.[40] In Moose and Eastern Swampy Cree the sponsoring anchor is in the diminutive suffix, assumed to be the rightmost /š/ of the suffix and referred to here as (DIM).

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[40]The sponsoring anchor is the anchor to which the harmonizing feature attaches to in the UR.

4.35) BA-left ALIGN (DIM, L; [-ant]-domain, L)

BA-left specifies that the sponsoring anchor, DIM, is aligned at the left edge of the harmony domain. A candidate which violates this constraint would not have the left edge of the diminutive suffix at the left edge of the harmony domain.

4.36) BA-right ALIGN(DIM, R; [-ant]-domain, R)

BA-right specifies that the sponsoring anchor, DIM, be at the right edge of the harmony domain. A candidate would violate this constraint if the harmony domain extends to the right edge of the word, unless the diminutive suffix, and thus the sponsoring anchor, is at the right edge of the word.

Wide Scope Alignment constraints extend the F-domain to the edge of a morphological or prosodic constituent. This family of constraints conflicts with the Basic alignment constraints to license F-domains larger than just the sponsoring anchor. These are also further divided into WSA-left and WSA-right

4.37) WSA-left ALIGN([-ant]-domain, L; Pwd, L)

WSA-left allows for the extension of the [-ant]-domain to the left edge of the word. A candidate would violate this constraint if the left edge of the [-ant]-domain does not align with the left edge of the word.

4.38) WSA-right ALIGN([-ant]-domain, R; Pwd, R)

WSA-right allows for the extension of the [-ant]-domain to the right edge of the word. A candidate would violate this constraint if the [-ant]-domain only extends to the edge of the diminutive suffix, not to the word edge.

Because these constraints conflict and want opposing domains, ranking these two sets of constraints in different ways can result in the different harmony patterns as illustrated in (4.29) previously and here again below:

4.29 a) Leftward harmony

WSA-left >> BA-left; BA-right >> WSA-right

candidate	**WSA-left**	**BA-right**	**BA-left**	**WSA-right**
CV(AVC)	*!	*!		
(CVAVC)		*!	*	
CV(A)VC	*!			*
☞ (CVA)VC			*	*

b) Rightward harmony

WSA-right >> BA-right; BA-left >> WSA-left

candidate	**WSA-right**	**BA-left**	**BA-right**	**WSA-left**
☞ CV(AVC)			*	*
(CVAVC)		*!	*	
CV(A)VC	*!			*
(CVA)VC	*!	*!		

c) Bidirectional harmony

WSA-left >> BA-left; WSA-right >> BA-right

candidate	**WSA-left**	**WSA-right**	**BA-left**	**BA-right**
CV(AVC)	*!			*
☞ (CVAVC)			*	*
CV(A)VC	*!	*!		
(CVA)VC		*!	*	

In Cree, the harmony is leftward, not bidirectional nor rightward as established in §4.3.1. Therefore the optimal ranking of these constraints is WSA-lf dominating BA-left, resulting in the correct leftward extension of the [-ant]-domain. As well, BA-right dominates WSA-right so that the harmony domain aligns with the right edge of the diminutive suffix. These constraint interactions are shown in the tableaux below.

4.39) Constraint Interactions

a) WSA-left >> BA-left

candidate	BA-left	WSA-left
☞ sîpî(šiš)ihk		*
(šîpîšiš)ihk	*!	

b) BA-right >> WSA-right

candidate	BA-right	WSA-right
☞ sîpî(šiš)ihk		*
sîpî(šišihk)	*!	

The following tableau illustrates the interaction of all four constraints. The dotted line indicates there is no ranking between the constraints, the solid line indicates the ranking.

4.40) WSA-left, BA-right >> BA-left, WSA-right

candidate	WSA-left	BA-right	BA-left	WSA-right
☞ (šîpîšiš)ihk			*	*
sîpî(šiš)ihk	*!			*
(šîpîšišihk)		*!	*	
sîpî(šišihk)	*!	*!		

The constraint EXPRESSION establishes that the feature [F] must be affiliated with every anchor in an F-domain. The constraint forces the realization of the harmonic feature

within the F-domain. Ideally it would like every segment within the domain to express the harmonic feature. The constraint for Moose and Western Swampy is given below the definition:

4.41) EXPRESSION: [-anterior] must be affiliated with every anchor in [-ant]-domain.

EXPRESS[-ant]

- a 't' within the F-domain would violate this constraint because it is not [-anterior]
- a 'č' within the domain would not violate this constraint as it is [-anterior].

When EXPRESSION is dominating *INSERT[-ant] - a faithfulness constraint prohibiting elements that are not in the UR - harmony will occur. With the opposite ranking, EXPRESSION will be violated even if the domains are constructed. This illustrated in tableau (4.42) below.

4.42) EXPRESS[-ant]>> *INSERT[-ant]

candidate	**EXPRESS[-ant]**	***INSERT[-ant]**
☞ (šîpîšiš)ihk		*
(sîpîšiš)ihk	*!	

EXPRESSION may also be violated by feature occurrence and feature co-occurrence constraints. Feature occurrence constraints state that certain features occur together. The constraints define the anchors to which the harmonic feature can attach, restricting the

distribution of the harmonic feature [-anterior] within the [-ant]-domain. In Moose and Eastern Swampy Cree, the harmonic feature is restricted to coronal consonants.

4.43) FEATURE OCCURRENCE: [anterior]-->[coronal][41]

- a candidate which had a [-anterior] 'p' would violate this constraint.

- a candidate with a [-anterior] 't' would not violate this constraint.

The optimal ranking of FEATURE-OCCURRENCE and EXPRESS is for FEATURE-OCCURRENCE to dominate EXPRESS. The optimal form is one that does not have the feature [-ant] inserted onto nodes other than coronal. This is illustrated in the tableau below.

4.44) FEATURE OCCURRENCE >> EXPRESS

candidate	F-OCCURRENCE	EXPRESS
☞ (šîpîšiš)ihk		*
(šîpîšiš ihk / [-ant]	*!	

The feature co-occurrence constraints, also called CLASH constraints, are a family of constraints that mark certain feature combinations as ill-formed. Here, the constraint

[41]This feature occurrence constraint is just one possible feature occurrence constraint in this language. In this analysis it is the only one that is necessary.

CLASH given in (4.45) shows that the language does not like [+sonorant,-anterior] segments. This accounts for the data such as *pilêšišak* 'birds' in (2.11) which showed that the coronal sonorants did not participate in the diminutive consonant harmony.

4.45) CLASH: [sonorant,-anterior]

- a candidate which has a [-anterior] *n* would violate this constraint
- a candidate with a [+anterior] *n* does not violate this constraint

The CLASH constraint must also dominate Express as shown in tableau (4.46) below.

4.46) CLASH >> EXPRESS

olâkanišihk 'in a small dish'

dish-DIM-LOC

candidate	CLASH	EXPRESS
☞ (olâkaniš)ihk		*
(olâkaniš)ihk / [-ant]	*!	

As shown, CLASH must dominate EXPRESS for the nasal segment not to be realized as [-anterior].

The constraint interactions given above simplified specific parts of the hierarchy to more easily illustrate the relationships between specific constraints. Below in (4.47a) I have combined the constraints in a dominance hierarchy to show how they interact for

determining the optimal representation in (4.47b) for *awâšišasâmak* . Note that I have left CLASH out of the tableau simply because it would not do any work within the harmony domain.

4.47) a) *INSERT[CORONAL] >>FEATURE OCCURRENCE, CLASH >> PARSE[-ant], EXPRESS, BA-rt, WSA-lf>> BA-lf, WSA-rt >> *INSERT[-ANT]

b) awâšišasâmak

child-DIM-snowshoe

'child's snowshoe'

candidates	*Insert [cor]	F-OCCUR	Parse [-ant]	Express	BA-rt	WSA-lf	BA-lf	WSA-rt	*Insert [-ant]
☛(awašiš)asâmak							*	*	
awas(iš)asâmak			*!			*!		*	
(awašišašâmak)					*!		*		
(awasis)asamak				*!			*	*	
(awasis)asâmak [+ant]		*!					*	*	
(ašašiš)asâmak	*!						*	*	
(awašiš)ašâmak							*	*	*!

By the constraint ranking, the optimal candidate which emerges is the first candidate, *awâšišasâmak*. This hierarchy accounts for all of the cases where the diminutive consonant harmony occurs as expected. Unfortunately, not all of the data exhibit the consonant symbolism in the presence of the diminutive suffix. There are exceptions which are the subject of the following sections.

4.3.2.1 Exceptions: Potential anchors which do not exhibit harmony

The following are examples where there are potential anchors not exhibiting diminutive consonant harmony.

4.48)	môs-'iyânšîš		'small moose-hide'	Ellis (53:2 MC)
	'sâčîš'šak	(asâtiy)	'small poplars'	Ellis (55:9 MC)
	môsošiš	(môswa)	'small moose'	Pentland (MC)
	pôsikâčiš	(English loan)	'pussycat'	Ellis (26:3 ES)

For this set of data a lexically determined ranking reversal as proposed by McCarthy and Prince (1993b) would be necessary to determine the optimal output for this set of data. McCarthy and Prince used the lexically determined ranking reversal for Ulwa where there were two possible surface forms for specific words concatenated to the suffix *-ka*. They state "each constraint masks the other completely when dominant; we only see that both are active from the lexically determined ranking reversal." (McCarthy and Prince 1993b: 32) This proposal allows for specific words to "change" the order of constraints in

the hierarchy. I have altered their proposal slightly because I feel that my proposal better represents the processes of lexical exceptions within the Optimality framework.

With many of the current linguistic theories, the exceptions are usually dealt with individually and separately from the generalizations. Exceptions are usually considered to be memorized. Memorization is not an uncommon practice in many languages, and it can be shown that children do learn the exceptions to a generality after learning the generality. This memorization would be analogous to the acquisition of the past tense forms for English children. When children learn the generalization that the morpheme *-ed* is added on to verb stems to make the past tense, they do this to all of the verbs including the exceptions. At some point they learn that some past tenses are irregular and use for example, 'went' instead of 'goed'. Parallel distributed processing suggests that both the path via the rule and the path to the specific lexical item are occurring simultaneously, but that the path to the lexical exception is much faster and gets the answer much quicker. In Optimality theory, a specific constraint can be formulated and memorized by children learning the language and is then ranked in the hierarchy above the more general constraint.

I have illustrated this with lexically specific BA-lf constraints such as the one proposed in (4.49). This constraint would dominate the WSA-lf constraint so that the wide harmony domain would no longer be optimal for this particular lexical item. The tableau in (4.49b) illustrates this and the constraint ranking given in (4.49 c) shows how the lexical constraint fits into the hierarchy as I have discussed so far.

4.49) Lexically determined ranking reversal:

môsošiš 'little moose'

moose-DIM

a) BA-left(môsošiš): ALIGN(Sponsoring Anchor, L; [-ant]-domain, L)

b) BA-left(môsošiš) >> WSA-lf>> BA-left

candidate	BA-lf(môsošiš)	WSA-lf	BA-lf
☞ môso(šiš)		*	
(môšošiš)	*!		*

c) *INSERT[CORONAL] >> FEATURE OCCURRENCE, CLASH >> BA-left(môsošiš) >>

EXPRESS, BA-rt, WSA-lf >>BA-lf, WSA-rt

4.3.2.2. Variation due to an *sk* or *šk* sequence:

The following data seem to optionally violate the constraint CODA-COND [s].

4.50) Data:

askihkoš	(askihk)	'little kettle'	9:9 ES
askihkoša	(askihk)	'small kettle'	9:9 ES
askihkos	(askihk)	'small kettle'	9:10 ES
očiškwacîšiš	(očiskwačiw)	'little devil'	12:15 ES
wîskačâniš	(wîskačân)	'little whiskey-jack'	14:5 ES; 66:1 MC
iškwêšiš	(iskwêw)	'girl'	P, 60:3 MC;10:10 ES
iskwêšiš	(iskwêw)	'girl'	4:5 ES; 61:1 MC

wîskacâniši-wayân	'little whiskey-jack's skin'	14:4 ES
miskwayân'šiša	'little beaverskin'	9:21 ES
amiskošiši-wayâna	'pelt of a small beaver'	9:21 ES
kiyâskošišak (kiyâskwak 'gulls')	'terns'	11:4 ES
kiyâskošiša	'terns'	11:3,5 ES

By ranking CODA-COND[s] equally with WSA-left we would get the variation in the surface forms between diminutives with *sk* sequences and those with *šk* sequences. This is illustrated in (4.51) below.

4.51) iškwêšiš or iskwêšiš 'girl'

a) CODACOND[s], WSA-left[42]

candidate	CODACOND [s]	WSA-left
(iškwêšiš)	*	
iskwê(šiš)		*

[42]Note: For at least some of the speakers this variation is true for the iškwêšiš / iskwêšiš pair, however some speakers may rank CODACOND [s]>> WSA-left if they have a stronger tendency not to produce /š/ in a coda position, or have the opposite ranking WSA-left >>CODACOND if their restriction on codas is weaker.

4.3.2.3. Dissimilation of coronal stridents in Diminutive Suffix:

The following data exhibit some sort of dissimilation in the diminutive suffix. Consonant harmony is not evident throughout the entire word.

4.52) Data:

iškwêšisa	'girl'	60:2 MC
atipisihk	'fine mesh at end of snowshoe'	53:3 MC
askihkos	'little kettle'	9:10 ES

These examples are not grouped with those in (4.3.2.1) where a lexically determined ranking reversal has been proposed. Rather, the dissimilation is for other reasons. These examples cannot be lexical exceptions because *iškwêšisa, iskwêšisa*, and *askihkos* each have corresponding examples without the dissimilation in the diminutive suffix.

One possible explanation for these examples is that they were mistranscribed. The phonetic analysis did show statistically that as a group, the diminutive segments were phonetically indistinguishable from /š/, however this analysis did not determine the phonemic correspondent of each segment. Another possible explanation is that these examples may have been misarticulated with [s] rather than the intended [š]. The phonetic research showed a number of outliers in the control [š] data that would likely be heard as [s]. This kind of variation in the acoustics of intended and perfectly articulated [š]'s is completely normal.

4.3.2.4. Other Variability

This final category contains the final few exceptions that did not fit into the other categories I have listed. This contains seemingly free variation between words that are not the result of the restriction on codas, but seem to be variable for other reasons.

4.53) Data

a)	ačimošiša	(atim)	'pup'	9:15 ES
	ačimošiš		'pup'	9:16 ES
	atimošiša		'pup'	9:16 ES
b)	mištâpêškwêšiša	(mistâpêskwêw)	'giant girl'	56:1 MC
	mistâpêskwêšiša		'giant girl'	56:2 MC
	mistâpêskwêšišak		'giant girls'	56:3 MC
c)	n'čawâšimišinân		'our child'	51:3 MC
	n'čawâšimišak		'my children'	65:9 MC
	n'cawâšimišak		'my children'	7:9 ES
	otawâšimišwâwa		'their children'	44:2

These words may have restricted environments, each appearing in specific semantic environments. For example, adult children may not always be referred to with the diminutive; however young children will more likely be referred to using the diminutive. One way of analyzing the examples where semantic blocking is occurring for specific referents is similar to the lexically determined ranking reversal as proposed in (§4.3.2.1).

These examples would be subject to lexically specific constraints which depend on the referent, such that a BA-left lexically specific-lr (large referent) constraint would dominate the WSA-lf constraint so that the wide harmony domain would no longer be optimal for this particular lexical item. The tableau in (4.54b) illustrates this and the constraint ranking given in (4.54 c) shows how the lexical constraint fits into the hierarchy.

4.54) Lexically determined ranking reversal:

atimošiša 'pup' (referred to 'a dog')

a) BA-left(atimošiša)-lr: ALIGN(Sponsoring Anchor, L; [-ant]-domain, L)

b) BA-left(atimošiša)-lr >> WSA-lf>> BA-left

candidate	BA-lf(atimošiša)-lr	WSA-lf	BA-lf
☞atimo(šiš)a		*	
(acimošiša)	*!		*

c) *INSERT[CORONAL] >> FEATURE OCCURRENCE, CLASH >> BA-left(atimošiša)-lr >> EXPRESS, BA-rt, WSA-lf >>BA-lf, WSA-rt In the case of

As stated in the previous section (§4.3.2.3), some of these examples may also be misarticulated with [s] rather than the intended [š]. The phonetic research showed a number of outliers in the control [š] data that would likely be heard as [s] and this kind of variation is completely normal.

4.3.3 Plains and Western Swampy Cree:

Plains and Western Swampy Cree also exhibit regressive consonant harmony. The data in (4.55) follow the regressive harmony pattern where the harmony domain extends to the left of the word.

4.55) Data

ocawâsimisa		'his children (obv)'
acihkwayânisa	(atihkwayân)	'a little caribou hide (obv)'
ocawâsimisiwâwa		'their children'
oskinîkîs	(oskinîkiw)	'youth, boy'
pisiskisîs	(pisiskiw)	'little animal'
ciscêmâs	(cistêmâw)	'tobacco'
mêscakâs	(mêstakây)	'hair'
nicêmisis	(nitêm)	'my little horse'
miscacimosis	(mistatim)	'pony'

The data in (4.56) show the few exceptions to the regressive harmony pattern.

4.56)	mistikwânis (mistikwân)	'little head'
	nitawâsimisak	'my children'
	otawâsimisa	'his children (obv)'

The final two examples *otawâsimisa* and *nitawâsimisak* might be said to exhibit free variation with the alternate form where the *t* does affricate. However, the speaker from whom I elicited the data suggested that these forms are used when addressing or talking about one's adult children. The harmonic form will appear when actually speaking about children. This would not be free variation of the surface form, since the environments are restricted. This is why I have included them in the category of exceptions to the harmony pattern. While the harmonized word form will be optimal when the referent is a child, the unharmonized form is optimal when the referent is an adult.

The diminutive suffix is aligned as explained previously in (4.3.1.2). The harmonizing feature in these dialects is not the same as for the Moose and Eastern Swampy Cree dialects. I have analyzed the harmonizing feature as [+continuant].

The Feature domains in which these features are realized are however licensed in the same manner, with the following ranking :

4.57) WSA-LEFT >> BA-LEFT

BA-RIGHT >>WSA-RIGHT.

With the interaction of other constraints relevant to this harmony pattern, the /t/ optimally becomes a coronal alveolar affricate. The constraints necessary in this interaction from the grammar are listed below.

4.58) *Insert[+continuant] Do not insert [+continuant]

Parse[-continuant] Do not delete [-continuant]

Parse[+continuant] Do not delete [+continuant]

*NoContour: Segments may not have both the positive and negative value for a feature [F]

Feature occurrence: [continuant]-->[coronal]

Clash: *[nasal,+continuant]

BA-right: Align(Sponsoring Anchor,R; [+cont]-domain,R)

BA-left: Align(Sponsoring Anchor,L; [+cont]-domain,L)

Express: Express[+cont]

WSA-left: Align([+cont]-domain,L;Pwd,L)

WSA-right: Align([+cont]-domain,L;Pwd,L)

The constraint NOCONTOUR fails candidates with affricates in them. For these dialects, this constraint is ranked fairly low to allow the affricate */ts/* to be the optimal surface form in the diminutive.

4.59) *NOCONTOUR: Segments may not have both the positive and negative value for a feature [F]

The crucial rankings of the constraints for the diminutives is given in (4.60). The table in (4.60b) shows the hierarchy's ability to choose the optimal form of *nicêmisis*.

4.60 a) FEATURE OCCURRENCE, CLASH,>> BA-rt, WSA-lf >>

BA-lf, WSA-rt, PARSE[-continuant], PARSE[+continuant], EXPRESS >>

*Insert[+continuant], *NoContour

b. nicêmisis 'my little horse'

1poss-horse-DIM

candidate	*Insert (cor)	Feature occur	Clash	BA-rt	WSA-lf	Parse [-cont]	Parse [+cont]	Express [+cont]	BA-lf	WSA-rt	*Insert [+cont]	*No Contour
☞(nicêmisis)									*		*	*
nitêm(isis)					*!							
(nitêmisis)								*!	*			
(nit<s>êmisis)							*!		*			
(ni<t>sêmisis)						*!			*		*	
(sicêmisis)			*!						*		**	*
(nicêmisis) [+cont]			*!						*		*	*
(nicênisis)	*!								*		*	*
(nicêmisis) [-ant]		*!							*		*	*

The second category of diminutive which I propose to be lexical exceptions would be analyzed in much the same way as for Moose and Eastern Swampy Cree in §4.3.2.1 and in §4.3.2.4. A lexically-specific BA-left constraint or BA-left (large referent) constraint would be proposed as in (4.61a) and this would dominate the general WSA-left constraint

as shown in (4.61b). The tableau in (4.61c) illustrates how the optimal candidate is picked. The constraint hierarchy in (4.61d) illustrates how this constraint might be ranked in the hierarchy.

4.61) Lexically determined ranking reversal:

a) BA-lf (mistikwânis): Align(Sponsoring Anchor,L; [+cont]-domain,L)

b) BA-lf (mistikwânis) >> WSA-lf

c)

candidate	BA-lf(mistikwânis)	WSA-lf
☞ mistikwan(is)		*
(miscikwânis)	*!	

d) *Insert(coronal) >> Feature occurrence, Clash>>BA-lf(mistikwânis)>>

Express, BA-rt, WSA-lf >> BA-lf, WSA-rt

4.4 Summary

I have tried to clarify through Optimality Theory and Optimal Domains Theory the diminutive coronal harmony patterns found in several dialects of Cree. For these dialects, ranking the constraints defining harmony domains in one manner results in the pattern with regressive leftward harmony. The lexical exceptions to this pattern were the result of a higher ranking lexically specific alignment constraint aligning the left edge of the

sponsoring anchor with the left edge of the domain, thereby outranking the general Wide-Scope Alignment-left constraint and making the regressive harmony not optimal.

While the harmonic feature may be different for the two sets of dialects, the harmony patterns are the same. Where I was unable to demonstrate using Autosegmental Theory how free variation would be handled, the constraint interaction between WSA-left and CodaCond resulted in the free variation between outputs.

Chapter 5

Conclusions

This chapter ties all of the Cree dialects discussed in this thesis together. The first section describes the major conclusions of my research. Section 2 describes problems and possibilities with describing a unified approach to discussing Cree diminutive sound symbolism across the dialects.

