Extrametricality and Ojibwa Stress

G. L. Piggott

McGill University

0. Introduction.

The standard measure of the value of theoretical innovations is the extent to which they yield significant insights into and explanations for some phenomenon that seems otherwise inexplicable. Recently, Hayes (1981, 1982) has proposed that the theory of metrical phonology should permit grammars to contain a type of rule referred to as an extrametricality rule. Such rules designate certain units as extrametrical, thus removing them from consideration at specific points in a derivation and blocking their incorporation into metrical structures. Extrametrical units may range from single segments to a complete suffix. Hayes argues that the postulation of extrametricality rules leads to illuminating descriptions of stress systems of many languages including that of English. Harris (1983) has provided further support for the explanatory value of such rules in his analysis of stress in Spanish. In this paper, I will try to add to the already substantial body of evidence in support of the concept of extrametricality rules by showing how they lead to an explanation of stress and other related phenomena in Ojibwa.

1. Overview of the Ojibwa Data.

Ojibwa is an Amerindian language of the Algonquian family. The discussion will focus primarily on data from the Odawa (i.e. Ottawa) dialect, though I will show how certain minor adjustments to the proposed analysis can accommodate certain facts attested in other dialects.

Since the point of this paper is to demonstrate how the theory of metrical phonology together with the concept of extrametricality deepens our understanding of certain phonological phenomena in Ojibwa, it is appropriate that a description of the facts be presented in some alternative framework. The reader would then be in a position to appreciate fully the greater explanatory power of the analysis which I propose. I will therefore provide an overview of the relevant facts as these are described in the framework of Chomsky and Halle (1968, hereafter SPE). The stress rules to be presented are discussed briefly in Johnson (1972) and Kaye (1973) but receive a more detailed exposition in Piggott (1980a:67-103). What follows is a review of the analysis presented by Piggott with only minor and inconsequential changes in the presentation of data.

The analysis based on SPE requires five rules of stress placement for Ojibwa. One of these rules accounts for the occurrence of stress on every long vowel in a word as is illustrated by the examples in (1) below.

1. (a) ó:dè:tò: 'he goes to town'

(b) ǰí:mà:n 'boat, canoe'

(c) bó:nì: 'he alights'

The required rule is obviously (2).

2. $\begin{matrix} V \\ [+\text{long}] \end{matrix} \longrightarrow [+\text{stress}]$

In addition to rule (2), there is an alternating stress rule that assigns stress to even-numbered vowels in a sequence of syllables containing short vowels, counting from left to right. Such a rule is required to account for the appearance of stress in words such as those in (3).

3. (a) mizínahìgàn 'book'

(b) ni-mízinàhigàn 'my book'

(c) namádabì 'he sits'

(d) ni-námadàbi-mìn 'we sit'

Except for the appearance of stress on the final syllable of (3a), to be accounted for by a rule to be introduced shortly, the pattern illustrated by the data in (3) can be described by the iterative rule (4) below.

4. $V \longrightarrow [+\text{stress}] \ / \ \begin{matrix} V \\ [-\text{stress}] \end{matrix} \ C_0 \ \_\_\_$

This right-linear rule applies to a string from left to right and assigns stress to alternate short vowels. Notice that rule (4) cannot be responsible for the appearance of stress on long vowels, since, as the words in (1) illustrate, every long vowel is stressed. In addition, data such as those in (5) show that the short vowel in a syllable which immediately follows a syllable containing a long vowel cannot be stressed by rule (4).

5. (a) minó:kamì 'It is spring'

(b) ní:nimìzì 'he is weak'

(c) ni-gì:-wí:sinìmìn 'we ate'

Rule (4) as formulated would produce the desired effect only if rule (2) is ordered to apply first (i.e. before rule 4). This sequencing of the two rules would account for all the data presented so far except for the appearance of stress on the final syllables of (3a), (5b) and (5c). These forms, and indeed all the forms encountered so far, illustrate an invariant feature of the word in Ojibwa: the vowel in the final syllable of the surface representation of words is always stressed. This fact suggests that there is an additional rule of the form stated in (6).

6. $V \dashrightarrow [+\text{stress}] \ / \ \underline{\quad\quad} \ C_0 \ \#$

Given that both rules (4) and (6) are required, it becomes impossible to tell which of these rules is responsible for the appearance of stress on the final syllable of words such as those in (3b), (3c) and (3d), for example. There is no independent evidence for a crucial ordering of these two rules.

In addition to the three stress rules presented so far, the analysis proposed in Piggott (1980a) recognizes a minor rule that stresses the first vowel in certain bisyllabic words. These words, which are illustrated in (7), all have the canonic shape <u>CV̆NCV</u> (where V̆ represents a short vowel and N a nasal consonant).

7. (a) góndà 'these (animate)'

(b) níndà 'these (inanimate)'

(c) bángì: 'few'

Notice that the first vowel in each of the words in (7) is short and would not be stressed by the alternating stress rule (4) or by any of the rules cited so far. For this set of words, Kaye (1973) proposed the following rule:

8. $V \dashrightarrow [+\text{stress}] \ / \ \# \ C \ \underline{\quad} \ \underset{[+\text{nasal}]}{C} \ C \ V \ \#$

The final stress rule proposed for Ojibwa in the SPE framework places the main word stress on the antepenultimate stressed syllable of a word with more than two stressed syllables and on the penultimate stressed syllable of a word which contains two stresses. In the forms cited so far the main stress in indicated by an acute accent (´). The appropriate rule has the following form.

9. $$\underset{[+\text{stress}]}{V} \text{ ---> } [\ \text{stress}]\ /\ \underline{\quad\quad}\ \left(X \begin{bmatrix} V \\ +\text{stress} \end{bmatrix} Y\right)_0^2 C_0 \#$$

Condition: where X and Y are (possibly null) phonological strings containing no stressed vowels and no word boundary (i.e. #)

The rule is formulated as in (9) to ensure that in a word which contains only one stressed vowel this vowel will naturally bear the primary stress.

The derivation below illustrates the application of the principal stress rules identified so far.

10.	oda:we:wigamigw	'a store'
	odà:wè:wigamigw	Rule (2)
	odà:wè:wigamìgw	Rule (6)
	odà:wè:wigàmìgw	Rule (4)
	odà:wé:wigàmìgw	Rule (9)
	odà:wé:gàmìk	(other rules)

Among the 'other rules' referred to in the above derivation is a process which reduces or deletes an unstressed vowel. Whether reduction or complete deletion occurs is apparently determined by the context, and there are also differences between dialects. This deletion/reduction process is stated in Piggott (1980a) as in (11).

11. $$\underset{[-\text{stress}]}{V} \text{ ---> } [+\text{reduced}]$$

Another deletion process involved in the derivation in (11) is responsible for the loss of the final glide (/w/). I have argued in Piggott (1980b) that the deletion of word final glides must be accounted for by the application of the same rule which deletes word final short vowels. The data in (12), (13) and (14) show the loss of the stem-final short vowel in the first person singular forms but the retention of this vowel in first person plurals.

12. (a) ni-gítìm 'I am lazy'

(b) ni-gítimì-mìn 'we are lazy'

13. (a) ni-nágàm 'I sing'

(b) ni-nágamò-mìn 'we sing'

14. (a) ni-námadàp 'I sit'

(b) ni-námadàbi-mìn 'we sit'

I propose that the required rule would be formulated as in (15).

