At a grass roots level there is a group called the L.E.A.D. Agency, Inc. (Local Environmental Action Demanded). Along with Tar Creek Superfund Site, they work to educate the community on environmental issues affecting Northeast Oklahoma. They actively pursue raising awareness at the community level and work towards implementation of counter actions on the hazards that put their community at risk for exposure to contaminants.

Today, this 40 square miles of "Indian Territory" which use to be a land of prairie and teeming with wildlife, now poses a threat to human health. With so much emphasis on ecological issues and ecosystems needing to be brought back into balance, Tar Creek still remains polluted with acid water; chat piles loom on the landscape; birds are not heard chirping amongst these gray mountains; blood lead levels are still high in children; and to date, no real studies have been done on adults in the area. This "twenty year old environmental hazard" on Indian lands speaks loudly of exploitation, environmental injustice, and continues to pose a threat to the health and well being of Indians in northeast Oklahoma.

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A New Look at Menominee Vowel Harmony

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INTRODUCTION

Menominee vowel harmony (VH) is a well-known linguistic phenomena that poses some problems for linguistic theory. This paper seeks to solve these problems. Menominee is the only member of the Algonquian language family that has VH. This VH was described in Bloomfield (1962:96–97) as an iterative process that raises [e:], [o:] and [oʔ] to [i:], [u:] and [uʔ] respectively when a high vowel or post-consonantal glide occurs further to the right in the word. Although [e], [o], [a] and [a:] are transparent, [ɛ] and [ɛ:] block VH. Analyses of Menominee VH that are based on this description encounter several problems. First, no analysis of Menominee VH as a height harmony has accurately predicted which vowels are opaque and which are transparent. Second, an examination of Bloomfield's phonetic descriptions reveals that a modern featural analysis cannot rely on his choice of phonetic symbols in order to determine the relevant features used in Menominee. Third, neither the triggers nor the targets as described by Bloomfield (1962) form a unified class and no analysis has adequately accounted for the exceptions. In sum, a modern analysis cannot rely solely on the brief descriptions of Menominee VH given in Bloomfield (1962).

This paper takes a close look Bloomfield's phonetic descriptions and the interaction of other phonological rules with VH. In the process of clearly laying out the data, I also evaluate the problems that previous analyses of Menominee vowel harmony encounter when all of the data is examined. I conclude that an analysis of the process as [ATR] harmony, such as that presented in Archangeli and Pulleyblank (1995), correctly predicts which vowels are opaque and which are transparent. Furthermore, a closer look at the phonetics of Menominee reveals that the description of the targets and triggers is not correct. All mid vowels are affected by VH and only high vowels trigger vowel harmony.

The majority of the data used in this paper come from Bloomfield's grammar (1962) and lexicon (1975). Although both were published posthumously, they are based on fieldwork he completed in the 1920s. Some data also come from work done by the Menominee team of the

Wisconsin Native American Languages Project (WNALP), headed by Kenneth Miner.[1]

OVERVIEW OF MENOMINEE PHONOLOGY

Phonemic Inventory

The consonant phonemes of Menominee are given in table 1 and the vowels are given in tables 2 and 3. This analysis comes from Bloomfield (1962:2) but for reasons explained in §2.2, I have changed some of his symbols in order to be consistent throughout the paper.[2]

Table 1: Consonants

	Bilabial	Alveolar	Palatal	Velar	Glottal
Stops	p	t		k	ʔ
Fricatives		s			h
Affricates			č		
Nasals	m	n			
Glides	w		y		

Table 2: Short Vowels

i	u
e	o
æ	a

Table 3: Long Vowels

i:	u:
e:	o:
æ:	a:

There are also two diphthongs which occur in both long and short syllables. Bloomfield's representation of the diphthongs is given in Table 4.

Table 4: Diphthongs (Bloomfield 1962:2).

short	long
ya	ia
wa	ua

Phonetically there is some free variation. The free variation in the consonants is most clearly heard in the affricate, which varies from [ts] to [č], and the alveolar fricative, which varies from [s] to [š]. The long vowels are not reported to have free variation except [æ:], which Bloomfield says can vary "from a vowel like that of French *tête,* through the type of English *bad*, to opener variants approaching the vowels of French *brave* and English *father*" (1962:4).

Bloomfield's descriptions are impressionistic. Therefore I have put his descriptions into phonetic transcription in Tables 5 and 6 (Bloomfield 1962:2–11).

