Prince (1983) analyzed Cayuga as having both tone and a metrically determined stress accent. The distribution of tones and their interaction with laryngealization form an interesting pattern that suggests that Oklahoma Cherokee has recently changed from being a predominantly stress accent language to being a tone language with stress accent restricted to certain forms. As such, it is an example of a language in which tone and stress systems interact.

Laryngeal Metathesis and Vowel Deletion in Cherokee

Edward S. Flemming

1. Introduction

'Laryngeal metathesis' is the label assigned to a complex set of metathesis and deletion processes conditioned by laryngeal features in Cherokee (Cook 1979, Scancarelli 1987).

An example of metathesis is given in (1):

(1) a. *ààgì-hnààlv́v́'i* → *ààkìnààlv́v́'i* 'I am angry'
1sB-angry;prs

cf. b. *ùu-hnààlv́v́'i* 'he is angry'
3sB-angry;prs

c. *ààgì-gòòhv̀v́'i* 'I saw it'
1sB-see;pst

(1a) shows that the /h/ metathesizes across a short vowel, ending up adjacent to a voiceless unaspirated stop, forming an aspirated stop. (1b) provides evidence for the underlying form of the stem, which surfaces in the third person where metathesis does not apply. (1c) indicates the form of the 1sB agreement prefix when metathesis does not apply.

The case of deletion is exemplified in (2).

(2) a. *ùu-lv̀v̀gwòhdi̋i'i* → *ùulv̀v̀kwdi̋i'i* 'he likes it'
3sB-like;prs

cf. b. *jìì-lv̀v̀gwòòdi̋i'i* 'I like him'
1sA-like;prs;'

(2a) shows the loss of underlying /o/, rendering /gw/ adjacent to /h/, which results in an aspirated labialized stop. (2b) shows the source of evidence for root-internal deletions of this kind: the 'glottal grade' of the stem. Certain agreement prefixes, including 1sA select the so-called glottal grade of a stem. The process of glottal grade formation is discussed in detail by Munro (this volume), but the crucial aspect here is that it typically involves replacing the first /h/ in the stem by a glottal stop, and since /h/ conditions metathesis and deletion, this change can remove the environment for these processes. In the dialect of our consultant, pre-consonantal glottal stops surface as glottalization and lengthening of the preceding vowel, so no actual glottal stop is transcribed in (2b), however the h-ʔ alternation can be seen clearly in forms such as those in (4) In any case, no /h/ is present so underlying /o/ surfaces undeleted. Comparison of glottal grade forms with their 'h-grade' counterparts thus provides useful evidence for the occurence of deletion.

(4) a. *àa-hv́v́'a* 'she's moving it'
3sA-move;prs

b. *jì-'v́v́'a* 'I'm moving it'
1sA-move;prs;'

Thus metathesis and deletion apply in a CVhX environment:

(6) Metathesis: CVhX → ChVX
Deletion: CVhX → ChX

Both processes are subject to complex conditioning factors outlined in (7).

(7) i. The identity of C - sonorant or obstruent
- aspirated or unaspirated
ii. The identity of X - sonorant or obstruent
iii. The length of V
iv. The tone on V

This paper has two goals: firstly, to show that the complex conditioning of metathesis and deletion can be analyzed as the result of the interaction of simple, general constraints, and secondly, to consider issues relating to the analysis of metathesis.

2. Optimality theory

The analysis will be formulated in terms of Optimality Theory (Prince and Smolensky 1993). Important features of this approach adopted here are as follows:

1. Phonologies consist of sets of ranked, violable constraints, e.g.
   'Syllables must have onsets'
   *[-back, +round]
   'Align [+round] with the right edge of the word' (Spread [+round])

2. The output form of a given input UR is that representation which best satisfies the constraints. Thus constraint violation can be forced by a conflicting higher ranked constraint. For example, if *[-back, +round] is ranked above 'Spread [+round]' then spreading onto a front vowel will be blocked.

3. A crucial set of constraints are the 'faithfulness' constraints (cf. Prince and Smolensky 1993) which require the output to be similar to the input. Without constraints of this kind, the input could be replaced by a dramatically different, but otherwise extremely well-formed, output. The key families of faithfulness constraints adopted here, from Kirchner 1993, are ParseF and *Insert F, which can be formulated as follows:

(8) Parse F: do not delete feature F from the input representation.
*Insert F: do not insert feature F.

Optimality theory is adopted here as a tool which allows us to bridge the gap between the work of phoneticians such as Ohala (1983, 1992), Lindblom (1990), Stevens and Keyser (1989) and Kawasaki (1982) on providing substantive phonetic explanations for tendencies in phonological patterning, and the analysis of the phonologies of individual languages. For example, the tendency for front vowels to be unrounded, and back vowels to be rounded has been explained in terms of the acoustic effects of rounding. Back vowels differ from front vowels in having a smaller difference between the frequencies of the first and second formants. Rounding lowers the second formant, thus rounding a back vowel makes it more distinct from a front vowel. However, phonologists must analyze individual languages, not cross-linguistic tendencies, and some languages contravene the tendencies. For example Turkish has front rounded and back unrounded vowels.

In optimality theory, a phonological grammar consists of universal constraints ranked in

order of priority. If we regard the phonetic desiderata adduced to explain phonological tendencies as constraints, we can account for the failure of specific languages to observe them in terms of the ranking order. A superordinate constraint overrides the tendency to observe a lower-ranked constraint, as in the case of a language which has front rounded vowels, where constraints that favor making a large number of vowel contrasts available override the dispreference for front rounded vowels.

Thus optimality theory allows us to formulate specific phonological analyses in terms of general substantive constraints. The crucial elements of the theory from this point of view are that it uses constraints rather than rules, and that it provides a tractable mechanism for the resolution of conflicts between constraints, namely the ranking of constraints.

3. The analysis of metathesis

The analysis of metathesis in terms of optimality theory raises interesting issues. It is not difficult to see motivations for metathesis. For example the pattern of historical metathesis shown in (9) can be understood as being motivated by the well-established preference for open syllables (Ultan 1978). The question is what constraints restrict the application of metathesis.

(9) Metathesis in the development of French:

brebis	< **vervecem**	'young lamb'
troubler	< **torbler**	'to disturb, worry'
fromage	< ***formaticum**	'cheese'

Clearly metathesis involves some kind of violation of faithfulness to the input representation, but the relevant constraints cannot belong to the family of Parse F and *Insert F constraints because nothing is added or deleted. Metathesis violates faithfulness to the temporal sequencing of the input, so we need constraints against altering ordering relations.

Standard autosegmental phonology recognizes two timing relations: association (which represents simultaneity or overlap) and temporal precedence. We will posit constraints relating to each.

(10) Parse Association: A feature in the input should appear associated to the same position in the ouput.

Parse Ordering: Do not reverse precedence relations.