15. $$\begin{bmatrix} +\text{son} \\ -\text{cons} \\ -\text{long} \end{bmatrix} \text{---->} \quad \emptyset \quad / \quad \_\_\_\_ \; \#$$

In several instances in which words appear in the surface phonetic representation with word-final short vowels, these can be shown to be the result of a loss of an underlying word-final glide. For example, the third person singular forms cited as (3c) and (5b) are derived from forms with an underlying suffix -w which is the general marker for 3rd person in intransitive verbs. As might be expected, there are also instances of final glides that become word-final only after the loss of a final short vowel. Apart from such apparent counter-example to rule (15), there are some exceptions to this rule, among them being forms such as those cited in (7a) and (7b). This group of exceptions will be the focus of attention later. The members of this group all have stress on a word-final short vowel which exceptionally is not deleted.

Notice that on the basis of the occurrence of forms such as (12a) and (13a), the deletion rule (15) must feed and must therefore be ordered to apply before rule (6) which places stress on the vowel in a final syllable.

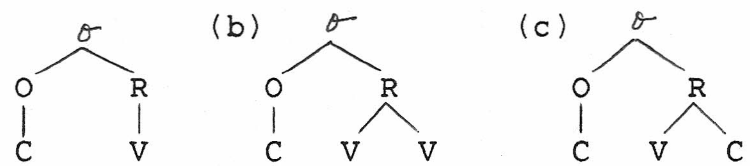
This review of stress and related phenomena in Ojibwa has touched on those features which an alternative account must encompass. The analysis just sketched can be criticized on a number of points. For example, it treats the existence of four rules that determine the placement of non-primary stresses as a coincidence. These rules must all be considered to be independent of and unrelated to each other. Secondly, the SPE-type analysis does not and perhaps cannot capture any relationship between the two deletion processes (11) and (15). The former is clearly sensitive to stress and must apply after the stress rules; the latter is ordered before at least one of the stress rules. One might reasonably expect that a different analysis would address and perhaps eliminate such criticisms. I will show that an account of the relevant facts in the framework of metrical phonology is surprisingly straightforward and does address the issues just raised.

2. The Metrical Framework.

The fundamental assumption of metrical theory is that phonological representations are organized into hierarchical structures, having the form of a series of binary branching trees. The construction of such trees is governed by principles such as those presented in Halle and Vergnaud (1979) and in Hayes (1981). In this framework, it is assumed that the segments of a language are organized into syllables, syllables are arranged into prosodic units called feet and feet are organized into word trees. It is the metrical structure of words that determines the stress patterns.

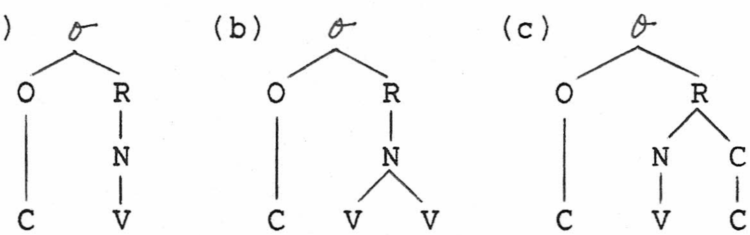
It is now generally recognized that stress is determined by properties of the structure of the syllable, since the latter (i.e. syllable structure) determines the structure of feet. Following Halle and Vergnaud (1979) there is a widely accepted view that the syllable has two labeled constituents, the onset (O) and the rime (R) and that it is the shape of the rime that determines how feet are organized. Specifically, it is claimed that foot structure and hence stress distinctions may be sensitive to the distinction between branching and non-branching rimes. Non-branching rimes are associated with open syllables containing lax vowels (the CV-type), while branching rimes characterize closed syllables and those with long vowels or diphthongs. These structures are illustrated in (16).

16. (a) (b) (c)



In Piggott and Singh (1983), it is argued that a theory of syllable structure must recognize the nucleus (N) and coda (C) as labeled constituents of the rime. Such a conception of syllable structure is reflected in the work of many others including that of Kaye and Lowenstamm (1981). The structure which would be equivalent to those in (16) would be as in (17).

17. (a) (b) (c)



In this framework long vowels as well as diphthongs are analysed a branching nuclei.

The two conceptions of syllable structure are not necessarily irreconcilable. They may be regarded as the result of different setting of some parameter(s). Thus, one might expect languages to fall into two basic groups: (i) those in which phonological processes are sensitive only to the structure of the rime and (ii) those in which the nucleus and/or coda play some role. However the differences between structures such as those in (16) and (17) are accommodated in phonological theory, there seems to be sufficient evidence to justify the representations in (17). For example, stress systems that are sensitive to the distinction between long and short vowels can be readily accounted for in terms of structures such as those in (17) without having to make reference to segmental features. One such stress system is that of Ojibwa, as will be shown later.

In addition to the evidence from certain stress systems, it can be shown that there is also support for the conception of syllable structure reflected in (17) in that such structures permit rather illuminating analyses of other phonological phenomena. For example, the assumption that the nucleus is a constituent of the rime and that it may branch as in (17b) plays a crucial role in the analysis of epenthesis proposed by Piggott and Singh (1983). This analysis of epenthesis depends not only on the geometry of the syllable but also on certain substantive properties of the nucleus. Specifically, sonorant consonants (i.e. nasals and liquids) must be permitted to appear not only in a non-branching nucleus such as (17a) but also as the second (i.e. right-most) constituent of the nucleus. Hence a structure such as (17b) may be the appropriate representation of a syllable with a long vowel, a traditional diphthong or a sequence of a vowel followed by a nasal or liquid.

Piggott and Singh (1983) argue that the epenthetic consonant which appears in the development of Middle English (ME) *þimble* from Old English (OE) *þymel* or in the derivation of Old French *prendre* from *prenre* arises in each case as a result of a rule that assigns a sonorant consonant to the nucleus of the first syllable in these words, leaving a empty position which is automatically filled by a consonant. The proposed analysis of consonant-epenthesis could not be sustained in a theory of syllable structure which restricts representations to those in which there are no labeled constituents internal to the rime.

The privileged appearance of sonorant consonants in the nucleus also serves to explain the effects of these consonants on the stress pattern of English. There are two cases in which sonorants are clearly involved in determining how certain English words are stressed. Piggott and Singh (1983) propose an analysis of the difference between stress on a word such as *nóminative* as opposed to *límitàtive* which requires that a sonorant consonant appearing before the suffix *-ative* be assigned to the nucleus of the preceding syllable. The proposal is based on the assumption that at a point in the derivation of the words *nóminative* and *límitàtive* the following representation hold, according to the stress rules proposed in Hayes (1981).

18. (a) nominative (b) limitative

It is at this point that the reassignment of the sonorant *n* to the preceding nucleus affects (18a), resulting in the deletion of the weak branch of the foot. The resulting configuration satisfies the structural description of the rule of Poststress Destressing (Hayes 1982:258) and the correct derivation of stress on *nóminative* is derived. <1>

The second case of destressing that is obviously dependent on the occurrence of a sonorant in the syllable that is affected is the now familiar set exemplified by words such as *légendàry*, *désultòry* and *mómentàry*. The standard metrical analysis of these words assumes that they have been subject to the rule of Sonorant Destressing at a point in the derivation (Hayes 1982:253). This rule would remove the foot that would otherwise occur over the second syllable of each of the words identified. The result is that this syllable never gets stressed. It is suggested in Piggott and Singh (1983) that this defooting process should really be treated as another instance of the application of a rule which assigns a sonorant to a nucleus. The implication is that there is no rule of Sonorant Destressing, as such. In the analysis of Ojibwa stress to be presented shortly I will provide some indirect support for the view that a destressing process that affects words such as *nóminative* and *légendàry* should be linked to movement of a sonorant into the nucleus of a syllable.

