Syllabification, stress and derivation by phase in Ojibwa*

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“Why is language the way it is [and not otherwise]?”
(adapted from O’Grady 2003)

Abstract
This paper provides evidence that word-internal syntax can play a crucial role in the determination of phonological well-formedness. The focus is on an apparent paradox in Ojibwa; the language both avoids and tolerates vowels in hiatus. Adopting the theory of word structure promoted by Distributed Morphology, we argue that V-V sequences are tolerated at the juncture between phases, as the latter are defined by Chomsky (1999) and further elaborated by Marvin (2002) among others. Otherwise such sequences are systematically avoided. The apparent paradox is a consequence of the fact that only the elements within a phase are evaluated to determine the well-formedness of syllables and feet. Derivation by phase also provides insight into two strategies for avoiding vowels in hiatus, vowel loss and consonant epenthesis. We argue that vowel loss emerges at the stage when vocabulary items are inserted into a phase (i.e. at spell-out), while consonant epenthesis occurs after spell-out. Consonant epenthesis is also demonstrably linked to a requirement that certain morphemes must be moved (i.e. cliticized) at the PF interface to avoid the formation of sub-optimal stress feet. Cliticization has consequences for the hypothesis that phases are impenetrable.

1. Introduction. The phonology of Ojibwa, an Eastern Algonquian language, displays two superficially contradictory properties. On the one hand, there seems to a preference for vowels to be preceded by consonants, enforced by the familiar strategies of vowel deletion and consonant epenthesis. On the other hand, there is considerable tolerance for heterosyllabic vowel sequences (i.e. V-V). Data like those in (1) illustrate the first property.

(1)  a. Vowel deletion
    name:g  'sturgeons'
    name:-aq
    'STURGEON-PLURAL'

   b. Consonant epenthesis
    nida:pawe:  'I have nightmares'
    ni-a:pawe:
    '1P-HAVE NIGHTMARES'

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In (1a), the initial vowel of the plural suffix is lost after a vowel-final root. In (1b), a coronal stop (i.e. [d]) is inserted between the 1st Person prefix and a V-initial root. The second property is illustrated in (2).

(2) a. nibia:gamose: 'I walk here in snowshoes'
   ni-bi-a:gam-o-se: '1P-TOWARDS SPEAKER-SNOWSHOE-WALK'

b. nigi:ayamose: 'I walked in snowshoes'
   ni-gi-a:gam-o-se: '1P-PAST-SNOWSHOE-WALK'

These words exemplify the two conditions under which V-V sequences are permitted in Ojibwa. In (2a), the morpheme /bi/ is one of the preverbal modifiers. Such morphemes always end in a vowel, and they may be followed by V-initial morphemes. The V-final past tense marker /gi:/ in (2b) may also be followed by V-initial morphemes.

The goal of this paper is to reconcile the apparent contradictions reflected in (1) and (2). We provide an analysis that brings together two fairly recent developments in linguistic theory. One of these is reflected in our representation of the structure of Ojibwa words in accordance with the tenets of Distributed Morphology (DM) (Halle & Marantz 1993, 1995). The other is the adoption of the proposal by Chomsky (1999, 2005) that the computational system of language submits chunks of abstract structure to the PF component of the grammar where they are given phonetic interpretation and to the LF component where semantic interpretation is assigned. The chunks of abstract structure are called phases. We claim that morpho-syntax generates one or more phases in the derivation of an Ojibwa word and certain aspects of the phonology mirror this conception of derivation. In particular, our paper adds to the work of Marvin (2002) by demonstrating that conditions on syllabification and stress assignment can be constrained by phase boundaries. Derivation by phase yields a straightforward explanation for the difference between (1) and (2).