Parse Ordering (Ordering) is formulated as shown to allow adjacent features to become associated to the same root node without violating this constraint. Similarly, features associated to the same root may be linearized into adjacent features without violating ordering (11). However, both of these changes would violate Parse Association.

(11)
```
  F            F             F             F
  |            |             |             |
x x x   →    x x x   or    x x x   →     x x x
    |          |             |               |
    G          G             G               G
```

Reversing the order of two features constitutes a violation of Ordering:

```
(12)      F1 F2            F1   F2
          |  |              |    |
          x  x  x     →     x  x  x
                |              |
                G              G
```

A final type of temporal sequencing constraint relates to epenthesis. Inserting a segment into an input does not alter any precedence relationships, but it does violate the contiguity of the sequence. Thus we will adopt the following constraint (cf. Kenstowicz 1994):

(13) Contiguity: Do not insert segments that are not present in the input[1]

4. [Spread glottis] sounds in Cherokee

Before we turn to the analysis of metathesis and deletion it is necessary to clarify the phonetic and phonological nature of the Cherokee sounds with particular relevance to these processes, those which involve the feature [spread glottis] ([s.g.]). Table one shows the representation of Cherokee sounds central to the present paper in orthography and in IPA, together with brief phonetic descriptions.

Orthography	IPA transcription	Description
d, g, j	t, k, tʃ	voiceless unaspirated stops/affricates ('g' can be voiced intervocalically)
t, k, ch	tʰ, kʰ, tʃʰ	voiceless aspirated stops/affricates
h	h, ɦ	breathy voiced intervocalically, voiced elsewhere
hw	w̤	breathy voiced labio-velar glide
hy	j̤, j̥	breathy voiced or voiceless palatal glide
hn	n̤	breathy voiced nasal (breathy closure, modal release)
hl	ɬ	voiceless lateral fricative

Table 1. Selected Cherokee sounds.

It is essential to realize that while the orthography includes sequences of sonorants and *h*, these are in fact conventional linearization of essentially simultaneous events. For example *hw* represents a breathy labio-velar, not a sequence of /h/ followed by a labio-velar. Thus I assume that the breathy glides are represented phonologically as identical to voiced glides apart from the addition of the [s.g.] specification.

Note that breathy sounds become partially devoiced before voiceless obstruents and are then spelled *wh, yh, nh* respectively in the orthography. However, I assume that this devoicing is a gradient phonetic effect, and that their phonological representations are essentially unchanged.

Realizing that [s.g.] occurs associated to sonorants eliminates some apparent cases of metathesis suggested by the orthography. For example, the derivation in (14a) essentially involves vowel deletion. However, in the orthographic transcriptions given, deleting *i* leaves the sequence *lh*, whereas the actual result is written *hl*. So, orthographically, this derivation does involve metathesis of *h* across *l*. but in fact what is occurring is the merger of /h/ and /l/ to produce a [s.g.] lateral.

[1]This constraint could be alternatively be formulated as 'do not alter immediate precedence relations', where immediate precedence is a relation defined only between adjacent elements.

(14) a. *aa-lihtàwo* → *àahltàwo* 'he's combing his hair'
3sA-comb.hair;prs

cf. b. *gà-lìitàwo* 'I'm combing my hair'
1sA-comb.hair;prs;'

More generally, the sequences [Ch] and [hC] are not well-formed unless C is a stop closure. Thus the segment /h/ appears only adjacent to a stop closure or intervocalically, as in (15).

(15) Intervocalic /h/:
àa-hv̌v'a 'she's moving it'
3sA-move;prs

nìhi 'you'

/h/ preceding a stop:
hìhdlìya 'you're sharpening it'

sàhkòónge 'blue'

ùlàasìhdéeni 'his foot'

Any underlying sequence consisting of /h/ and a sonorant will surface as a single segment with a [s.g.] specification, as discussed above. This distribution is analyzed in the following section.

Given the fact that the orthography obscures some important aspects of the phonological representation of words, it is important to keep orthographic and phonological representations distinct. To this end, orthographic transcriptions will be presented in italics, e.g. *àahltàwo*, while phonetic and phonemic transcriptions will be indicated by square brackets, e.g. [àaɬtàwo], and slant brackets, e.g. /àalìhtàwo/, respectively.

5. The distribution of [s.g.]

In this section we will consider the phonological representations of the [s.g.] sounds as the basis for an analysis of the patterns outlined above.

Following Steriade (1992a, 1993), I propose that stops and nasals are represented with two positions to which features may associate: a closure and a release, which has approximant or fricative stricture. A closure position is symbolized as A_0, a fricative as A_f, and an approximant as A_{max}. Partial representations of sample Cherokee stops and nasals are shown in (16):

(16) unaspirated *b*. aspirated *p*: plain nasal *n*: breathy nasal *hn*:

```
                          [s.g.]                             [s.g.]
                            |                                  |
 A0 Amax                  A0 Amax      A0 Amax               A0 Amax
 |                        |            |                     |
 place                    place        [nasal]               [nasal]
 |                        |
 labial                   labial
```

Breathy glides are represented as in (17):

(17) *hy*:

```
[s.g.]
  |
 Amax
  |
 place
  |
 dorsal
```

We turn now to the analysis of the generalization that the sequences [Ch] and [hC] are not well-formed unless C is a stop closure. Presumably general constraints on syllabification or phonotactics rule out tautosyllabic [Ch] and [hC] clusters, other than aspirated stops (18), since such clusters are cross-linguistically very rare, but for present purposes we will formulate a single constraint, *Ch, barring these clusters.

(18) Ill-formed clusters:

*.Ch (where C is an approximant or fricative)
*Ch.
*.hC
*hC.

Two further constraints are relevant to the correct resolution of an ill-formed input cluster:

(19) Parse [s.g.]: Don't delete the feature [s.g.]
Parse association: A feature in the input should appear associated to the same position in the ouput.

Given the ranking shown in (20), a cluster violating *Ch will be resolved by associating [s.g.] to C. This satisfies Parse [s.g.], but violates lower ranked Parse Association, since [s.g.] has been reassociated to the preceding segment (see 21).[2]

(20) *Ch, Parse [s.g.] >> Parse Association

[2]In Optimality Theory, the evaluation of a set of candidates with respect to a constraint ranking is conventionally presented in table form. The input representation is shown in the top left, with the output candidates in the column below it. The constraints are arranged along the top row from highest ranked, on the left, to lowest ranked. Constraints which are equally ranked are separated by a dotted line. An asterisk (*) in a cell indicates that the candidate at the left of that row violates the constraint at the head of that column. An exclamation point (!) after an asterisk indicates that the violation eliminates that candidate from contention. The optimal candidate is marked with an arrowhead (>) in the left column.