Table 5: Short Vowels

/i/ [i] [ɪ]	/u/ [u] [ʊ]
/e/ [ɪ]	/o/ [o] [ʊ]
/æ/ [æ] [ɛ][ɪ]	/a/ [a] [ʌ]

Table 6: Long Vowels

/i:/ [i:]	/u:/ [u:]
/e:/ [e:]	/o:/ [o:]
/æ:/ [æ:]	/a:/ [a:]

The materials produced by the WNALP give more concrete descriptions. The phonetic realizations of the vowels as described by WNALP are given in Tables 7 and 8 (Miner 1975:15–21).

Table 7: Short Vowels

/i/ [i] [ɪ]	/u/ [u]
/e/ [ɪ]	/o/ [o] [ʊ]
/æ/ [æ] [ɛ][ɪ]	/a/ [a] [ʌ]

Table 8: Long Vowels

/i:/ [i:]	/u:/ [u:]
/e:/ [e:]	/o:/ [o:]
/æ:/ [æ:]	/a:/ [a:] [ɔ:]

The allophones of the vowels as given by Bloomfield differ slightly from the allophones described by the WNALP. In particular, while Bloomfield gives two allophones for /u/, the WNALP gives only one. This is most likely due to the fact that Bloomfield reports that /u/ only occurs in one morpheme (1962:9–10). Bloomfield also gives only one allophone for /æ:/ and two for /a:/, while the WNALP gives two for /æ:/ and one for /a:/. These differences between the allophonic descriptions of the low vowels given by Bloomfield (1962) and Miner (1975, 1979) may derive from the fifty years difference between the dates of their fieldwork, or from the fact that Bloomfield's phonetic descriptions are not precise.

The low front vowel

In recent analyses of Menominee VH there has been confusion over the phonemic and featural analysis of the low front vowel due to Bloomfield's choice of symbols. In the grammar, Bloomfield uses an epsilon to represent these vowels. This is merely an orthographic decision and not phonemically significant, for Bloomfield clearly describes this vowel as a "very open vowel" (Bloomfield 1946:86). In earlier publications, he used an <ä> to represent the low front vowel. Using <ä> to represent the low front

[1] This project published a word list and pedagogical materials in the 1970s. The WNALP used a practical orthography that closely resembles Bloomfield's final phonemic analysis presented in his grammar and lexicon. I have put all examples into one phonemic system since not all the sources use the same system.

[2] Bloomfield uses /q/ for the glottal stop, /c/ for the affricate and /ɛ, ɛ:/ for the low front vowels. The low front vowels are discussed in the next section.

vowel had already been an established Algonquianist practice by the time Bloomfield started to work on Menominee (Goddard 1987:208). Bloomfield apparently changed from using a-umlaut to epsilon because of a personal orthographic preference, as indicated in letter he wrote to Michelson in 1920 (Goddard 1987:208). Bloomfield wrote, "I like to use ɛ for ä, whether long or short". However, several analyses of vowel harmony have been based on the misconception that there is a mid lax vowel in Menominee.

Bloomfield's description of Menominee vowel harmony

Bloomfield's description of Menominee VH is as follows. [e:], [o:], and [o?] are raised to [i:], [u:], and [u?] respectively when a high vowel or glide that immediately follows a consonant occurs later in a word. An intervening [æ] or [æ:] blocks this raising (Bloomfield 1962:96–97). Examples of VH are given in (1).[3] In all the examples I have underlined the target vowels and boldfaced the trigger vowels.[4]

(1) a. neta:tu:hpim
ne-t -ato:t-**pi** -m
1-EPEN-on? -by.mouth.AI-NON.3
'I eat from on top of something' (Bloomfield 1975:31)

b. ku:nyak
ko:ny-ak
snow-PL.AN
'lumps of snow' (Bloomfield 1962:96)

c. ke:skenæ:hčihosow
ke:sk-e -næhč**i:** -ahosi-w
cut-EPEN-hand/finger-REFL-3
'he cuts off his own finger or hand' (Bloomfield 1975:92)

[3] Bloomfield does not always provide a gloss for morphemes. Where possible, I have guessed at a meaning and placed a question mark after the gloss. When a guess is impossible, a question mark will be used on the gloss line.