I have devoted some attention to the description of syllable structure because of the crucial role it plays in the determination of stress. Metrical structure, which accounts for stress patterns on words, is constructed on the projection of constituents of syllables. It is, therefore, important that proposed analyses of syllable structure be well-supported. I have argued so far that the syllable may have a labeled constituent called a nucleus, that long vowels (and diphthongs) may be analysed as a branching nuclei and that the nucleus may contain a sequence of a vowel plus a sonorant. Evidence in support of this characterization of syllable structure would take the form of stress rules which apply to those elements which can appear in the nucleus. Ojibwa is clearly among the languages that have such a system of stress rules. Indeed, other Algonquian languages have also been cited as requiring recognition of the nucleus as a constituent, two such languages being Menomini (Pesetsky, 1979) and Passamaquoddy (Stowell, 1979). I will now explore the sort of rules which are required to provide an adequate account of stress in Ojibwa.

4. The analysis of Ojibwa Stress:

4.1. Introducing the Stress Rules

The essential features of Ojibwa stress have already been introduced. It has been established that all long vowels in a word must receive some stress, as illustrated by forms in (1). This feature of all long vowels should serve to strengthen the claim that these vowels cannot be treated as structurally equivalent to closed syllables (i.e. VC-type syllables). The data in (19) reveal that the stress on long vowels does not parallel the occurrence of the stress on what should be regarded as vowels in closed syllables.

19. (a) minógì 'he is growing well'

    (b) mí:niwì 'it bears fruit'

    (c) mindídò 'he is big'

    (d) nišká:dizì 'he is angry'

    (e) askánizì 'he is thin'

The stress rules that are required must accomplish the following: (a) assign stress to every long vowel; (b) in a sequence of short vowels, stress the even-numbered ones; (c) stress the vowel in all surface word-final syllables. I have earlier implied that the stress rules can ignore an underlying word-final short vowel, which is normally deleted. (The final short vowel in the forms of (19) are protected from deletion by the underlying third person suffix -w, which is, of course, deleted in these forms.)

Careful consideration of the Ojibwa data in terms of the properties of metrical structure outlined in Hayes (1981) indicate that the basic stress pattern is determined by constructing maximally binary feet from left to right across a word, right nodes being dominant. A general constraint that the recessive nodes cannot branch applies. As a first approximation of the required rules, I propose the following:

20. (a) A word-final short vowel is extrametrical

    (b) Project nuclei

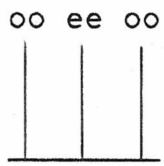
    (c) Construct maximally binary feet from left to right across the word. Right node is dominant; recessive node cannot branch. Label feet w s

    (d) A nucleus not associated with a foot by (c) is projected as an independent foot.

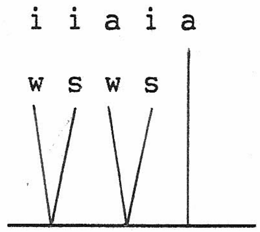
The statement (20d) does not really have the status of a rule, for it is really a general convention.

The application of these rules would provide for stress on long vowels, alternating stress and stress on surface word-final syllables. Of course a syllable designated as extrametrical would not get any stress. The result of the application of these rules to three words is shown in (21b-d). (Note that long vowels are, by convention, treated as sequences of vowels cf. (21a)).

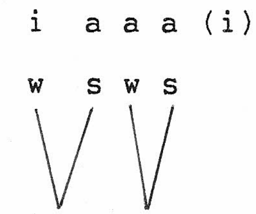
21. (a) ó:dè:tò: 'he goes to town'



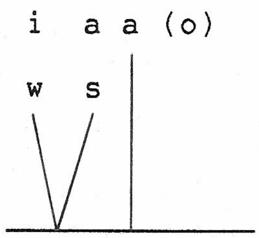
(b) mizínahìgàn 'book'



(c) ni-námadàb(i) 'I sit'



(d) ni-nágàm(o) 'I sing'



In the framework of metrical phonology, every foot contains one stressed syllable, which, in the case of a branching foot, must be the strong syllable of the foot. The syllable of an independent foot must , therefore, carry some stress. Given these assumptions, all vowels of (21a) must be stressed, and the alternating pattern in (21b) and (21c) is captured.

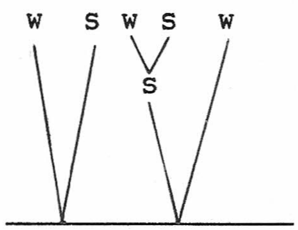
Rule (20c) together with convention (20d) predicts that word-final syllables that are visible to the stress rules must invariably be stressed, since they will either be the strong syllables of binary feet (21c) or they will form independent feet (21b). The syllables that are invisible to the stress rules are, of course, those designated as extrametrical by (20a). According to Hayes (1982:235), extrametrical syllables are incorporated into metrical structure by the convention called Stray Syllable Adjunction (SSA), cited as (22) below.

22. Adjoin a stray syllable as a weak member of an adjacent foot.

SSA applies to representations such as (21c) and (21d) resulting in (23a) and (23b), respectively.

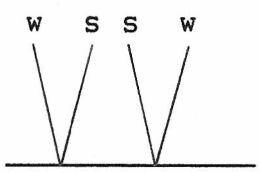
23. (a) ni-námadàb(i) 'I sit'

i a a a (i)



(b) ni-nágàm(o) 'I sing'

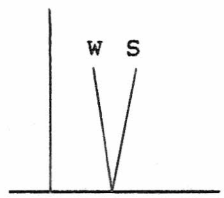
i a a (o)



Since long vowels are projected as branching nuclei, the stress rule (20c) guarantees that long vowels in adjacent syllables could not be organized into a foot, one node of which would have to be recessive (labeled w). Notice also that while a syllable with a long vowel could be a right node of a binary foot, such a syllable could not be dominated by a left (i.e. weak) node of a foot. Hence, the analysis of words such as mi:niwi and niška:dizi must proceed as follows.

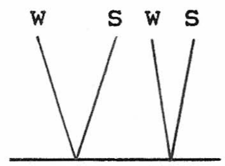
24. (a) mí:niwì-w 'it bears fruit'

ii i i



(b) niška:dizi-w 'he is angry'

i aa i i



The rules outlined in (20) assign stress to every Ojibwa syllable that bears some stress, except for instances of forms such as those in (7) to which I will return later. However, these rules do not determine the location of primary stress. Recall that primary stress was described as being assigned to the antepenultimate stressed syllable in words with three or more stressed syllables, but to the penultimate stressed syllable of words with two stressed syllables. Primary stress assignment can be captured by the rules of Word-Tree Construction (WTC) given below as (25).

25. (a) The rightmost foot in a word is designated as extrametrical

(b) Incorporate remaining feet into a right-branching word-tree. Label right node s iff it branches.

According to Hayes (1982:271-272), an extrametrical foot such as one designated by (25a) is incorporated in a word-tree by the convention (26), which is an analogue of SSA applied at the foot level (i.e. SFA).

26. Adjoin an extrametrical foot as a weak member of the word-tree.

These rules in (25) apply in a straightforward manner to all the words encountered so far. Words with two feet as determined by the rules in (20) will receive primary stress on a constituent of the first foot, while, for words with more than two feet, the equivalent stress will be contained within the antepenultimate foot. The following derivations illustrate the application of all stress rules discussed so far.

27. (a) ni-námadàb(i) 'I sit'

i a a a (i)

w s w s w Rules (20) and SSA

s

s (w) WTC and SFA

(b) mí:niwì-w 'it bears fruit'

ii i i

w s Rules (20) and SSA

s (w) WTC and SFA

(c) ni-gì:-namádáb(i) 'I sat'

i ii a a a (i)

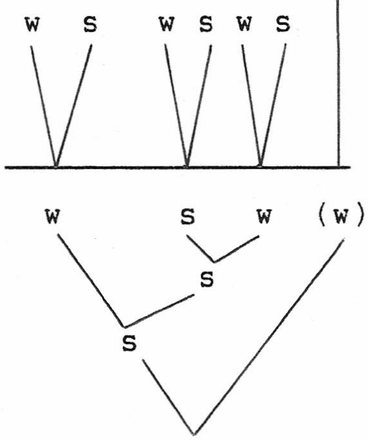
w s w s s w Rules (20) and SSA

s w (w) WTC and SFA

s

(d) ni-gì:-namádabì-mìn 'We sat'

i ii a a a i i Rules (20)



WTC and SFA

4. 2. Vowel Reduction and Vowel Deletion.