The outline of the paper is as follows. Section 2 provides a detailed overview of the various ways in which the language both avoids and tolerates V-V sequences. In §2.1, we illustrate the range of strategies that are used to eliminate such sequences, while §2.2 provides examples of constructions where V-V sequences emerge and are tolerated. Our analysis of the contradictory syllabification patterns is developed in §3. We begin with a sketch of those elements of Distributed Phonology and the theory of derivation by phase that are crucial to our analysis. Then, in §3.1 we give an overview of the basic structure of an Ojibwa word, focusing primarily on verbs; it justifies recognition of word-internal lexical categories such as aP and vP. Each of these categories constitutes a phase. We then argue in §3.2 that restrictions on syllabification must apply phase-internally and therefore cannot target elements that belong to different phases. In §3.3, we consider a problem posed by the morphological status of pronominal prefixes and show how it is solved when these prefixes are analyzed as clitics. Section 3.4 focuses on the two strategies employed by Ojibwa to avoid vowels in hiatus. We argue that the choice is structure-dependent. Vowel loss applies to elements that are spelled out within phases,
while consonant-epenthesis affects vocabulary items that are spelled out in separate phases. In §3.5, we extend derivation by phase to stress assignment and define the conditions under which Ojibwa must tolerate a degenerate stress foot. Some of the implications of our analysis are evaluated in §4, while the main conclusions are summarized in §5.

2. The Ojibwa treatment of vowels in hiatus. As indicated above, Ojibwa, as described by Bloomfield (1957), Kaye, et al (1971), Piggott & Kaye (1973), Piggott (1980) and others, makes use of a range of strategies to avoid surface occurrences of vowel sequences. Nevertheless, the language also displays considerable tolerance for such sequences. The facts that support these contradictory claims are documented in the next two sections.

2.1 Avoidance of vowels in hiatus. Among the strategies that Ojibwa uses to prevent the occurrence of vowels in hiatus, vowel deletion is quite common. It is responsible for the loss of the second vowel of an underlying V-V sequence, when a vowel-initial suffix immediately follows a vowel-final morpheme. Occurrences of the animate plural (/-ag/) and possessive (/-im/) suffixes in (3a) and (3b), respectively, illustrate the effect of this deletion process.

(3) a. name:g 'sturgeons
   name:-ag
   'STURGEON-PLURAL'

   b. ni-name:m 'my sturgeon'
      ni-name:-im
      '1P-STURGEON-POSSESSIVE'

In each of the words in (3), the loss of the suffix vowel ensures that the final syllable begins with a consonant. When the same suffixes follow consonant-final morphemes, as in (4), they are fully preserved.

(4) a. miskominag 'raspberries'
    miskw-imin-ag
    'RED-BERRY-PLURAL'

   b. nigo:ko:jim 'my pig'
      ni-go:ko:j-f-im
      '1P-PIG-POSSESSIVE'

The inanimate plural (/-.an/) and locative (/-.ing/) suffixes display alternation patterns similar to those in (3) and (4).

Vowel deletion also affects certain prefix-root combinations. The relevant constructions are combinations of one of the three pronominal affixes /ni-/ (1st Person), /gi-/ (2nd Person) and /o-/ (3rd Person) and certain roots. For example, we infer from forms like (3b) and (4b) that the 1st Person affix is realized as [ni] before a morpheme
that begins with a consonant. However, the vowel of this affix is lost in words like those in (5).

(5)  
  a. no:s  
     ni-o:s  
     '1P-FATHER'
  
  b. no:komis  
     ni-o:komis  
     '1P-GRANDMOTHER'
  
  c. no:te:  
     ni-o:te:  
     '1P-FAMILY'

The words in (5) belong to the set of inalienably possessed nouns. This set includes terms referring to kinship relations, body parts and some 'exceptional' items such as 'pants' 'socks' and 'lice'. The roots that appear in these nouns never occur without the support of a preceding morpheme. They are therefore conventionally classified as dependent roots. When a V-initial root of this class is preceded by one of the personal affixes, the vowel of the affix is always deleted, thereby avoiding vowels in hiatus.

In contrast with the pattern in (5), there is no vowel loss when a pronominal affix precedes a V-initial root that is not a member of the dependent class. Instead, the avoidance of vowels in hiatus is achieved by inserting a coronal stop ([d]) between the final vowel of the affix and the initial vowel of the root. The epenthetic consonant shows up in both nouns and verbs, as illustrated, respectively, in (6) and (7).