[4] 2 = second person; 3 = third person; 3.CONJ = third person in conjunct verbal paradigm; AGEN = agential; AI = intransitive animate verb final; AI/II = intransitive animate and intransitive inanimate verb final; EPEN = epenthetic; HABIT = habitual; II = intransitive inanimate verb final; LOC = locative; N.FINAL = noun final; NON.3 = non-third person; PL.AN = animate plural; REFL = reflexive; TA = transitive animate verb final; TH = theme sign – marks if person hierarchy is direct or reverse.

d. ke:potæč**i:**næ:w
ke:pot-æč**i:**-æn -a:-w
rub -belly-by.hand.TA-TH-3
'he holds him, in his hands and rubs him' (Bloomfield 1975:90)

In 1a the high vowel of the last syllable causes the long /o:/ to its left to raise to [u:]. In 1b the /o:/ raises to [u:] because there is a glide that is preceded by a consonant to the right. In 1c, the /e:/ in the first syllable does not raise to [i:] although there is a high vowel to the right because there is a long low front vowel between the target and the trigger. In 1d the /e:/ also fails to raise even though there is a high vowel to the right because there is a short low front vowel between the target and the trigger. In both 1c and 1d, then, a low front vowel blocks harmony.

As the example in 2 shows, non-post-consonantal glides do not trigger VH.

(2) ače:skewew
ače:skew-e -w
mud -be.AI/II-3
'he/it is muddy' (Bloomfield 1975:8)

Example 2 has a long /e:/ and this possible target is followed by two intervocalic glides, but vowel harmony does not occur.

Although Bloomfield does not explicitly list the vowels that are transparent to vowel harmony, the examples he gives in 4.66 show that [e], [o] and [a] are transparent. The examples in 3 show that these three vowels are transparent to VH.

(3) a. ači:skehkyah
ače:ske-hk**i:w** -Eh
mud -earth/land-LOC
'locative, muddy place' (Bloomfield 1975:8)

b. mači:pokwat
mat-e -pokwat-w
bad-EPEN-taste.II-3
'it tastes nasty' (Bloomfield 1975:107)

c. aski:pakiw
ask-e -pak-y**i**:-w
fresh-EPEN-leaf-II-3
'it is green' (Bloomfield 1975:30)

d. esi:ʔta:hkiw
æN-e -ʔta: -hki· -w
thus -EPEN- bodily.activity.AI-addiction.AI-3
'he is given to doing so' (Bloomfield 1975:60)

In all of the examples in 3 there are vowels that come between the target and the trigger of vowel harmony, yet vowel harmony does take place. In 3a the transparent vowel that comes between the target and the trigger is a short [e]. The transparent vowel in 3b is a short [o]. In both 3c and 3d the transparent vowels are low back vowels: a short low back vowel in 3c and a long low back vowel in 3d.[5]

The short /o/ in 3b is not affected by VH since short vowels are not targets of vowel harmony unless followed by a glottal stop. The example in 4 shows the raising of /oʔ/.

(4) kuʔnatwa:ʔ
koʔN-at -wa: -ʔ
fear -2ON3.CONJ-PL.AN-PL.AN
'if thou fearest them' (Bloomfield 1962:96)

The short /o/ in the first syllable of example 4 raises to /u/, triggered by the post-consonantal glide that occurs further to the right. Since [oʔ] acts like a long vowel in this harmony rule we would expect [eʔ] to be affected also. However, /eʔ/ rarely occurs in Menominee (Bloomfield 1962:8). The fact that I could find no examples of /eʔ/ raising is most likely an accidental gap.

Bloomfield does not explicitly state that that VH is iterative. However, data from the Lexicon (1975) given in 5 show that VH in Menominee is iterative if there is more than one long mid vowel to the left of the trigger and there is no intervening low front vowel.

(5) a. kæhki:nu:hamati:k
kæhkeno:hamati:k
'schoolhouse, school' (Bloomfield 1975:76)

b. ni:či:skih
ne-e:t -e:ski: -ah
1-accompany-enemy-SG.AN
'my enemy' (Bloomfield 1975:7)

[5] /N/ in 3d and 4 is a morphophoneme used by Bloomfield.

c ke:sæhki:hkiwew
ke:sæhk -e -hki:w -e -w
cedar -wood-EPEN-land-be.AI/II-3
'it is a cedar swamp' (Bloomfield 1975:91)

In 5a, the /e/ of the second syllable is lengthened by a metrical rule. Then, both the resulting long [e:] and the long /o:/ are raised because of the high vowel in the last syllable of the word. In 5b, the two short vowels in the first and last morphemes /e/ and /a/, respectively are deleted and the two long /e:/s that remain are raised to /i:/, triggered by the high vowel in the last syllable. The first epenthetic /e/ in 5c is lengthened by same rules as in 5a. This long [e:] is then raised to [i:] by the presence of a high vowel to the right. However, the /e:/ in the first syllable is not raised to [i:] because there is a low front vowel between this first syllable and the high vowel. The examples in 5 also show that following Bloomfield's analysis the metrical rules that lengthen the vowels in 5a and 5c must occur before vowel harmony.