5.1 Conclusions

While diminutive sound symbolism is evident in all of the dialects of Cree, it is realized slightly differently in the dialects. One component of the thesis examined the diminutive sound symbolism in two dialects, Moose Cree and Eastern Swampy Cree, which distinguished between the phonemes /s/ and /š/. The examination included both a phonetic and phonological analysis of diminutive sound symbolism. The second component of the thesis discussed the phonological analysis of the Plains Cree and Western Swampy Cree dialects.

5.1.1 Moose Cree And Eastern Swampy Cree

The analysis of the Moose Cree and Eastern Swampy Cree dialects included a description of the data available for analysis and examined the variability of the sound symbolism evident in the data. A phonetic analysis was undertaken to determine whether there was a true phonological change occurring in the diminutive and to check some of the

transcriptions in the text. There were many instances where a potential /š/ was written as /s/ or a potential /č/ was written as /t/. The phonetic analysis did determine that statistically the diminutive fricative was unlike the non-diminutive [s], and for most of the speakers, was not an intermediate fricative between [s] and [š]. The fact that some of the diminutive fricatives were transcribed as [s] instead of [š] could be attributed to normal speech. Even in the control data, there were a number of outliers in both the non-diminutive [s] and non-diminutive [š] groups. This variation in the acoustics of intended and even perfectly articulated /š/'s is completely normal.

For the phonological analysis, Cree diminutive consonant symbolism was treated as an example of consonant harmony. Using Optimal Domains Theory, consonant harmony was demonstrated as the interaction of various constraints realizing the harmonizing feature within a Feature-domain (F-domain). The F-domains were evaluated by Basic Alignment and Wide Scope Alignment constraints such that wide scope alignment constraints dominating Basic Alignment constraints would result in large harmony domains and the reverse, Basic Alignment constraints dominating Wide Scope Alignment constraints, would result in no harmony domains. Leftward harmony as exhibited in the Cree language is the result of Wide Scope Alignment-left dominating Basic Alignment-left. The fact that the harmony does not spread to the right is the result of Basic Alignment-right dominating Wide Scope Alignment-right. The dominance of CLASH and FEATURE OCCURRENCE over EXPRESS resulted in the transparent harmony shown in the Moose and Eastern Swampy Cree diminutives exhibiting regular harmony. The lexical exceptions to this pattern were the result of a higher ranking lexically-specific

alignment constraint aligning the left edge of the sponsoring anchor with the left edge of the domain, thereby outranking the general Wide-Scope Alignment-left constraint and making the regressive harmony not optimal. The variation exhibited in coda position by the *s-k* and *š-k* sequences were analyzed as the interaction between the constraints WSA-left and CODACOND [s]. The constraint interactions were able to account for the Cree diminutive harmony as exhibited by the data and by the acoustic analysis.

5.1.2 Plains Cree and Western Swampy Cree

For these dialects, a set of data was examined to classify the examples where diminutive harmony occurred and where it did not. The set of data was much smaller than for Eastern Swampy Cree and Moose Cree because sound symbolism is only evident in the palatalization of /t/. Only a small set of the data did not exhibit the sound symbolism.

A phonetic analysis was not undertaken for these dialects because the phonetically observable distinctions between the diminutive and non-diminutive forms of words is much more limited. Diminutive sound symbolism is only evident in the palatalization of /t/ to /c/. In the phonetic analysis of the palatalization of /t/ in the Eastern Swampy Cree and Moose Cree dialects, the length of time the fricative was produced was too short to be measured using the LPC analysis. I would expect to encounter the same problem here.

For the phonological analysis, Optimal Domains Theory presented consonant harmony through the interaction of various constraints realizing the harmonizing feature within a Feature-domain (F-domain). The F-domains were evaluated in the same manner as for Moose and Eastern Swampy Cree. The difference in the dialects is the optimal

emergence of the harmonizing feature. The harmonizing feature in the Moose and Eastern Swampy Cree dialects was [-anterior]. In the Plains and Western Swampy Cree dialects, the harmonizing feature is [+continuant]. The same interaction of CLASH and FEATURE OCCURRENCE over EXPRESS as well as the interaction of PARSE[-continuant], PARSE[+continuant] dominating*INSERT[+continuant], and *NOCONTOUR will result in the transparent harmony shown in the Cree diminutives exhibiting regular harmony.

The few lexical exceptions to this pattern were the result of a higher ranking lexically specific alignment constraint aligning the left edge of the sponsoring anchor with the left edge of the domain, thereby outranking the general Wide-Scope Alignment-left constraint and making the regressive harmony not optimal.

5.2 Unifying the dialects

One of my original goals for this thesis was to develop a unified approach to Cree diminutive sound symbolism in which the harmony would operate in the same way across the dialects. Unfortunately, this goal was not realized. From inspection of the phonemes which participate in the harmony, it was determined that the harmonizing feature for Moose and Eastern Swampy Cree was [-anterior], yet that same feature was unable to account for the sound symbolism as it occurred in the Plains Cree and Western Swampy Cree dialects. For the Plains Cree and Western Swampy Cree dialects, the harmonizing feature was [+continuant], which also cannot account for the harmony in the Moose Cree and Eastern Swampy Cree dialects.

While I did mention one reason for not undertaking a phonetic analysis of the

Plains Cree and Western Swampy Cree dialects, there is a good reason to do one. There is "free variation" in the western Cree dialects of /s/ to [š] as Wolfart (1973) discusses for Plains Cree, but the variation is not phonemic. To determine whether this palatalization is more prevalent in the diminutive would make a fascinating acoustic study. As Hinton, Nichols and Ohala (1994) point out, sound changes often do not affect sound-symbolic words. Phonemes that may have disappeared elsewhere in a language may still thrive in the sound-symbolic vocabulary. The variation that is still evident in these dialects of Cree *may* be even more common in the sound-symbolic vocabulary. A statistical analysis as that was done for the Eastern Swampy and Moose Cree Dialects, would provide a useful tool to determine this. If it were shown that the diminutive fricative of these dialects was in fact [š], it would provide a good step toward unifying the dialects and show that anteriority is the important feature spreading in the diminutive sound symbolism.

Appendix 1
Data and Sources

The following data are glossed by lexeme. The individual grammatical morphemes are not glossed. For example, *awâšiša* and *awâšiš* are both glosssed as 'child' and *awâšišak* is glossed as 'children.'

The data are listed by source

1. Ahenakew, Freda.. personal communication.

nicawâsimisak	'my children'
ê-ocawâsimisiyit	'she had a child'
miscacimosis	'pony'
misacimosis	'pony'
acimosis	'puppy'
nicacimosis	'my puppy'
acihkosis	'little caribou'
nicacihkosis	'my little caribou'
ocawâsimis	'his child'
otawâsimis	'his child'

2. Bear, Ida. Narrative, May 11, 1995, received from the personal files of Dr. Charlotte Reinholtz.

ocawâsimisa	'his children'
ocawâsim(is)iwâwa	'their children'
acihkwayân(i)sa	'a caribou hide'

3. Ellis, C. D. Spoken Cree.[43]

sîpîšiš	'creek'
iskwêšiš	'girl'
wâskâhikanišiš	'little house'
niskišiš	'little goose'
maskwâšiš	'little bear'
acimošiš	'puppy'
manicoš	'insect, boil'
masinahikaniš	'license'
alikwačâsišiš	

[43]This data is not included in the analysis because there is no way of knowing whether the data is directly elicited from native speakers.

4. Ellis, C. D. "âtalôhkâna nêsta tipâcimowina" Cree Legends and Narratives.

piskwamiskošiš	'Little Piskwamisk' (lit. little hump')	p 387
ačakâš	'mink'	
paskwahčîwi-šîpîšiš	'Little White Top Creek' (lit. 'little stump creek')	p 386
otawâšimišwâwa	'their children'	44:2
apiscililîskwêsis	'midget girl'	
apiscawâšiš	'small child'	46:63

Simeon Scott (texts 1-12) Eastern Swampy Cree

amisk-wayânišiš	'small beaverskin'	9:21
amisko-wâpikošiš	'beaver mouse'	3:7
čapašîš	'(down) below'	1:7
awiyâšîša	'animal'	1:7
očawâšimišiwâwa	'their children'	1:9
očawâšimiša	'his/her children'	9:17; 11:6
očawâšimiš'	'his/her/children'	11:3
'či-očawâšimišin'ci	'they had children'	11:2
kîy-ati-očawâšimišiw	'he began to have children"	12:10
n'cawâšimišak	'my children'	7:9 [44]
awâšiša	'child'	11:1,2; 9:5,19,20
awâšiš	'child'	9:3,5,19,20
'wâšiša	'child'	9:20
k'-apišîš'šit	'it is small'	3:8
kîn'kisčiy-apikošiš	'pointed mouse'	3:8
kây-apišîš'šit	'it is very small'	3:10
apišîš	'small'	6:1; 7:3
êy-apišâšinîniki	'it is small'	8:5
âpikošîš	'mouse'	3:8,9,10
iškwêšiš	'girl'	4:7; 10:10
iškwêšiša	'girl'	6:2
iskwêšiš	'girl'	4:5,6
napêšiš	'boy'	6:2
mânišîš	'a little'	6:4
oški-'škîša	'new little fir trees'	7:8
miši-šîpîšišihkân	'creek'	11:8
šîpîšiša	'creek'	8:5
mîkiwâmišiš	'small wigwam'	9:8

---

[44]This was written as *n'tawâšimišak* in the text, but it was shown to be *n'cawâšimišak* (§3.4.2) in the actual speech.

acimošiša	'pup'	9:15
acimošiš	'pup'	9:16
atimošiša	'pup'[45]	9:16
ociškwacîšiš	'little devil, windigo'	12:15
wîhcikôšiš	'little windigo'	12:15
askihkoša	'small kettle'	9:9
askihkoš	'small kettle'	9:9
askihkos	'small kettle'	9:10
miskwayân'šiša	'little beaverskin'	9:21
amiskošiši-wayâna	'pelt of a small beaver'	9:21
kiyâskošiša	'terns'	11:3,5
kiyâskošišak	'terns'	11:4
aškîšiniw	'a little bit of earth'	6:4
apisčačimoš	'small dog, pet'	9:15

Xavier Sutherland (texts 13-26) Eastern Swampy Cree

awiyâšîšak	'animals, creatures'	18:2,3,6; 19:9; 22:4
awiyâšîša	'animal, creature'	18:3
'wiyâšîšak	'animal, creature'	18:1
tôwiy-awiyâšîšak	'Every kind of animal'	19:9
awiyâšîši-pimiy	'animal grease'	23:3
mânišîš	'a little'	19:3
kâ-apišîšišit	'it is little'	15:5
kâ-'pišîš'šit	'it is little'	15:5
ê-apišîš'šicik	'they were small'	26:1
apišîš	'a little'	19:4
awâšišak	'children'	21:1
wîci-'wâšišiwâwa	'their fellow-children'	21:1
wâpikošiš	'mouse'	15:5,26:3
wâpikošîšak	'mice'	26:3
nisto-minikošiš	'three minutes'	19:4
mîniša	'berries'	19:1,2,3,5
wîskacâniš	'little whiskey-jack'	14:5
wîskacâniši-wayân	'little whiskey-jack's skin'	14:4
pôsikâciš	'pussycat'	26:3

Gilbert Fairies (texts 45-49) Moose Cree

šîpîšišihk	'creek'	45:1
'wiyâšîš	'animal, beast'	46:1
'wiyâšîša	'animal, beast'	46:1
kitapišîš'šin	'you are small'	46:1

[45]Author noted depalatalization of /c/ to /t/ (Ellis 1995: 396, note 23)

ê-'pišîš'iyan	'you are little'	46:1
ačičamôš	'squirrel'	46:1,2
wêyâšîšak	'beasts'	47:1
mân'šîš	'brief'	49:1
ocawâšimišwâwa	'their children'	49:1
awâšišak	'children'	49:2,3
awâšiš	'child'	49:4

Sophie Gunner (texts 50-57) Moose Cree

ocawâšimišiwâwa	'their children'	51:2
ocawâšimiša	'his/her children'	56:5
n'cawâšimišinân	'our child'	51:3
ê-'wâšišîwiyân	'as a child'	50:6
'wâš'šîwiyân	'when I was a child'	52:4
k'-âwâš'šîwiyân	'while I was a child'	53:4
awâšiš	'child'	51:1, 52:1,4
awâsiš	'child'	52:1
awâšišak	'children'	51:1,2
awâšišasâmak	'child's snowshoe'	53:4
manšîš	'a little'	50:1
ma'šîš	'a little'	54:1
apišîš	'a little'	54:2, 55:2,3
apišimaniyâpiy	'small netting line'	53:2
awîyâšîšak	'animals'	55:1
olâkanišihk	'in a small dish'	54:2
olâkan'šihk	'in a small dish	54:1
'wîyâšîš	'animal'	55:4
môs-'iyânšîš	'small moose hide'	53:2
atipisihk	'small end'	53:3
'sâčîš'šak	'small poplars' [46]	55:9
'čayâniš	'his little thing'[47]	56:2
mištâpêškwêšiša	'giant girl'	56:1
mistâpêskwêšiša	'giant girl'	56:2
mistâpêskwêšišak	'giant girls'	56:3
apiscililîš	'little person'	56:8
wîskacâniš	'little whiskey-jack'	56:3

[46]In a note (#36 page 425) the form was given as ašâtîšišak. Palatalization of /t/ was not present and no comments were made on this 'corrected' word-form. This form is not included in the analysis because there is no way of knowing whether it was directly elicited from a native speaker.

[47]Euphemism for *wîtakay* 'his penis'

Willie Frenchman (texts 58-62) Moose Cree

e-awâš'šîwiyân	'I was a child'	59:1
iškwêšisa	'girl'	60:2
iskwêšiša	'girl'	60:2
iškwêšiša	'girl'	60:3
iškwêšiš	'girl'	60:3
'škwêšiš	'girl'	60:3
iskwêš'šak	'girls'	61:2
iskwêšišak	'girls'	61:2
pilêšišak	'birds'	61:4
pilêšiš	'bird'	61:4

Hannah Loon (texts 63-67) Moose Cree

êy-awâšišîwiyân	'when I was a child'	64:1
ê-'wâšišîwiyân	'when I was a child'	65:1
ocawâšimiša	'his child'	64:3
n'cawâšimišak	'my children'	65:9
n'kî-'wâšišîwin	'I was a child'	65:6
awâšiša	'child'	65:2
'wâšišak	'children'	65:2,5,7,8
awâšišak	'children'	65:2
awâš'šak	'children'	65:4
awâšiš	'child'	65:8
iškwêšišak	'girls'	64:2
iškwêš'ša	'girl'	64:3
iškwêšiš	'girl'	64:3
'škwêšišak	'girls'	64:5
nîc'-iškwêšiš	'my girlfriend'	65:7
n'kî-'pišiš'šin	'I was little'	65:4
manšiš	'a little'	65:5, 66:3
miniša	'berries'	65:6
âpikošîš	'mouse'	66:1,2,3
âpikošîša	'mouse'	66:2
âpakošîš	'mouse'	66:3
wîskacâniš	'little whiskey-jack'	66:1,2,3
wîskacâniša	'little whiskey-jack'	66:3
wîskacân	'whiskey-jack'	

5. McDonald, Brian. "mîhkâw, kaskitêwâw, wâpiskâw, osâwâw" from Cree Songbook

nicêhis 'my little heart'

6. Venturini, Lydia a Manitoba Swampy Cree speaker, baby-talk diminutive data received from Dr. K. Russell.
* The symbol /c/ here represents the phonetic segment [tc]

pôcîcic	'little kitty cat'
cîcîpicic	'ducky'
acimocîc	'puppy'
nicêmicic	'my puppy'
apikocîcic	'mouselet'
ôhômicîcic	'owlet'
nihômicîcic	'my owlet'
nitôhômicîcic	'my owlet'
maskocic	'little bear'
(*mackocic)	
niskacic	'little goose'
amiskocic	'little beaver'
sâsêskwânic	'little frying pan'
(*câcêskwânic)	

7. Pentland, D. H. Diminutive Consonant Symbolism In Algonquian.

šîpîšiš	'creek'
iškwêšiš	'girl'
môsošiš	'little moose'
(*môšošiš)	

8. Wolfart, H. C. and Freda Ahenakew.1993. "kinêhiyâwiwininaw nêhiyawêwin" The Cree Language is our Identity.

pîhcwâhkanis	'cigarette'
oskinîkîs	'youth, boy'
pisiskisîs	'little animal'
oskanis	'his little bone"
asinîs	'stone'
ciscêmâs	'tobacco'
mêscakâs	'hair'
mohkomânis	'knife'
nôcokwêsiw	'little old woman'
êkoca	'there'

8. Wolfart, H. C. and Freda Ahenakew. 1998. *kôhkominawak otâcimowiniwâwa Our Grandmothers' lives, as told in their own words.*

moščošosa (moštošwa) 'the calf'[48]

9. Wolfart, H. C. 1973. Plains Cree.

ocêmisisa	'his little horse (obv)'
ocakohpis	'his little blanket'
nicêmisis	'my little horse'
ê-ocawâsimisiyit	'she had a child'
mistikwânis	'little head'
otawâsisimisa	'his children (obv)'
acimosis	'little dog'
miscahîs	'quite a lot'

[48]This speaker has a cluster of palatal fricative and affricate instead of preaspirated *c* written as hc in standard. The cluster, written as *šč*, seems to exhibit a substantially lower degree of frication than is heard in many instances diminutive palatalization (Ahenakew and Wolfart 1992:378)

Appendix 2
Centre of Gravity Program

```
#!/usr/local/bin/perl
#
# GRAVITY (.PERL)
# September 2, 1997
#
# calculates summary statistics for each in a list of CSL FFT files,
# e.g., centre of gravity
#

$GRAVITY_CUTOFF = 6000;
$PEAK_CUTOFF = 3000;

while ($filename = <>) {
 chomp $filename;
 if ($filename) {
  open (FILE, $filename) or die "Can't open file $filename";


  $moments = 0;
  $gainsum  = 0;
  $peakfreq  = 0;
  $peakgain  = 0;
  @slicesums = (0, 0, 0, 0);

  $line = <FILE> until ($line =~ /BIN/);

  while ($line = <FILE>) {
      $line =~ /\w+\s+(\d+\.\d+)\s+(\d+\.\d+)/;
      $frequency = $1;
      $gain = $2;
      if (($frequency <= $GRAVITY_CUTOFF) and ($frequency >
$PEAK_CUTOFF)){
        $moments = $moments + ($frequency * $gain);
        $gainsum = $gainsum + $gain;
      }
      if ($frequency > $PEAK_CUTOFF) {
        if ($gain > $peakgain) {
            $peakgain = $gain;
            $peakfreq = $frequency;
```

```
            }
        }
        $slicesums[whatslice($frequency)] += $gain;
    }
    print $filename, "\t", $moments/$gainsum, "\t", $peakfreq, "\t",
        $peakgain, "\t", $slicesums[1], "\t", $slicesums[2], "\n";
    close FILE;
  }
}


sub whatslice {
    ($freq) = @_;
    if ($freq < 1000) {return 0};
    if ($freq < 3000) {return 1};
    if ($freq < 5000) {return 2};
    return 3;
}
```

Appendix 3
Centre of Gravity Results

The following pages represent the results from the centre of gravity program listed in Appendix 2. They are presented in a spreadsheet, each individual speaker's data is listed separately.