(6)  
  a. e:mikwa:n  
     'spoon'
  
  b. nide:mikwa:n  
     ni-e:mikwa:n  
     '1P-SPOON'

(7)  
  a. a:pawe:  
     'he has nightmares'
     a:pawe:-w  
     'HAVE NIGHTMARES-3p1'
  
  b. nida:pawe:  
     'I have nightmares'
     ni-a:pawe:  
     '1P-HAVE NIGHTMARES'

Pronominal affixes therefore trigger both vowel-deletion (5) and consonant-epenthesis (6, 7) to avoid surface occurrences of vowels in hiatus.

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1 For reasons not fully understood, the 3rd Person affix is a suffix in intransitive verbs. It is subject to deletion in a word-final position (Piggott 1980a,b).
A hiatus-avoiding strategy is also evident, when pronominal 'subject' affixes appear as suffixes in a certain class of verbs, belonging to a set labeled the Conjunct Order in traditional Algonquian studies. Verbs of this class are used in subordinate clauses and in the formation of Wh-questions. They take a distinct set of pronominal affixes. Affixes marking 1st Person and 2nd Person singular have glide-initial variants after verb stems that end in a vowel, as illustrated by the examples below.

(8)  

a. a:pawe:ja:n  
    a:pawe:-ja:n  
    'HAVE NIGHTMARES-1P'

b. a:pawe:jan  
    a:pawe:-jan  
    'HAVE NIGHTMARES-2P'

However, vowel-initial variants of the two suffixes in (8) occur after verb stems that end in a consonant.

(9)  

a. dagojina:n  
    dagojín-a:n  
    'ARRIVE-1P'

b. dagojínan  
    dagojín-an  
    'ARRIVE-2P'

As far as we are aware, the glide [j] that follows the verb stem in (8a, b) but not in (9a, b) has no independent morphological function. Its appearance must therefore be controlled by the phonology.

Another indication that Ojibwa avoids V-V sequences is evident in a construction that is pervasive in Algonquian languages. One of the components of this construction is a morpheme belonging to group that traditional Algonquian studies label 'concrete Finals'. However, we consider them to be roots. This group includes the following examples, which are demonstrably vowel-initial.

(10)  

a. a:daga:  
    'swim'  

b. ose:  
    'walk'

c. ise:  
    'fly'

d. a:p  
    'laugh'

e. a:b  
    'see'

f. a:bik  
    'rigid'

The traditional label for such morphemes is a reflection of their dependency; they must be preceded by root morphemes. Sometimes there are two allomorphs of the first rootmorpheme in such a compound, one C-final and the other V-final. Two examples of such allomorphy are provided below.

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2 We restrict the term 'Final' to those morphemes that are category defining, as will be discussed in §3.1.
Allomorphy selection in Ojibwa ensures that the C-final variant from (11) appears before V-initial roots like those in (10). Some examples of these compounds are cited in (12) (with a hyphen separating the two root morphemes).

(11) C-final  V-final
    a. inim      ini       'away'
    b. biba:m    biba:     'around'

(12) a. inim-aːdaga:  'swim away'
     biba:m-aːdaga:  'swim around'
 b. inim-ose:       'walk away'
     biba:m-ose:     'walk around'
 c. inim-ise:       'fly away'
     biba:m-ise:     'fly around'

The selection of a V-final counterparts of the initial elements in (16) would obviously generate the V-V sequences that the language disfavours. 4

2.2 Tolerance of vowels in hiatus. The disfavouring of V-V sequences illustrated in the preceding section contrasts strikingly with the tolerance of such sequences in a number of contexts. The description of the conditions under which vowels in hiatus are permitted in Ojibwa must make reference to the morphological structure of verbs and nouns. Focusing first on verbs, there is general agreement that every member of this category contains a verb stem to which inflectional endings, if any, are attached. A stem may be preceded by a set of verbal modifiers, traditionally labeled 'preverbs'. Tense markers are usually assigned to this class, but it is probably more appropriate to treat them as members of a separate category, since they invariably precede any other preverb in the same construction. In the paradigm described in traditional Algonquian studies as the Independent Order, the only morpheme that may precede a tense marker is a pronominal prefix; the latter may be informally identified as the subject marker. The template in (13) therefore provides the appropriate picture of the components of an Ojibwa verb in the Independent Order.