(21)

<table>
<tr><th>/hl/</th><th>*Ch</th><th>Parse [s.g.]</th><th>Parse Assoc</th></tr>
<tr><td>hl</td><td>*!</td><td></td><td>*</td></tr>
<tr><td>> [s.g.]
|
l</td><td></td><td></td><td>*</td></tr>
<tr><td>l</td><td></td><td>*!</td><td></td></tr>
</table>

The two remaining possibilities, the heterosyllabic clusters C.h and h.C are ruled out by a dispreference for codas, formulated as the constraint *Coda:

(22) *Coda: syllables should not have codas.

This constraint is also ranked above Parse Association, so merging Ch and hC clusters is preferrable to creating a coda, even at the cost of violating Parse Association:

(23)

<table>
<tr><th>/hC[+son]/</th><th>*Coda</th><th>Parse [s.g.]</th><th>Parse Assoc</th></tr>
<tr><td>h.C</td><td>*!</td><td></td><td></td></tr>
<tr><td>> [s.g.]
|
C</td><td></td><td></td><td>*</td></tr>
</table>

Thus whenever a cluster of a sonorant and /h/ arises, it will surface as a breathy sonorant. But in the case of clusters of /h/ and an oral stop closure, there is an additional higher ranked constraint against merging /h/ with the closure (24). Effectively, this constraint states that there are no preaspirated stops in Cherokee.

(24) *preasp. :

```
*[s.g.]
   |
  A0
   |
 [-son]
```

(25) *preasp. >> *Coda

So, as shown in (26), in this case hC will be syllabified with /h/ in coda.

(26)

<table>
<tr><th>/hC/</th><th>*preasp.</th><th>*Coda</th><th>Parse [s.g.]</th></tr>
<tr><td>> h.C</td><td></td><td>*</td><td></td></tr>
<tr><td>[s.g.]
|
C</td><td>*!</td><td></td><td></td></tr>
</table>

Thus the only cases in which the sequences /Ch/ and /hC/ will surface is when C is a stop closure, and thus forms an aspirated stop in Ch, and is unable to merge with /h/ in /hC/.

6. Metathesis and deletion

There are two processes conditioned by [s.g.] in Cherokee: laryngeal metathesis and deletion. Methathesis involves the migration of [s.g.] from one consonant to another across an intervening vowel. Deletion applies to a vowel preceding a [s.g.] sound. The incidence of these two processes is summarized in (27). The table shows when the two processes apply to a CVhX sequence, depending on whether C is an unaspirated plosive or a sonorant, and on whether the following sound, X, is a stop, sonorant, or vowel (the fricative /s/ is discussed below). Examples instantiating each cell in the table are given in (28)-(39).

(27) Incidence of metathesis and deletion in the configuration: CVhX

C\X	plosive	son	vowel
plosive	del	met	del
son	del	-	-

del = 'V deletes' met = 'h metathesizes across V'

Examples (T = any plosive, N = any sonorant):

TVhT → ThT	(28) *g-ahdiya* 3sA-use;prs	→	*k-dǐya*	'he is using it'
	(29) *uu-lvvgwohdii'i* 3sB-like;prs	→	*ùu-lv̀v̌kwdǐi'i*	'he likes it'
TVhN → ThVN	(30) *aagi-hwasga* 1sB-buy;prs	→	*àakǐwàsga*	'I'm buying it'
	(31) *ga-hnaalvvsdi* 3sA-make.angry;prs	→	*kànàálv́vsdi*	'he's making him angry'
$TV_1hV_2 \rightarrow ThV_2$	(32) *da-hi-wooniisi* fut-2sA-speak;fut	→	*tǐwóónìisi*	'you will speak'
	(33) *aagi-hawoosdii'a* 1sB-choke;prs	→	*àakàwóósdǐi'a*	'I'm choking'
NVhT → NhT	(34) *aa-lihkooddi* 3sA-shatter;prs	→	*àahlkòòddi*	'he's shattering it'
	(35) *aani-htoosadii'a* 3pA-hang.up.long.object;prs	→	*àanhtóósàdǐi'a*	'they're hanging it (long) up'
NVhN	(36) *d-úunà-hnúuwa* dis-3p>3p-wear.shirt;prs			'they wear shirts'
	(37) *wàhya*			'wolf'
NVhV	(38) *nǐhi*			'you'
	(39) *wàhv́sga*			'he is placing it'

The table indicates a fundamental split between the cases where the preceding consonant, C in CVhX, is a plosive and the cases where it is a sonorant. Where C is a plosive (a stop or affricate), either deletion or metathesis always applies, but if C is a sonorant, deletion only applies under restricted circumstances. We will analyze the incidence of metathesis and deletion in terms of two basic processes. One deletion process applies without regard to the identity of C, and is triggered by [s.g.] immediately preceding a plosive. This process accounts for the application of deletion in the leftmost column of (27), and will be labelled 'breathy vowel

deletion', in anticipation of the proposed analysis. The second process applies when C is a plosive, and may result in deletion or metathesis. This process accounts for the observations in the two rightmost cells in the top row of (27), and will be labelled 'metathesis', even though it results in deletion in some cases.

Evidence that there are two distinct processes operative here is provided by the fact that /s/ also conditions deletion of a preceding vowel, without regard to the nature of the preceding segment (40). I.e. breathy vowel deletion is triggered by /s/ as well as /h/ preceding a stop, whereas metathesis is triggered by /h/ or a breathy sonorant only.

(40)

TVs → Ts	*aagi-sgaasdaaneelv* 1sB-scare;pst	→	*àagsgáásdáànèèlv*	'he scared me'
NVs → Ns	*aa-danasiini* 3sA-crawl;prs	→	*àadànsǐini*	'he's crawling'
	aa-lisgi 3sA-dance;prs	→	*àalsgi*	'he is dancing'

The basis for the difference between the two processes can be analyzed in terms of the constraints that motivate them. Metathesis results from the attempt to associate [s.g.] to the optimal position, whereas breathy vowel deletion is motivated by a requirement to spread [s.g.] from a voiceless sound. In the remainder of this section we will consider first metathesis then breathy vowel deletion, accounting for the properties particular to each phenomenon, then we will turn to the factors that they have in common. We expect shared properties because both processes involve the feature [s.g.] and both involve deletion so constraints on [s.g.] and constraints on deletion will apply equally to both.

6.1. Metathesis. The first process can be understood as resulting from the attempt to associate [s.g.] to the optimal position. The best docking site for [s.g.] is on the release of a stop, where the high rate of air-flow allows the realization of salient cues to the state of the glottis (Kingston 1990). The alternative positions in which [s.g.] can appear are in isolation as [h], or associated to a sonorant. The feature [s.g.] is undesirable on a sonorant because it conflicts with the realization of sonorancy and voicing (Stevens and Keyser 1989). The segment [h] is also problematic. Post-vocalic [s.g.] preceding a stop (e.g. -iht-) has essentially the same spectral shape as the preceding vowel, and thus will be substantially masked by it (Bladon 1986). Inter-vocalic [h] also does not produce any major transitions in spectral shape or amplitude, especially if voiced (as in Cherokee), although there will be some widening of formant bandwidths, and loss of higher frequency energy. Thus it is unsurprising that the distribution of /h/ is often restricted (for instance, in English, /h/ may only occur as the onset of a word or stressed syllable).