In the survey of the Ojibwa facts (section 2), attention was drawn to a rule (11) which deletes or reduces unstressed vowels, noticeably in the Odawa dialect. It was also pointed out that there is another rule (15), one of the effects of which is to delete word-final short vowels. The combination of these two rules determines that the surface phonetic forms of the words cited in (27) are as in (28).

28. (a) nnámdàp 'I sit'

(b) mí:nwì 'it bears fruit'

(c) ngí:nmàdàp 'I sat'

(d) ngì:nmádbìmìn 'we sat'

Given the surface representations in (28), rules (11) and (15) would seem to have something in common in that each has as an effect the loss of short vowels. However, in a linear model of phonology such as SPE, it is impossible to capture directly any similarity between the two processes, since the contexts and conditions which determine their application are considered to be distinctly different. Rule (11) can only apply to unstressed vowels and must therefore apply after the rules of stress placement. On the other hand, rule (15) must apply before the stress rules, since it feeds at least one of ther latter rules. I do not intend to imply that adequate phonological description of the Odawa dialect of Ojibwa must treat the processes described by (11) and (15) as the result of the application of one rule. Clearly the two processes differ, since the vowel reduction/deletion rule (11) does not necessarily result in a total loss of an unstressed vowel. For example, (27a) may also be realized as [nənáməd̀àp]. However, although the two processes are different, phonological theory must still capture any significant relation between them.

Consider, now, the derivations in (27). It is obvious that metrical analysis throws some light on what the two deletion processes have in common. The vowels which undergo reduction/deletion by a process equivalent to (11) and those which are subject to deletion by (15) are located in the weak syllable of a foot. The Ojibwa phenomena, thus, appear to conform to a general property of vowel reduction/deletion process, stated in (29).

29. Only syllables in weak metrical positions may be affected by vowel reduction processes.

Notice that this claim holds for the Ojibwa vowel reduction and deletion processes only because the word-final short vowel is designated extrametrical. The extrametrical syllable is always incorporated by SSA (22) into an adjacent foot as a weak member. Thus, the word-final short vowel will always be in a weak metrical position. The postulation of an extrametricality rule for Ojibwa has, therefore, clearly deepened our understanding not only of stress in this language but also of vowel reduction and deletion.

4. 3. Extending Extrametricality in Ojibwa

It was pointed out earlier that the deletion of word-final short vowels is accomplished by the same process that deletes word-final glides. Indeed, rule (15) is formulated to capture this fact. In Piggott (1980a) and again in (1980b), it is argued that the only description of those facts which the SPE-framework would permit is one in which the two deletion processes were accounted for by one rule (15). The argument is based on the observation that neither deletion process can feed the other. For example, the data in (5) and (19) show that the loss of a word-final w may leave a word-final short vowel which is not subject to deletion. But there are also data such as those in (30) and (31).

30. (a) ni-wi:ndigo:w 'I am a monster'

(b) ni-wi:ndigo:wi-min 'we are monsters'

31. (a) nid-anišinabe:w 'I am an Indian'

(b) nid-anišinabe:wi-min 'we are Indians'

The paradigms in (30) and (31) parallel those in (12), (13) and (14) and, thus, unmistakably, point to the application of a process deleting the word-final short vowels in the derivation of (30a) and (31a). Since in the SPE framework the deletion of the word-final glide cannot occur before the deletion of the word-final short vowel and, conversely, the deletion of the word-final short vowel cannot occur before the deletion of the final glide, there can only be one process involved.

The unity of the processes of deletion can be readily maintained in the metrical framework. Instead of rule (20a), the extrametrical rule (32) could be proposed.

32. A [+son, -cons, -long] segment is extrametrical.

According to Hayes (1982), it is not necessary to specify that an extrametrical rule must apply at the edge of a word, since this is guaranteed by the Peripherality Condition which is expressed as follows:

33. $$\begin{bmatrix} \text{X} \\ +\text{ex} \end{bmatrix} \longrightarrow [-\text{ex}] \;/\; \underline{\quad}\; \text{Y} \;]_{\text{D}}$$

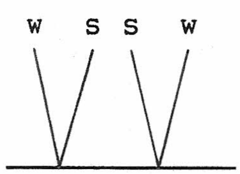
Where Y - Ø and D is the domain of the stress rules.

The Peripherality Condition is intended to ensure that extrametrical elements occur only at the edge of words or phrases.

Given (32), the derivation of <u>ni-nágàm</u> 'I sing', <u>nagámò</u> 'he sings', and <u>mí:niwì</u> 'it bears fruit' would proceed as follows.

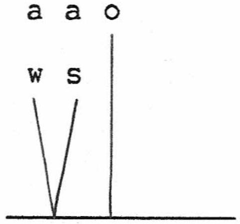
34. (a) ni-nágàm(o) 'I sing'

i a a (o) Rules (32), (20b), (20c), (20d) and SSA



(b) nagámò-(w) 'he sings'

a a o Rules (32), (20b), (20c), (20d) and SSA



(c) mí:niwì-(w) 'it bears fruit'

ii i i Rules (32), (20b),

w s (20c), (20d) and SSA

At this point, the attempt to unify the deletion of word-final short vowels and of word-final glides in the metrical framework runs into trouble. This difficulty has two sources. The unified treatment of the two processes depends on the affected segments appearing in equivalent structural positions. A word-final short vowel appears in a weak metrical position because it is adjoined by SSA (22). It is not obvious how a convention like SSA can be extended to apply to a glide alone. The second source of difficulty is in the rule (20b). This rule embodies the claim that metrical structures in Ojibwa are constructed on the projection of nuclei.

It is clear that the solution to the two problems raised above is the same. The word-final glide must be analysed as a constituent of the nucleus of the final syllable. In Piggott and Singh (1983), it is proposed that the assignment of the glide to the nucleus is the unmarked option realized by the strategies of syllabification. Given this required reanalysis of forms (34b) and (34c), only one other proposal is necessary in order to account for the deletion facts. I propose that Stray Syllable Adjunction be subject to the following constraint.

35. Only the nucleus or a constituent of the nucleus can be adjoined as a weak member of an adjacent foot.

With a condition such as (35), the derivation of the forms in (34) may be completed.

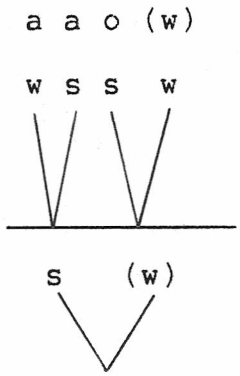
36. (a) ni-nágàm(o) 'I sing'

i a a (o)

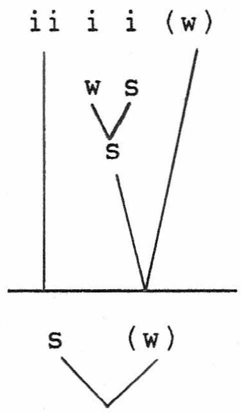
w s s w

s (w)

(b) nagámò-(w) 'he sings'



(c) mí:niwì-(w) 'it bears fruit'

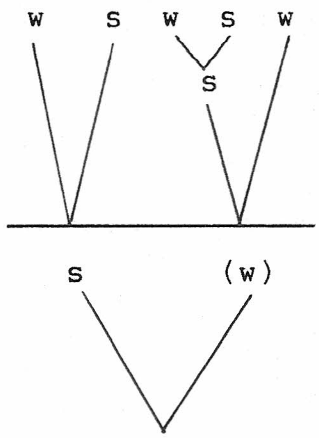


From the derivations in (36) it can readily be seen that word-final short vowels, word-final glides and indeed all other segments that may undergo deletion/reduction appear in similar structural positions, i.e. as constituents of weak syllables. The proposed analysis has, therefore, maintained the semblance of unity between the processes of final short vowel deletion and final glide deletion which is supposed to be expressed in rule (15).