The columns in the spreadsheet represent the following information:

filename: The name of the file where the fricative's results to the Fast Fourier Transform were saved in. Each file was given a name made up of three parts: the type of fricative, the text number corresponding to Ellis (1995), and an arbitrary number.
data: This is the word in which the fricative measured was spoken.
fricative: This indicates the type of fricative and the location in the word form the beginning. For example, *s1* indicates the first s from the left in the word, or *S2* indicates the second 'ʃ' from the left of the word
fricative type: This indicates whether the fricative was either a control (non-diminutive) fricative or experimental (diminutive) fricative.
centre of gravity: This is the numerical result indicating the centre of gravity of the fricative
high amplitude: This is the frequency above 1000Hz with the highest amplitude.
amplitude: the amplitude
amplitude 1-3000Hz: the amplitude between 1000 and 3000Hz
amplitude 3-6000Hz: the amplitude between 3000 and 6000Hz

The data is here presented in a slightly different style than in the rest of this thesis due to the inability to recreate some phonemic symbols in the spreadsheet program. The following represents the modifications to the phonemic representation indicated in chapter 2:

c -> palato-alveolar affricate [tʃ]
S ->: palato-alveolar fricative [ʃ]
ii-> î : high front unrounded vowel [i]
e -> ê: mid-front unrounded vowel [e]
oo -> ô: high back unrounded vowel [o]
aa -> â: low, front to back unrounded vowel ranging from [a] to [ɑ]

Data: Simeon Scott

filename	data	fricative	fricative type	centre of gravity	high amplitude	amplitude	amplitude 1-3000 Hz	amplitude 3-6000 Hz
CS1.FFT	miSi-mikisiwi-wacistonihk	s1	non-diminutive s	4312.824	3085.94	25.79	741	830.35
CS10.FFT	miiskaw	s1	non-diminutive s	4467.37744	4414.0601	30.7600002	1150.92	1163.1999
CS11-1.FFT	kiyaaskwak	s1	non-diminutive s	4439.58154	3085.9399	33.1300011	1141.57	1193
CS11-2.FFT	kii-posipanihow	s1	non-diminutive s	4615.16504	4531.25	34.25	603.35999	1068.87
CS11-3.FFT	maaskoc	s1	non-diminutive s	4544.7207	5156.25	29.2600002	1224.54	995.13
CS11.FFT	kii-kisken'tam	s1	non-diminutive s	4535.96289	4414.0601	21.2600002	967.06	814.90997
CS12-1.FFT	e'ti'tipiskaanik	s1	non-diminutive s	4557.17725	4140.6299	29.9099998	692.13001	934.22998
CS12-2.FFT	k'-aat'-iiSi-saskahwaahcik	s1	non-diminutive s	4572.09033	4296.8799	30.9400005	705.95001	1131.03
CS12-3.FFT	k'-aat'-iiSi-saskahwaahcik	s2	non-diminutive s	4644.00244	5234.3799	29.1800003	724.32001	1012.12
CS12-4.FFT	ekii-caakaasis	s1	non-diminutive s	4587.9624	4765.6299	27.7199993	916.41998	920.46997
CS12-5.FFT	ekii-caakaasis	s2	non-diminutive s	4552.46875	4375	30.2299995	535.57001	1000.61
CS12-6.FFT	kaa-piihciskaakocik	s1	non-diminutive s	4485.29297	3515.6299	34.8400002	1022.95	1340.92
CS12-7.FFT	misiwe	s1	non-diminutive s	4578.41602	4179.6899	27.5900002	669.92999	1011.38
CS12.FFT	kii-kisken'taminiwa	s1	non-diminutive s	4542.58105	4375	23.5499992	1057.11	737.92999
CS13.FFT	kiipimaatisiw	s1	non-diminutive s	4645.63672	5039.0601	35.3300018	941.15997	1002.13
CS14.FFT	taapiskooc	s1	non-diminutive s	4210.54395	3007.8101	38.25	1174.99	1290.58
CS15.FFT	taapiskooc	s1	non-diminutive s	4246.70068	3242.1899	46.2400017	1408.64	1585.72
CS16.FFT	pakwataskamikohk	s1	non-diminutive s	4451.14404	4531.25	24.4799995	1079.95	846.46997
CS17.FFT	miSi-maskwa	s1	non-diminutive s	4526.2627	5039.0601	29.6000004	1273.61	1030.4399
CS18.FFT	opimatisiiwininaaw	s1	non-diminutive s	4370.5166	3164.0601	32.3499985	1346.36	1047.0601
CS19.FFT	kaakiiwasisicik	s1	non-diminutive s	4566.35938	4335.9399	26.8400002	1066.22	865.70001
CS2.FFT	e-kiSipanaskisicik	s2	non-diminutive s	4411.53857	3007.8101	31.2800007	884.91998	1007.37
CS20.FFT	kii-wiici-pimaatisiimew	s1	non-diminutive s	4436.96728	4687.5	30.3099995	1089.14	1124.89
CS21.FFT	tapiskoc	s1	non-diminutive s	4299.3916	3046.8799	46.3800011	1490.85	1546.85

CS22.FFT	iskani-kiiSik	s1	non-diminutive s	4407.63037	3046.8799	39.1699982	1204.42	1743.17
CS23.FFT	askiy	s1	non-diminutive s	4553.26318	5039.0601	30.2000008	1060.18	1128.47
CS24.FFT	askiy	s1	non-diminutive s	4551.97949	6171.8799	33.7000008	1373.43	1339.4399
CS25.FFT	askiniw	s1	non-diminutive s	4547.18506	5078.1299	35.0600014	1004.76	1284.86
CS26.FFT	nesta	s1	non-diminutive s	4483.30664	3320.3101	27.2800007	692.89002	1024.63
CS27.FFT	ostikwaanihk	s1	non-diminutive s	4391.65381	3125	29.2600002	842.34003	1118.16
CS28.FFT	e-kiSikamiskaanik	s1	non-diminutive s	4576.67139	4453.1299	31.2999992	842.78998	1057.11
CS29.FFT	ci-pimaatisiyaan	s1	non-diminutive s	4453.49072	4453.1299	29.6499996	784.97998	1122.51
CS3.FFT	mistasiniya	s2	non-diminutive s	4487.75781	4453.1299	33.4099998	792.63	1324.25
CS30.FFT	isa	s1	non-diminutive s	4474.86475	4570.3101	36.3699989	972.72998	1156.15
CS31.FFT	ininasiniy	s1	non-diminutive s	4518.88623	4843.75	30.2700005	1094.73	1190.49
CS32.FFT	mistaaskiihk	s1	non-diminutive s	4479.24609	3710.9399	31.4500008	895.04999	1252.5601
CS33.FFT	mistaaskiihk	s2	non-diminutive s	4630.11963	4531.25	27.8799992	912.15997	948.96002
CS34.FFT	miikis	s1	non-diminutive s	4598.98682	4492.1899	28.2099991	913.84003	991.65997
CS35.FFT	wiiskaac	s1	non-diminutive s	4452.86963	3867.1899	30.7399998	816.47998	1175.64
CS36.FFT	eskwapekahk	s1	non-diminutive s	4437.09619	3789.0601	30.1299992	1016.85	1190.5601
CS4.FFT	mistasiniya	s1	non-diminutive s	4450.29102	3476.5601	41.4900017	1103.96	1657.67
CS5.FFT	kii-pimaatisiwak	s1	non-diminutive s	4448.59619	3085.9399	27.8899994	860.75	1084.36
CS6.FFT	otakaskwa	s1	non-diminutive s	4503.51123	4609.3799	33.4399986	1401.88	1402.71
CS7.FFT	otakaskwa	s1	non-diminutive s	4517.20264	4609.3799	28.8600006	1337.1899	1127.33
CS9-1.FFT	ayaas	s1	non-diminutive s	4530.04395	4375	42.0600014	1251.09	1450.63
CS9-10.FFT	ayaas	s1	non-diminutive s	4507.13086	4296.8799	30.7900009	607.44	1198.93
CS9-11.FFT	ispi	s1	non-diminutive s	4476.57568	4414.0601	31.0599995	470.72	1221.77
CS9-12.FFT	ayaas	s1	non-diminutive s	4465.05664	3593.75	29.75	736.15002	856.70001
CS9-13.FFT	kisiwaasiw	s1	non-diminutive s	4509.13135	4492.1899	30.6499996	1322.64	1020.24
CS9-14.FFT	kisiwaasiw	s2	non-diminutive s	4464.04443	4687.5	27.0799999	1359.22	777.45001

CS9-15.FFT	kii-piikosicoS	s1	non-diminutive s	4312.27393	3398.4399	36.9700012	1075.13	1333.62
CS9-16.FFT	iskani-kiiSik	s1	non-diminutive s	4485.82617	3437.5	32.5	799.97998	1319.63
CS9-2.FFT	ayaas	s1	non-diminutive s	4531.18848	4375	29.3400002	1089.2	1077.98
CS9-3.FFT	kii-kisiwaasiw	s1	non-diminutive s	4447.14502	3710.9399	34.7099991	1256.86	1479.24
CS9-4.FFT	kii-kisiwaasiw	s2	non-diminutive s	4623.37256	4687.5	40.5	966	1155.45
CS9-5.FFT	e-kii-pimaatisit	s1	non-diminutive s	4546.7168	4765.6299	27.8500004	847.07001	813.31
CS9-6.FFT	noosisim	s1	non-diminutive s	4453.81348	3554.6899	37.4300003	1007.06	1472.42
CS9-7.FFT	noosisim	s2	non-diminutive s	4473.72217	4101.5601	35.4399986	965.06	1508.9399
CS9-8.FFT	otaskihkw'	s1	non-diminutive s	4621.39844	4609.3799	30.9500008	713.59003	869.58002
CS9-9.FFT	kiSaspin	s1	non-diminutive s	4364.63184	3320.3101	33.8899994	848.15002	1182.36
CS9.FFT	kaa-akwaasitopet	s1	non-diminutive s	4409.42871	4179.6899	29.7900009	1277.0601	1178.26
CSH1.FFT	miSi-mikisiwi-wacistonihk	S1	non-diminutive S	4207.94775	3554.6899	39.9900017	1035.18	1605.4301
CSH10.FFT	e-miSikiticik	S1	non-diminutive S	4420.53564	3007.8101	43.5800018	1548.23	1710.03
CSH11-1.FFT	kiwaSiSaan	S1	non-diminutive S	4517.40674	5390.6299	36.5900002	1029.72	1537.09
CSH11-4.FFT	iSitiSahwew	S1	non-diminutive S	4369.21924	3359.3799	35.8300018	879.08002	1358.66
CSH11-5.FFT	iSitiSahwew	S2	non-diminutive S	4464.13965	3398.4399	35.1100006	944.95001	1404.8001
CSH11-6.FFT	kaa-iSi-piihciSkawaat	S1	non-diminutive S	4426.94873	3398.4399	37.1399994	739.46002	1322.95
CSH11-7.FFT	kaa-iSi-piihciSkawaat	S2	non-diminutive S	4454.89648	3593.75	39.1800003	1293.52	1503.8001
CSH11.FFT	pwamoS'	S1	non-diminutive S	4432.87256	3046.8799	44.9799995	1501.5501	1601.18
CSH12-1.FFT	k'-aat'-iiSi-saskahwaahcik	S1	non-diminutive S	4483.32031	3945.3101	32.9099998	614.32001	1298.75
CSH12.FFT	miSikinoSewa	S1	non-diminutive S	4439.99023	3164.0601	42.5499992	1455.99	1788.82
CSH13.FFT	miSikinoSewa	S2	non-diminutive S	4448.51025	3632.8101	46.7999992	1350.8101	1835.95
CSH14.FFT	miSikinoSewa	S1	non-diminutive S	4458.58008	3593.75	43.6699982	1422.28	1783.22
CSH15.FFT	miSikinoSewa	S2	non-diminutive S	4462.5293	3632.8101	42.6300011	1468.1	1793.93
CSH16.FFT	piiniS	S1	non-diminutive S	4437.55127	3867.1899	37.5499992	999.32001	1522.27
CSH17.FFT	ka-maaciSon	S1	non-diminutive S	4365.05176	3515.6299	33.2999992	1466.83	1252.78

CSH18.FFT	kii-kwaaSkwwepitew	S1	non-diminutive S	4428.83789	3125	43.1599998	1674.7	1586.4
CSH19.FFT	k'-aati-neeniiSiyahk	S1	non-diminutive S	4331.68457	3789.0601	46.0800018	1332.1	1847.65
CSH20.FFT	niiStam	S1	non-diminutive S	4383.03906	3593.75	42.6599998	1149.84	1745.23
CSH21.FFT	e-niiSicik	S1	non-diminutive S	4324.24512	3632.8101	47.0900002	1347.57	1791.23
CSH22.FFT	aSay	S1	non-diminutive S	4358.5415	3632.8101	54.1500015	1343.59	1800.36
CSH23.FFT	e-'ti-maamiSikiticik	S1	non-diminutive S	4330.81494	4023.4399	44.1399994	1099.21	1592.98
CSH24.FFT	kici-mekwaaaSkwaacik	S1	non-diminutive S	4266.98145	3085.9399	43.1300011	1544.6899	1321.88
CSH25.FFT	miSi-maskwa	S1	non-diminutive S	4323.3335	3164.0601	49.4799995	1120.37	1658.05
CSH26.FFT	kaa-'Si-taSiihkecik	S1	non-diminutive S	4334.03564	3554.6899	39.2700005	944.85999	1391.89
CSH27.FFT	kaa-'Si-taSiihkecik	S2	non-diminutive S	4198.7002	3203.1299	35.3199997	859.59998	1141.52
CSH28.FFT	kiiSikaak	S1	non-diminutive S	4378.48877	3203.1299	43.9700012	1197.78	1801.7
CSH29.FFT	e-niiSicik	S1	non-diminutive S	4393.63232	4179.6899	44.2099991	1112.34	1726.96
CSH2B.FFT	e-kiSipanaskisicik	S1	non-diminutive S	4264.11279	3007.8101	38.0200005	958.5	1332.84
CSH3.FFT	piniS	S1	non-diminutive S	4286.60889	3046.8799	38.3499985	962.29999	1224.12
CSH30.FFT	kinweS	S1	non-diminutive S	4393.70117	3164.0601	44.5499992	1321.6801	1863.92
CSH31.FFT	iskani-kiiSik	S1	non-diminutive S	4401.66748	3203.1299	37.1500015	993.71002	1366.73
CSH32.FFT	oSkiiSikohk	S1	non-diminutive S	4435.23535	3789.0601	26.1000004	533.37	980.14001
CSH33.FFT	oSkiiSikohk	S2	non-diminutive S	4426.53467	3046.8799	27	531.5	1106.53
CSH34.FFT	oSkiiya	S1	non-diminutive S	4379.9248	3125	39.6699982	1257.0601	1561.04
CSH35.FFT	omiiSaapoowinaanihk	S1	non-diminutive S	4395.58691	3554.6899	38.5699997	1140.99	1639.0601
CSH36.FFT	wanakoSiniwa	S1	non-diminutive S	4531.56397	4531.25	37.7700005	772.66998	1311.63
CSH37.FFT	e-wanakoSin'ci	S1	non-diminutive S	4558.26563	4414.0601	31.1399994	779.34998	1100.5
CSH38.FFT	e-kiSikamiskaanik	S1	non-diminutive S	4421.95654	3007.8101	38.2000008	1037.84	1331.64
CSH39.FFT	e-ci-kiSi-n'tawikicik	S1	non-diminutive S	4415.11133	3203.1299	39.2900009	961.03998	1527.78
CSH4.FFT	kaa-kiiSikaak	S1	non-diminutive S	4339.39209	4062.5	41.7900009	1044.77	1593.67
CSH40.FFT	taSine	S1	non-diminutive S	4416.11084	4023.4399	32.4599991	770.48999	1363.97

CSH41.FFT	niiStam	S1	non-diminutive S	4460.85107	4648.4399	31.3899994	850.88001	1316.99
CSH42.FFT	kaa-SaaSaakiSihk	S1	non-diminutive S	4315.37988	3046.8799	27.3299999	1729.1	1136.37
CSH43.FFT	kaa-SaaSaakiSihk	S2	non-diminutive S	4462.43506	3046.8799	33.5299988	1246.14	1465.85
CSH44.FFT	kaa-SaaSaakiSihk	S3	non-diminutive S	4441.73486	3476.5601	36.1699982	960.06	1373.41
CSH45.FFT	SiSipa	S1	non-diminutive S	4257.15918	3046.8799	35.1599998	956.88	1086.72
CSH46.FFT	SiSipa	S2	non-diminutive S	4444.62695	3984.3799	36.1800003	790.28998	1481.87
CSH47.FFT	niiSo	S1	non-diminutive S	4393.56201	3046.8799	40.1100006	1492.54	1543.24
CSH48.FFT	niiSo	S1	non-diminutive S	4519.53076	5742.1899	26.8199997	1180.75	1052.38
CSH49.FFT	e-minwaaSiSin'ci	S1	non-diminutive S	4499.51367	3242.1899	35.2999992	1669.04	1294.8101
CSH5.FFT	ka-'S-iihtaayahk	S1	non-diminutive S	4255.43848	3710.9399	41.1899986	889.28003	1537.22
CSH50.FFT	e-minwaaSiSin'ci	S2	non-diminutive S	4468.29834	6171.8799	32.9099998	891.46997	1383.34
CSH52.FFT	piSiSik	S2	non-diminutive S	4498.60889	6679.6899	35.8300018	789.47998	1420.0501
CSH53.FFT	iSihokopan	S1	non-diminutive S	4457.47705	4453.1299	35.8600006	962.81	1586.01
CSH6B.FFT	ka-iSi-wepinat	S1	non-diminutive S	4428.45801	3164.0601	46.4599991	1735.61	1909.96
CSH7.FFT	aniSa	S1	non-diminutive S	4383.35742	3828.1299	39.5800018	1021.83	1506.23
CSH8.FFT	kii-maamiSikiticik	S1	non-diminutive S	4497.06494	4492.1899	38.9300003	1231.01	1644.24
CSH9-1.FFT	kaa-'Si-nakaci-wepahwaat	S1	non-diminutive S	4410.9043	3046.8799	38.6399994	1267.83	1561.14
CSH9-10.FFT	kiSaspin	S1	non-diminutive S	4369.58936	3125	26.6000004	584.15002	944.20001
CSH9-11.FFT	kii-mitiSahwew	S1	non-diminutive S	4256.64941	3085.9399	34.0900002	1159.5601	1089.46
CSH9-12.FFT	k'-iiSinaakosiw	S1	non-diminutive S	4319.64502	3164.0601	37.3199997	950.57001	1338.08
CSH9-13.FFT	kiSiSaw	S1	non-diminutive S	4376.70166	3710.9399	32.7299995	772.44	1318.91
CSH9-14.FFT	kiSiSaw	S2	non-diminutive S	4416.01953	4375	30.6399994	783.15997	1100.02
CSH9-15.FFT	e-miSanik	S1	non-diminutive S	4340.7915	3007.8101	36.6599998	1052.65	1392.9301
CSH9-16.FFT	e-wiici-taSiihkemaat	S1	non-diminutive S	4310.11426	3164.0601	35.1399994	934.97998	1119.99
CSH9-17.FFT	maaSi	S1	non-diminutive S	4335.68799	3007.8101	30.1399994	841.07001	1125
CSH9-18.FFT	takoSin	S1	non-diminutive S	4364.50781	3632.8101	28.6299992	726.02002	1141.6899

CSH9-19.FFT	kaawiici-taSihkemaat	S1	non-diminutive S	4438.88281	3671.8799	30.3899994	615.81	1055.98
CSH9-2.FFT	maSi	S1	non-diminutive S	4338.58008	3593.75	34.0999985	1933.85	1254.41
CSH9-20.FFT	ci-miSak	S1	non-diminutive S	4312.6333	3007.8101	38.1699982	950.44	1377.78
CSH9-21.FFT	kiSe-'n'niw	S1	non-diminutive S	4571.66943	4414.0601	36.75	874.15997	1197.42
CSH9-22.FFT	cacaSiwekiSimew	S1	non-diminutive S	4424.3916	3789.0601	31.4699993	928.19	1318.07
CSH9-23.FFT	cacaSiwekiSimew	S2	non-diminutive S	4471.04834	3632.8101	38.5400009	891.29999	1399.65
CSH9-24.FFT	kii-piikosicoS	S1	non-diminutive S	4410.95361	3437.5	29.5699997	693.89002	1195.98
CSH9-25.FFT	iskani-kiiSik	S1	non-diminutive S	4463.8208	3085.9399	32.3499985	1146.1	1082.13
CSH9-26.FFT	ey-oSihaat	S1	non-diminutive S	4421.59961	3515.6299	36.2799988	963.59998	1358.5501
CSH9-3.FFT	maaSi	S1	non-diminutive S	4458.06201	3046.8799	39.7400017	1279.32	1583.16
CSH9-4.FFT	ciiweyaaSiwak	S1	non-diminutive S	4393.95361	3710.9399	41.3699989	1519.36	1704.43
CSH9-5.FFT	peSkiS	S1	non-diminutive S	4447.50488	4531.25	35.1599998	1020	1315.4
CSH9-6.FFT	peSkiS	S2	non-diminutive S	4412.01074	3671.8799	35.7900009	681.59998	1446.8101
CSH9-7.FFT	kii-paahpahkiSininiwa	S1	non-diminutive S	4319.31055	3125	31.5799999	743.84003	1200.4
CSH9-8.FFT	moSak	S1	non-diminutive S	4245.83203	3007.8101	21.3099995	1429.4399	787.51001
CSH9-9.FFT	maSkooc	S1	non-diminutive S	4343.62988	3437.5	35.9900017	1298.6801	1243.97
CSH9.FFT	kinoSewak	S1	non-diminutive S	4502.27686	5000	43.2299995	1822.04	1841.35
ES1.FFT	kiin'kisciapikoSiS	s1	diminutive	4497.9663	5859.3799	40.1	1314.42	1738.8199
ES11-1.FFT	kiyaaskoSiSa	s1	diminutive	4424.7773	3007.8101	27.11	885.81	1002.11
ES11-2.FFT	kiyaaskoSiSak	s1	diminutive	4365.8716	3750	32.71	1012.82	1150.52
ES11-3.FFT	kiyaaskoSiSa	s1	diminutive	4498.0161	5781.25	36.55	1123.96	1328.0699
ES2.FFT	kiin'kisciapikoSiS	s1	diminutive	4403.0405	3710.9399	36.32	994.23	1562.1801
ES4.FFT	iskweSiS	s1	diminutive	4450.0088	3515.6299	32.92	1221.14	1369.84
ES5.FFT	iskweSiS	s1	diminutive	4413.1455	3554.6899	44.78	1462.47	1785.77
ESH1.FFT	capaSiS	S1	diminutive	4099.1445	3007.8101	31.33	1126.1801	1121.29
ESH10.FFT	apikoSiiS	S2	diminutive	4381.4873	3710.9399	42.52	1101.4301	1753.05

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ESH11-1.FFT	awaaSiSa	S1&2	diminutive	4508.0142	5820.3101	32.1	1095.22	1254.23
ESH11-10.FFT	kiyaaskoSiSa	S1	diminutive	4423.0786	3710.9399	22.11	732.98	823.78
ESH11-11.FFT	kiyaaskoSiSa	S2	diminutive	4419.4219	3554.6899	28.46	486.41	1052.85
ESH11-12.FFT	kiyaaskoSiSak	S1	diminutive	4398.02	3281.25	28.64	1159.55	707.14
ESH11-13.FFT	kiyaaskoSiSak	S2	diminutive	4397.6704	3007.8101	28.04	928.86	996.74
ESH11-14.FFT	kiyaaskoSiSa	S1	diminutive	4429.9268	3632.8101	31.17	1178.52	1108.02
ESH11-15.FFT	kiyaaskoSiSa	S2	diminutive	4393.291	3593.75	35.77	745.13	1268.37
ESH11-16.FFT	ocawaaSimiSa	S1	diminutive	4315.6699	3359.3799	44.48	1063.13	1584.58
ESH11-17.FFT	ocawaaSimiSa	S2	diminutive	4457.9351	3007.8101	31.73	629.48	1152.51
ESH11-4.FFT	awaaSiS	S1	diminutive	4403.9531	3046.8799	30.66	1013.68	1040.05
ESH11-5.FFT	awaaSiS	S2	diminutive	4527.1045	4531.25	30.65	743.43	1240.48
ESH11-6.FFT	'ci-ocawaaSimiSin'ci	S1	diminutive	4214.8369	3125	29.75	1157.83	785.32
ESH11-7.FFT	'ci-ocawaaSimiSin'ci	S2	diminutive	4462.3599	3554.6899	31.01	724.52	1288.59
ESH11-8.FFT	ocawaaSimiS	S1	diminutive	4546.4653	6406.25	23.04	1019.62	729.51
ESH11-9.FFT	ocawaaSimiS	S2	diminutive	4472.5801	3710.9399	31.4	729.07	1170.4301
ESH11.FFT	apikoSiiS	S1	diminutive	4371.5898	3359.3799	40.99	1046.25	1435.89
ESH12-1.FFT	kiiy-ati-ocawaaSimiSiw	S1	diminutive	4529.8477	4882.8101	37.15	1007.98	1480.75
ESH12-2.FFT	kiiy-ati-ocawaaSimiSiw	s2	diminutive	4434.6421	3203.1299	30.32	866.43	1096.35
ESH12-3.FFT	ociSkwaciiSiS	S1	diminutive	4492.9287	6171.8799	37.9	1341.25	1378.52
ESH12-4.FFT	ociSkwaciiSiS	S2	diminutive	4407.9575	3359.3799	34.15	958.35	1294.55
ESH12-5.FFT	ociSkwaciiSiS	S3	diminutive	4481.0371	3789.0601	38.61	942.27	1613.1
ESH12-6.FFT	wihcikooSiS	S1	diminutive	4371.5498	3437.5	29.01	1213.03	1016.28
ESH12-7.FFT	wihcikooSiS	S2	diminutive	4437.3921	3046.8799	30.86	640.06	1091.83
ESH12.FFT	apikoSiiS	S2	diminutive	4413.7568	3203.1299	37.08	973.39	1618.09
ESH13.FFT	apikoSiiS	S1	diminutive	4405.2324	3359.3799	43.83	1079.34	1638.0699
ESH14.FFT	apikoSiiS	S2	diminutive	4387.144	3203.1299	36.09	985.54	1553.2