6.1.1. Deletion in TVhV sequences. Conceptually, deletion and metathesis can result from the requirement that [s.g.] associate to the optimal position, the release of a stop, even at the cost of deleting an intervening vowel. The constraints required to formalize this analysis correspond to the considerations adduced above regarding the optimal placement of [s.g.]. So *[s.g., son] represents the fact that [s.g.] and [+sonorant] are antagonistic features, and *h represents the fact that [h] is also dispreferred. By contrast, [s.g.] on a stop release does not violate any constraints. Two 'faithfulness' constraints against deletion of vowels and [s.g.] are also required.

(41) *[s.g., son]: Avoid the feature combination [+s.g., +sonorant].
*h: Avoid [h].
Parse V: Do not delete vowels.
Parse [s.g.]: Do not delete [s.g.]

In Cherokee, these constraints are ranked as shown in (42). In a /TVhV/ sequence this results in deletion of the first vowel, leaving /h/ in the release position following the plosive (43).

(42) Parse [s.g.] >> *[s.g., son], *h >> Parse V

(43) $TV_1hV_2 \to ThV_2$ *da-hi-wooniisi* → *tíwóónìisi* 'you will speak'
fut-2sA-speak;fut

/tahi/	Parse [s.g.]	*[s.g., son]	*h	Parse V
tahi			*	
> t<a>hi		*		*!
ta<h>i	*!			

Deletion does not apply with a preceding sonorant (44). This is because deletion in this situation would result in a breathy sonorant, which is as marked as [h] (45).

(44) NVhV *nìhi* 'you'

(45)

/nihi/	Parse [s.g.]	*[s.g., son]	*h	Parse V
> nihi			*	
n<i>hi		*		*!
ni<h>i	*!			

6.1.2. Metathesis in TVhN sequences. Extending this analysis to the instances of metathesis requires refinement of this basic picture. First, we must allow for the possibility that a [s.g.] feature that originates on one segment can surface on another. Such a change is a violation of the temporal ordering.

Metathesis most transparently involves optimal placement of [s.g.]. Metathesis applies only to take [s.g.] from a sonorant, a dispreferred location, onto the release of a stop, the optimal location (46). This clearly involves violation of Parse Association, so this constraint must be ranked below *[s.g., son] (47).

(46) TVhN → ThVN *aagi-hwasga* → *àakìwàsga* 'I'm buying it'
1sB-buy;prs

(47) *[s.g., son] >> Parse Association

Simply linearizing [s.g.] to precede a sonorant, then deleting the intervening vowel, as in the case of intervocalic /h/ above (4.1.1.), would not yield the correct output:

(48)
```
[s.g.]         [s.g.]
  |      →       |
k i j        *k <i> h j
```

I suggest that this output is ill-formed because, in a well-formed Cherokee consonant cluster, a consonant following a stop will be in the release position of that stop. In an aspirated stop, this is also the position to which [s.g.] is associated, so a sonorant following an aspirated stop will be [s.g.]. Thus the ultimate output of (48) would in fact contain a breathy sonorant, as in (49), and thus represents no improvement over the input.

(49)
```
[s.g.]        [s.g.]
  |     →       |
k i j        k <i> j
```

Cherokee does not contain any clusters in which a sonorant is second member except for the labialized stops [k^w, g^w]. This fact, and metathesis, can be accounted for if we assume that a vowel is epenthesized to prevent such clusters (50). Thus the apparent metathesis is analyzed as a minimal form of epenthesis: a vowel is inserted whose place features are provided by the deleted vowel. This reassociation of the vowel features is possible because the intervening [h] consists solely of a laryngeal specification, and therefore does not block the spread of vowel place features (cf. Steriade 1987).

(50)
```
  [s.g.]            [s.g.]
    |                 |
x x x      →     x<x>x  x  x
| | |            |  |      |
k i j            k  i      j
```

6.1.3. Alternative analyses of metathesis. According to this analysis, laryngeal metathesis is not true metathesis, in the sense that the order of the vowel and [s.g.] is not simply switched, rather the apparent reversal of order results from deletion and epenthesis.[3] In present terms, true metathesis would involve a violation of Ordering, reversing an ordering relationship. Such violations must be possible to account for metathesis in consonant clusters, for example, where epenthesis could hardly be implicated. Thus it would be possible to analyze Cherokee laryngeal metathesis in this way. That is, *[s.g., son] could be ranked above Ordering, so Ordering could be violated to avoid a breathy sonorant.

There are two reasons to prefer the analysis in terms of deletion and epenthesis. Firstly, metathesis is not generally possible in Cherokee. Although the optimal position for [s.g.] is the release of a stop, [h] does not metathesize with a following stop to associate to this position:

(51) hT –x→ Th :

hìhdlíya 'you're sharpening it'

sàhkóónge 'blue'

Given the current formulation of Ordering, permitting metathesis of [s.g.] with a vowel would also permit metathesis with a consonant, because Ordering constrains reversal of ordering relationships without regard to the type of segments involved. It would be possible to replace Ordering with a set of constraints such as 'Preserve CV Ordering' and 'Preserve CC ordering' with the latter being ranked higher than the former in Cherokee, permitting CV metathesis but not CC metathesis. However this sacrifices the simplicity of the Ordering constraint adopted here.

The more important reason for preferring the deletion/epenthesis analysis of laryngeal metathesis is that it allows a unified analysis of parallels between metathesis and deletion. Both

[3] A comparable analysis of metathesis in Maltese Arabic is proposed in Hume (1992).

metathesis and deletion apply only with short vowels (6.3.1). If both processes involve deletion, this fact can be accounted for in terms of a single constraint against deleting long vowels, as proposed below. If metathesis is a distinct operation, then separate constraints will have to be invoked to block the two processes under the same conditions.

6.1.4. Deriving the properties of metathesis. To formalize the proposed analysis of metathesis we need an additional constraint, Contiguity (X, above), which forbids insertion of segments that were not present in the input. This constraint must be ranked below *[s.g., son] to allow metathesis to occur, as illustrated in (52). In the optimal output, [s.g.] is delinked from a sonorant, and surfaces on the release of a stop at the cost of violating lower ranked constraints by deleting and epenthesizing vowels.