(13) The Ojibwa verb complex

<table>
<thead>
<tr>
<th>Pronominal affix</th>
<th>Tense marker</th>
<th>Modifier</th>
<th>Verb stem</th>
<th>Inflection</th>
</tr>
</thead>
</table>

3 Although the C-final variant has the same final consonant (i.e. [m]), we consider this to be coincidental, similar to the fact that some English pronouns begin with the voiced fricative [ɹ]. However, we do not rule out the possibility that the consonant [m] is a linking morpheme in root-root compounds. The difference between the two possibilities would have no significant consequences for the analysis developed in this paper.

4 Occurrences of the V-final allomorphs in (11) are presented in the next section. Later, in §3.2 and §3.4, we discuss where and how allomorphy selection is made.
The slots to the left of the verb stem are not always occupied by morphemes with phonetic substance. There is no overt exponent of present tense and no overt pronominal prefix in the 3rd Person form of an intransitive verb.

Within the verb complex, any morpheme occupying a modifier (=preverb) position must end in a vowel and the initial morpheme of a verb stem may begin with a vowel. A V-V sequence that emerges under such conditions does not trigger vowel deletion or consonant epenthesis.

(14) Modifier-verb stem sequences

a. biba:a:gamose: 'he walks around in snowshoes'
   biba:-a:gam-ose:
   'AROUND-SNOWSHOE-WALK'

b. inia:gamose: 'he walks away in snowshoes'
   ini-a:gam-ose:
   'AWAY-SNOWSHOE-WALK'

Heterosyllabic V-V sequences may also occur within the Ojibwa verb complex at the juncture between the past tense marker and a following morpheme. The vowel-initial entity that follows the tense marker may be a verb stem (15a) or a preverbal modifier (15b).

(15) a. gi:a:gamose: 'he walked in snowshoes'
   gi:-a:gam-ose:
   'PAST-SNOWSHOE-WALK'

b. gi:inia:gamose: 'he walked there in snowshoes'
   gi:-ini-a:gamose:-Ø
   'PAST-AWAY-SNOWSHOE-WALK'

Occurrences of the future marker /wi:/ may also result in V-V sequences.

Almost all of the categories that make up the verb template have counterparts in the noun complex. Noun stems may be followed by inflectional suffixes and preceded by modifiers and pronominal affixes.

(16) The Ojibwa noun complex

<table>
<thead>
<tr>
<th>Pronominal affix</th>
<th>Modifier</th>
<th>Noun stem</th>
<th>Inflection</th>
</tr>
</thead>
</table>

As we saw in examples (3), (5) and (6), V-V sequences are avoided in stem-affix and affix-stem combinations within nouns. However, the following examples show that such sequences are tolerated at the juncture between a modifier and a noun stem.
In summary, vowels in hiatus are tolerated (a) at the juncture between a modifier and a verb or noun stem, and (b) at the juncture between the past or future tense marker and a following morpheme.

3. Ojibwa word-internal syntax and the spell-out of phases. The Ojibwa facts present two challenges. First, we must explain why the language both avoids and tolerates vowels in hiatus. Secondly, we must explain why both vowel deletion and consonant epenthesis are used in avoiding V-V sequences. We claim that the necessary explanation is crucially dependent on the way elements are put together to form Ojibwa words. As mentioned in the introduction, our conception of the structure and interpretation of words is informed by two developments in linguistic theory. First, DM theory postulates that words have an internal structure that is generated by principles that are essentially the same as those that generate the structure of sentences. The abstract structure is spelled out, in part, by inserting the vocabulary items that appear in the surface realization of words. The second theoretical development adopted in this paper is phase theory as proposed by Chomsky (1999, 2005) and further elaborated by Nissenbaum (2000). It postulates that the syntactic configuration that constitutes a phase is submitted to the PF and LF components where phonological and semantic interpretations are computed in tandem. The phase-by-phase interpretation is cyclic. Hence, phonological and semantic properties determined on cycle n are transferred to cycle n+1.