PREVIOUS ANALYSES

Previous analyses as height harmony

Bloomfield describes Menominee VH as the raising of mid vowels to high vowels (1962:3). Following this initial analysis, Cole and Trigo (1988) and Steriade (1987) provide analyses of Menominee VH as a height harmony within a generative framework.

Bloomfield does not give a feature analysis of the phonemes in Menominee, but instead lists the phonemes and explains their qualities by giving an English or French word that contains a segment that more or less matches the Menominee sound. Both Cole and Trigo (1988) and Steriade (1987) assume a feature analysis of the Menominee phonemes based on analyses of the corresponding English phonemes. I have provided their featural analysis in Table 9.

Table 9: Feature Analysis of English Vowels

	i	e	ɛ	u	o	a
high	+	–	–	+	–	–
back	–	–	–	+	+	+
low	–	–	–	–	–	+
round	–	–	–	+	+	–
tense	+	+	–	+	+	–

All of the authors assume a three-way height difference, with two high vowels, three mid vowels and one low vowel. One flaw in this analysis is that Menominee does not have the lax mid vowels /ɛ:/ and /ɛ/, but has instead the low front vowels /æ:/ and /æ/. Apparently, the authors were misled by Bloomfield's choice of epsilon to represent the low front vowel.

The brief analysis presented in Steriade (1987) uses the feature analysis from Table 9 and underspecification to explain why the low back vowels are transparent to the spread of [+high]. She argues that vowels are only specified for the plus value of the feature [high], therefore the low vowels are transparent to the spread of [+high]. Since Steriade is only using the example of Menominee to show only how underspecification can predict transparent vowels, she does not try to explain why the vowel that she considers to be a mid lax vowel blocks harmony.

The analysis presented in Cole and Trigo (1988) attempts to explain both the opaque and the transparent vowels in Menominee. They describe Menominee VH as parasitic harmony, defined as "a harmony process which is dependent on both the trigger and target being multiply linked to some contextual feature" (Cole and Trigo 1988:19–20). This analysis of Menominee is crucially dependent upon the analysis of the low front vowel as a mid lax vowel, which is then specified as [-tense]. The parasitic nature of Menominee VH comes from the fact that a vowel that is linked to [-tense] cannot be also linked to [+high], thereby blocking the spread of [+high]. Since, as discussed, the treatment of the vowel that Bloomfield (1962) symbolized with <ɛ> as a mid lax vowel is incorrect, the analysis presented in Cole and Trigo (1988) fails to explain why the low back vowel is transparent to height harmony, but the low front vowel is opaque.

Problems with height harmony

Neither of the previous analyses of Menominee VH as a height harmony explains why the low front vowel blocks harmony but the low back vowel does not. Part of the problem with their analyses is the incorrect analysis of the low front vowel. However, even with this correction a height analysis and theories of feature geometry that treat the vowel space with front/back and high/low distinctions cannot naturally capture the asymmetry between the low vowels in Menominee. Using traditional features, such as those found in the model given in Halle (1995), Menominee has three distinctive features for vowels: high, low and back. Following underspecification theory, vowels must be specified in the underlying

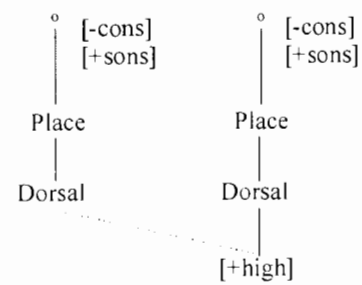
representation for the plus value of these three features. The underlying feature values for Menominee vowels under this analysis are given in 6.

(6)

i [+high]	u [+high] [+back]
e	o [+back]
æ [+low]	a [+low] [+back]

Ignoring the fact that VH only affects long mid vowels for the moment, the rule that spreads [+high] is given in 7.

(7)



Since the feature that spreads is [+high], the fact that the low back vowels and the mid vowels are unspecified for [high] explains why they are transparent. However, the low front vowel should be equally transparent since it too has no specification for the feature [high]. This analysis using traditional features cannot explain why the low front vowel in Menominee is opaque without relying on ad hoc mechanisms.