(52) TVhN → ThVN

/tan̤/	*[s.g., son]	*h	Parse V	Segment	Contiguity
tan̤	*!				
t<a>n̤	*!		*		
> t<a>han			*	*	*

Metathesis applies only with a preceding plosive[4]

Obviously, metathesis does not apply where the preceding consonant is a sonorant (53) because it would result in an breathy sonorant, which is precisely the segment that metathesis applies to eliminate.

(53) NVhN   *d-úùnà-hnúùwa*   'they wear shirts'
dis-3p>3p-wear.shirt;prs

Metathesis also does not apply in the absence of any preceding consonant (54). Metathesis in this case would violate several constraints to create an /h/, which is as undesirable as a breathy sonorant (55).

(54) *àhóol*   –x→ **hool*   'his mouth'
àhyv̀hjéeni   –x→ **hayvhjeeni*   'his neck' (Feeling and Pulte 1975: 29)
àhnàwo   –x→ **hanawo*   'shirt'

(55)

/an̤/	*[s.g., son]	*h	Parse V	Segment	Contiguity
> an̤	*				
<a>han		*	*!	*	*

[4]Cook (1979) does not make this observation. His rule of laryngeal metathesis predicts that metathesis should apply with a preceding sonorant. While it must be borne in mind that Cook's description is based on the North Carolina dialect of Cherokee, while the present study is based on a speaker of Oklahoma Cherokee, there is evidence that /h/ does not metathesize onto sonorants in Cook's data either. He presents two forms that are regular according to the current analysis as exceptions to his rule (p.11):

aanahneejoo'vska   'they are playing a sport'
ganohliitooha   'he is hunting'

According to the present analysis metathesis should not apply since the potential target in each case is a sonorant /n/. The only example Cook supplies in support of metathesis onto sonorants is a complex derivation of an object-specific verb, *gahlasga* 'he is putting a round object in a container' (p.10). As Blankenship (this volume) demonstrates, the formation of such stems is unproductive and highly idiosyncratic, so this example is not compelling motivation for admitting metathesis onto sonorants.

Metathesis only applies to breathy sonorants

There are two other configurations in which metathesis might apply: /TVhV/ and /TVhT/ (the case of [s.g.] on a fricative is discussed in 6.1.7). In the case of /TVhV/, discussed in 4.1.1. above, the result of deletion is a well-formed configuration, [ThV], in which [s.g.] is associated to the release of a stop, so there is no motivation to violate further constraints to epenthesize a vowel as in metathesis. In fact the result of epenthesis, [ThV$_1$V$_2$], would be ill-formed because vowel sequences are not permitted in Cherokee and are resolved by deletion of V$_1$.

Deletion of the vowel in a /TVhT/ sequence also produces a well-formed output: [ThT]. In any case, deletion in this environment is also motivated by the constraints responsible for breathy vowel deletion (6.2, below).

Metathesis applies only to breathy sonorants because it is in this case that the output of deletion is a configuration in which epenthesis is motivated, i.e. an aspirated stop-sonorant sequence.

Metathesis operates leftwards

Note that it is not stipulated anywhere that metathesis should operate leftwards. This is related to the observation that /h/ does not metathesize with a following stop (56).

(56) hT –x→ Th :

hìhdíìya   'you're sharpening it'

sàhkòónge   'blue'

This shows that Ordering, the constraint against reversing precedence relations, must be ranked above *h, so metathesizing in this context is a greater violation than allowing /h/ to surface. In fact precedence relations are never violated in Cherokee, so Ordering is an undominated constraint.

This ranking also yields the result that shifting [s.g.] to the right cannot result in an improvement (57). For an input containing a breathy sonorant, the only output preferrable to leaving [s.g.] in the same position is one in which [s.g.] is associated to the release of a stop. This can only be achieved by moving [s.g.] rightwards if that movement is across a stop and this would require reversing the precedence relation between [s.g.] and the following stop. That is, given that metathesis cannot apply across an adjacent stop, it clearly cannot apply across a vowel and a stop.

(57)

/n̤ati/	Ordering	*[s.g., son]	*h	Parse V	Parse Association	Contiguity
> n̤ati		*				
nah<a>ti			*	*!	*	*
nathi	*!				*	

6.1.5. The behavior of labialized velars. It is interesting to note that [s.g.] does not metathesize onto a labialized velar stop (58).

(58) *àágwà-hnúúwa* –x→ **ààkwànúúwa* 'I'm wearing a shirt'
1sB-wear.shirt;prs

dòódágwòhnv –x→ **dòódákwònv* 'Monday'

This is expected given the phonological representations assumed here according to which a labialized stop consists of two positions; a stop closure and a release which is identical to the sonorant [w] (59). Thus metathesis onto a labialized stop is blocked for exactly the same reason that [s.g.] does not metathesize onto [w]: it would produce a dispreferred breathy sonorant.

(59)
$$\begin{array}{cc} A_0 & A_{max} \\ | & | \\ k & w \end{array}$$

This analysis implies that aspirated labial velars are dispreferred because they involve the marked feature combination [s.g., +sonorant]. Thus we might expect that the vowel epenthesis that applies in metathesis would apply erroneously to break up this sequence.

(60) kw → *khiw

The crucial observation in explaining why this does not occur is that we have not analyzed metathesis as involving epenthesis of a vowel per se, rather it involves insertion of a vowel position. The features associated to that position are present in the underlying representation. Thus we can prevent epenthesis breaking up labialized velars by giving a high ranking to *Insert Feature, a constraint against inserting features (61). So while inserting a vowel segment in violation of contiguity is less violation than creating a breathy sonorant, inserting features on that vowel is a greater violation.

(61) *Insert F >> *[s.g., son], *h >> Parse V >> Contiguity

/kwa/	*Insert F	*[s.g., son]	Parse V	Segment	Contiguity
> kwa		*			
khiwa	*!				*

6.1.6. The behaviour of /l/. The laterals exhibit apparently exceptional behaviour with regard to metathesis, in that [s.g.] does not metathesize off /hl/, with one apparent exception:

(62) a. *gà-hlíha* –x→ **kàlíha* 'he is sleeping'
3sA-sleep;prs

b. *gàhlgwóógi* –x→ **kàlgwóógi* 'seven'

c. *gà-hlv̂v́'iha* –x→ **kàlv̂v́'iha* 'he's tying him up'
3sA-tie.up;prs

exception:
d. *dee-ga-lihgwadeega* → *dèèkálihgwàdéega* 'he's turning him over'
dis-3sA-turn.over;prs

Thus *hl* is not behaving like a sonorant, in that it seems to be a satisfactory docking site for [s.g.], and thus does not trigger metathesis. This is unsurprising if we take into account the fact that *hl* is phonetically a lateral fricative [ɬ], not a breathy approximant, and thus does not

violate *[s.g., son].