Data: Simeon Scott

ESH15.FFT	apikoSiiS	S1	diminutive	4318.5444	3164.0601	30.03	841.75	970.19
ESH16.FFT	kaay-apiSiiS'Sit	S1	diminutive	4267.623	3398.4399	35.14	1097.25	1169.63
ESH17.FFT	kaay-apiSiiS'Sit	S2	diminutive	4367.3584	3320.3101	38.29	1064.25	1420.84
ESH19.FFT	iskweSiS	S2	diminutive	4312.3354	3593.75	31.71	1100.58	1233.29
ESH2.FFT	capaSiS	S2	diminutive	4149.9546	3125	39.65	1014.64	1353.72
ESH20.FFT	iskweSiS	S2	diminutive	4308.9458	3554.6899	31.67	1004.45	1182.8
ESH23.FFT	iSkweSiS	S1	diminutive	4372.6216	3476.5601	30.07	947.26	1092.65
ESH24.FFT	iSkweSiS	S3	diminutive	4450.0767	3164.0601	40.18	1339.15	1721.5601
ESH25.FFT	apiSiiS	S1	diminutive	4397.3086	4296.8799	36.84	918.98	1258.0699
ESH26.FFT	apiSiiS	S2	diminutive	4363.1758	4726.5601	33.88	1034.35	1475.0601
ESH28.FFT	napeSiSa	S2	diminutive	4269.9858	3984.3799	40.55	1032.8199	1559.01
ESH29.FFT	iSkweSiSa	S1	diminutive	4371.6377	3164.0601	49.93	1414.63	1797.1899
ESH3.FFT	awiyaaSiSa	S1	diminutive	4309.1362	3554.6899	41.12	959.42	1502.54
ESH31.FFT	iSkweSiSa	S3	diminutive	4337.1797	3203.1299	44.54	1259.86	1676.79
ESH32.FFT	ocawaaSimiSiwaawa	S1	diminutive	4285.2632	4023.4399	35.45	1061.12	1422.25
ESH33.FFT	ocawaaSimiSiwaawa	S2	diminutive	4254.7251	3085.9399	45.69	1316.42	1482.5699
ESH34.FFT	apiSiiS	S1	diminutive	4468.7954	3398.4399	39.15	1095	1541.13
ESH36.FFT	maanSiiS	S1	diminutive	4350.0161	3046.8799	37.67	1134	1538.53
ESH37.FFT	maanSiiS	S2	diminutive	4432.083	3085.9399	37.61	1245.9	1558.08
ESH38.FFT	aSkiiSiniw	S1	diminutive	4520.0962	4296.8799	41.19	1291.63	1720.61
ESH39.FFT	aSkiiSiniw	S2	diminutive	4508.1426	4531.25	41.96	1103.61	1729.99
ESH4.FFT	awiyaaSiSa	S2	diminutive	4260.7314	4023.4399	38.85	954.99	1578.47
ESH40.FFT	oSki-'SkiiSa	S2	diminutive	4500.6763	3007.8101	30.02	742.05	1139.84
ESH41.FFT	oSki-'SkiiSa	S1	diminutive	4313.0947	3007.8101	34	786.15	1143.38
ESH42.FFT	oSki-'SkiiSa	S3	diminutive	4339.6504	3593.75	26.97	807.64	936.69
ESH43.FFT	n'tawaaSimiSak	S1	diminutive	4452.9878	3515.6299	37.92	1097.54	1321.66

Data: Simeon Scott

ESH44.FFT	n'tawaaSimiSak	S2	diminutive	4402.1855	3398.4399	32.97	829.41	1138.73
ESH45.FFT	SiipiiSiSa	S1	diminutive	4369.0801	3828.1299	34.74	719.37	1330.76
ESH46.FFT	SiipiiSiSa	S2	diminutive	4442.7202	3437.5	38.71	797.72	1415.53
ESH47.FFT	SiipiiSiSa	S3	diminutive	4477.1738	4375	37.4	809.88	1523.15
ESH48.FFT	ey-aapiSaaSininiki	S1	diminutive	4456.813	3164.0601	35.56	1048	1410.6
ESH49.FFT	ey-aapiSaaSininiki	S2	diminutive	4477.6616	3984.3799	34.51	1171.23	1400.24
ESH50.FFT	iSkweSiS	S1	diminutive	4459.8765	4414.0601	35.92	1198.49	1482.08
ESH5.FFT	ocawaaSimiSiwaawa	S2	diminutive	4213.0962	3164.0601	51.22	1116.55	1671.1899
ESH51.FFT	iSkweSiS	S3	diminutive	4416.1655	3750	37.31	1051.1899	1450.22
ESH6.FFT	ocawaaSimiSiwaawa	S1	diminutive	4395.7163	3359.3799	38.46	1243.74	1493.3199
ESH6A.FFT	kiin'kisciapikoSiS	S1	diminutive	4408.4443	3476.5601	47.72	1702.4399	1936.34
ESH7.FFT	k'-apiSiS'Sit	S1	diminutive	4464.9551	3984.3799	40.86	1008.91	1612.42
ESH8.FFT	k'-apiSiS'Sit	S2	diminutive	4431.667	3320.3101	37.87	1160.6801	1527.39
ESH9-1.FFT	awaaSiS	S1	diminutive	4336.1465	3593.75	33.32	900.62	1249.37
ESH9-10.FFT	askihkoS	S1	diminutive	4312.3198	3554.6899	32.93	698.4	1140.35
ESH9-11.FFT	acimoSiSa	S1	diminutive	4182.1528	3359.3799	27.36	914.42	891.2
ESH9-12.FFT	acimoSiSa	S2	diminutive	4234.8086	3476.5601	31.55	664.7	978.45
ESH9-13.FFT	atimoSiSa	S1	diminutive	4356.6763	3359.3799	30.92	867.25	1023.38
ESH9-14.FFT	atimoSiSa	S2	diminutive	4427.7773	4218.75	30.72	575.75	1226.28
ESH9-15.FFT	ocawaaSimiSa	S1	diminutive	4280.1934	3203.1299	37.94	1064.42	1401.71
ESH9-16.FFT	ocawaaSimiSa	S2	diminutive	4310.7104	3789.0601	35.78	769.08	1287.04
ESH9-17.FFT	awaaSiSa	S1	diminutive	4312.5288	3164.0601	27.7	930.39	942.72
ESH9-18.FFT	awaaSiSa	S2	diminutive	4438.0493	3632.8101	33.58	687.19	1165.74
ESH9-19.FFT	awaaSiS	S1	diminutive	4331.0884	3085.9399	30.58	935.3	961.54
ESH9-2.FFT	awaaSiS	S2	diminutive	4378.2773	3007.8101	31.91	1030.42	1132.75
ESH9-20.FFT	awaaSiS	S2	diminutive	4435.2739	3125	33.13	1205.84	1337.1801

Data: Simeon Scott

ESH9-21.FFT	awaaSiSa	S1	diminutive	4404.1416	3125	32.51	777.82	1244.0601
ESH9-22.FFT	awaaSiSa	S2	diminutive	4424.3037	3476.5601	31.42	553.25	1250.6801
ESH9-23.FFT	'waaSiSa	S1	diminutive	4401.2295	3085.9399	30.58	960.45	1224.3
ESH9-24.FFT	'waaSiSa	S2	diminutive	4422.5693	3437.5	32.42	752.98	1204.8101
ESH9-26.FFT	'waaSiSa	S2	diminutive	4661.791	5039.0601	32.43	716.47	1020.09
ESH9-27.FFT	awaaSiS	S1	diminutive	4319.8789	3007.8101	22.5	1280.37	600.29
ESH9-28.FFT	awaaSiS	S2	diminutive	4607.3496	4570.3101	26.6	676.61	697.95
ESH9-29.FFT	ocawaaSimiSa	S1	diminutive	4451.291	3046.8799	33.9	1178.21	1046.25
ESH9-3.FFT	awaaSiS	S1	diminutive	4316.0688	3125	34.88	994.25	1178.76
ESH9-30.FFT	ocawaaSimiSa	S2	diminutive	4495.9375	5117.1899	31.9	692.83	1115.39
ESH9-31.FFT	misk'wayaan'SiSa	S1	diminutive	4510.5288	3007.8101	31.41	668.74	1171.9399
ESH9-32.FFT	misk'wayaan'SiSa	S2	diminutive	4497.8228	4609.3799	37.72	678.19	1353.1801
ESH9-33.FFT	amiskoSiSi-wayaana	S1	diminutive	4322.4971	3359.3799	36.93	783.45	1216
ESH9-34.FFT	amiskoSiSi-wayaana	S2	diminutive	4358.5693	3359.3799	37.21	801.83	1389.6801
ESH9-4.FFT	awaaSiS	S2	diminutive	4401.7017	3671.8799	33.19	811.01	1354.38
ESH9-6.FFT	awaaSiSa	S2	diminutive	4391.1489	3710.9399	32.77	818.65	1210.24
ESH9-7.FFT	miikiwaamiSiS	S1	diminutive	4374.4487	3554.6899	34.83	927.91	1362.59
ESH9-8.FFT	miikiwaamiSiS	S2	diminutive	4393.8945	3554.6899	34.98	878.08	1418.46
ESH9-9.FFT	askihkoSa	S1	diminutive	4308.4941	3085.9399	36.62	1022.04	1268.74
ESH9.FFT	apikoSiiS	S1	diminutive	4467.8828	3476.5601	42.13	1236.39	1791.17
Affricate data:								
ESC1.FFT	kiin'kisciapikoSiS	c1		4467.9673	3828.1299	44.31	1079.5601	1679.35

Data: Simeon Scott

Notes:

1) Initially some kin terms were included in the measurements for the diminutive fricative of this speaker. They were deleted for the final analysis of the diminutive fricative, since they were not really diminutives. They included the terms:

nimiS	'big sister' (baby talk)
nimis	'big sister'
niSiim	'my young brother'
oSima	'young sibling'

2) Also, *cahkapeS,* 'Chahkabesh' was deleted from analysis because it is a name. Because of these deletions of files, there are some file numbers missing in the spreadsheet.

3) Simeon Scott often deleted syllables and in the process some diminutive fricatives. Sometimes these were transcribed in the texts such as *k'-apiSiS'Sit* 'it is little.' Other times they were not shown in the text for example *iSkweSiS* 'girl' was often pronounced with the second syllable missing *iSkw'iS.*

Data: Xavier Sutherland

filename	data	fricative	fricative type	centre of gravity	high amplitude	amplitude	amplitude 1-3000 Hz	amplitude 3-6000 Hz
cs14-1.fft	pisiskkaapamew	s1	non-diminutive s	4665.5498	4570.3101	26.03	807.94	792.59
cs14-2.fft	pisiskkaapamew	s2	non-diminutive s	4538.8965	4101.5601	30.26	679.2	999.32
cs14-3.fft	mistapeskwew	s1	non-diminutive s	4488.6865	5039.0601	25.97	611.49	1032.75
cs14-4.fft	mistapeskwew	s2	non-diminutive s	4502.6841	4531.25	22.93	921.08	854.34
nd14-1.fft	wiiskacaana	s1	non-diminutive s	4310.79	3203.1299	33.92	1204.55	1033.5699
cs15-1.fft	kiskisipaniw	s2	non-diminutive s	4506.8184	4375	17.14	591.67	585.5
cs15-2.fft	wayes	s1	non-diminutive s	4339.9312	3281.25	28.1	1202.5601	794.73
cs15-3.fft	piisimo-	s1	non-diminutive s	4479.627	3046.8799	18.81	902.17	625.52
cs15-4.fft	e-'t'-iisi-kihtohtet	s1	non-diminutive s	4353.0186	3046.8799	23.31	1037.3	846.43
cs15-5.fft	iisi-taapakwet	s1	non-diminutive s	4397.9736	3203.1299	24.33	829.18	748.45
cs15-6.fft	wesaa	s1	non-diminutive s	4721.0479	6289.0601	23.2	937.93	482.76
cs15-7.fft	-kiSaasiket	s1	non-diminutive s	4723.5156	4609.3799	17.53	686.48	407.96
cs15-8.fft	piisim-	s1	non-diminutive s	4557.376	4687.5	17.5	829.79	560.07
cs18-1.fft	kiskisopaniw	s1	non-diminutive s	4803.8174	5195.3101	25.52	735.34	598.25
cs18-10.ff	ayiitahamaasaw	s1	non-diminutive s	4706.3667	5156.25	21.74	484.96	599.95
cs18-11.ff	saasaa	s1	non-diminutive s	4656.5034	6875	22.23	697.29	641.81
cs18-12.ff	saasaa	s2	non-diminutive s	4815.5391	7617.1899	25.29	707.33	360.82
cs18-13.ff	kisiteSimewmanaa	s1	non-diminutive s	4801.3525	5390.6299	23.27	741.87	418.51
cs18-2.fft	kiskisopaniw	s2	non-diminutive s	4803.8174	5195.3101	25.52	735.34	598.25
cs18-3.fft	askiiniw	s1	non-diminutive s	4700.3169	7656.25	29.06	1068.03	776.7
cs18-4.fft	miwatihkaasow	s1	non-diminutive s	4536.4409	4843.75	27.75	872.53	918.04
cs18-5.fft	wiin'eSinaakosit	s1	non-diminutive s	4510.5723	4882.8101	22.08	724.65	687.82
cs18-6.fft	pisiskihtawehkaasow	s1	non-diminutive s	4807.3149	5507.8101	30.73	807.9	722.17
cs18-7.fft	pisiskihtawehkaasow	s2	non-diminutive s	4735.6992	5390.6299	28.84	1064.59	698.83
cs18-8.fft	pisiskihtawehkaasow	s3	non-diminutive s	4579.9458	4609.3799	27.05	635.33	785.21
cs18-9.fft	maaht'iisa	s1	non-diminutive s	4556.9287	4687.5	24.77	993.87	708.37
cs19-1.fft	-taahcipohitisoyaan	s1	non-diminutive s	4417.4438	4140.6299	41.28	1381.9301	1727.5601
cs19-10.ff	maskwa	s1	non-diminutive s	4408.105	4296.8799	34.36	1158.53	1363.79
cs19-11.ff	wesaa	s1	non-diminutive s	4460.248	4492.1899	31.71	1193.8101	1298.58
cs19-12.ff	n'ka-wiisakaapin	s1	non-diminutive s	4362.5752	4296.8799	39.43	1293.42	1533.98

cs19-13.ff	e-micisonici	s1	non-diminutive s	4255.0513	4023.4399	38.92	1328.36	1552.71
cs19-14.ff	kaa-itwehkaasot	s1	non-diminutive s	4396.6538	4296.8799	40.62	1278.49	1523.08
cs19-15.ff	sihkosiwak	s1	non-diminutive s	4513.75	4375	34.91	1156.1899	1355.4301
cs19-16.ff	sihkosiwak	s2	non-diminutive s	4412.2036	4296.8799	37.45	1190.02	1555.08
cs19-2.fft	isa	s1	non-diminutive s	4273.061	3867.1899	41.92	1300.6801	1661.38
cs19-3.fft	maskwa	s1	non-diminutive s	4360.5664	4453.1299	33.44	1328.14	1398.01
cs19-4.fft	kaa-mate-waasitek	s1	non-diminutive s	4489.2085	4726.5601	31.05	1158.4399	1151.77
cs19-5.fft	awasite	s1	non-diminutive s	4511.4419	4609.3799	36.4	1330.6801	1395.5601
cs19-6.fft	kikii-wiisakaapihtay	s1	non-diminutive s	4440.6201	4335.9399	37.5	1216.1	1413.35
cs19-7.fft	misiwe	s1	non-diminutive s	4467.4702	4375	35.72	912.08	1419.61
cs19-8.fft	wiisakaapin	s1	non-diminutive s	4404.2383	4414.0601	38.21	1180.8101	1453.87
cs19-9.fft	awas	s1	non-diminutive s	4429.1533	4492.1899	35.61	1433.51	1559.95
cs21-1.fft	paastaaamowin	s1	non-diminutive s	4240.271	3750	49.1	1529.39	1951.51
cs21-2.fft	niiSokamakisiwaakopan	s1	non-diminutive s	4336.2021	3828.1299	35.03	1254.14	1395.08
cs21-3.fft	tapiskooc	s1	non-diminutive s	4274.8428	3007.8101	56.74	1774.48	1806.03
cs21-4.fft	isi-kakwwecimew	s1	non-diminutive s	4278.1816	3515.6299	46.3	1509.34	1773.46
cs21-5.fft	misiwe	s1	non-diminutive s	4305.9785	3281.25	47.92	1440.6801	1917.75
cs21-6.fft	isa	s1	non-diminutive s	4329.4546	4023.4399	34.76	1139.8101	1368.47
cs22-1.fft	sakimewa	s1	non-diminutive s	4424.1499	5273.4399	27.11	960.28	1036.45
cs22-2.fft	pimmaat'sinaaawaaw	s1	non-diminutive s	4395.4727	4492.1899	34.09	1337.29	1301.37
cs22-3.fft	e-kii-tootamaasocik	s1	non-diminutive s	4330.2129	3906.25	38.13	1048.72	1546.55
cs23-1.fft	ki-kisiwaasiw	s1	non-diminutive s	4420.8784	3632.8101	25.48	796.36	911.17
cs23-2.fft	ki-kisiwaasiw	s2	non-diminutive s	4409.8511	3046.8799	25.95	763.13	1024.5
cs23-3.fft	eSi-pasitepanik	s1	non-diminutive s	4691.9409	7929.6899	26.6	658.86	638.51
cs23-4.fft	e-kisisaawet	s1	non-diminutive s	4506.8359	7851.5601	27.95	865.44	658.49
cs23-5.fft	e-kisisaawet	s2	non-diminutive s	4464.4365	7812.5	30.03	870.57	702.02
cs26-1.fft	piponasiwak	s1	non-diminutive s	4526.8618	3007.8101	18.48	772.64	573.24
cs26-2.fft	kaa-'Sinihkaasocik	s1	non-diminutive s	4402.8892	3125	21.82	824.67	676.81
cs26-3.fft	miicisoowak	s1	non-diminutive s	4264.4863	3007.8101	27.22	1130.25	951.29
cs26-4.fft	miicisocik	s1	non-diminutive s	4370.3779	3750	27.53	972.15	887.14
cs26-5.fft	okaaSakaskiweesiw	s1	non-diminutive s	4224.6519	3046.8799	29.59	1098.85	847.52

csh14-1.ff	iSkwaa-	S1	non-diminutive S	4336.0415	3398.4399	46.58	1644.15	1325.63
csh14-2.ff	eSi-piihtoomot	S1	non-diminutive S	4294.1143	3125	41.42	1376.36	1346.17
cs14-3.fft	eSi-pohci-wepiSkawaat	S1	non-diminutive S	4488.6865	5039.0601	25.97	611.49	1032.75
csh14-4.ff	eSi-pohci-wepiSkawaat	S2	non-diminutive S	4220.4858	3164.0601	43.92	1377.25	1259.11
csh14-5.ff	eti-iSi-kihcihnaat	S1	non-diminutive S	4383.2061	3007.8101	39.38	1047.58	1239.45
csh14-6.ff	e-'t'-iiSihnaat	S1	non-diminutive S	4428.8911	3085.9399	36.3	1301.21	1194.7
csh14-7.ff	iiSkwewa	S1	non-diminutive S	4536.6523	4843.75	22.34	727.28	855.59
csh15-1.ff	iSinaakwan	S1	non-diminutive S	4281.937	3359.3799	26.16	830.94	821.35
csh15-2.ff	iSinaakwan	S1	non-diminutive S	4349.6509	3007.8101	31.15	1109.96	1018.42
csh15-3.ff	kinweS	S1	non-diminutive S	4201.623	3281.25	31.64	1162.87	905.45
csh15-4.ff	aaSay	S1	non-diminutive S	4359.8638	3125	29.74	956.7	1056.71
csh15-5.ff	aaSay	S1	non-diminutive S	4370.6187	3007.8101	31.8	1178.87	1017.43
csh15-7.ff	-kiSaasiket	S1	non-diminutive S	4420.6099	3515.6299	27.41	842.34	1014.89
csh18-1.ff	n'tahaaSakaamew	S1	non-diminutive S	4644.4985	4921.8799	29.94	912.86	980.29
csh18-10.f	n'k'iiSkwaa-Sihtaan	S2	non-diminutive S	4569.8887	5742.1899	35.34	1256.61	1229.27
csh18-11.f	waaSa	S1	non-diminutive S	4464.4438	3320.3101	30.56	881.61	1184.55
csh18-12.f	kisiteSimewmanaa	S1	non-diminutive S	4449.2275	3906.25	35.95	1054.7	1408.25
csh18-2.ff	aaSay	S1	non-diminutive S	4405.126	3437.5	37.33	1148.83	1395.34
csh18-3.ff	aaSay	S1	non-diminutive S	4416.3374	3320.3101	39.87	1402.85	1543.0601
csh18-5.ff	n'tehaaSakaamet	S1	non-diminutive S	4454.7974	3476.5601	30.09	1015.21	1093.26
csh18-6.ff	kaa-pimaaSakaamet	S1	non-diminutive S	4442.75	3593.75	28.75	985.82	1101.12
csh18-7.ff	wiin'eSinaakosit	S1	non-diminutive S	4409.1982	3398.4399	36.06	1025.52	1331.35
csh18-9.ff	aaSay	S1	non-diminutive S	4404.8877	3476.5601	42.72	1336.9399	1397.84
csh19-1.ff	nihcikiSinici	S1	non-diminutive S	4282.0352	3515.6299	48.28	1317.7	1804.1
csh19-10.f	niSkiiSikohk	S1	non-diminutive S	4343.0991	3515.6299	46.07	1587.89	1851.51
csh19-11.f	niSkiiSikohk	S2	non-diminutive S	4323.6348	3007.8101	43.35	1572.58	1671.79
csh19-12.f	wayeS	S1	non-diminutive S	4198.6826	3437.5	43.56	1386.62	1732.61
csh19-13.f	kaa-iSi-ayitaapiyaan	S1	non-diminutive S	4275.0571	3359.3799	47.08	1230.37	1725.8
csh19-15.f	niSkiiSikohk	S2	non-diminutive S	4287.75	3281.25	46.35	1368.53	1729.28
csh19-16.f	kaa-miSaaniki	S1	non-diminutive S	4253.647	3203.1299	49.42	1683.41	1758.4399
csh19-17.f	kaa-k'-iiSi-	S1	non-diminutive S	4294.6016	3164.0601	41.6	1482.1	1511.3