A surprising but pleasing aspect of the analysis just proposed is that it embodies an explanation for the fact that neither process of deletion can feed the other. Any short vowel that becomes word-final after the deletion of a word-final glide would not be in the weak syllable of a foot, as is reflected in (36b) and (36c). On the other hand, a glide that becomes word-final after deletion of a word-final short vowel would not be in a position to undergo deletion. Indeed, such a glide would be invisible to the deletion process, since it would not be available on the projections. This point is illustrated in the derivation of the form in (37) below.

37. ni-wí:ndigò:w(i) 'I am a monster'

i ii i oo (i)



The *w* which becomes final in the surface form of (37) *ni-wí:ndigō:w* is not visible to the deletion rule because the rule can only affect elements in weak metrical positions and the elements in such positions can only be constituents of the nucleus. According to the theory of syllabification outlined in Piggott and Singh (1983), the glide preceding the word-final short vowel in (37) must be assigned to the onset of the last syllable in the word. It can, therefore, not be projected.

I have succeeded in expressing what unites the processes of final glide deletion and of final short vowel deletion, and I believe that I have also managed to explain why neither can feed the other. Given the proposed analysis and explanations, it now turns out to be the case that whether the two deletion processes are expressed as one or two rules is of no consequence. An analysis in the SPE framework is not only forced to postulate one rule, but it must also include a stipulation that this rule (15) cannot apply iteratively. Since the metrical analysis avoids the necessity for such a language-specific, rule-specific stipulation, it can really be claimed that the deletion phenomena in Ojibwa have been illuminated.

I have so far avoided proposing formal statements of the various deletion and/or reduction processes that have been recognized. Since nothing much hinges on the choice of a formalism, I propose the following informal restatement of rules (11) and rule (15), respectively.

38. A vowel in the weak syllable of a foot is reduced/deleted.

39. At the right edge of a word, a segment which is dominated by a weak node of a foot is deleted.

Almost all of the Ojibwa data that are relevant to the analysis of stress and various deletion/reduction processes can be accounted for by the analysis that I have outlined so far. However, Bloomfield (1946) points to one feature of Algonquian languages including Ojibwa which remains unaddressed. He observes that all these languages undergo a process of vowel shortening which affects word final long vowels. Accordingly, the following paradigms occur in Ojibwa.

40. (a) ni-bímosè 'I walk'

(b) ni-bímosè:-min 'we walk'

41. (a) ni-níbà 'I sleep'

(b) ni-níbà:-min 'we sleep'

42. (a) ni-bímibàtò 'I run'

(b) ni-bìmibátò:-mìn 'we run'

The new data can be accounted for if rule (32) is replaced by rule (43) below.

43. The right branch of a nucleus is extrametrical.

Since long vowels are branching nuclei ({VV), they would be structurally parallel to the vowel+glide sequences that have recently been analysed. A final V of a long vowel and a word-final w would be extrametrical and would be incorporated into an independent foot as a weak member. Both elements would be subject to deletion by (39), and final long vowels would be shortened by one mora. Rule (43) must be interpreted as applying to a non-branching nucleus, since word-final short vowels are extrametrical. A strict interpretation of the Peripherality Condition (33) ensures that rule (43) can affect only nuclei at the right edge of a word. If the final syllable is closed (i.e. if there is a coda), the nucleus would remain unaffected (e.g. 27d).

Some obvious questions should arise at this point. One of these concerns the realization of word-final glides after long vowels. Is such a glide deleted? That it clearly must be is illustrated by the 3rd person forms below. (The 3rd person suffix is -w).

44. (a) bimósè: 'he walks'

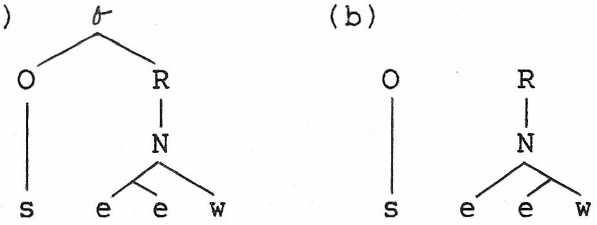
(b) nibà: 'he sleeps'

(c) bimíbatò: 'he runs'

To maintain the analysis of final glide deletion which has been proposed, the underlying final w required in the forms of (44) would have to be a constituent of the nucleus and be designated as extrametrical.

Such an analysis would raise another question. What is the appropriate analysis of the nucleus of the final syllable of a word such as (44a) which contains a long vowel? Two of the more plausible possibilities are (45a) and (45b).

45. (a) (b)



Of these, (45a) is intuitively the more appealing, since the two elements of the long vowel are immediate sister constituents. The second structure (45b) treats a part of the long vowel as an immediate sister of the glide w. If (45a) is correct, it would seemingly entail that the derived final long vowels in (44) should not be subject to vowel shortening, since only the final w would be in the appropriate (i.e. weak) position to undergo deletion. On the other hand, (45b) would seem to permit both the deletion of the final glide and the shortening of the resulting final long vowel. Unfortunately, the available data is not unambiguous. Hence, the choice between (45a) and (45b) cannot be made.

At the beginning of this paper, I pointed out that the discussion of issues will focus primarily on data from the Odawa dialect of Ojibwa. However, some support for the correctness of the analysis is provided by data from the group of dialects known as Algonquin. The support is in the relatively trivial adjustments that would have to be made to the rules presented so far in order to account for certain manifestations of vowel deletion/reduction in these dialects. The focus is on deletion/reduction in word-final syllables. In these dialects the following observations hold.

46. (a) Final short vowels are deleted <2>

(b) Final glides are deleted

(c) Final long vowels are shortened

(d) A short vowel in a closed final syllable is reduced

(e) A long vowel in a closed final syllable is shortened.

Of these, (46d) and (46e) are clearly not attested in the Odawa dialect of Ojibwa. Sometimes (46d) results in the deletion of the short vowel. For example, in all dialects of Ojibwa, the singular form of the word for 'canoe' is as in (47a) and the plural in most dialects is (47b). But (47c) is attested for (some) Algonquin dialects.

47. (a) ǰi:ma:n 'canoe'

(b) ǰi:ma:n-an 'canoes'

(c) ǰi:ma:n-n 'canoes' (Algonquin)

I have developed an analysis of deletion/reduction at the end of the word which relies on application of a rule of extrametricality to a constituent of a word-final nucleus. However, (46d) and (46e) would seem to require that such a rule apply to vowels in closed final syllables. Given the Peripherality Condition (33) as I have interpreted it above, rule (43) should not be applicable to a nucleus in a closed syllable. One might try to get around this problem by proposing for the Algonquin dialects a rule of extrametricality which would designate the coda of a final syllable as extrametrical. By ordering this proposed rule before rule (43), the desired results can be obtained. However, a simpler and more appealing analysis is available; simpler in that it requires no more rules than have already been postulated.

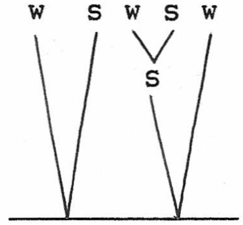
Recall that the rules proposed in (20) are ordered so that the extrametricality rule (revised as (43)) must apply before the projection rule. This ordering seems to be important for the Odawa dialect, since rule (43) cannot affect word-final closed syllables. Consider, now, the consequences of reordering the extrametricality rule with respect to the projection rule. Under such a reordering, word-final coda would become invisible to the extrametricality rule and all the facts covered by the statements in (46) can now be accommodated. The partial derivations in (48) illustrate the relevant results for forms with closed final syllables.