Note that the lateral fricative is in a sense the [s.g.] counterpart of the lateral approximant, in that an underlying sequence of /h/ adjacent to /l/ does surface as [ɬ]. For example, in (63) deletion of the vowel between /h/ and /l/ results in [ɬ] (orthographically *hl*):

(63) *aa-lihtawo* → *àahltàwo* 'he's combing his hair'
3sA-comb.hair;prs

Presumably the contrast between a breathy lateral and a lateral fricative would be too slight to be reliably perceived. Certainly Maddieson's (1984) survey identified no languages that contrasted voiceless lateral approximants and fricatives. This potential distinction is thus neutralized in favour of the lateral fricative in Cherokee, perhaps because of the greater salience of voiceless fricatives compared to voiceless or breathy approximants (cf. Maddieson 1980).

Although the fact that *hl* does not trigger metathesis is in fact unexceptional, given its phonetic nature, we now have to explain why [s.g.] does not metathesize onto /l/, if it is an acceptable docking site. We can account for this fact by ranking Parse [sonorant], a constraint against changing the value of [sonorant], higher than *[s.g., son]. Changing a lateral approximant into a fricative, i.e. changing it from [+sonorant] to [-sonorant], is then a greater violation than creating a breathy sonorant :[5]

/lan/	Parse [son]	*[s.g., son]	*h	Parse V	Contiguity
> lan		*			
l<a>han	*!			*	*

6.2. Breathy vowel deletion. We now turn to the analysis of breathy vowel deletion. This process is triggered by /h/ followed by a stop, or by /s/ (64-68). Note that

NVhT → NhT (64) *aa-lihkooddi* → *àahlkòòddi* 'he's shattering it'
3sA-shatter;prs

(65) *aani-htoosadii'a* → *àanhtóósàdíi'a* 'they're hanging it (long) up'
3pA-hang.up.long.object;prs

TVs → Ts (66) *aagi-sgaasdaaneelv* → *àagsgáásdáànèèlv* 'he scared me'
1sB-scare;pst

NVs → Ns (67) *aa-danasiini* → *àadànsíini* 'he's crawling'
3sA-crawl;prs

(68) *aa-lisgi* → *àalsgi* 'he is dancing'
3sA-dance;prs

I suggest that in both cases, deletion is conditioned by [s.g.]. The coronal fricative [s] is produced with a very spread glottis to allow maximal airflow (Collier, Lisker, Hirose and Ushijima 1979, Yoshioka, Löfqvist and Hirose 1982). Obviously the process cannot be motivated in terms of optimal placement of [s.g.] since /s/ is a satisfactory site for this feature, and because the deletion can result in the creation of breathy sonorants (64-65). Instead it seems that what is involved is simple extension of [s.g.] onto a preceding vowel. Any resulting breathy

[5]The lateral fricative can also condition vowel deletion, however this deletion is dsitinct from the processes discussed here. It is optional and only applies to the vowel [i].

vowels are deleted.[6] Spreading of [s.g.] is simply a matter of the preferred timing of the [s.g.] gesture with respect to a preceding vowel, possibly to allow more time to achieve a fully abducted glottis. The motivation for deletion is presumably the elimination of a marked sound type, breathy vowels. We shall see further evidence that breathy vowel deletion involves spreading of [s.g.] when we consider the circumstances under which this process is blocked (below).

If breathy vowel deletion is conditioned by [s.g.], the question remains as to why [s.g.] only spreads from /s/ and /h/ preceding a stop, but not from breathy sonorants. I suggest that the reason lies in the fact that these latter sounds are breathy voiced, and hence involve only partial abduction of the vocal folds, allowing vibration to persist. Preceding a stop, /h/ is fully voiceless (although it is breathy intervocalically), and /s/ is always fully voiceless. So these sounds involve greater abduction of the vocal folds than breathy sonorants, and hence might might be more prone to extending the duration of the abduction gesture.[7] The spreading constraint can be formulated as in (69).

(69) Extend [s.g.]: [s.g.] associated to a voiceless segment must be associated to a preceding vowel also.

Deletion results if we rank this constraint above Parse V. There are then two conflicting demands on a vowel preceding voiceless [h] or [s]: it must be breathy to satisfy Extend [s.g.], but if it is breathy it violates *[s.g., son]. Given that we have already motivated ranking *[s.g., son] above Parse V, and that Extend [s.g.] is ranked above Parse V, the best resolution of this conflict is to delete the vowel so neither higher-ranked constraint is violated (70).

(70) *[s.g., son], *h >>Extend [s.g.] >> Parse V

(71)

/nas/	*[s.g., son]	*h	Extend [s.g.]	Parse V
nas			*!	
n̤as	*!			
> n<a>s				*

Breathy vowel deletion is blocked by high tone

Breathy vowel deletion does not apply to a vowel that bears high tone:

(72) *àa-góhv̀vsda* –x→ **àakv̀vsda* 'he burned it'
3s>3s-burn;prs

gà-dèedósga –x→ **gàdèetsga* 'I'm diving'
1sA-dive;prs

jìi-nv̀vdóhgv́v'i –x→ **jìinv̀vtgv́v'i* 'my tooth'
1sA-tooth;'

This blocking effect can be explained in terms of a constraint against the co-occurrence of [s.g.] and high tone:

[6]Thanks to Donca Steriade for suggesting this approach.
[7]The palatal glide is sometimes voiceless, but given that it can also be realized as breathy voiced, I assume that this sporadic devoicing is due to the relatively narrow oral constriction involved rather than vocal fold abduction. The narrow constriction results in a rise in supraglottal pressure which can prevent vocal cord vibration.

(73)
*H
|
μ
|
[s.g.]

This constraint is phonetically motivated because spreading the glottis has a lowering effect on fundamental frequency, which would disrupt the realization of the high tone. The constraint is also independently required in the analysis of Cherokee tonal phonology (Wright this volume).

Note that this account of the blocking effect of high tone depends on the assumption that breathy vowel deletion involves the spread of [s.g.] onto the deleted vowel, because it explain the blocking in terms of a constraint on this spreading, rather than on deletion per se.

Breathy vowel deletion does not apply to initial vowels

Word-initial vowels are not subject to breathy vowel deletion before /s/:

(74) *àsgàya* 'man'

ùsga 'head'

The status of deletion of initial vowels before /h/ is unclear because there do not appear to be any words in Cherokee which begin with a sequence of the form /VhT-/.