csh19-18.f	eti-pimiSihk	S1	non-diminutive S	4303.3774	3125	47.46	1486.84	1827.16
csh19-19.f	Sa	S1	non-diminutive S	4267.8198	3632.8101	43.34	1424.26	1620.23
csh19-2.ff	pwaaaamoSi	S1	non-diminutive S	4222.1699	3242.1899	58.69	1614.01	1935.08
csh19-20.f	niSiiwataan	S1	non-diminutive S	4302.7847	3398.4399	46.49	1341.72	1834.4
csh19-21.f	SaakweSiwak	S1	non-diminutive S	4135.6699	3281.25	47.49	1422.4301	1569.3
csh19-22.f	SaakweSiwak	S2	non-diminutive S	4289.9336	3828.1299	45.7	1415.71	1829.62
csh19-23.f	k'iiSi-wepinamoopan	S1	non-diminutive S	4262.8115	3437.5	47.11	1743.24	1741.3
csh19-24.f	otootakiSim	S1	non-diminutive S	4370.0068	3828.1299	44.69	1737.72	1976.86
csh19-3.ff	kaweSimoyaan	S1	non-diminutive S	4285.5835	3125	58.62	1655.04	1839.54
csh19-4.ff	kaa-miSaak	S1	non-diminutive S	4344.937	3359.3799	47.3	1534.74	2012.8101
csh19-5.ff	e'-Si	S1	non-diminutive S	4229.4966	3281.25	54.11	1549.42	1912.26
csh19-6.ff	pikiSeyaak	S1	non-diminutive S	4327.9507	3671.8799	49.89	1728.51	2030.28
csh19-7.ff	n'tiSinen	S1	non-diminutive S	4323.2832	3398.4399	50.55	1836.0699	2024.6
csh19-8.ff	kaa-iSi-papaaSkicenamaapaan	S1	non-diminutive S	4327.0049	4179.6899	35.02	1454.46	1396.25
csh19-9.ff	kaa-iSi-papaaSkicenamaapaan	S2	non-diminutive S	4295.4839	3046.8799	41.73	1835.99	1501.65
csh21-1.ff	iSinihkaatew'ma	S1	non-diminutive S	4319.292	3515.6299	49.01	1455.1899	1894.33
csh21-2.ff	niiSokamakisiwaakopan	S1	non-diminutive S	4387.3535	3046.8799	51.29	1677.5601	1935.76
csh21-3.ff	etaSiihkecik	S1	non-diminutive S	4337.7017	3710.9399	48.13	1556.38	1938.6
csh21-4.ff	aaSay	S1	non-diminutive S	4274.7466	3203.1299	48.47	1458.4	1767.36
csh21-5.ff	Si-mihcetin'c'	S1	non-diminutive S	4308.9917	3515.6299	47.02	1374.4	1730.62
csh21-6.ff	maaSkooc	S1	non-diminutive S	4410.0342	3828.1299	42.05	1517.15	1757.6899
csh22-1.ff	taSine	S1	non-diminutive S	4326.2295	3242.1899	43.75	1241.51	1803.92
csh22-2.ff	taSine	S1	non-diminutive S	4352.5781	3437.5	48.54	1510.02	1961.65
csh22-3.ff	kaa-'Si-wanawiit	S1	non-diminutive S	4269.541	3164.0601	54.97	1845.85	1985.05
csh22-4.ff	kapaSimow	S1	non-diminutive S	4330.7217	3750	48.15	1409.11	1876.49
csh23-1.ff	Kaa-'Si-we-wepiSkatat	S1	non-diminutive S	4393.252	3125	33.41	1217.03	1195.77
csh23-2.ff	e-kii-kiSiwaahikot	S1	non-diminutive S	4351.6978	3046.8799	42.91	1469.01	1205.58
csh23-3.ff	Kaa-iSitakaayaak	S1	non-diminutive S	4480.6748	3007.8101	32.83	889.43	1193.15
csh23-4.ff	kaa-'Sinaakosit	S1	non-diminutive S	4246.4292	3007.8101	35.1	1019.92	1128.08
csh23-5.ff	maak'eSi-pasitepanik	S1	non-diminutive S	4262.3691	3671.8799	32.57	1043.37	1120.24
csh23-6.ff	k'at'-iiSiwanawiit	S1	non-diminutive S	4251.2852	3085.9399	40.12	1364.7	1212.65

csh26-2.ff	pwaamoSi	S1	non-diminutive S	4383.5884	3007.8101	41.03	1347.09	1089.2
csh26-3.ff	kiiSikaanik	S1	non-diminutive S	4410.5977	3515.6299	32.64	1017.36	1138.87
csh26-4.ff	maak'e-ti-miSikiticik	S1	non-diminutive S	4284.7114	3515.6299	38.26	1161.0699	1154.4301
csh26-5.ff	kiSapin	S1	non-diminutive S	4350.8345	3359.3799	32.28	909.7	901.62
csh26-6.ff	kiSapin	S1	non-diminutive S	4373.0762	3203.1299	36.72	1053.38	1116.38
csh26-7.ff	okaaSakaskiweesiw	S1	non-diminutive S	4214.9233	3554.6899	36.86	1201.87	1235
es14-1.fft	wiiskacaaniSi-wayaana	s1	diminutive	4426.3438	3515.6299	36.94	1242.78	1397.46
es14-2.fft	wiiskacaaniS	s1	diminutive	4298.5186	3515.6299	37.49	1224.84	1207.8
es26-1.fft	poosikaaciS	s1	diminutive	4138.231	3203.1299	41.96	1696	1121.46
esh14-1.ff	wiiskacaaniSi-wayaana	S1	diminutive	4408.1528	3085.9399	38.82	1197.67	1147.24
esh14-2.ff	wiiskacaaniS	S1	diminutive	4342.9585	3281.25	39.31	1120.6	1242.3
esh15-1.ff	kaa-'piSiiS'Sit	S1	diminutive	4405.5513	3671.8799	25.28	911.2	908.54
esh15-10	waapikoSiiS	S2	diminutive	4346.9507	3320.3101	25.96	1080.21	932.43
esh15-11.f	waapikoSiiS	S1	diminutive	4348.8892	3007.8101	27.71	994.65	849.64
esh15-12.f	waapikoSiiS	S2	diminutive	4413.7031	3007.8101	22.53	927.37	842.42
esh15-13.f	kaa-apiSiiS'Sit	S1	diminutive	4216.4937	3007.8101	25.18	847.24	716.27
esh15-14.f	kaa-apiSiiS'Sit	S2 & S3	diminutive	4418.6099	3476.5601	20.61	792.81	715.79
esh15-2.ff	kaa-piSiiS'Sit	S2 & S3	diminutive	4381.5522	3398.4399	28.83	953.45	1031.62
esh15-3.ff	waapikoSiiS	S1	diminutive	4389.9761	3281.25	25.41	979.46	882.64
esh15-4.ff	waapikoSiiS	S2	diminutive	4275.8066	3007.8101	25.37	872.11	791.11
esh15-5.ff	waapikoSiiS	S1	diminutive	4354.3345	3242.1899	25.39	946.15	819.02
esh15-6.ff	waapikoSiiS	S2	diminutive	4238.6553	3281.25	25.11	888.9	705.48
esh15-7.ff	waapikoSiiS	S1	diminutive	4120.522	3164.0601	27.32	964.26	766.1
esh15-8.ff	waapikoSiiS	S2	diminutive	4227.0576	3320.3101	21.97	638.33	641.71
esh15-9.ff	waapikoSiiS	S1	diminutive	4353.6699	3125	31.06	1040.87	981.59
esh18-10.f	awiyaaSiiSak	S2	diminutive	4356.7407	3398.4399	29.48	783.93	979.14
esh18-11.f	awiyaaSiiSa	S1	diminutive	4395.4868	3007.8101	33.48	1219.58	1243.96
esh18-12.f	awiyaaSiiSa	S2	diminutive	4372.4141	3632.8101	34.29	1045.99	1229.91
esh18-13.f	awiyaaSiiSak	S1	diminutive	4295.9102	3515.6299	34.09	1047.1801	1111.1899
esh18-14.f	awiyaaSiiSak	S2	diminutive	4365.082	3632.8101	31.94	894.8	1191.78
esh18-2.ff	awiyaaSiiSak	S2	diminutive	4358.3804	3398.4399	30.58	726.63	1058.61

esh18-3.ff	wiyaaSiiSak	S1	diminutive	4421.8926	3007.8101	34.86	1082.14	1189.14
esh18-4.ff	wiyaaSiiSak	S2	diminutive	4419.0957	3007.8101	27.93	723.99	1158.46
esh18-5.ff	awiyaaSiiSak	S1	diminutive	4408.6006	3007.8101	38.76	1293.02	1314.9399
esh18-6.ff	awiyaaSiiSak	S2	diminutive	4423.251	3007.8101	30.38	1006.77	1138.3199
esh18-7.ff	awiyaaSiiSak	S1	diminutive	4329.5737	3007.8101	38.71	1245.86	1372.89
esh18-8.ff	awiyaaSiiSak	S2	diminutive	4329.5737	3007.8101	38.71	1245.86	1372.89
esh18-9.ff	awiyaaSiiSak	S1	diminutive	4323.5117	3789.0601	30.46	1002.26	1093.1899
esh19-1.ff	miiniSa	S1	diminutive	4329.2852	3593.75	50.16	1582.22	2109.47
esh19-10.f	miiniSa	S1	diminutive	4304.3125	3398.4399	53.43	1634.62	2044.03
esh19-11.f	nisto-minikoSiS	S1	diminutive	4217.585	3046.8799	42	1695.75	1487.5601
esh19-12.f	nisto-minikoSiS	S2	diminutive	4266.3354	3046.8799	44.54	1606.11	1585.0601
esh19-13.f	awiyaaSiiSak	S2	diminutive	4328.644	4492.1899	44.75	1529.61	1881.2
esh19-14.f	toowiy-awiyaaSiiSak	S1	diminutive	4308.7417	3476.5601	36.97	1264.42	1546.64
esh19-15.f	toowiy-awiyaaSiiSak	S2	diminutive	4308.127	3554.6899	36.76	1172.84	1450.85
esh19-16.f	aawiyaaSiiSak	S1	diminutive	4124.8501	3671.8799	41.24	1184.17	1547.14
esh19-17.f	aawiyaaSiiSak	S2	diminutive	4134.7983	3203.1299	42.78	1361.12	1454.66
esh19-2.ff	miiniSa	S1	diminutive	4232.0703	3359.3799	44.95	1463.86	1744.5699
esh19-3.ff	miiniSa	S1	diminutive	4173.0669	3398.4399	40.21	1470.84	1560.5699
esh19-4.ff	maniSiiS	S1	diminutive	4320.0439	3750	48.41	1747.58	2010.12
esh19-5.ff	maniSiiS	S2	diminutive	4257.9272	3007.8101	47.78	1641.1	1831.8
esh19-6.ff	apiSiiS	S1	diminutive	4258.1826	3007.8101	46.17	1667.22	1832.24
esh19-7.ff	apiSiiS	S2	diminutive	4222.9268	3085.9399	46.31	1761.9399	1834.14
esh19-8.ff	apiSiiS	S1	diminutive	4267.0742	3437.5	44.72	1430.72	1769.11
esh19-9.ff	apiSiiS	S2	diminutive	4254.9443	3359.3799	44.49	1526.9399	1661.21
esh21-1	awaaSiSak	S1						
esh21-2.ff	awaaSiSak	S2	diminutive	4330.6919	3242.1899	50.21	1613.86	1918.17
esh21-5.ff	wiici--'waaSiSiwaawa	S1	diminutive	4269.8716	3398.4399	47.85	1470.24	1755.8101
esh22-1.ff	awiyaaSiiSak	S1	diminutive	4336.2905	3046.8799	46.61	1501.29	1773.9399
esh23-1.ff	awiyaaSiiSi-pimiy	S1	diminutive	4365.6074	3007.8101	39.56	1029.6801	1295.02
esh23-2.ff	awiyaaSiiSi-pimiy	S2	diminutive	4365.6074	3007.8101	39.56	1029.6801	1295.02
esh26-1.ff	e-apiSiiS'Sicik	S1	diminutive	4426.9858	3046.8799	35.34	861.43	1086.95

esh26-2.ff	e-apiSiiS'Sicik	S2	diminutive	4170.8652	3593.75	32.86	854.81	1016.23
esh26-3.ff	waapikoSiiSak	S1	diminutive	4202.7783	3359.3799	37.26	1310.98	1107.08
esh26-4.ff	waapikoSiiSak	S2	diminutive	4365.6597	3281.25	34.99	1107.11	1264
esh26-5.ff	poosikaaciS	S1	diminutive	4200.5127	3398.4399	42.59	1317.83	1272.86
esh26-6.ff	waapikoSiiSak	S1	diminutive	4236.6963	3398.4399	37.89	1062.27	1111.45
esh26-7.ff	waapikoSiiSak	S2	diminutive	4397.5391	3242.1899	30.52	949.44	1044.6
esh26-8.ff	waapikoSiiS	S1	diminutive	4361.042	3515.6299	33.2	932.54	985.96
esh26-9.ff	waapikoSiiS	S1	diminutive	4365.8315	3085.9399	30.34	1004.86	1055.21

Data: Gilbert Faries

filename	data	fricative	fricative type	centre of gravity	high amplitude	amplitude	amplitude 1-3000 Hz	amplitude 3-6000 Hz
cs45-1.fft	nisooye	s1	non-diminutive s	3757.4614	3359.3799	12.8	659.79	284.33
csh45-2.fft	e-ytahamaasot	s1	non-diminutive s	3654.3843	3437.5	11.9	860.66	241.72
cs46-1.fft	niikaanisit	s1	non-diminutive s	3643.9048	3085.9399	16.72	928.1	347.9
cs46-2.fft	aawas	s1	non-diminutive s	4196.8613	3632.8101	16.01	937.63	492.19
cs46-3.fft	wesa	s1	non-diminutive s	3871.1086	3281.25	14.94	934	343.58
cs47-1.fft	pilesiwak	s1	non-diminutive s	4341.6519	3164.0601	17.8	1134.76	510.7
cs47-2.fft	omisita	s1	non-diminutive s	3819.3721	3476.5601	12.83	827.69	211.74
cs47-3.fft	osita	s1	non-diminutive s	4042.271	3281.25	17.62	1123.55	500.44
cs47-4.fft	saakahikanihk	s1	non-diminutive s	4478.5967	4843.75	27.1	1072.23	879.08
cs47-5.fft	e-kisiwaasit	s1	non-diminutive s	4355.5615	3476.5601	15.42	910.84	514.86
cs47-6.fft	osita	s1	non-diminutive s	4499.543	3476.5601	18.65	1134.3	586.64
cs49-1.fft	eSi-kiskisiyan	s1	non-diminutive s	4529.0542	4609.3799	30.94	1066.51	977.18
cs49-10.fft	misawaac	s1	non-diminutive s	4406.0474	4687.5	26.19	1356.26	1072.99
cs49-2.fft	eSi-kiskisiyan	s2	non-diminutive s	4590.6763	4609.3799	26.18	795.54	843.8
cs49-3.fft	n'kiskisihtay	s1	non-diminutive s	4714.2734	5664.0601	27.11	949.84	694.98
cs49-4.fft	n'kiskisihtay	s2	non-diminutive s	4535.1558	5664.0601	20.24	916.94	656.71
cs49-5.fft	taapiskoc	s1	non-diminutive s	4411.6836	3125	30.12	1382.9301	1145.8
cs49-6.fft	n'tispiihcisiinaan	s2	non-diminutive s	4528.1221	4921.8799	22.89	957.13	790.28
cs49-7.fft	n'kisiwaasinan	s1	non-diminutive s	4458.6133	4570.3101	22.79	966.95	872.95
cs49-8.fft	n'kisiwaasinan	s2	non-diminutive s	4510.6719	4921.8799	21.48	1089.99	847.85
cs49-9.fft	e-kii-paasicipotek	s1	non-diminutive s	4284.8525	3710.9399	27.58	1178.49	1005.43
csh45-1.fft	e-miSalik	S1	non-diminutive S	3919.0706	3476.5601	28.78	1173.65	939.52
csh46-1.fft	piiliS	S1	non-diminutive S	4016.302	3359.3799	32.72	950.93	945.22

csh46-2.fft	piiliS	S1	non-diminutive S	3804.7805	3398.4399	21.18	1045.08	570.96
csh47-1.fft	wehc'-iiSinaakwanilik	S1	non-diminutive S	4054.5261	3515.6299	29.96	708.3	914.74
csh47-2.fft	e-wi-makoSecik	S1	non-diminutive S	3901.8167	3164.0601	29.93	1333.42	867.7
csh47-3.fft	e-makoSecik	S1	non-diminutive S	4127.3037	3320.3101	30.36	1136.36	1054.13
csh47-4.fft	kii-pimiciSahwew	S1	non-diminutive S	4124.6494	3320.3101	33.65	1360.13	998.73
csh47-5.fft	k'-iiSi-wepiSkam	S1	non-diminutive S	4089.6304	3085.9399	26.21	1233.22	653.7
csh47-6.fft	k'-iiSi-wepiSkam	S2	non-diminutive S	4071.782	3554.6899	28.44	1359.73	979.13
csh49-1.fft	eSi-kiskisiyan	S1	non-diminutive S	4363.9648	3554.6899	30.56	1044.74	1144.2
csh49-10.fft	kaa-peci-miSakaal'ci	S1	non-diminutive S	4312.7148	3437.5	35.83	1169.3101	1233.0699
csh49-11.fft	ispiS	S1	non-diminutive S	4353.6475	3242.1899	26.43	1168.6801	988.27
csh49-2.fft	takoSinopanak	S1	non-diminutive S	4297.8628	3085.9399	23.48	1089.28	894.53
csh49-3.fft	miSakaapanak	S1	non-diminutive S	4331.8994	3085.9399	34.36	1178.1899	1167.92
csh49-4.fft	maan'-e-miSakacik	S1	non-diminutive S	4333.5454	3476.5601	26.37	1024.3	983.34
csh49-5.fft	piiliS	S1	non-diminutive S	4405.2266	4531.25	28.19	1177.42	1151.48
csh49-6.fft	nimaaSihkaanaan	S1	non-diminutive S	4364.9238	3476.5601	34.35	975.38	1278.51
csh49-7.fft	n'Siihkihikonaanak	S1	non-diminutive S	4388.3516	3398.4399	32.74	1126.16	1321.97
csh49-8.fft	SiiSiipak	S1	non-diminutive S	4321.6216	3398.4399	25.26	985.17	955.22
csh49-9.fft	SiiSiipak	S2	non-diminutive S	4321.2979	3437.5	33.12	1078.67	1153.64
esh45-1.fft	SiipiiSiSihk	S1	diminutive	4065.645	3164.0601	18.42	760.6	405.9
esh45-2.fft	SiipiiSiSihk	S2	diminutive	3837.615	3437.5	23	801.28	670.81
esh45-3.fft	SiipiiSiSihk	S3	diminutive	3901.2485	3437.5	30.31	754.69	729.48
esh46-1.fft	'wiyaaSiiS	S1	diminutive	3861.0627	3320.3101	27.14	1093.47	830.19
esh46-2.fft	'wiyaaSiiS	S2	diminutive	3760.2302	3320.3101	24.99	920.54	635.74
esh46-3.fft	'wiyaaSiiS	S1	diminutive	4038.9766	3359.3799	27.82	1339.27	939
esh46-4.fft	'wiyaaSiiS	S2	diminutive	4043.3691	3398.4399	27.89	1035.3101	895.1
esh46-5.fft	kitapiSiiS'Sin	S1	diminutive	3916.6506	3437.5	30.87	1137.83	915.03

esh46-6.fft	kitapiSiiS'Sin	S2&3	diminutive	4068.856	3281.25	30.46	1075.62	982.69
esh46-7.fft	e-'piSiiS'iyan	S1	diminutive	3986.8958	3515.6299	27.35	1078.15	740.81
esh46-8.fft	e-'piSiiS'iyan	S2	diminutive	3918.5713	3476.5601	31.78	960.69	893.24
esh47-1.fft	weyaaSiiSak	S1	diminutive	4075.6204	3320.3101	29.61	1257.42	899.67
esh47-2.fft	weyaaSiiSak	S2	diminutive	4051.6885	3242.1899	37.45	987.72	1002.24
esh49-1.fft	maan'SiiS	S1	diminutive	4330.2847	3593.75	32.47	1022.69	1192.58
esh49-2.fft	maan'SiiS	S2	diminutive	4389.9585	3554.6899	40.8	1083.9399	1359.41
esh49-3.fft	ocawaaSimiSiwaawa	S1	diminutive	4363.2588	3320.3101	29.19	1285.26	1108.89
esh49-4.fft	ocawaaSimiSiwaawa	S2	diminutive	4403.2603	3085.9399	28.97	1284.91	1230.61
esh49-5.fft	awaaSiSak	S1	diminutive	4365.7837	4531.25	35.03	1355.95	1333.38
esh49-6.fft	awaaSiSak	S2	diminutive	4338.5781	3164.0601	28.73	1024.79	1030.87
esh49-7.fft	awaaSiSak	S1	diminutive	4387.3555	3476.5601	38.5	1483.14	1402.8
esh49-8.fft	awaaSiS	S1	diminutive	4371.7031	3398.4399	29.41	1259.1	1263.45
esh49-9.fft	awaaSiS	S2	diminutive	4320.6616	3085.9399	26.39	1068.0601	1010.46
Affricates								
ec49-1.fft	ocawaaSimiSiwaawa	c	diminutive c	4300.1802	3906.25	22.59	1006.53	850.67