Some theories of feature geometry use slightly different features to define the vowel space. Clements and Hume (1995) use the feature [open] instead of [high] to define aperture. The feature [-open] would then correspond to [+high]. This feature, [open], can be subdivided for particular languages that have more than one degree of height difference. A language like Menominee, which has three levels of height difference, would have both [open 1] and [open 2], with [open 1] defining a larger aperture than [open 2]. In this model with underspecification theory the features for Menominee vowels would look something like 8, using [dorsal] instead of [back].

(8)

i [-open 1] [-open 2]	u [-open 1] [-open 2] [+dorsal]
e [-open 1]	o [- open 1] [+dorsal]
æ	a [+dorsal]

The feature that spreads is [-open 2]. Since the low vowels and the mid

vowels are not specified for [open 2], they should all be transparent to the spread of [-open 2]. Therefore, this analysis also leaves the asymmetry between the low vowels unexplained.

There are theories that do not treat the vowel space as symmetric, such as Government-based Phonology (GBP) (van der Hulst 1988, 1989) and Dependency Phonology (DP) (Durand 1990; Harris and Lindsey 1995). However, these theories predict that there can be no raising height harmony, but only lowering harmony. Clearly Menominee is not a lowering harmony so a height analysis within DP and GBP is impossible.

Menominee vowel harmony as ATR harmony

Considering the difficulty of providing an adequate analysis of Menominee VH as a height harmony that is descriptive, let alone explanatory, it becomes clear that a different approach is necessary. There have been analyses of apparent height harmony as [RTR] harmony, such as Kenstowicz (1979), Hall and Hall (1980), and Doak (1992) or as [ATR] harmony, such as Schlindwein (1987), and Durand (1991). The connection between height and tongue root is natural since "advancing the tongue root almost inevitably leads to raising (and fronting) the tongue body" (van der Hulst and van de Weijer 1995:510). Utilizing this phonetic evidence, it is possible to re-analyze Menominee VH as [ATR] harmony.

In order to re-analyze Menominee VH as an [ATR] harmony, a re-analysis of the vowel features is needed. However, this is not entirely new since not all linguists have analyzed Menominee in terms of the features given in 6. Hockett (1981:54) states that "It is misleading to tabulate the M[enominee] short (or long) vowels in two columns of three each." So instead of two columns, Hockett presents the vowels in four columns and two rows, as given in 9.

(9) [u] [i]
[o] [æ] [e] [a]

The presentation of the vowels as in 9 clearly shows a break with the traditional analysis of the vowel space. Hockett shows the parallel relationship between [u] to [o] and [i] to [e], but indicating that the low vowels are somehow different. He also indicates that there are only two heights rather than three.

A featural analysis that both draws on the insights that Hockett (1981) offers and uses the feature [ATR] is given in Table 10.

Table 10: ATR Analysis of Menominee Vowels

	i	e	æ	u	o	a
ATR	+	–	+	+	–	–
back	–	–	–	+	+	+
low	–	–	+	–	–	+
round	–	–	–	+	+	–

The difference between the vowels [i] and [u], and [e] and [o], respectively, is the feature [+ATR]. Within an underspecification analysis, the vowels are underlyingly specified for only the plus value of the feature [ATR]. The feature that spreads in vowel harmony is this feature, [+ATR]. The fact that the mid vowels and the low back vowel are transparent to harmony falls out naturally, since they would not be specified for the feature [ATR]. Similarly, the fact that the low front vowel blocks harmony is also an automatic result since it is specified for [+ATR].

Just such an [ATR] analysis of Menominee VH is presented in Archangeli and Pulleyblank (1994). They only use three features, called F-elements, in the underlying representation of the six vowels in Menominee. The unary features they use are [+low], [+round], and [+ATR]. The specifications for the vowels in Menominee using these features are given in 10. The feature [+ATR] does not spread but is inserted on long non-low vowels when there is a [+ATR], non-low vowel in the word. However, like Cole and Trigo (1988), Archangeli and Pulleyblank (1994) do not explain why [o?] is affected by VH, nor why intervocalic glides do not trigger VH.

(10) /i/ [+ATR] /u/ [+ATR] [+round]
/e/ /o/ [+round]
/æ/ [+ATR] /a/ [+round]
[+low] [+low] (Archangeli and Pulleyblank 1994:375)

MENOMINEE VOWEL HARMONY: TRIGGERS AND TARGETS

The analysis of Menominee VH as [ATR] harmony rather than height harmony explains one of the three apparently unusual aspects of Menominee VH, that the low front vowel but not the low back vowel blocks harmony. However, two other issues remain. Neither the triggers nor the targets of vowel harmony form a natural class.