48. (a) ni-nagamomin 'we sing'

i a a o i Rule (20b)

i a a o(i) Rule (43) and

w s w s w other rules

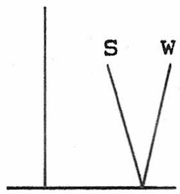


(b) ǰi:ma:n-an 'canoes'

ii aa a Rule (20b)

ii aa (a) Rule (43) and

other rules

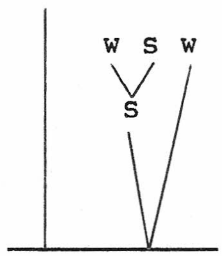


(c) wi:ndigo:g 'monsters'

ii i oo Rule (20b)

ii i o(o) Rule (43) and

other rules



Clearly, in the above derivations, the word-final syllables should be affected by the deletion/reduction of the vowels.

I have shown how the incorporation of an extrametricality rule into a grammar of Ojibwa leads to an explanation of the processes that delete word-final short vowels and glides. However, not every underlying word-final short vowel or glide is deleted in this language. In a number of bisyllabic words, the final short vowel or glide is retained.

49. (a) miší 'firewood'

(b) niká 'Canada goose'

(c) niší 'kill him'

(d) má:bà 'this (animate)'

(e) má:ndà 'this (inanimate)'

(f) žá:žì 'already'

50. (a) bižíw 'lynx'

(b) bagíw 'gum, sap'

(c) waǰíw 'mountain'

Given the description outlined so far, the exceptional nature of the words in (49) and (50) can be represented in one of two ways. Either these words are lexically marked as having an independent foot on the final syllable or they are exceptions to the rule of extrametricality (43). Under the first hypothesis, the lexial representations would be similar to the following.

```
51.  (a)  miši          (b)  bižiw
            |                  |
            F                  F
```

These representations would block application of the process of word-final short vowel deletion to all the words in (49), but two problems surface. It seems that the extrametricality rule would still apply to the final w of a word like biziw This segment would then be adjoined as a weak member of the adjacent foot and would be in a position to undergo deletion. The second problem is in relation to stress. All the words in (49) and (50) bear stress on the final syllable. But stress appears on the first syllable only if this syllable contains a long vowel. The derivation of words with long vowels in the first syllable would proceed as in (52) and would produce the correct results.

```
52.  (a)   ma:ba
              |
              F

     (b)   aa a    Projection and Stress rules

     (c)   aa a    Word Tree Construction

           s (w)
```

Consider now the derivation predicted for a word like that in (49a).

53. (a) mi$\check{s}$i
F

(b) mi$\check{s}$i Projection and Stress rules

(c) mi$\check{s}$i Word Tree Construction

s(w)

All the words in (49) would be assigned stress on both syllables and, furthermore, the first syllable would be interpreted as having the greater prominence. These results are clearly not correct.

The second hypothesis about the exceptionality of words like those in (49) and (50) appears more promising. If these words are exception to the extrametricality rule, then the final syllables would be visible to the rules of stress assignment and word-tree construction. The derivations of (49a) and (49b) and of (50a) would be as follows:

54. (a) mi$\check{s}$i 'firewood'

i i

w s

(b) ma:ba 'this (animate)'

aa a

s (w)

(c) bižiw 'lynx'

i iw

w s

These results are quite satisfying, for they can be considered to provide support for the concept of extrametricality. By proposing that final glides and vowels are extrametrical, it is possible to provide a unified account of the processes of deletion that affect them and to relate deletion of these elements to other deletion and vowel reduction processes. It would be appropriate therefore, that exceptions to the processes that delete these word-final elements should be best described in the metrical framework as exceptions to the extrametricality rule.

4. 3. Stress and the Sonorant Effect in Ojibwa

Earlier I suggested that the stress patterns of certain words such as *nóminative* and *légendàry* can be attributed to the appearance of sonorant consonants in the nuclei of syllables. Specifically, I claimed that the destressing processes which these words undergo are direct results of a process which assigns a sonorant consonant to the nucleus of a syllable. This movement of a sonorant to the nucleus which produces as an automatic consequence a modification of foot structure is what I am calling the Sonorant Effect. In Piggott and Singh (1983) it is claimed that the defooting effect which accompanies the movement of the sonorant consonant is a consequence of the following general principle:

55. Whenever there is a change in the structure of a rime or nucleus, the branch of the foot which dominates this rime or nucleus is automatically deleted.

If there is any validity to the proposed Sonorant Effect one would expect to find it instantiated elsewhere both in English and in other languages. I believe that it is this effect that is responsible for the exceptional stress pattern that occurs on words such as those cited earlier as (7), repeated here as (56). What is exceptional about the stressing of these words is that the initial syllable, in each case, not only is stressed but carries the main stress as well, although it contains a short vowel.

56. (a) góndà 'these (animate)'

(b) níndà 'these (inanimate)'

(c) bángì: 'few'

These words have a stress pattern identical to that attested in words such as those in (57).

57. (a) bó:nì: 'he alights'

(b) ǰí:mà:n 'canoe, boat'

(c) má:bà 'this (animate)'

Obviously the forms (56a) and (56b) are exceptions to the rule that deletes word-final short vowels, and these must therefore be lexically marked for not undergoing the extrametricality rule. However, it is clear that the exceptional stress pattern on the forms in (56) is not directly linked to the exceptional retention of final short vowels, since the words include (56c) <u>bangi</u>: with a word-final long vowel. If the Ojibwa rules that are introduced earlier are applied to the forms (56a) and (56c) the results would be (58a) and (58b), respectively.

58. (a) *gondá (b) *bangí:

o a a ii

w s w s

The pattern derived is clearly not correct for the forms indicated.

In order to account for the stress on the words in (56), the derivation would have to produce two (independent) feet in each of these words. Note, now, as Kaye (1973) points out, that the vowel in the first syllable of each of these words is invariably followed by a nasal consonant. Moreover, in Ojibwa, nasals are the only members of the class of sonorant consonants. Given the theory of syllabification outlined in Piggott and Singh (1983), this nasal consonant would normally be assigned to the coda of the first syllable. I now propose that after the stress rules produce the structures in (58), a rule moves the sonorant consonant from the coda to the nucleus of the first syllable. Given convention (55), the application of this rule to the structures in (58) would produce the representations in (59).

59. (a) gonda (b) bangi:

o a a ii

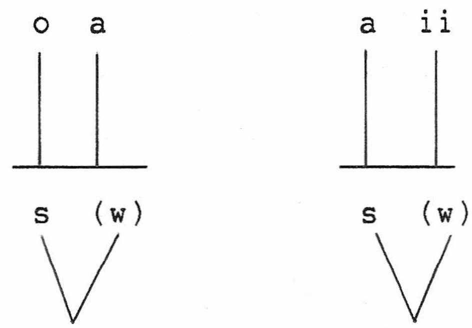
At this point, a potential problem arises. The SSA convention (22) should be applicable to the structures in (59). Application of SSA would reattach the dislocated syllable as a weak member of the adjacent foot, resulting in structures identical to those in (58). If SSA does not apply to the representations in (59), an independent foot would be constructed on the first syllable and it would be possible to account for the stress pattern on the words in (56). It seems, therefore, that the application of SSA to the structures in (59) must be blocked. I propose that the failure of SSA to apply to (59) is a consequence of the following constraint on foot structure.

60. A weak node cannot branch.

Since the rule which moves the sonorant into the nucleus of the first syllable of the words in (56) creates a branching nucleus, this structure cannot be dominated by the weak branch of a foot.