It is not clear what the best analysis of these facts is. Possibly there is a constraint against deleting word-inital vowels. This analysis seems stipulative, but such a constraint might have a basis in the importance of word onsets to lexical access (Marslen-Wilson and Zwitserlood 1989). Another possible basis for an explanation for this phenomenon is the fact that words which are underlyingly vowel-initial are typically produced with an initial glottal stop. There might be a constraint against adjacent [constricted glottis] and [s.g.] features, since these features involve contrary movements of the vocal folds, and this constraint would thus prevent [s.g.] from spreading onto a vowel preceded by a glottal stop. Some support for this analysis is provided by the following form in which a vowel preceded by a glottal stop is not deleted by a following /s/:

(75) *wìjìnéé'v̀sga* –x→ **wìjìnéé'sga*

6.3. Shared properties of metathesis and breathy vowel deletion.

There are two properties common to both metathesis and breathy vowel deletion: both are blocked by long vowels, and neither applies to a vowel preceded by a [s.g.] consonant. As mentioned above, we expect these processes to exhibit commonalities, because although they differ in their motivations, both involve [s.g.] and both involve vowel deletion, so any constraints relating to [s.g.] or vowel deletion are likely to affect both processes. We shall see that in each case, a single, well-motivated constraint accounts for the shared property of the two processes.

6.3.1. Metathesis and deletion are blocked by long vowels.

Metathesis does not apply across a long vowel, and long vowels are never deleted (76-78).

[8]We might expect the final output of deletion to be **wìjìnéesga* since pre-consonantal glottal stops surface as glottalization or tonal effects in the dialect of our consultant.

(76) Deletion does not apply to /TVVhV/:

gèègìnììgòòhvv̀́'i 'he saw us'
3s>1p-see;pst

g-áádùùhv̀sga 'he's baking it'
3s>3s-bake;prs

(77) Metathesis does not apply in /TVVhN/:

àà-gòòhwàhtii'a 'he sees him'
3s>3s-see;prs

g-v̀v̀hnìha 'he's hitting him'
3s>3s-hit;prs

(78) Breathy vowel deletion does not apply in /VVs/:

ùlààsìhdéèni 'his foot'

tìwóónììsi 'you (sg.) will speak'

Sequences of the form /VVhT/ do not occur in Cherokee, so it is not possible to show that breathy vowel deletion triggered by pre-consonantal /h/ does not apply to long vowels.

The non-application of both processes can be accounted for jointly, since we have analyzed metathesis as crucially involving deletion. That is, metathesis across a long vowel implies deletion of a long vowel (79), and if this deletion is impossible, then so is metathesis.

(79) taaṉ –x→ *t<aa>haṉ

Thus both phenomena can be acounted for by the natural assumption that it is a greater violation to delete (i.e. fail to Parse) a long vowel than a short vowel. Formally, we posit an undominated constraint:

(80) Parse VV: Don't delete bimoraic vowels.

(81)

/laas/	Parse VV	*[s.g., son]	*h	Extend [s.g.]	Parse V
> laas				*	
lạạs		*!			
l<aa>s	*!				*

6.3.2. Blocking of metathesis and deletion by aspiration. The processes of metathesis and deletion pattern alike in that neither applies in the configuration CVh if C is aspirated, or if C is /s/.

(82) Metathesis does not apply to /ThVhC/:

w-ùuw-ààkàhnv̀v́'i –x→ **wùuwààkànv̀v́'i* 'he's placing it'
way-3sB-place;prs

àa-tìhn i –x→ **àatìni* 'he's taking him somewhere'
3s>3s-take.somewhere;prs

(83) Breathy vowel deletion does not apply to /[s.g.]VhT/:

ùu-hììsòhdáànèèha –x→ **ùuhììsdáànèèha* 'he is homesick'
3sB-be.homesick;prs

jìì-dààn v̀vtèh dììsgo –x→ **jììdààn v̀vtdììsgo* 'I worry him'
1s>3s-worry;prs

(84) Breathy vowel deletion does not apply to /[s.g.]Vs/:

ùu-hwàsga –x→ **ùuhwsga* 'he's buying it'
3sB-buy;prs

àà-dììtv̀sgv́v'i –x→ **ààdììtsgv́v'i* 'his drinking'
3sA-drink;nom

(No examples with the sequence /ThVhV/ could be identified.)

Both effects can be analyzed in terms of a single 'OCP'-type constraint forbidding adjacent [s.g.] specifications:

(85) *[s.g.][s.g.]
r r

This constraint is undominated, so a vowel between two [s.g.] segments cannot be deleted because the output would then contain adjacent [s.g.] segments in violation of the constraint (86). Metathesis is blocked in the same way because it also involves deletion of a vowel preceding a [s.g.] segment (87).

(86)

/soht/	*[s.g.][s.g.]	*[s.g., son]	*h	Extend [s.g.]	Parse V
> soht				*	
sọht	*!	*!			
s<o>ht	*!				*

(87)

/khaṉ/	*[s.g.][s.g.]	*[s.g., son]	Parse V	Parse Assoc.	Contiguity
> khaṉ		*			
kh<a>haṉ	*!		*	*	*

6.3.3. Deletion cannot feed metathesis. The analysis developed so far correctly predicts that deletion cannot feed metathesis. For example, breathy vowel deletion applies to the form shown in (88), resulting in a configuration (*ganh*) that appears to be an appropriate input for metathesis, but metathesis does not apply.[9]

(88) *gàn v̀hdóhgv́v'i* → *gànhdóhgv́v'i* –x→ **kàndóhgv́v'i*

This fact is easy to understand when we consider the relation between the original input and the final output, which is what the optimality theoretic grammar evaluates. In the input /n/ precedes /h/, but in the unattested final output, /h/ precedes /n/. That is a precedence relation has

[9]Deletion of the [6] is blocked by its high tone.

been reversed in violation of the undominated constraint Ordering, so this output is not possible. A combination of deletion and metathesis will always violate Ordering in this way.

6.4. Further issues. There are a number of exceptions to the rules proposed here. Some are probably idiosyncratic lexical exceptions, but there are also some apparently systematic exceptions that suggest further embellishments of the analysis.

6.4.1. Deletion before /t/. In the forms in (89), deletion applies before /t/, apparently without any /h/ present.

(89)	*àagì-tàhlàwòòsga* 1sB-get.angry;prs	→ *àaktàhlàwòòsga*	'I'm getting angry'
cf.	*ùu-tàhlàwòòsga* 3sB-get.angry;prs		'he's getting angry'
	àagw-àtv̀v̀dáàsdi 1sB-listen;prs	→ *àakwtv̀v̀dáàsdi*	'I'm listening to it'
cf.	*ùu-tv̀v̀dáàsdi*[10] 3sB-listen;prs		'he's listening to it'

/t/ does not always cause deletion:

(90)	*àagw-àtv́v́nv̀v́'i* 1sB-hang;pst	'I hung (the picture)'
	àagw-àtàwèèdóònv̀v́'i 1sgB-kiss;pst	'He kissed me'

A possible analysis of these data is to propose that these stems are h-initial underlyingly. The /h/ doesn't surface after a long-vowelled prefix like /uu-/ because it cannot be syllabified: as noted above, Cherokee does not permit sequences of the form [VVhC]. With a short vowelled prefix, like /aagi-/, the /h/ causes vowel deletion.