Triggers of vowel harmony

The triggers of VH as described by Bloomfield are high vowels, both

long and short, and post-consonantal glides. This set of triggers does not form a natural class since intervocalic glides do not trigger VH. A look at the phonetics of Menominee as well as a close look at Bloomfield's phonemic notation reveals that the post-consonantal glides form part of the vocalic nucleus of a syllable that contains a diphthong while the intervocalic glides fill consonant positions.

Bloomfield's formulation of the VH triggers is necessary due in part to his choice of orthography for the diphthongs. His orthographic representation and the phonetic of the diphthongs are given in Table 11.

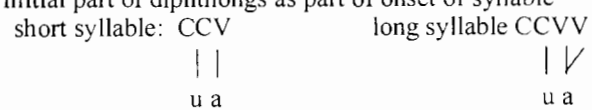
Table 11: Diphthongs

	Short	Long	Short	Long
Bloomfield's orthography	ya	ia	wa	ua
Phonetic realization	[yə]	[iə]	[wə]	[uə]

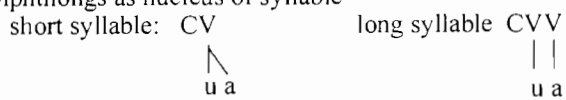
All of the diphthongs trigger vowel harmony. The long diphthongs are included in the class of high vowels since Bloomfield writes the long diphthongs as a sequence of two vowels, a high vowel followed by a low back vowel. However, since he writes the short diphthongs as a sequence of a glide and a low back vowel and since short diphthongs also trigger vowel harmony, Bloomfield must add the clause that post-consonantal glides also trigger VH. Whether or not the onset of a diphthong is a glide or a vowel is debatable, but the evidence shows that in Menominee it is a vowel.

The two possible representations are given in 11.

(11) a. Initial part of diphthongs as part of onset of syllable



b. Diphthongs as nucleus of syllable



If the structure of the diphthongs in Menominee is that of 11a, then we would expect the phonetic realizations to be [ya], [wa], [wa:] and [ya:]. However, this is not the case. The phonetic realizations of the diphthongs given in Table 11 show that the low back vowel is still reduced and the initial part of the diphthong is vocalized in a long syllable. This supports the

analysis of diphthongs as given in 11b, that diphthongs form the vocalic nucleus of the syllable.

Further evidence that the diphthongs form the nucleus of a syllable comes from the behavior of post-consonantal glide plus vowel combinations. While there are no underlying combinations of post-consonantal glide plus vowels other than /a/, these combinations often arise at morpheme boundaries. Examples are given in 12, where the post-consonantal glides are in bold.

(12) a. ahk**e:**wew
ahk**y-e:**we -w
earth/land-be.AI/II-3
'it is earth, land' (Bloomfield 1975:8)

b. nekæ:**p**č**w** isim
ne-kæp**w** -æči:-Esi-m
1-enclosed-belly-by.heat.AI-NON.3
'I sweat' (Bloomfield 1975:83)

In 12a the post-consonantal /y/ is followed by an /e:/ and they surface as [e:]. In 12b there is a post-consonantal /w/ followed by /æ/ which surfaces as [o]. The combinations of post-consonantal glide plus a vowel other than [a] surface as one vowel in both 12a and 12b. The rules for the combinations of post-consonantal glides plus vowels other than /a/ and /a:/ are given in 13.

(13) Post-Consonantal Glide + Vowel Rules
a. {wæ, wo, wE} → o/C_
b. we → i/C_
c. wi → i/C_
d. {wi:, wæ:} → i:/C_
e. we: → o:/C_
f. {yE, yæ} → e/C_
g. {ye, yi} → i/C_
h. yo → o/C_
i. {yæ:, yi:} → i:/C_
j. ye: → e:/C_
k. we → o/C_w (Bloomfield 1962: 84–86)

In all of the rules in 13 the glide and following vowel fuse and surface as one vowel. Since the combination of post-consonantal glides and vowels

other than a low back vowel results in the fusion of the two into one vowel as given in 13, it is consistent to treat the combination of post-consonantal glide and /a/ as fusion into a vowel, a diphthong.