A constraint such as (60) would lead to the completed derivations in (61a) and (61b), corresponding to (59a) and (59b).

61. (a) góndà (b) bangi:



It is obvious that these representations are exactly the ones that must be assigned to the words in (56) to account for the stress on these words. This illuminating analysis of these cases of apparently exceptional stress placement in Ojibwa is only possible in a theory of phonology which recognizes the nucleus as a constituent of the syllable and, thus, allows for a particular way of capturing the Sonorant Effect.

5. Ojibwa Stress and the Theory of Metrical Grids.

My analysis of Ojibwa stress and of various related phenomena such as vowel reduction, vowel deletion, vowel shortening and glide deletion assumes that the metrical theory of stress rules outlined, for example, in Hayes (1981) is basically correct. This theory claims that stress is determined by properties of metrical trees which are constructed in accordance with a limited set of general principles. One of the fundamental assumptions is that the nodes of trees are labeled s/w, reflecting relative prominence. Among the proposed labeling conventions is the one that is incorporated into the Ojibwa rule of Word-Tree Construction (25b). This convention which is referred to in Liberman and Prince (1977) as the Lexical Category Prominence Rule (LCPR) labels a right (or left) node (s)trong iff it branches. Following Liberman and Prince it has been generally assumed that a properly constructed and labeled tree maps directly onto a metrical grid. A grid is composed of rows of slots, each slot being aligned with a syllable. A slot may or may not contain a grid mark, the positioning of grid marks being determined by the s/w labeling of the nodes of the tree. The metrical grid is supposed to reflect the pattern of relative prominence of syllables within words and phrases, the more prominent syllables being associated with the greater number of grid marks.

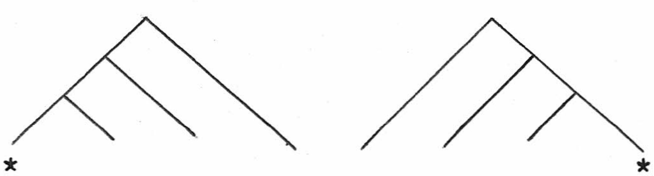
Recently, this approach to the analysis of stress has been challenged. It is argued by Halle and Vergnaud and by others that the labeling of the nodes of metrical trees is not necessary for the proper construction of grids and is therefore superfluous. Prince (1983) takes a more extreme position. He contends that metrical trees are "superannuated" and play no role in determining the shape of grids. For him, stress patterns are represented entirely by metrical grids. I do not intend to address the difference between these two positions directly, but I consider it instructive to examine how the rules of Ojibwa stress might be expressed in terms of at least one version of the theory of metrical grids. The investigation will be carried out in the framework within which certain properties of metrical trees determine the structure grids.

For Halle and Vergnaud and also for Hayes (1981) metrical trees are either maximally binary (i.e. bounded) or unbounded. Furthermore, in every tree one branch, either the left-most or the right-most, is dominant, the other branch(es) being recessive. The following illustrate the four basic types, with the dominant branch indicated by an asterisk (*).

62. (a) bounded

(left-dominant) (right-dominant)

(b) unbounded



(left-dominant) (right-dominant)

The correlation between tree structure and the metrical grid is expressed by the simple convention (63).

63. Place a grid mark in a slot aligned with a syllable in a dominant position in tree structure.

The Halle-Vergnaud theory allows for a maximum of three rows of slots, thus embodying the claim that languages distinguish at most three degrees of stress. The theory also includes a well-formedness condition on metrical grids according to which the presence of a grid mark in a slot on given row entails the presence of a mark on the corresponding slot on a lower row. The significance of this convention becomes apparent when it is noted that the location of main stress within a string is indicated by the occurrence of a grid mark in the appropriate slot on the third or topmost row. Thus, whenever a rule places a grid mark on the topmost row, an empty slot on a lower row will automatically get filled.

With the preceding preliminaries out of the way, the application of grid theory in the description of Ojibwa stress may now be considered. The system which I have described earlier places primary stress on one of the syllables of a word and allows for a number of non-primary stresses. The rules in (20) and (25) have already been shown to provide for quite illuminating descriptions of a range of facts. Given an extrametricality rule, (20c) accounts for stress on long vowels, alternating stress on a sequence of syllables with short vowels and stress on a (visible) word-final syllable. In grid theory, a rule similar to (20c), but lacking the labeling convention, in combination with (63) achieves a similar effect. The relevant rule is (64).

64. Construct bounded right-dominant trees from left-to-right across a word; recessive nodes cannot branch.

Rules (63) and (64) yield the following representations.

65. (a)

```
x  x  x

o:de:to:        'he goes to town'
```

(b)

```
  x   x    x

mizinahigan-an      'books'
```

(c) x x x

ni-gi:-namadab(i) 'I sat'

(d) x x x x

ni-gi:-namadabi-min 'we sat'

The stressed syllables are clearly represented in the above examples. However, of greater interest is the account of primary stress. Recall that the description in terms of labeled metrical trees correctly places primary stress on the stressed syllable of the antepenultimate foot whenever a word contains three or more feet, but, in words with only two feet, the first foot contains the primary stress. Note the representations in (27).

Construction of neither right nor left dominant unbounded trees over the roots of the trees in (65) will produce the desired results, even if the extrametricality rule (25a) is applicable. The most appealing analysis is to assume that there is a rule like (25a) and also the rule (66) below which applies to the representations in (65).

66. Construct bounded left-dominant trees from right-to-left.

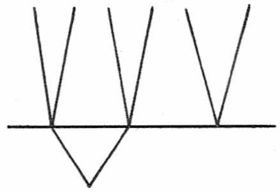
Since the final 'feet' in representations such as those in (65) are not visible to rule (66), the following outputs will be obtained.

67. (a) x

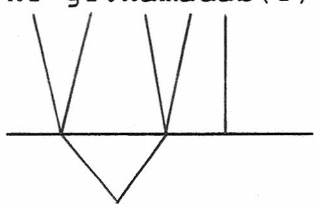
x x x

o:de:to: 'he goes to town'

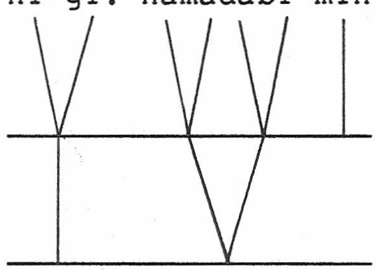
```
(b)     x

        x   x    x

      mizinahigan-an        'books'
```



```
(c)      x

         x    x    x

      ni-gi:namadab(i)      'I sat'
```



```
(d)      x     x

         x     x   x  x

      ni-gi:-namadabi-min   'we sat'
```



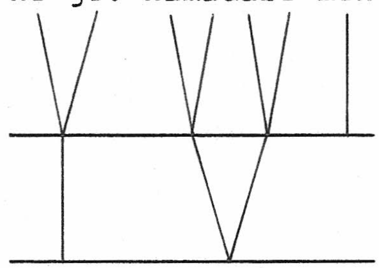
The primary stress can now be assigned to representations such as the above by application of rule (68), obviously a version of the End Rule proposed by Prince (1983).

68. Place a grid mark on the topmost row over the rightmost syllable in a word whose stress is equal to or greater than that of any other syllable in the word. <3>

This rule will derive from (67d) the representation in (69), giving exactly the desired results. <4>

69.

```
             x
        x    x
        x    x   x  x
  ni-gi:-namadabi-min   'we sat'
```



It can readily be shown that the theory of metrical grids can account for the occurrence of stress on exceptional words such as <u>miši</u> 'fire wood' <u>góndà</u> 'these (animate)' in a straightforward manner. Recall that these are exceptions to the extrametricality rule (43) and that the latter exceptionally bears stress on the first syllable. Application of rules (63) and (64) produces the representations in (70a) and (70b).