Data: Sophie Gunner

filename	data	fricative	fricative type	centre of gravity	high amplitude	amplitude	amplitude 1-3000 Hz	amplitude 3-6000 Hz
CS50-1.FFT	n'siikinen	s1	non-diminutive s	4336.0474	3359.3799	22.22	797	777.4
CS50-2.FFT	misiwe	s1	non-diminutive s	4350.7231	3476.5601	39.49	805.87	1296.5
CS50-3.FFT	e'ti-paasot	s1	non-diminutive s	3881.4822	3085.9399	19.99	1001.84	539.27
CS50-4.FFT	pimaatisiyaan	s1	non-diminutive s	4339.4282	3398.4399	26.17	933.91	844.82
CS51-1.FFT	misiwe	s1	non-diminutive s	4409.8032	3945.3101	38.85	873.7	1366.23
CS51-2.FFT	etahkwapisocik	s1	non-diminutive s	4344.9849	3398.4399	41.69	1423.63	1433.4301
CS51-3.FFT	paasikaatewa	s1	non-diminutive s	4366.002	4375	32.07	974.73	1155.72
CS51-4.FFT	e-sakaa	s1	non-diminutive s	4385.0962	4453.1299	29.75	725.23	1061.14
CS51-5.FFT	e-p'matisiyaahk	s1	non-diminutive s	4293.0176	3203.1299	26.71	860.95	791.89
CS51-6.FFT	kaa-p'maatisiicik	s1	non-diminutive s	4362.6729	4414.0601	33.89	872.02	1261.38
CS52-1.FFT	tahto-misit	s1	non-diminutive s	4428.1997	3125	40.7	1535.03	1609.05
CS52-10.FFT	e-'skwekihaakaniwit	s1	non-diminutive s	4461.481	3828.1299	40.13	1465.9301	1591.08
CS52-11.FFT	niiswaas	s1	non-diminutive s	4482.498	3242.1899	35.1	1166.85	1103.9301
CS52-12.FFT	misit	s1	non-diminutive s	4441.9678	3085.9399	37.86	1225.73	1198.9
CS52-13.FFT	piiskaakan	s1	non-diminutive s	4383.9551	3125	34.89	1221.8101	1315.8
CS52-14.FFT	palaciisa	s1	non-diminutive s	4396.8022	3281.25	37.41	1079.98	1348.49
CS52-2.FFT	kitiskwaaskohtaan	s1	non-diminutive s	4413.6558	3671.8799	39.02	1692.65	1634.05
CS52-3.FFT	kimistikoma	s1	non-diminutive s	4372.8281	3632.8101	47.87	1738.64	1929.8
CS52-4.FFT	kiiy-aapatisiwak	s1	non-diminutive s	4430.3442	3398.4399	40.75	1294.99	1452.84
CS52-5.FFT	niiso	s1	non-diminutive s	4343.6973	3242.1899	50.05	1612.48	1931.65
CS52-6.FFT	e-'t'-iiskweekisit	s1	non-diminutive s	4452.3276	3398.4399	38.93	1555.09	1522.3
CS52-7.FFT	e-'t'-iiskweekisit	s2	non-diminutive s	4469.8716	4843.75	35.85	1500.61	1457.0601
CS52-8.FFT	n'kotwaas	s1	non-diminutive s	4387.8032	3789.0601	40.43	1328.5601	1445.16

CS52-9.FFT	misit	s1	non-diminutive s	4259.8086	3046.8799	46.15	1530.76	1476.78
CS53-1.FFT	mooso-wayaan	s1	non-diminutive s	4399.7593	3398.4399	35.3	1337.4	1338.4399
CS53-10.FFT	misiwe	s1	non-diminutive s	4464.6606	4140.6299	37.71	1121.41	1307.66
CS53-11.FFT	ositiyehk	s1	non-diminutive s	4406.1968	4296.8799	34.59	1337.51	1403.62
CS53-12.FFT	aasaam	s1	non-diminutive s	4488.5117	4843.75	29.88	1374.23	1256.86
CS53-13.FFT	asaamak	s1	non-diminutive s	4544.3496	4570.3101	34.86	1239.01	1305.49
CS53-2.FFT	moos'-'iyaan	s1	non-diminutive s	4350.1641	4257.8101	33.26	1183.5601	1360.5699
CS53-3.FFT	moos'-'iyaan'SiS	s1	non-diminutive s	4343.627	3281.25	34.99	1061.97	1181.16
CS53-4.FFT	aapatisiiwin	s1	non-diminutive s	4429.4082	3046.8799	35.82	1302.98	1459.26
CS53-5.FFT	asaama	s1	non-diminutive s	4451.1226	8046.8799	31.6	1333.3	1331.01
CS53-6.FFT	asaama	s1	non-diminutive s	4465.9307	4453.1299	28.49	881.98	1078.8199
CS53-7.FFT	asaama	s1	non-diminutive s	4432.7759	3007.8101	31.58	1471.13	1417.27
CS53-8.FFT	misiwe	s1	non-diminutive s	4420.7832	4023.4399	40.97	1159.05	1588.12
CS53-9.FFT	misiwe	s1	non-diminutive s	4477.666	4804.6899	31.61	1328.39	1329.01
CS54-1.FFT	e-kiisisamaahk	s1&2	non-diminutive s	4482.1626	4648.4399	28.97	925.47	1137.99
CS54-2.FFT	misiwe	s1	non-diminutive s	4611.3379	4687.5	33.83	900.97	1271.76
CS54-3.FFT	n'siinenaan	s1	non-diminutive s	4465.7231	4921.8799	27.48	886.73	1130.21
CS54-4.FFT	kis'samaahk	s1&2	non-diminutive s	4461.8604	4687.5	33.08	1184.55	1262.84
CS54-5.FFT	n'kiis'senaan	s1&2	non-diminutive s	4384.0566	3242.1899	26.71	895.13	1101.4301
CS54-6.FFT	n'tasicikaswaanaanak	s1	non-diminutive s	4412.2471	4140.6299	42.31	1296.8	1740.5699
CS55-1.FFT	'ssiwe	s1&2	non-diminutive s	4456.5459	7265.6299	33.32	1320.75	1353.17
CS55-10.FFT	-saasaakihtataat	s1	non-diminutive s	4443.5913	4335.9399	32.79	1374.6	1345.12
CS55-11.FFT	-saasaakihtataat	s2	non-diminutive s	4435.124	4375	30.9	864.03	1108.0601
CS55-12.FFT	misiwe	s1	non-diminutive s	4477.2061	3046.8799	36.09	1265.99	1370.62
CS55-13.FFT	'kii-saakihtataat	s1	non-diminutive s	4436.9375	3203.1299	28.88	969.2	1069.62
CS55-14.FFT	kitaapatisiiwin	s1	non-diminutive s	4425.3164	3554.6899	31.24	1224.6801	1202.4

CS55-2.FFT	pilesiwak	s1	non-diminutive s	4424.9141	3632.8101	32.66	1255.85	1270.26
CS55-3.FFT	osa	s1	non-diminutive s	4282.7666	3789.0601	34.19	1079.97	1323.23
CS55-4.FFT	ayasikweSimok	s1	non-diminutive s	4405.8086	4453.1299	36.46	1462.08	1519.3
CS55-5.FFT	misiwe	s1	non-diminutive s	4447.2031	3750	35.93	1351.23	1373.96
CS55-6.FFT	sakapwew	s1	non-diminutive s	4474.7476	6445.3101	32.42	1161.55	1255.29
CS55-7.FFT	sakap...	s1	non-diminutive s	4470.3184	5585.9399	33.4	1429.62	1335.98
CS55-8.FFT	sakapwew	s1	non-diminutive s	4436.3335	3984.3799	39.9	1247.4399	1385.27
CS55-9.FFT	kii-whci-noohtaakosiliwa	s1	non-diminutive s	4414.8989	3906.25	39.56	1118.6899	1605.78
CS56-1.FFT	oomis'	s1	non-diminutive s	4614.4043	4648.4399	37.96	1052.47	1140.59
CS56-10.FFT	e-pec'-saasaakaaskon	s2	non-diminutive s	4438.1797	4687.5	41.68	1019.13	1373.98
CS56-11.FFT	mistikohk	s1	non-diminutive s	4499.1167	4414.0601	40.18	1316.6801	1546.3101
CS56-12.FFT	kiSe-mistapeskwew	s1	non-diminutive s	4424.4849	3320.3101	43.49	1396.65	1468
CS56-13.FFT	kiSe-mistapeskwew	s2	non-diminutive s	4495.5171	5937.5	27.97	1149.95	849.77
CS56-14.FFT	mistaskihkohk	s1	non-diminutive s	4391.7725	3398.4399	42.13	1284.38	1718.22
CS56-15.FFT	misiwe	s1	non-diminutive s	4612.3813	6562.5	34.7	1311.05	1222.1
CS56-16.FFT	mistaapewak	s1	non-diminutive s	4449.0898	4101.5601	40.17	1225.4399	1513.58
CS56-17.FFT	ninaasipepahtaan	s1	non-diminutive s	4465.5347	3437.5	28.2	960.79	671.81
CS56-18.FFT	meskanaahk	s1	non-diminutive s	4596.2222	6992.1899	23.38	1094	613.88
CS56-19.FFT	eskwaak	s1	non-diminutive s	4527.2822	5156.25	20.62	692.16	654.53
CS56-2.FFT	mistikohk	s1	non-diminutive s	4460.2544	3320.3101	36.35	1431.9301	1581.53
CS56-3.FFT	miiskwaaskoSimot	s1	non-diminutive s	4395.7363	3515.6299	41.73	1567.33	1617.74
CS56-4.FFT	mistaapeskwewa	s1	non-diminutive s	4520.9468	4648.4399	40.8	1196.24	1559.36
CS56-5.FFT	mistaapeskwewa	s2	non-diminutive s	4564.2822	6250	35.22	1330.49	900.62
CS56-6.FFT	saakasaakinam	s1	non-diminutive s	4675.4419	6796.8799	31.08	728.9	772.58
CS56-7.FFT	saakasaakinam	s2	non-diminutive s	4590.3208	4960.9399	41.33	1230.9399	1411.9399
CS56-8.FFT	mistaapew	s1	non-diminutive s	4467.4229	4101.5601	46.95	1018.14	1492.95

CS56-9.FFT	niwiiyasinawaanaanak	s1	non-diminutive s	4554.543	4960.9399	32.31	1156.05	1109.9
CSH50-1.FFT	niSaSiw'nen	S1	non-diminutive S	4253.6587	3046.8799	43.11	1168.23	1567.79
CSH50-2.FFT	niSaSiw'nen	S2	non-diminutive S	4263.313	3437.5	38.07	1179.04	1327.03
CSH50-3.FFT	piiliS	S1	non-diminutive S	4258.7324	3164.0601	43.36	1212.24	1491.79
CSH50-4.FFT	piiliS	S1	non-diminutive S	4230.2129	3085.9399	39.93	1241.0699	1354.15
CSH50-5.FFT	milwaaSin	S1	non-diminutive S	4196.2974	3906.25	41.9	1190.05	1631.92
CSH50-6.FFT	ci-wewepaaSit	S1	non-diminutive S	4203.686	3046.8799	37.26	1350.64	1255.95
CSH50-7.FFT	kaa-k'iiSi-waapahamaan	S1	non-diminutive S	4097.7437	3281.25	39.48	1242.05	1346.39
CSH50-8.FFT	e-'Si-okiiciSimacik	S1	non-diminutive S	4246.6602	3007.8101	44.38	1368.15	1639.1899
CSH51-1.FFT	Sipaa	S1	non-diminutive S	4279.0664	3281.25	45.26	1055.85	1693.9399
CSH51-2.FFT	iSi-kaahtinikatewa	S1	non-diminutive S	4274.4395	3867.1899	41.29	1332.0601	1653.4399
CSH51-3.FFT	piSiSik	S1	non-diminutive S	4246.2939	3242.1899	43.58	1129.34	1607.16
CSH51-4.FFT	piSiSik	S2	non-diminutive S	4283.3823	3085.9399	42.31	901.7	1522.14
CSH51-5.FFT	milwaaSin	S1	non-diminutive S	4202.8237	3867.1899	40.31	1306.66	1543.55
CSH51-6.FFT	piSiSik	S1	non-diminutive S	4308.4937	3281.25	48.93	1344.9399	1778.39
CSH51-7.FFT	piSiSik	S2	non-diminutive S	4293.5435	3359.3799	40.09	1148.88	1554.46
CSH51-8.FFT	piiliS	S1	non-diminutive S	4181.5732	3242.1899	35.2	1118.9	1167.01
CSH51-9.FFT	-'Si-ihtaawikihaacik	S1	non-diminutive S	4311.3184	4062.5	39.58	895.41	1416.99
CSH52-1.FFT	kici-wewepaaSicik	S1	non-diminutive S	4369.8232	3945.3101	50.22	1901.4301	2088.4199
CSH52-10.FFT	ey-oSihtamawaakaniwit	S1	non-diminutive S	4331.918	3632.8101	50.46	1685.8	1997.99
CSH52-2.FFT	kinweS	S1	non-diminutive S	4325.123	3828.1299	43.15	1476.22	1713.04
CSH52-3.FFT	weSihkaniwit	S1	non-diminutive S	4336.3545	3476.5601	51.72	1898.45	2106.28
CSH52-4.FFT	waaSakaam	S1	non-diminutive S	4396.5356	3125	53.84	1878.5699	2049.29
CSH52-5.FFT	'Saakanaapiy	S1	non-diminutive S	4159.0298	3203.1299	35.02	1365.91	1166.75
CSH52-6.FFT	e-taahtaapiSahot	S1	non-diminutive S	4291.5903	3398.4399	47.65	1738.26	1813.95
CSH52-7.FFT	e-miSikiticik	S1	non-diminutive S	4361.4473	3242.1899	47.72	1512.1801	1937.42

CSH52-8.FFT	e-'piSiiSiSit	S1	non-diminutive S	4305.708	3085.9399	49.19	1588.9	1838.97
CSH52-9.FFT	e-'piSiiSiSit	S2&3	non-diminutive S	4273.3413	3359.3799	51.35	1428.54	1907.02
CSH53-1.FFT	iSinihkaasow	S1	non-diminutive S	4377.5835	4140.6299	45.67	1437.39	1916.9301
CSH53-10.FFT	e-'Skimet	S1	non-diminutive S	4382.7485	3984.3799	43.93	1583.58	1981.25
CSH53-11.FFT	piiliS	S1	non-diminutive S	4345.8555	3164.0601	45.01	1490.34	1867.77
CSH53-12.FFT	'Skimaataat	S1	non-diminutive S	4320.1235	3984.3799	47.75	1461.14	2013.28
CSH53-13.FFT	e-'ti-kiiSihaat	S1	non-diminutive S	4338.9492	3320.3101	48.67	1503.5601	1914.08
CSH53-14.FFT	e-'Skimaataat	S1	non-diminutive S	4367.2432	3750	47.49	1537.4301	2050.0601
CSH53-15.FFT	'Saakanaapiya	S1	non-diminutive S	4384.998	3242.1899	47.56	1373.01	1941.78
CSH53-16.FFT	kici-oSihtaayaan	S1	non-diminutive S	4351.5239	3281.25	49.24	1514.61	1946.9399
CSH53-2.FFT	Saakanaapiy	S1	non-diminutive S	4338.793	3906.25	39.62	1021.06	1686.66
CSH53-3.FFT	kiciy-oSihtaat	S1	non-diminutive S	4350.9922	3437.5	47.24	1308.42	1822.98
CSH53-4.FFT	miSetwaa	S1	non-diminutive S	4401.9033	4531.25	46.78	1748.87	2025.16
CSH53-5.FFT	kii-pahpaSkiSam	S2	non-diminutive S	4371.3208	3085.9399	48.04	1766.34	2130.1299
CSH53-6.FFT	e-'S'-paSkiSikaatek	S3	non-diminutive S	4301.7568	3203.1299	44.56	1078.04	1752.5601
CSH53-7.FFT	Saakanaapiy	S1	non-diminutive S	4202.064	3242.1899	41.75	1359.66	1398.79
CSH53-8.FFT	kinweS	S1	non-diminutive S	4109.0801	3046.8799	39.31	1124.75	1271.98
CSH53-9.FFT	n'taSiiwiin	S1	non-diminutive S	4366.5342	4414.0601	37.83	1196.25	1687.71
CSH54-1.FFT	n'toS'htaanaan	S1	non-diminutive S	4324.1157	3164.0601	41.99	1546.6899	1571.28
CSH54-2.FFT	n'tiSin'kaatenaan	S1	non-diminutive S	4392.0972	3203.1299	46.45	1390.96	1878.29
CSH54-3.FFT	kinweS	S1	non-diminutive S	4351.5127	3984.3799	43.47	1608.21	1738.04
CSH54-4.FFT	kinweS	S1	non-diminutive S	4332.3975	3085.9399	42.89	1276.4399	1784.1
CSH54-5.FFT	piliS	S1	non-diminutive S	4302.9741	3828.1299	35.46	1418.7	1419.33
CSH54-6.FFT	pahkweSi	S1	non-diminutive S	4392.0972	3203.1299	46.45	1390.96	1878.29
CSH54-7.FFT	pahkweSikan	S1	non-diminutive S	4329.6587	3125	40.97	1202.62	1541.48
CSH55-1.FFT	iSinihkaasokopaneh	S1	non-diminutive S	4210.1968	3281.25	46.32	1325.02	1343.73

CSH55-10.FFT	SeSekoSimaat	S1	non-diminutive S	4403.6636	3203.1299	43.3	1579.9301	1896.04
CSH55-11.FFT	SeSekoSimaat	S2	non-diminutive S	4397.5029	3945.3101	44.98	1452.03	1929.1899
CSH55-12.FFT	wiiyaaSimin	S1	non-diminutive S	4307.3159	4101.5601	44.43	1470.9	1866.09
CSH55-13.FFT	e-kii-kiSiimaat	S1	non-diminutive S	4330.5303	3476.5601	42.79	1420.8199	1775.28
CSH55-14.FFT	kaa-'Si-nipaat	S1	non-diminutive S	4301.6099	3320.3101	44.05	1403.7	1634.61
CSH55-15.FFT	piiliS	S1	non-diminutive S	4321.3374	3984.3799	35.52	1416.1	1342.8101
CSH55-16.FFT	kikiSawaahin	S1	non-diminutive S	4276.1553	3125	44.8	1524.0601	1770.04
CSH55-2.FFT	kiiSihtaayaane	S1	non-diminutive S	4344.5381	3320.3101	42.84	1506.91	1847.8101
CSH55-3.FFT	kiiy-oSihtaaw	S1	non-diminutive S	4309.5264	3281.25	47.66	1730.52	1885.36
CSH55-4.FFT	e-miSaalik	S1	non-diminutive S	4284.5972	3554.6899	52.55	1707.73	2054.27
CSH55-5.FFT	oSkiiSikw'	S2	non-diminutive S	4337.9644	4062.5	43.67	1702.66	1863.59
CSH55-6.FFT	taSine	S1	non-diminutive S	4415.7534	4765.6299	40.27	1319.11	1579.28
CSH55-7.FFT	'Saakanaapiiliw	S1	non-diminutive S	4333.2012	3437.5	48.89	1175.14	1800.3
CSH55-8.FFT	ayasikweSimok	S1	non-diminutive S	4331.8315	3281.25	49.21	1765.29	1999.9301
CSH55-9.FFT	ke-iSitepoyan	S1	non-diminutive S	4382.5254	3398.4399	46.34	1588.91	1866.01
CSH56-1.FFT	iSinihkaataakaniwinokopan	S1	non-diminutive S	4507.6455	3632.8101	32.36	761.81	1059.9399
CSH56-10.FFT	kaa-'Si-piihciSiniyaan	S1	non-diminutive S	4522.5439	3554.6899	32.56	943.06	1164.51
CSH56-11.FFT	eSi-kihcipahtaayaan	S1	non-diminutive S	4501.9512	4296.8799	37.8	1118.47	1231.23
CSH56-12.FFT	oS'	S1	non-diminutive S	4309.7188	3046.8799	38.12	1371.15	1440.78
CSH56-13.FFT	wayeS	S1	non-diminutive S	4408.5117	3242.1899	35.56	1358.85	1381.71
CSH56-14.FFT	k'-iiSilawiitokwe	S1	non-diminutive S	4426.5786	4414.0601	38.08	1254.88	1464.79
CSH56-15.FFT	e-'Silawiyaan	S1	non-diminutive S	4492.3301	4648.4399	40.6	1194.01	1443.3101
CSH56-2.FFT	kii-niiSo-taSiihkewak	S2	non-diminutive S	4471.251	4765.6299	38.15	1020.77	1391.11
CSH56-3.FFT	aayaakowiyaaskoSimow	S1&2	non-diminutive S	4413.687	3203.1299	41.42	1658.8	1565.4399
CSH56-4.FFT	e-miiskwaaskoSimot	S1	non-diminutive S	4454.6709	4257.8101	35.07	1454.78	1569.4301
CSH56-5.FFT	aaSay	S1	non-diminutive S	4387.1362	3437.5	39.59	1065.09	1462.1