Placing the diphthongs in the rhyme of the syllable instead of the onset also creates a unified syllable structure in Menominee. Excluding syllables with diphthongs there are eight syllable types in Menominee; V, VV, CV, CVV, VC, VVC, CVC, and CVVC. The analysis of diphthongs as part of the vocalic nucleus of a syllable as in 11b does not create new syllable types but fits into the existing system. However, the analysis in 11a would require adding two syllable types; CGV and CGVV.

Analyzing the diphthongs as forming the vocalic nucleus of a syllable also allows the triggers of VH to be described in terms of natural classes. The triggers are all high vowels since the post-consonantal glides in Bloomfield's orthography that appear to trigger vowel harmony are diphthongs.

Targets of vowel harmony

In his published works, Bloomfield[6] uses a phonemic system for writing Menominee, with the result that his data do not reflect allophonic variation. Instead, allophonic variation is discussed in his descriptions of the phonemes. Bloomfield describes the short vowels in general as "very short and relaxed" (1962:5) yet says that they are "strongest" before the glottal stop. The "short and relaxed" allophones are what are often described as lax or reduced vowels, [ɪ ɛ ʊ ʌ] and the "strong" allophones are the tense or full vowels, [i æ u o a]. An informal description of this rule is given in 14.[7]

(14) tense/full vowels become lax/reduced except when followed by a coda glottal stop

[6] Although Bloomfield describes both /i/ and /e/ as [ɪ] everywhere except before a glottal stop, Goddard (personal communication) remembers hearing a clear difference between /i/ and /e/ while he was conducting fieldwork on Menominee. Bloomfield's discussions of the front vowels in personal letters (Goddard 1987) as well as one comment in the grammar (1962:3) also indicate that these two phonemes may have difference phonetic realizations.

[7] The rule provided in (1) differs slightly from Miner (1979) where in a discussion of the front vowels he says that the full/tense allophones occur before laryngeals, [h ʔ]. While further research is needed to determine which formulation of the rule is correct, either formulation is adequate for the current discussion since the short mid vowels never occur before [h].

The allophones for the short vowels in each environment are given in Table 12.

Table 12: Allophones of the Short Vowels

before a glottal stop		elsewhere	
/i/ [i]	/u/ [u]	/i/ [ɪ]	/u/ [ʊ]
–	/o/ [o]	/e/ [ɪ]	/o/ [ʊ]
/æ/ [æ]	/a/ [a]	/æ/ [ɛ][ɪ]	/a/ [ʌ]

The fact that /e/ only has one allophone in Table 12 is not phonemically significant since it results from the distribution of this phoneme: /e/ never occurs before a laryngeal and therefore has no tense or full [e] allophone. Although the low front vowel is the only vowel that has three allophones, this vowel still follows the rule given in 14. The full allophone [æ] occurs before coda laryngeals and the lax or reduced allophones, [ɪ] and [ɛ] occur elsewhere in free distribution.

Since the differences between the short vowels are neutralized in every position except before a glottal stop, Bloomfield struggled with the phonemicization of these vowels. As he writes: "the determination of the short vowels in the normal form is the greatest difficulty of Menomini phonetics" (1962:6). Bloomfield sometimes relied on the phonological effects of a short vowel to decide which phoneme was present in a word (Goddard 1987:185–186). For example, if a phonetic [ɪ] triggered vowel harmony and lengthened in related forms to [i:], then he treated this vowel as a phonemic /i/. On the other hand if an [ɪ] did not trigger vowel harmony and lengthened to [e:], then he treated it as a phonemic /e/.

However, in regard to vowel harmony, it is impossible to hear if vowel harmony affects short vowels since there is no phonetic difference between an /e/ and /i/. The example from 3a is given again in 15 with its underlying form, Bloomfield's writing system and its phonetic realization.

(15) / ačẹ:skẹhkya:h/ *phonemic form*
ačị:skẹhkyah *Bloomfield's orthography*
[ačị:skɪhkyah] *phonetic realization*

The long /e:/ in the second syllable is raised to [i:] and Bloomfield therefore writes this vowel as an <i:> in his published works. Bloomfield knew that this vowel raised because there is a phonetic difference between the two long front vowels, /i:/and /e:/. However, the /e/ in the third syllable is phonetically [ɪ], which could be any of the front vowels since they all have an allophone [ɪ]. Bloomfield knew that this vowel was underlyingly a

phonemic /e/ since in related forms it lengthens to [e:]. I assume that since he could not hear any effect of VH, he chose to write this vowel as an <e> and say that the short vowels are not affected by vowel harmony. Yet, if the short /e/ of the third syllable did raise, there would be no phonetic difference in the pronunciation of this vowel since both /e/ and /i/ are phonetically the same in this environment.