70. (a)

```
    x
  miši
```

(b)

```
     x
  gonda
```

Rule (68) in conjunction with the well-formedness condition which requires that a grid mark on a row entails a corresponding grid mark on a row would change (70a) to (71), correctly characterizing the stress pattern on this word.

71.

```
    x
    x
    x
  miši
```

The derivation of stress on <u>góndà</u> 'these (animate)' is only slightly more complicated. Obviously, it must still be assumed in grid theory that the stress on this word is in part the result of the Sonorant Effect described above. The immediate changes to the representation (70b) is shown in (72).

72.
```
 x  x
gonda
```

Since (72) is subject to the extrametricality rule (25a), application of rule (66) should produce the following output. <5>.

73.
```
 x
 x  x
gonda
```

Rule (68) now guarantees that the first syllable must bear primary stress.

I have demonstrated that a theory of metrical grids can account for the stress system of Ojibwa. However, the earlier analysis in terms of labeled metrical trees seemed particularly attractive because it was the basis for rather revealing descriptions of a number of reduction and deletion processes. The following processes were identified.

74. (a) Deletion/reduction of unstressed vowels.

(b) Deletion of word-final short vowels.

(c) Deletion of word-final glides

(d) Shortening of word-final long vowels

(e) Reduction of short vowel in a closed final syllable (Algonquin)

(f) Shortening of a long vowel in a closed final syllable (Algonquin)

It now seems reasonable to consider whether and how grid theory would account for the above phenomena.

It is obvious that the unstressed vowels which are subject to reduction/deletion appear in syllables where no grid marks appear above them. An extrametrical short vowel would also not have any grid marks assigned to the slot above it. Thus, (74a), (74b) and even (74e) can be related. However, it is difficult to see how (74c), (74d) and (74f) can be related in the framework of a grid theory that does not permit reference to tree structure. Notice that in all Ojibwa dialects word-final long vowels must bear some stress and this must mean that a grid mark appears in a slot above each vowel. Similarly, a word-final glide is always part of a stressed syllable, except in Algonquin dialects. Consequently, it cannot be the case that the syllables affected by the processes in (74) share a common feature of being associated with empty slots.

The analysis of Ojibwa which relates the processes in (74) assumes that extrametrical elements are adjoined to adjacent tree structures (i.e. feet) as 'weak' sisters. This assumption must be maintained even when metrical trees and metrical grids are adopted as appropriate for an adequate treatment of stress.

6. Summary.

The metrical analysis of Ojibwa stress which I have elaborated in this paper represents a considerable improvement over the description required in a linear framework. Where linear phonology requires five seemingly unrelated statements of the stress rules, the metrical analysis reduces these to rule (20c) or (64) and the rules in (25) or rule (66). The statement (20c) actually accounts for all non-primary stresses which in the linear analysis are described by four of the five rules. The metrical analysis thus ascribes to the placement of basic stresses in Ojibwa words an essential unity which cannot be expressed in the linear analysis. Both analyses must recognize that main stress is assigned by an independent set of rules.

This description of Ojibwa stress relies greatly on the concept of the extrametrical rule. This permits not only an explication of stress placement but also leads to a highly revealing account of various vowel reduction, vowel deletion and glide deletion processes. It can therefore be claimed that the Ojibwa facts provide support for the theory of metrical structure elaborated in Hayes (1981). The modifications and refinements to this theory which I have proposed are relatively minor. For example, I claim that certain dialect differences can be reduced to different ordering of the application of the extrametricality rule (43) and the rule which projects nuclei. Such a possibility is clearly allowed for in Hayes' theory. I further require that the adjunction convention (SSA) be constrained to apply only to a structure that contains the nucleus or a constituent of the nucleus.

In addition to the support for extrametricality, it must be noted that the complete analysis of Ojibwa stress is only possible if the phenomenon identified as the Sonorant Effect is recognized. However, appeal to the Sonorant Effect is only possible in a theory of syllable structure in which the nucleus is recognized as a basic constituent. The Ojibwa data thus provides evidence in support of a theory of syllable structure proposed in several works and defended in Piggott and Singh (1983), according to which the syllable consists of two obligatory constituents, the onset and the rime, and the latter contains a nucleus and, optionally, a coda.

As a final comment, I should point out that, in the preliminary discussion of Ojibwa stress, a distinction between primary and non-primary stress is indicated. Clearly, however, the analysis either in terms of labeled metrical trees or in terms of grids describes at least three degrees of stress. Notice the representation in (69). A cursory review of the available data suggests that this prediction is not without some support. However, research in progress should throw more light on the pattern of non-primary stress in Ojibwa.

Notes

* The work reported here is supported in part by a grant from the Social Sciences and Humanities Research Council of Canada (No: 410-82-0891X1)

1. Travis (1983) provides an illuminating analysis of stress and vowel reduction in such words in terms of metrical grids.

2. As indicated in Piggott (1980b), Algonquin dialects show the effects of this rule in a limited number of forms. Historical word-final short vowels have been protected from deletion in Algonquin dialects by an innovation that adds an ending <u>-nan</u> to relevant verb forms.

3. This rule can only be maintained if it is assumed that rule (66) does not result in the placing of grid marks on the topmost row.

4. Another grid which accounts for the placement of primary stress can be derived from a representation such as (67d) by constructing an unbounded right dominant tree over the existing structure.

5. A form such as (70a) is also subject to the extrametricality rule (25a), but this makes no difference to the derivation of stress on such a word.

References

Bloomfield, L. (1946) "Algonquian", Linguistic Structures of Native America, ed. by H. Hoijer, et al. Viking Fund Publications in Anthropology, No. 6, 85-129

Chomsky, N. and M. Halle (1968) The Sound Pattern of English, Harper and Row, New York

Halle, M., and J.-R. Vergnaud (1979) "Metrical Structures in Phonology", Unpublished Ms. MIT, Cambridge, Mass.

Harris, J. (1983) Syllable Structure and Stress in Spanish Linguistic Inquiry Monograph 8, MIT Press, Cambridge, Mass.

Hayes, B. (1981) A Metrical Theory of Stress Rules, Doctoral dissertation, MIT, Cambridge, Mass. [Revision distributed by Indiana University Linguistics Club]

Hayes, B. (1982) "Extrametricality and English Stress," Linguistic Inquiry 13, 227-276

Johnson, C.D. (1972) Formal Aspects of Phonological Description, Mouton, The Hague

Kaye, J.D. (1973) "Odawa Stress and Related Phenomena," In Piggott and Kaye (1973)

Kaye, J.D. and J. Lowenstamm (1981) "De la Syllabicite," Unpublished Ms. Universite du Quebec à Montreal

Liberman, M., and A. Prince (1977) "On Stress and Linguistic Rhythm," Linguistic Inquiry 8, 249-336

Pesetsky, D. (1979) "Menomini Quantity", MIT Working Papers in Linguistics I, 115-139

Piggott, G.L. (1980a) Aspects of Odawa Morphophonemics, Garland Publishing Inc. New York

Piggott, G.L. (1980b) "Implications of Linguistic Change for Concrete Phonology" Canadian Journal of Linguistics 25, 1-19

Piggott, G.L. and J.D. Kaye (1973) Odawa Language Project: Second Report. Linguistic Series No. 1, Centre for Linguistic Studies, University of Toronto

Piggott, G.L. and R. Singh (1983) "The Empty Node in Phonology: An Analysis of Epenthesis", Unpublished Ms. McGill and Universite de Montreal, Montreal

Prince, A. (1983) "Relating to the Grid" Linguistic Inquiry 14, 19-100

Stowell, T. (1979) "Stress Systems of the World, Unite!" MIT Working Papers in Linguistics I, 51-76

Travis, L. (1982) "Evidence for the Grid" Unpublished Ms., MIT, Cambridge, Mass.