CSH56-6.FFT	wt-eSi-walawiipalit	S1	non-diminutive S	4294.1572	3125	35.87	1249.61	1300.41
CSH56-7.FFT	kii-kiiSinawasokopan	S1	non-diminutive S	4405.6025	4492.1899	40.91	1353.67	1633.88
CSH56-8.FFT	e-kiiSinawasot	S1	non-diminutive S	4478.894	4765.6299	31.43	1104.4301	1122.54
CSH56-9.FFT	petweweSinwak	S1	non-diminutive S	4359.5645	3476.5601	34.07	1083.85	1150.95
ES52-1.FFT	awaasiS	s1	diminutive	4087.4172	3242.1899	27.24	1397.92	859.14
ES53-1.FFT	moos'-iyaanSiS	s1	diminutive	4368.2769	3085.9399	42.1	1318.58	1383.6801
ES53-2.FFT	atipisihk	s1	diminutive	4394.7681	7617.1899	30.85	999.88	1133.88
ES53-3.FFT	awaaSiSasaamak	s1	diminutive	4483.7705	4726.5601	30.2	767.78	1125.03
ES55-1.FFT	'saaciiS'Sak	s1	diminutive	4590.9644	5976.5601	30.6	792.84	986.13
ES56-1.FFT	mistaapeskweSiSa	s1	diminutive	4445.9307	4296.8799	34.86	1060.71	1350.46
ES56-2.FFT	mistaapeskweSiSa	s2	diminutive	4430.9927	4179.6899	39.14	1370.12	1590.1
ES56-3.FFT	mistaapeskweSiSak	s1	diminutive	4499.6499	4531.25	42.2	1141.86	1608.45
ES56-4.FFT	mistaapeskweSiSak	s2	diminutive	4431.9893	3867.1899	38.66	1372.49	1650.0699
ES56-5.FFT	mistaapeskweSiSak	s1	diminutive	4518.8672	5937.5	32.59	1111.42	1106.9399
ES56-6.FFT	mistaapeskweSiSak	s2	diminutive	4436.7295	3085.9399	38.16	1297.9301	1493.14
ES56-7.FFT	otaanisa	s1	diminutive	4279.1587	3085.9399	32.13	676.02	902.77
ES56-8.FFT	apisciliiiS	s1	diminutive	4416.2168	3007.8101	37.55	1458.75	1516.83
ESH50-1.FFT	man'SiiS	S1	diminutive	4214.3608	3320.3101	37.87	1101.15	1364.59
ESH50-2.FFT	man'SiiS	S2	diminutive	4189.5479	3281.25	38.46	1080.29	1472.0699
ESH50-3.FFT	e-'waaSiSiiwiyaan	S1&2	diminutive	4248.7266	3359.3799	38.24	1099.36	1563.77
ESH51-1.FFT	awaaSiS	S1	diminutive	4174.021	3437.5	40.77	1244.34	1411.97
ESH51-10.FFT	n'cawaaSimiSinaan	S2	diminutive	4214.5405	3242.1899	40.87	1251.71	1432.4399
ESH51-2.FFT	awaaSiS	S2	diminutive	4307.3013	3750	44.18	861.49	1644.6899
ESH51-3.FFT	awaaSiSak	S1&2	diminutive	4318.3359	4140.6299	38.54	1194.0699	1589.99
ESH51-4.FFT	awaaSiSak	S1&2	diminutive	4269.9443	3125	40.28	1201.64	1634.01
ESH51-5.FFT	awaaSiSak	S1&2	diminutive	4176.7725	3242.1899	41.89	1147.9	1512.61

ESH51-6.FFT	awaaSiSak	S1&2	diminutive	4287.6226	3203.1299	40.76	1233.6801	1701.71
ESH51-7.FFT	ocawaaSimiSawa	S1	diminutive	4227.7632	3007.8101	39.04	1533.0601	1315.74
ESH51-8.FFT	ocawaaSimiSawa	S2	diminutive	4154.623	3085.9399	39.73	1672.62	1444.6801
ESH51-9.FFT	n'cawaaSimiSinaan	S1	diminutive	4162.436	3203.1299	45.25	1475.6801	1589.0699
ESH52-1.FFT	awaaSiS	S1	diminutive	4272.6592	3046.8799	52.87	1794.6	1921.89
ESH52-10.FFT	waaS'Siiwiyaan	S1&2	diminutive	4328.4736	3437.5	46.77	1356.77	1679.48
ESH52-2.FFT	awaaSiS	S2	diminutive	4250.1978	3867.1899	49.74	1507.42	1975.61
ESH52-3.FFT	awaaSiS	S1	diminutive	4357.3179	3242.1899	48.35	1856.65	1975.7
ESH52-4.FFT	awaaSiS	S2	diminutive	4381.9556	3984.3799	50.85	1584.47	2078.22
ESH52-6.FFT	awaaSiS	S1	diminutive	4268.2295	3085.9399	42.62	1657.1801	1581.4
ESH52-7.FFT	awaaSiS	S2	diminutive	4344.0073	4062.5	45.21	1310.78	1855.91
ESH52-8.FFT	awaaSiS	S1	diminutive	4125.5405	3046.8799	33.63	1270.27	853.28
ESH52-9.FFT	awaaSiS	S2	diminutive	4128.8379	3203.1299	34.38	1303.15	1077.33
ESH53-1.FFT	moos'-iyaanSiS	S1	diminutive	4312.8174	3007.8101	39.11	1234.04	1437.4
ESH53-2.FFT	moos'-iyaanSiS	S2	diminutive	4338.793	3906.25	39.62	1021.06	1686.66
ESH53-3.FFT	apiSimaniyaapiy	S1	diminutive	4366.1543	3320.3101	48.09	1498.7	2006.65
ESH53-4.FFT	awaaSiSasaamak	S1&2	diminutive	4395.1665	4218.75	40.05	1190.29	1670.38
ESH53-5.FFT	k'-aawaaS'Siiwiyan	S1&2	diminutive	4374.8638	3906.25	43.87	1195.28	1849.0699
ESH54-2.FFT	apiSiiS	S1	diminutive	4233.4248	3046.8799	43	1436.35	1487.49
ESH54-3.FFT	apiSiiS	S2	diminutive	4322.8838	3593.75	39.82	1000.75	1433.2
ESH54-4.FFT	apiSiiS	S1	diminutive	4258.0757	3242.1899	40.83	1077.63	1549.1801
ESH54-5.FFT	apiSiiS	S2	diminutive	4068.5869	3125	18.95	480.36	428.25
ESH54-6.FFT	olaakaniSihk	S1	diminutive	4335.0283	3828.1299	39.73	1159.3101	1502.39
ESH54-7.FFT	apiSiiS	S1	diminutive	4291.0737	3164.0601	40.21	1515.75	1518.37
ESH54-8.FFT	apiSiiS	S2	diminutive	4248.8345	3281.25	46.02	988.95	1539.99
ESH55-1.FFT	awiiyaaSiiSak	S1	diminutive	4346.0562	4179.6899	44.47	1684.37	1974.42

ESH55-2.FFT	awiiyaaSiiSak	S2	diminutive	4356.415	3242.1899	46.25	1351.66	1858
ESH55-3.FFT	apiSiiS	S1	diminutive	4367.4668	3437.5	47.23	1627.16	1925.21
ESH55-4.FFT	apiSiiS	S2	diminutive	4341.6045	3476.5601	44.62	1490.48	1756.95
ESH55-5.FFT	apiSiiS	S1	diminutive	4295.3486	3164.0601	47.24	1418.3199	1735.54
ESH55-6.FFT	apiSiiS	S2	diminutive	4343.9771	3476.5601	43.54	1193.77	1612.84
ESH55-7.FFT	'wiyaaSiiS	S1	diminutive	4367.9087	4023.4399	45.97	1720.24	1976.66
ESH55-8.FFT	'wiyaaSiiS	S2	diminutive	4326.9028	3085.9399	42.32	1342.26	1729.6899
ESH55-9.FFT	'saaciiS'Sak	S1&2	diminutive	4502.7686	6796.8799	34.35	1133.1899	1328.92
ESH56-1.FFT	miStaapeSkweSiSak	S1	diminutive	4503.1895	4453.1299	39.47	1242.4399	1548.79
ESH56-10.FFT	ocawaaSimiSa	S2	diminutive	4233.4189	3320.3101	38.37	1022.79	1338.02
ESH56-11.FFT	apisciliiiS	S1	diminutive	4462.1396	7851.5601	31.9	1147.38	1055.27
ESH56-2.FFT	miStaapeSkweSiSak	S2	diminutive	4464.1519	4218.75	41.85	1511.77	1648.9301
ESH56-3.FFT	miStaapeSkweSiSak	S3&4	diminutive	4501.2803	4375	41.56	1283.78	1572.88
ESH56-4.FFT	mistaapeskweSiSa	S1&2	diminutive	4443.7856	4062.5	39.84	1086.4399	1541.5
ESH56-5.FFT	'cayaaniS	S1	diminutive	4469.063	4414.0601	38.43	972.8	1426.27
ESH56-6.FFT	mistaapeskweSiSak	S1	diminutive	4477.1099	4765.6299	37.11	1410.25	1499.29
ESH56-7.FFT	mistaapeskweSiSak	S2	diminutive	4462.7627	3515.6299	36.23	1224.27	1436
ESH56-8.FFT	mistaapeskweSiSak	S1&2	diminutive	4590.354	5976.5601	34.74	772.66	1048.8101
ESH56-9.FFT	ocawaaSimiSa	S1	diminutive	4380.7178	3671.8799	34.27	1334.62	1297.51
Affricates								
ec51-1	ocawaaSimiSawa	c1		4298.5044	3945.3101	42.87	1562.6899	1438.92
ec55-1	'saaciiS'Sak	c1		4506.8237	6601.5601	27.89	744.93	916.21
ec56-1	'cayaaniS	c1		4471.624	4531.25	41.8	993.19	1485.95
ec56-2	ocawaaSimiSa	c1		4421.5098	3710.9399	39.01	1256.29	1464.24

Data: Willie Frenchman

filename	data	fricative	fricative type	centre of gravity	high amplitude	amplitude	amplitude 1-3000 Hz
cs59-1.f	misiwe	s1	non-diminutive s	4489.247	4335.94	34.31	1299.29
cs59-2.fft	awasite	s1	non-diminutive s	4619.6821	4453.1299	24.02	829.77
cs59-3.fft	opaas'sikan	s1	non-diminutive s	4613.3916	4726.5601	33.23	1088.47
cs60-1.fft	iskani-pipon	s1	non-diminutive s	4554.998	4570.3101	37.89	1392.64
cs60-10.fft	isa	s1	non-diminutive s	4459.8921	3750	41.76	1057.75
cs60-11.fft	pasiko	s1	non-diminutive s	4463.7881	3789.0601	36.14	1142.3
cs60-12.fft	moos	s1	non-diminutive s	4523.3472	4218.75	37.58	1201.4399
cs60-13.fft	n'nahaahkaniskwem	s1	non-diminutive s	4321.3994	3867.1899	37.97	1474.2
cs60-14.fft	e-misiwesit	s2	non-diminutive s	4567.3398	4492.1899	29.57	859.74
cs60-15.fft	mooswa	s1	non-diminutive s	4334.8677	3789.0601	35.71	1132.13
cs60-16.fft	awakaa-ostesimaaawit	s2	non-diminutive s	4615.519	4921.8799	34.39	956.65
cs60-17.fft	iskwaasot	s1	non-diminutive s	4505.9077	4335.9399	40.57	1678.27
cs60-2.fft	maak'itel'htakosiwak	s1	non-diminutive s	4459.8315	4023.4399	37.14	1233.34
cs60-3.fft	itel'htakosiwak	s1	non-diminutive s	4458.3184	4296.8799	35.74	1013.87
cs60-4.fft	kii-miskawewak	s1	non-diminutive s	4471.0288	4218.75	33.89	1283.42
cs60-5.fft	n'nahaahkaniskweme	s1	non-diminutive s	4478.4224	3671.8799	36.92	1339.23
cs60-6.fft	eSi-sek'sicik	s1	non-diminutive s	4547.9878	4296.8799	40.74	1270.85
cs60-7.fft	naasic	s1	non-diminutive s	4581.3335	5273.4399	34.47	1007.5
cs60-8.fft	kiskkel'htamwak	s1	non-diminutive s	4556.4136	5468.75	37.76	1541.9301
cs60-9.fft	wes'aani	s1	non-diminutive s	4494.5742	4140.6299	43	1150.03
csh60-19.fft	saakahikan	s1	non-diminutive s	4520.6431	4453.1299	36.39	1110.7
cs61-1.fft	n'tiskopaan	s1	non-diminutive s	4483.9575	3710.9399	35.79	1225.1801
cs61-2.fft	kiiskaayawaaw	s1	non-diminutive s	4423.5923	3007.8101	41.53	1719.6

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cs61-3.fft	e-'Si-paahkosiyaan	s1	non-diminutive s	4486.7212	4296.8799	41.59	1473.35
cs61-4.fft	micon'iiskan'tipiskaaw	s1	non-diminutive s	4564.5771	4882.8101	39.03	1456.05
cs61-5.fft	micon'iiskan'tipiskaaw	s2	non-diminutive s	4461.6841	4062.5	38.46	1559.04
cs61-6.fft	iskan'-tipiskaaw	s1	non-diminutive s	4471.2017	4531.25	34.92	1332.58
cs61-7.fft	iskan'-tipiskaaw	s2	non-diminutive s	4429.916	4609.3799	38.65	1268.29
csh59-1.fft	piS'Sik	S1	non-diminutive S	4417.2183	3828.1299	39.64	1577.63
csh59-2.fft	ispiiS	S1	non-diminutive S	4375.0728	3476.5601	28.03	1078.58
csh59-3.fft	iSpiiS	S2	non-diminutive S	4410.124	3867.1899	32.27	677.41
csh59-4.fft	eSkwaa	S1	non-diminutive S	4439.2715	3710.9399	32.18	1402.3101
csh59-5.fft	kaa-milwaaSihki	S1	non-diminutive S	4366.9375	3632.8101	36.89	1275.83
csh60-1.fft	niiSitana	S1	non-diminutive S	4357.7007	3007.8101	44.67	1684.4301
csh60-11.fft	e-miSikitit	S1	non-diminutive S	4467.2148	3398.4399	36.08	1733.36
csh60-12.fft	kaa-iSkwaa-kimiwahk	S1	non-diminutive S	4440.3643	3007.8101	42.1	2065.5701
csh60-13.fft	kaa-iS'iiSpacistihk	S1	non-diminutive S	4511.3477	5742.1899	33.64	1469.77
csh60-14.fft	kaa-iS'iiSpacistihk	S2	non-diminutive S	4486.437	3359.3799	34.33	1711.72
csh60-15.fft	taSiihkecik	S1	non-diminutive S	4416.5801	3046.8799	42.69	1664.77
csh60-16.fft	kwaan-eSi-kwaSkwatotaa'cik	S1	non-diminutive S	4466.7764	3671.8799	34.71	1377.61
csh60-17.fft	peSinaakwan	S1	non-diminutive S	4412.4878	3515.6299	39.3	1588.15
csh60-18.fft	e-miSaak	S1	non-diminutive ʃ	4463.5723	3007.8101	33.82	1600.13
csh60-2.fft	pwaamoSi	S1	non-diminutive S	4381.0103	3398.4399	39.4	1473.77
csh60-20.fft	piiliS	S1	non-diminutive S	4409.9414	3437.5	38.5	1556.04
csh60-21.fft	maSihitowak	S1	non-diminutive S	4436.9775	3554.6899	32.21	1659.11
csh60-4.fft	e-peSi-nipahaat	S1	non-diminutive S	4351.1646	3398.4399	40.52	1544.55
csh60-5.fft	iSkwaahtemihk	S1	non-diminutive S	4425.3145	3398.4399	35.28	1551.27
csh60-6.fft	eSi-sek'sicik	S1	non-diminutive S	4517.9229	3710.9399	32.47	1132.79
csh60-7.fft	mooSak	S1	non-diminutive S	4408.7388	3359.3799	35.6	1559.61

csh60-8.fft	ooSkiniikiw	S1	non-diminutive S	4438.5171	3320.3101	35.83	1641.4301
csh60-9.fft	wiiwaSiw	S1	non-diminutive S	4513.4995	5273.4399	33.18	1789.96
csh61-1.fft	ke-'Si-nipahak	S1	non-diminutive S	4434.6328	3671.8799	39.36	1631.9399
csh61-2.fft	maSkoSiiya	S1	non-diminutive S	4469.2349	3593.75	36.47	1806.61
csh61-3.fft	maSkoSiiya	S2	non-diminutive S	4472.8228	3710.9399	37.55	1697.05
csh61-4.fft	e-'spiihci-kiSiiciwahk	S1	non-diminutive S	4410.8931	3046.8799	46.13	1900.84
csh61-5.fft	e-miSaak	S1	non-diminutive S	4452.3428	3046.8799	37.64	1955.96
csh61-6.fft	kwaan'eSi-pahkiSihk	S1	non-diminutive S	4372.8892	3203.1299	41.32	1646.63
csh61-7.fft	e-'Si-paahkosiyaan	S1	non-diminutive S	4371.7578	3554.6899	39.01	1526.29
csh61-8.fft	e-miSaak	S1	non-diminutive S	4485.7397	3085.9399	37.47	1979.83
csh61-9.fft	kwaan'eSi'kwaSkwatiyan	S1	non-diminutive S	4271.2041	3867.1899	41.05	1858.1
es60-1.fft	iskweSiSa	s1	diminutive	4507.4395	4140.6299	41.97	1498.5
es60-2.fft	n'kosis	s1	diminutive	4425.4873	4023.4399	35.18	1450.87
es60-3.fft	n'kosis	s2	diminutive	4364.5566	3984.3799	42.85	1412.0699
es60-4.fft	okosisa	s1	diminutive	4397.2578	3867.1899	33.88	1105.12
es60-5.fft	okosisa	s1	diminutive	4415.269	3945.3101	34.64	1217.3199
es60-6.fft	otaanisa	s1	diminutive	4656.8306	4765.6299	34.55	977.03
es60-7.fft	okosisa	s1	diminutive	4515.874	4804.6899	34.45	1320.58
es61-1.fft	iskweS'Sak	s1	diminutive	4483.2153	5273.4399	39.35	1755.9
es61-2.fft	otaanisa	s1	diminutive	4494.5068	4218.75	37	1095.52
es61-3.fft	iskweSiSak	s1	diminutive	4451.6387	3671.8799	40.86	1334.6801
esh59-1.fft	e-awaaS'Siiwiyaan	S1	diminutive	4400.5352	3671.8799	35.18	1425.45
esh60-1.fft	iSkweSisa	S1	diminutive	4450.876	3242.1899	41.4	1834.5
esh60-10.fft	'SkweSiS	S1	diminutive	4341.0127	3320.3101	48.54	1629.38
esh60-11.fft	'SkweSiS	S2	diminutive	4461.5869	3710.9399	28.73	1148.6899
esh60-12.fft	'SkweSiS	S3	diminutive	4379.3872	3867.1899	34.98	1100.99

Data: Willie Frenchman

esh60-2.fft	iSkweSisa	S2	diminutive	4424.0474	3515.6299	38.08	1561.37
esh60-3.fft	iskweSiSa	S1	diminutive	4463.5708	3476.5601	38.12	1470.2
esh60-4.fft	iSkweSisa	S1	diminutive	4393.8467	3046.8799	37.43	1827.78
esh60-5.fft	iSkweSisa	S2	diminutive	4442.8433	3281.25	39.38	1482.4
esh60-6.fft	iiSkweSiSa	S1	diminutive	4480.8672	3281.25	32.24	1348.55
esh60-7.fft	iiSkweSiSa	S2	diminutive	4395.3618	3281.25	35.95	1208.6899
esh60-8.fft	iSkweSiS	S1	diminutive	4247.5884	3242.1899	36.44	1511.8199
esh60-9.fft	iSkweSiS	S2	diminutive	4172.0801	3359.3799	36.04	1141.24
esh61-1.fft	iskweS'Sak	S1	diminutive	4441.7598	3593.75	40.14	1509.3199
esh61-2.fft	iskweSiSak	S1	diminutive	4338.1455	3554.6899	33.79	1122.55
esh61-3.fft	pileSiiSak	S1	diminutive	4364.377	3007.8101	44.5	1725.6801
esh61-4.fft	pileSiiSak	S2	diminutive	4389.3755	3007.8101	46.34	1781.27
esh61-5.fft	pileSiiS	S1	diminutive	4093.146	3007.8101	35.35	1226.8101
esh61-6.fft	pileSiiS	S2	diminutive	4244.1958	3046.8799	40.13	1620.95

notes:

Where *iSkweSisa* was transcribed in the text with the depalatalization of the diminutive suffix, these were not evident in the spectrograms. There was typically only one fricative evident in the diminutive suffix and was measured as one fricative, labelled in the chart as the first fricative.