Another set of exceptions is given in (91):

(91)	*nv̀hgi*	–x→	**nhgi*	'four'
	yàhtèènóohi	–x→	**yhtèènóohi*	'floor'
	wàhga	–x→	**whga*	'cow'

Onset clusters in Cherokee are of the form shown in (92), where T is any stop and C is any consonant:

(92) $(T)\left\{\begin{matrix} sT \\ C \end{matrix}\right\}$

Thus the forms in (91) could be blocked by syllabification constraints, but substantiating this claim would require a full analysis of Cherokee syllable structure, which is beyond the scope of this paper.

[10]The stem-initial vowel is deleted following the prefix vowel by a general process of deletion in vowel sequences.

6.4.2. Other exceptions. The following are exceptions about which I have little to say at present:

(93)	*j-ùsga* pl-head	–x→	**tsga*	'heads'
	j-ùsdíì'i pl-small	–x→	**tsdíì'i*	'small (pl.)'
	àa-dàhyìha 3sA-deny;prs	–x→	**àatàyìha*	'he is denying it'
	gà-hìi-skááha since?-2sA-scared;prs	–x→	**kìiskááha*	'you are scared of (rattlesnakes)'

Feeling and Pulte (1975) show a number of exceptions to deletion involving the sequence *dohd* (94). According to Pulte, this sequence has two sources: it can be part of the 'unintentional' suffix /dohd(an)/ on verbs, or an instrumental suffix /dohdi/, forming nouns. In many cases the vowel bears a high tone (94b), and thus is not expected to delete, but even when it bears a low tone, deletion does not apply (94a), so perhaps these morphemes are lexical exceptions to deletion.

(94) a.	*dègáhldòhdi*	–x→	**dègáhltdi*	'container'
	ùu-lìiyèèdòhdi 3sB-moan;inf	–x→	**ùulìiyèètdi*	'to moan' (Feeling and Pulte 1975: 173)
b.	*ùu-ksèsdóhdi* 3sB-watch;inf			'to watch him, to be careful' (Feeling and Pulte 1975: 171)
	ùw-ùuhìisdóhdi 3sB-accuse;inf			'to accuse him' (Feeling and Pulte 1975: 125)

7. Conclusions

The laryngeal metathesis and deletion processes in Cherokee are highly complex, being conditioned by a wide range of factors. Furthermore, while they appear to be independent processes in some respects, they share a number of common properties. We have seen that, in spite of their complexity, these processes can be analyzed in terms of a ranked set of simple constraints, most of which have clear phonetic motivation. In particular, many of the properties of metathesis follow from an understanding of the process as involving the optimal placement of the feature [s.g.].

In a purely rule-based approach to phonology, we would not expect processes regulated by separate rules to exhibit shared conditioning factors. Cook (1979) attempts to capture the similarity between the processes by formulating a single rule to account for both, however the resulting rule is extremely complex. This type of commonality between processes is expected if phonology is constraint-based, because all constraints relating to a given feature or configuration will affect all phenomena involving that feature or configuration. Metathesis and breathy vowel deletion both involve the feature [s.g.] and both involve deletion of vowels, and this is the basis of their shared properties.

Finally, we have considered the issue of constraints on faithfulness to linear ordering in phonology. This issue is raised most directly by metathesis phenomena, but is relevant to a wide range of processes including epenthesis (cf. Kenstowicz 1994). We tentatively adopted three constraints: Parse Association, requiring a feature to remain assocaited to its underlying position, Parse Ordering, a constraint against reversing precedence relations, and Contiguity, which requires that adjacent segments remain adjacent.

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The Cherokee Laryngeal Alternation Rule

Pamela Munro

Cherokee, an Iroquoian language spoken in Oklahoma and North Carolina, has an unusual morphophonological rule that renders many paradigmatic alternations in the verbal system extremely opaque. The rule is unusual in several respects. It is morphologically triggered: no specific phonological environment for its operation can be stated. While the rule operates strictly left-to-right, there may be a considerable distance between the trigger morpheme and the affected element. The effect of the rule is complex: any of a number of segmental or prosodic changes may be said to follow from it. Finally, it interacts in complex ways with other prosodic phenomena of the language, and is generally blocked from occurring at all in the environment of certain prosodic patterns. Even the basic facts of this rule, which I will refer to (following Lindsey n.d.) as Laryngeal Alternation, have been incompletely described in the literature, and no complete analysis has been offered for it. In this paper, I will present a clearer description of how the rule of Laryngeal Alternation works and suggest conclusions that follow from the data.[1] An idea I will consider in conclusion is that the current notion of the underlying phonological contrasts among Cherokee consonants should be revised.

Cherokee verb paradigms are difficult for the language learner to master because of complex agreement morphology and morphophonemics. Consider the paradigmatic relationship between the third-person singular and first-person singular forms of a Cherokee "active" verb in the present tense. There are several morphophonemic alternants of the pronominal agreement affixes for these two types of subjects. Thus, third-person singular subject verbs of this type may show either a *ga-* or an *a-* prefix, as in the (a) examples below, and first-person singular subject verbs of this type may show either a *ji-* or a *g-* prefix:

(1a) gà-wóónìya 'he's speaking'
3sA-speak;prs

(1b) jì-wóónìya 'I'm speaking'
1sA-speak; prs

(2a) à-adv́v́nèèlíí'a 'he's acting silly'
3sA-act.silly;prs

(2b) g-àdv́v́nèèlíí'a 'I'm acting silly'
1sA-act.silly;prs

[1]I want to thank all the members of the 1993 UCLA Cherokee group, without whose help the data presented could not have been analyzed and understood, especially (of course) Mrs. Virginia Carey, formerly of Tahlequah, Oklahoma, whose dialect is described here. Mrs. Carey's good humor and patience made investigating this topic a pleasure. (Our group included Victoria Anderson, Filippo Beghelli, Barbara Blankenship, Mike Dukes, Edward Flemming, Brian Potter, Nhlanhla Thwala, Kimberly Thomas, Bob Williams, and Richard Wright.) Thanks also go to Geoffrey Lindsey and especially Janine Scancarelli for their help and inspiration, to Donca Steriade for useful ideas, and to Janine Scancarelli for supportive comments on an earlier version of this paper. She has told me that some ideas in this paper are reminiscent of analyses proposed independently (and I am sure earlier) by Geoffrey Lindsey, of which unfortunately I have seen no written version.

I should note that several dialects of Cherokee have been described, and I have only scattered information on the exact realization of the Laryngeal Alternation rule in most of them. Mrs. Carey's dialect agrees quite well with the dialect (or mixture of dialects, according to Scancarelli) presented in Feeling (1975) and described by Pulte and Feeling (1975), and her speech is the major source for work by Scancarelli and Lindsey. Specific facts may well differ between dialects, but Scancarelli (1987: 20-21) suggests that the amount of interdialectal variation is not great.