The only environments where there is a phonetic difference between a mid vowel and a high vowel is when the vowel is long or has a glottal stop in the coda. This is shown in Table 13, which gives the phonetic realizations of the non-low vowels in three environments.

Table 13: Phonetic Realizations of Non-low Vowels

Short Vowel		Short Vowel + Glottal Stop		Long vowels	
/i/ [ɪ]	/u/ [ʊ]	/iʔ/ [iʔ]	/uʔ/ [uʔ]	/i:/ [i:]	/u:/ [u:]
/e/ [ɪ]	/o/ [ʊ]	-	/oʔ/ [oʔ]	/e:/ [e:]	/o:/ [o:]

It is not surprising that the only two environments which reflect vowel harmony according to Bloomfield are the only two environments which have a phonetic difference between the high and mid vowels. Since the phonetic differences between the high and mid short vowels is completely neutralized, except when followed by a glottal stop, it is impossible to hear if vowel harmony affects these vowels.

However, it is theoretically consistent to claim that all mid vowels are affected by vowel harmony. Since short mid vowels that are followed by a glottal stop are targets of vowel harmony, then we hypothesize that all short mid vowels are targets for vowel harmony. This avoids two theoretical problems. First, a specific rule that only targets long vowels and short vowels that are followed by glottal stop does not need to be written. Second, the issue of rule ordering with respect to metrical rules no longer exists since all non-low vowels are the target of VH.

CONCLUSION

Bloomfield analyzed Menominee vowel harmony as a height harmony that raised long mid vowels and [oʔ] to high vowels when a high vowel or post-consonantal glide appeared to the right in a word. Analyses based on this analysis encounter several problems providing an explanation for three aspects of Menominee VH: the transparent and the opaque vowels, the raising of only one short vowel, and the fact that intervocalic glides do not trigger vowel harmony. This paper provides answers to all three of these problems. An analysis as ATR harmony accounts for both the transparent and the opaque vowels, and the formulation of both the targets and triggers of VH can be restated in terms of natural classes. The targets are mid vowels and the triggers are high vowels.

However, before we come to any conclusions about the theoretical ramifications of Menominee vowel harmony, we should take into consideration the knowledge that Bloomfield 'normalized' his data. Goddard 1987 describes how Bloomfield's analysis changed over the years and also how he would change all his data after formulating a rule. In regard to vowel harmony, he did not formalize the relevant rules until after his last trip to the reservation in 1938, resulting in the fact that he had no chance to check and make sure he had the rules correctly formulated. Yet, he still went through his data and changed words so that they conformed to his rules. He mentions in the grammar that there are exceptions to the vowel harmony rule, but he does not provide these exceptions. In everything he published, the grammar and the lexicon, all words conform to his vowel harmony rules. Therefore it is possible that the published data is not representative of Menominee in the 1920's. I am currently conducting my own fieldwork in order to determine if the data I have presented is correct.

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Adnominal Demonstrative Words in Passamaquoddy

EVE NG
SUNY-Buffalo

INTRODUCTION

In the general linguistics literature, demonstratives are frequently described as deictic morphemes that orient the addressee's attention to something in the speech situation or in the linguistic discourse:

(1) Demonstratives are deictic expressions. They are primarily used to focus the hearer's attention on objects, persons, or locations in the speech situation, but they may also refer to linguistic entities in discourse. [Diessel 1999*a*: 19, after Lyons 1977:636–677]

Deixis is essentially a notional concept, but there is sometimes an intrusion of grammatical aspects into understandings of the "demonstrative" category, as Trask's definition, in characterizing demonstratives as determiners, shows.

(2) A determiner with a clear deictic function, such as *this* or *that* in English. [Trask 1993:76]

In a similar vein, in past treatments of Passamaquoddy and other Algonquian languages, "demonstrative" has also been defined by a mix of functional and morphological characteristics.[1] As is expected, deictic morphemes referring to beings and objects are identified as demonstratives; however, deictic place-referring morphemes are not. On the other hand, items which are not deictic in function, but which have the same stems and morphological behavior as the deictic morphemes, such as items serving as definite articles, have also been labelled "demonstratives."

The basis of the categorization is morphological. Both deictic morphemes referring to beings and objects and items serving as definite articles vary morphologically for the grammatical categories of number, animacy, and obviation, while place-referring deictics do not. Although this does

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