Data: Hannah Loon

filename	data	fricative	fricative type	centre of gravity	high amplitude	amplitude	amplitude 1-3000 Hz	amplitude 3-6000 Hz
ces66-4.fft				4256.6304	3671.8799	40.8	1234.59	1549.33
cs63-1.fft	k'aati-poosiyaan	s1	non-diminutive s	4341.0981	3828.1299	30.89	812.84	1177.79
cs63-2.fft	nookosiw	s1	non-diminutive s	4256.4268	4375	37.99	924.97	1418.36
cs63-3.fft	e-saak'hak	s1	non-diminutive s	4320.0376	4804.6899	29.15	777.65	1106.79
cs63-4.fft	taasipwaa	s1	non-diminutive s	4212.3823	3789.0601	35.13	1008.5	1360.03
cs64-1.fft	e-peci-pimaatisiit	s1	non-diminutive s	4401.1636	3046.8799	24	862.07	844.67
cs64-2.fft	epoosihiyamiht	s1	non-diminutive s	4442.5454	3945.3101	32.45	961.7	1253.5601
cs64-3.fft	wiiskaat	s1	non-diminutive s	4352.3955	4570.3101	33.42	1036.47	1333.79
cs64-4.fft	wiiskaat	s1	non-diminutive s	4359.4429	3984.3799	34.35	913.66	1323.51
cs64-5.fft	n'tati-laawinaakosinan	s1	non-diminutive s	4368.77	4335.9399	36.09	924.14	1178.42
cs64-6.fft	wes'aan'	s1	non-diminutive s	4486.7793	3476.5601	24.92	1321.27	904.02
cs64-7.fft	e-mate-otataamapiskaahiket	s1	non-diminutive s	4505.7925	4335.9399	22.8	885.46	804.52
cs65-1.fft	n'kii-saasaakiisitaan	s1	non-diminutive s	4488.4946	4960.9399	32.08	1296.5601	1174.5
cs65-10.fft	isa	s1	non-diminutive s	4545.1035	4765.6299	35.98	951.16	1135.59
cs65-11.fft	e-naasipetaapeyaahk	s1	non-diminutive s	4431.7061	5078.1299	25.24	1237.42	967.6
cs65-12.fft	n'taalimisin	s1	non-diminutive s	4604.2593	4843.75	32.64	1000.87	1122.7
cs65-13.fft	n'kii-poosinaan	s1	non-diminutive s	4555.1323	4882.8101	38.29	1109.11	1182.78
cs65-14.fft	e-iskwewiyaahk	s1	non-diminutive s	4305.2173	4218.75	35.64	1105.66	1406.54
cs65-15.fft	iskwewak	s1	non-diminutive s	4411.6157	4296.8799	29.75	854.84	1179.0699
cs65-16.fft	kii-poosiwak	s1	non-diminutive s	4206.7583	3554.6899	30.41	1587.09	1116.26
cs65-17.fft	misawaac	s1	non-diminutive s	4404.9248	4335.9399	43.44	1491.35	1570.46
cs65-19.fft	w'-iiskwaasot'sow	s1	non-diminutive s	4338.5884	4453.1299	36.74	1053.1	1281.85
cs65-18.fft	iskwew	s1	non-diminutive s	4404.9248	4335.9399	43.44	1491.35	1570.46
cs65-2.fft	n'kii-saasaakiisitaan	s2	non-diminutive s	4499.0156	3515.6299	31.02	1584.8199	1150.48

cs65-20.fft	k'-iiskwaasotisiw	s1	non-diminutive s	4289.519	3515.6299	41.54	1347.52	1613
cs65-21.fft	e-pec'iiSinakosit	s1	non-diminutive s	4460.1782	4804.6899	33.5	927.73	1072.76
cs65-22.fft	n'sakiniskepahaaw	s1	non-diminutive s	4410.3755	4531.25	43.71	995.75	1373.35
cs65-23.fft	n'sakiniskepahaaw	s2	non-diminutive s	4506.668	4921.8799	34.79	1210.98	1164.9399
cs65-24.fft	iskwewak	s1	non-diminutive s	4329.0127	4687.5	30.8	1077.65	1231.8199
cs65-25.fft	kii-kiisisow	s1	non-diminutive s	4348.4546	3164.0601	41.09	1501.61	1573.13
cs65-26.fft	iskwew	s1	non-diminutive s	4416.8896	4609.3799	37.6	1145.04	1343.8
cs65-27.fft	kii-whci-pimaatisiiw	s1	non-diminutive s	4527.27	4648.4399	28.27	887.71	1055.12
cs65-3.fft	miicisoyaahk	s1	non-diminutive s	4609.626	4843.75	37.71	759.5	1147.3
cs65-4.fft	kii-niSo-p'ponesiw	s1	non-diminutive s	4379.0283	4453.1299	38.33	802.03	1292.21
cs65-5.fft	e-'paa-naan'taw"-miicisoyaahk	s1	non-diminutive s	4353.1729	4492.1899	34.81	1247.84	1260.83
cs65-6.fft	kaa-piskwaahkaaaw	s1	non-diminutive s	4313.6143	4335.9399	41.58	1546.78	1571.2
cs65-7.fft	isa	s1	non-diminutive s	4342.0254	3515.6299	33.16	1088.39	1172.4
cs65-8.fft	wiisakel'htam	s1	non-diminutive s	4251.4189	3281.25	29.41	1303.87	1053.5
cs65-9.fft	n'kii-'hci-mitaahto-p'ponesin	s1	non-diminutive s	4395.5762	3125	22.52	891.32	712.02
cs66-1.fft	niipisiiskaahk	s1	non-diminutive s	4418.6357	3515.6299	22.83	927.95	848.41
cs66-2.fft	niipisiiskaahk	s2	non-diminutive s	4626.0698	6132.8101	22.42	927	618.88
cs66-3.fft	wehcis	s1	non-diminutive s	4592.7524	4921.8799	36.2	798.31	1108.14
cs66-4.fft	kiciskinew	s1	non-diminutive s	4235.3589	3046.8799	43.19	1389.5601	1765.95
cs66-5.fft	kaa-itwehkaasot	s1	non-diminutive s	4313.3945	4882.8101	31.84	1469.96	1115.98
cs66-6.fft	niipisiihk	s1	non-diminutive s	4472.4688	4453.1299	37.17	1197.6	1336.6899
csh63-1.fft	e-kii-takoSiniyaan	S1	non-diminutive S	4107.7134	3007.8101	44.31	1555.35	1314.61
csh63-2.fft	e-'kiSepaayaak	S1	non-diminutive S	4296.9502	3867.1899	38.92	1024.86	1651.27
csh63-3.fft	e-paamiSkaat	S1	non-diminutive S	4305.2129	3437.5	36.67	1173.73	1519.1
csh64-1.fft	kaa-k'-iiSi-otaskiispan	S1	non-diminutive S	4131.5171	3515.6299	39.78	1083.62	1446.4
csh64-2.fft	e-paamiSkat	S1	non-diminutive S	4298.6357	3359.3799	41.63	1211.95	1658.67

csh64-3.fft	e-'miSkaayaahk	S1	non-diminutive S	4309.3389	3398.4399	41.72	1362.0699	1735.26
csh64-4.fft	kinweS	S1	non-diminutive S	4232.1279	3320.3101	34.25	935.32	1317.4
csh64-6.fft	kaa-miSikiticik	S1	non-diminutive S	4160.5576	3554.6899	36.53	1247.39	1360.26
csh64-7.fft	S'awa	S1	non-diminutive S	4200.7822	3085.9399	42.45	1832.9	1628.09
csh64-8.fft	eSpiS	S2	non-diminutive S	4144.3384	3398.4399	41.2	1191.6801	1454.61
csh65-1.fft	oot'e-peSiwakiht	S1	non-diminutive S	4193.7715	3007.8101	49.77	1778.28	1629.92
csh65-10.fft	nisto-kiiSikaaw	S1	non-diminutive S	4099.1846	3359.3799	44.17	1372.6899	1556.62
csh65-11.fft	nisto-kiiSikaak	S1	non-diminutive S	4226.0986	3632.8101	47.86	1408.54	1809.86
csh65-12.fft	kii-niiSiwak	S1	non-diminutive S	4077.6086	3203.1299	42.31	1336.42	1494.95
csh65-13.fft	e-peci-p'miSakkaayaahk	S1	non-diminutive S	4210.1382	3203.1299	40.64	1411.36	1630.36
csh65-14.fft	e-koci-p'maaSakaamepicikeyaan	S1	non-diminutive S	4495.6694	4218.75	46.06	1579.7	1635.53
csh65-15.fft	'Saakanaapiy	S1	non-diminutive S	4270.3169	3710.9399	42.81	1154.85	1618.92
csh65-16.fft	kinweS	S1	non-diminutive S	4306.8101	3593.75	39.93	1375.5	1395.89
csh65-17.fft	ispiiS	S1	non-diminutive S	4063.2427	3593.75	41.21	1406.3101	1390.38
csh65-18.fft	kaa-peSiwakiht	S1	non-diminutive S	4225.6216	3359.3799	50.28	1275.51	1720.99
csh65-19.fft	'-paamiSkaayaahk	S1	non-diminutive S	4030.2578	3281.25	41.89	1086.75	1512.86
csh65-2.fft	kaa-iSi-cimeyaahhk	S1	non-diminutive S	4300.4922	3554.6899	44.16	1276.46	1524.11
csh65-20.fft	iiSkotew	S1	non-diminutive S	4323.52	3320.3101	40.12	1549.04	1529.1899
csh65-21.fft	e-pec'iiSinakosit	S1	non-diminutive S	4361.1167	4531.25	43.59	1306.85	1502.88
csh65-22.fft	maamiSikitiwak	S1	non-diminutive S	4208.4458	3476.5601	45.8	1303.92	1677.87
csh65-23.fft	kinweS	S1	non-diminutive S	4323.4839	4375	43.84	1311.34	1401.29
csh65-24.fft	ispiS	S1	non-diminutive S	4106.5972	3359.3799	48.03	1319.42	1628.22
csh65-3.fft	kaa-iSin'kacikaatek	S1	non-diminutive S	4321.0752	3515.6299	49.62	1463.1899	1979.58
csh65-4.fft	peyako-kiiSikaaw	S1	non-diminutive S	4087.5796	3476.5601	45.78	1184.29	1495.59
csh65-5.fft	e-miSkaaniwahk	S1	non-diminutive S	4185.9487	3359.3799	45.23	998.43	1596.04
csh65-6.fft	e-miSkaayaahk	S1	non-diminutive S	4354.6333	3984.3799	41.66	1360.16	1754.8199

csh65-7.fft	kiSe-'l'liw	S1	non-diminutive S	4298.8853	3320.3101	41.95	1489.03	1700.96
csh65-8.fft	kiSaakam'teliw	S1	non-diminutive S	4189.3008	3203.1299	47.64	1697.78	1745.6801
csh65-9.fft	piiliS	S1	non-diminutive S	4201.397	3359.3799	52.07	1413.99	1675.5699
csh66-1.fft	e-taSiihkeyaahkipan	S1	non-diminutive S	4280.7661	3632.8101	33.86	863.84	1401.4
csh66-2.fft	wayeS	S1	non-diminutive S	4305.7612	4335.9399	41.21	824.87	1407.77
csh66-3.fft	mahkeSiwak	S1	non-diminutive S	4393.3516	4570.3101	41.63	1132.9301	1408.29
csh66-4.fft	kinweS	S1	non-diminutive S	4269.2202	3437.5	37.17	1140.09	1325.05
csh66-6.fft	eSi-Sekopalihot	S2	non-diminutive S	4179.2212	3398.4399	45.94	1141.47	1704.85
csh66-7.fft	e-maSihitocik	S1	non-diminutive S	4344.0825	3671.8799	43.2	1185.42	1529.11
csh66-8.fft	pahkiSin	S1	non-diminutive S	4127.665	3554.6899	44.89	1386.23	1515.92
es63-1.fft	n'kosis	s1	diminutive	4257.4028	3750	37.51	828.88	1347.21
es63-2.fft	n'kosis	s2	diminutive	4313.6353	4257.8101	40.1	707.12	1437.73
es63-3.fft	nikosis	s1	diminutive	4304.8965	3203.1299	31.67	990.4	1277.3
es63-4.fft	nikosis	s2	diminutive	4211.7305	3632.8101	26.57	713.21	1058.12
es64-1.fft	otanisa	s1	diminutive	4412.2749	3281.25	18.72	842.57	625.8
es65-1.fft	otaanis'	s1	diminutive	4615.418	5195.3101	31.67	998.2	986.78
es66-1.fft	wiiskacaaniS	s1	diminutive	4212.8394	3007.8101	38.11	1191.5	1467.71
es66-10.fft	wiiskacaaniS	s1	diminutive	4231.4253	3593.75	43.02	1216.26	1518.37
es66-11.fft	wiiskacaaniS	s1	diminutive	4259.5244	3085.9399	35.99	927.15	1145.16
es66-12.fft	wiiskacaaniSa	s1	diminutive	4253.9473	3085.9399	40.66	966.33	1356.37
es66-13.fft	wiiskacaaniS	s1	diminutive	4418.854	4804.6899	39.47	924.51	1513.1899
es66-2.fft	wiiskacaaniS	s1	diminutive	4324.6216	4765.6299	42.88	818.63	1296.4
es66-5.fft	wiiskacaaniS	s1	diminutive	4136.0723	3710.9399	42.08	1151.1899	1426.17
es66-6.fft	wiiskacaaniS	s1	diminutive	4226.3525	3476.5601	36.26	793.53	1286.3101
es66-7.fft	wiiskacaaniS	s1	diminutive	4198.0283	3398.4399	43.8	1185.42	1533.77
es66-8.fft	wiiskacaaniS	s1	diminutive	4442.5571	4726.5601	36.3	964.86	1424.86

es66-9.fft	wiiskacaaniS	s1	diminutive	4427.3423	4960.9399	36.8	1197.79	1416.39
esh64-1.fft	ey-awaaSiSiiwiyaan	S2	diminutive	4340.7095	3593.75	35.89	1233.71	1343.21
esh64-10.fft	iSkweS'Sa	S3	diminutive	4223.4585	3750	38.48	1016.43	1501.09
esh64-11.fft	iSkweSiS	S1	diminutive	4077.2456	3046.8799	39.44	1448.74	1224.66
esh64-12.fft	iSkweSiS	S3	diminutive	4264.4648	3789.0601	38.72	976.89	1407.96
esh64-13.fft	ocawaaSimiSa	S1	diminutive	4451.8218	4609.3799	40.76	1291.4301	1437.9301
esh64-14.fft	ocawaaSimiSa	S2	diminutive	4390.3306	4023.4399	37.69	1004.98	1468.11
esh64-15.fft	'SkweSiSak	S1	diminutive	4150.0293	3007.8101	39.19	1358.51	1457.71
esh64-16.fft	'SkweSiSak	S2	diminutive	4223.1099	3007.8101	40.98	1119.3199	1485.99
esh64-17.fft	'SkweSiSak	S3	diminutive	4195.0786	3750	37.26	905.89	1449.7
esh64-2.fft	ey-awaaSiSiiwiyaan	S2	diminutive	4315.8237	3710.9399	39.78	898.55	1715.04
esh64-3.fft	iSkweSiSak	S1	diminutive	4122.812	3945.3101	34.09	1255.22	1247.01
esh64-4.fft	iSkweSiSak	S2	diminutive	4250.5527	3671.8799	48.72	1472.35	1768.22
esh64-5.fft	iSkweSiSak	S3	diminutive	4078.1487	3007.8101	37.82	1201.08	1402.97
esh64-6.fft	iSkweSiSak	S1	diminutive	4247.9937	3007.8101	33.99	1781.64	1306.83
esh64-7.fft	iSkweSiSak	S2	diminutive	4191.2051	3554.6899	39.08	1150.6801	1558.08
esh64-8.fft	iSkweS'Sa	S1	diminutive	4235.999	3007.8101	41.36	1327.16	1647.28
esh64-9.fft	iSkweS'Sa	S2	diminutive	4293.5679	3906.25	45.23	1242.92	1687.4
esh65-1.fft	e-waaSiSiiwiyaan	S1&2	diminutive	4340.8667	4101.5601	33.25	1176.23	1425.6801
esh65-10.fft	man'SiiS	S2	diminutive	4326.4468	3593.75	47.58	1580.3199	1672.1801
esh65-11.fft	'waaSiSak	S1	diminutive	4346.6191	4492.1899	44.05	1468.39	1528.86
esh65-12.fft	'waaSiSak	S2	diminutive	4501.9624	4687.5	38.45	1123.17	1291.99
esh65-13.fft	n'kii-'waaSiSiiwin	S1&2	diminutive	4358.2876	3007.8101	37.81	1327.14	1528.45
esh65-14.fft	miiniSa	S1	diminutive	4326.0771	3671.8799	40.05	1160.4301	1727.47
esh65-15.fft	ooko'waaSiSak	S1&2	diminutive	4175.7588	3476.5601	46.57	1295.78	1654.3101
esh65-16.fft	ooko'waaSiSak	S1&2	diminutive	4214.5605	3515.6299	42.73	1369.03	1747.96

esh65-17.fft	miiniSa	S1	diminutive	4305.7798	3632.8101	47.08	1405.58	1724.4
esh65-18.fft	niic'-iSkweeSiS	S1	diminutive	4234.0967	3554.6899	42.23	1829.1	1512.3
esh65-19.fft	niic'-iSkweeSiS	S2	diminutive	4232.7085	3593.75	49.27	1208.04	1814.88
esh65-2.fft	e-waaSiSiiwiyaan	S1	diminutive	4412.2681	4726.5601	31.58	1226.89	1155.14
esh65-20.fft	niic'-iSkweeSiS	S3	diminutive	4193.0635	3203.1299	44.18	1283.27	1636.42
esh65-21.fft	n'SiimiSa	S1	diminutive	4216.6851	3671.8799	48.72	1500.76	1837.4
esh65-22.fft	n'SiimiSa	S2	diminutive	4117.1323	3750	43.48	1410.58	1683.0699
esh65-23.fft	n'SiimiSa	S1	diminutive	4202.2783	3867.1899	40.4	1371.6801	1684.48
esh65-24.fft	n'SiimiSa	S2	diminutive	4292.8823	3593.75	41.77	1275.66	1734.42
esh65-25.fft	awaaSiS	S1	diminutive	4261.9805	3554.6899	49.11	1269.83	1734.2
esh65-26.fft	awaaSiS	S2	diminutive	4260.4019	3593.75	43.66	1363.02	1682.23
esh65-27.fft	ooko'waaSiSak	S1	diminutive	4233.5938	3085.9399	43.92	1435.3	1752.73
esh65-28.fft	ooko'waaSiSak	S2	diminutive	4336.7808	3750	40.05	1109.45	1633.79
esh65-29.fft	n'cawaaSimiSak	S1	diminutive	4125.2896	3242.1899	50.49	1391.89	1630.7
esh65-3.fft	e-waaSiSiiwiyaan	S2	diminutive	4260.4238	4179.6899	39.91	959.85	1417.37
esh65-30.fft	n'cawaaSimiSak	S2	diminutive	4057.6204	3203.1299	49.47	1455.72	1618.33
esh65-31.fft	n'cawaaSimiSak	S1	diminutive	4153.2432	3476.5601	43.66	1428.98	1564.38
esh65-32.fft	n'cawaaSimiSak	S2	diminutive	3912.0388	3281.25	47.99	1264.6	1347.84
esh65-33.fft	n'cawaaSimiSak	S1	diminutive	4181.4063	3437.5	40.47	1447.03	1491.99
esh65-34.fft	n'cawaaSimiSak	S2	diminutive	4007.6768	3281.25	42.62	1199.99	1387.08
esh65-4.fft	awaaSiSa	S1&2	diminutive	4288.9541	4335.9399	44.27	1384.83	1845.08
esh65-5.fft	awaaSiSak	S1&2	diminutive	4211.8413	3437.5	44.31	1380.61	1737.97
esh65-6.fft	'waaSiSak	S1&2	diminutive	4348.8325	4531.25	41.37	1497.64	1800.6801
esh65-7.fft	awaaS'Sak	S1&2	diminutive	4307.3105	3671.8799	44.27	1383.29	1719.42
esh65-8.fft	n'kii--'piSiiS'Sin	S1	diminutive	4294.2178	3945.3101	45.43	1359.98	1866.84
esh65-9.fft	n'kii--'piSiiS'Sin	S2&3	diminutive	4185.5137	3671.8799	48.16	1554.84	1785.65

esh66-1.fft	wiiskacaaniS	S1	diminutive	4279.8647	4218.75	35.88	1152.27	1264.35
esh66-10.fft	aapikoSiiS	S2	diminutive	4222.1016	3437.5	38.3	806.73	1499.37
esh66-11.fft	wiiskacaaniS	S1	diminutive	4362.8003	4257.8101	41.32	930.34	1557.1899
esh66-12.fft	wiiskacaaniS	S1	diminutive	4241.3516	3867.1899	34.32	839.3	1317.75
esh66-13.fft	wiiskacaaniS	S1	diminutive	4198.0493	3085.9399	35.72	1178.6899	1048.9
esh66-14.fft	aapikoSiiS	S1	diminutive	4298.9727	3320.3101	40.81	1241.95	1560.97
esh66-15.fft	aapikoSiiS	S2	diminutive	4269.6567	3789.0601	38.09	874.8	1490.76
esh66-16.fft	wiiskacaaniS	S1	diminutive	4427.7939	3125	44.34	1093.8	1478.1899
esh66-17.fft	aapikoSiiSa	S1	diminutive	4244.4268	3007.8101	41.25	1018.6	1386.13
esh66-18.fft	aapikoSiiSa	S2	diminutive	3977.3274	3046.8799	41.71	1009.66	1317.48
esh66-19.fft	aapikoSiiS	S1	diminutive	4393.1934	4531.25	38.29	964.46	1564.66
esh66-2.fft	wiiskacaaniS	S1	diminutive	4392.0015	4765.6299	36.7	785.88	1163.85
esh66-20.fft	aapikoSiiS	S2	diminutive	4382.395	5039.0601	45.68	813.62	1508.1
esh66-21.fft	aapikoSiiSa	S1	diminutive	4346.7012	3125	42.56	1235.4301	1598.28
esh66-22.fft	aapikoSiiSa	S2	diminutive	4309.3774	3437.5	44.17	1162.6801	1817.34
esh66-23.fft	wiiskacaaniS	S1	diminutive	4271.2485	3007.8101	33.36	1173.25	1330.2
esh66-24.fft	wiiskacaaniS	S1	diminutive	4393.853	4414.0601	39.73	965.47	1570.04
esh66-25.fft	wiiskacaaniS	S1	diminutive	4434.8311	5781.25	30.67	811.49	857.95
esh66-26.fft	wiiskacaaniSa	S1	diminutive	4284.5913	3476.5601	30.81	1180.28	1167.4399
esh66-27.fft	aapikoSiiS	S1	diminutive	4147.4443	3007.8101	35.52	1324.2	1118.34
esh66-28.fft	aapikoSiiS	S2	diminutive	4224.6768	3437.5	42.93	994.3	1528.12
esh66-29.fft	wiiskacaaniS	S1	diminutive	4648.3242	4570.3101	33.12	952.73	956.12
esh66-3.fft	wiiskacaaniS	S1	diminutive	4256.8252	4140.6299	38.35	1311.54	1412.17
esh66-30.fft	maan'SiiS	S1	diminutive	4531.6523	5312.5	35.69	1004.69	1346.45
esh66-31.fft	maan'SiiS	S2	diminutive	4531.6523	5312.5	35.69	1004.69	1346.45
esh66-32.fft	wiiskacaaniS	S1	diminutive	4060.5579	3437.5	34.37	1160.13	1102.73

esh66-33.fft	aapakoSiiS	S1	diminutive	4310.9536	3593.75	41.79	1435.21	1646.14
esh66-4.fft	aapikoSiiS	S1	diminutive	4226.5117	3007.8101	38.6	1128.1	1540.1899
esh66-44.fft	aapakoSiiS	S2	diminutive	4239.0552	3359.3799	41.65	1290.29	1550.54
esh66-5.fft	aapikoSiiS	S2	diminutive	4283.7007	3046.8799	42.37	1291.33	1703.39
esh66-6.fft	wiiskacaaniS	S1	diminutive	4307.854	3554.6899	34.5	1108.77	1310.0699
esh66-7.fft	aapikoSiiSa	S1	diminutive	4187.9038	3906.25	41	918.21	1609.11
esh66-8.fft	aapikoSiiSa	S2	diminutive	4247.7725	3710.9399	45.68	1055.3	1716.3101
esh66-9.fft	aapikoSiiS	S1	diminutive	4051.6807	3046.8799	41.91	1154.73	1382.29
Affricates								
ec64-1.fft	ocawaaSimiSa	c1		4333.437	3398.4399	41.96	1485.6899	1629.5699
ec65-1.fft	niic'-iSkweeSiS	c1		4333.6748	3593.75	42.27	1344.9301	1785.55
ec65-2.fft	n'cawaaSimiSak	c1		4221.8711	3164.0601	55.4	1609.63	1738.85
ec66-1.fft	wiiskacaaniS	c1		4469.3599	4648.4399	45.35	892.56	1264.8
ec66-2.fft	wiiskacaaniSa	c1		4498.6113	4960.9399	35.73	870.27	1046.0699
ec66-3.fft	wiiskacaaniS	c1		4567.4048	4492.1899	45.98	855.81	1442.09

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