In the original outline of phase theory, the phases are identified as CP and transitive vP. However, Chomsky (1999:14) seems to allow for the possibility that "phases are [any] configurations of the form F-XP, where XP is a substantive root projection, its category determined by the functional element F that selects it." Therefore, according to the tenets of DM, substantive categories like nouns, verbs and adjectives qualify as phases, since they contain category-defining elements. A number of people (e.g. Marvin 2002, Newell 2004, Barragan & Newell 2003) adopt such an extension of phase theory. Marvin, for example, shows that it is the basis for explaining how the two words (e.g. twinkling [twɪŋkəlɪŋ] 'act of twinkling') and twinkling [twɪŋklɪŋ] ('a short moment') may contain the same overt morphological pieces but display significant phonological and semantic differences. The crucial differences are reflected in the contrast between (18a) and (18b).

In these and subsequent examples, we take no position on the issue of the syntactic location of the head. We assume that linear order is partly determined by the morpho-phonology and is therefore not always directly reflected in the syntactic structure.
The first configuration (18a) contains two phases, associated with the functional elements little-\(v\) and little-\(n\). It embodies the claim that the noun is derived from the verb 'twinkle'. In the second configuration (18b), there is only one phase. The nominalizing suffix is attached directly to the root.

According to phase theory, semantic and phonological interpretation should be sensitive to the difference between the two configurations in (18). When the \(vP\) phase in (18a) is sent to PF and LF, respectively, it is simultaneously subjected to phonological and semantic requirements. Spell out at PF is controlled by various phonological constraints including a condition on syllabification that militates against the realization of a final obstruent-liquid cluster. The epenthesis of the schwa vowel (i.e. [ə]) generates a well-formed phonological string. Crucially, schwa-epenthesis applies to a phase-final sequence. At LF, the correspondent of this string is assigned a meaning. The pair of interpretations is indicated in (19), where upper case is used to identify the meaning.

(19) Input: [\(/\text{twïŋkl}/-Ø\_vP\)]  
Interpretations: [\(\text{twïŋkl}\)] - PF  
\(\text{TO TWINKLE}\) - LF

When the computational system generates the \(nP\) phase in (18a) and sends it to the PF and LF components, the interpretations shown in (19) are preserved with relatively minor adjustments.\(^6\)

(20) Input: [\(/\text{twïŋkl}/-Ø\_vP\-/iŋ/\_nP\)]  
Interpretations: [\(\text{twïŋklën}\)] - PF  
\(\text{ACT OF TWINKLING}\) - LF

---

\(^6\) Later, in § 3.3, we consider how adjustments to the spell-out of a phase are controlled.
In contrast with the \( nP \) phase of (18a), the interpretation of the \( nP \) phase of (18b) is not sensitive to any inherited properties. In the latter, schwa epenthesis is not triggered at the PF phase, because there is no phase-final obstruent-liquid sequence. In addition, the meaning assigned at LF is obviously not directly linked to the meaning of the verb 'twinkle'.

\[
\text{(21) Input: } \left[ \text{tw} \text{n} \text{kl}/-\text{}\text{n}/_{nP} \right] \\
\text{Interpretations: } [\text{tw} \text{n} \text{k} \text{l} \text{n}] - \text{PF} \\
\text{A SHORT MOMENT} - \text{LF}
\]

A correlation between form and meaning clearly emerges from the structural differences in (18).

In the frameworks of DM and phase theory, we will argue that V-V sequences in Ojibwa are tolerated between phases. For example, in the word \( nigi:a\text{gamose} \) 'I walked in snowshoes' (2b), the verb stem \( a\text{gamose} \) constitutes a phase and is spelled out at PF separately from other constituents of the word. The initial vowel of the verb stem is therefore invisible to the final vowel of the past tense marker \( gi; \), which is spelled out in a different phase. The constraint against V-V sequences is therefore never violated by vowels at the juncture between phases.

Our analysis of Ojibwa adapts a proposal by McGinnis (1995) that a word like (22a) is the realization of the pieces in (22b) (where the dotted line allows for the possibility of a more elaborate structure).

\[
\text{(22) a. } nigi:a\text{gamose:} \\
\text{ni-}gi;:-a\text{gam-ose:} \\
\text{'1P-PAST-SNOWSHOE-WALK'}
\]

b. 
\[
\text{CP} \\
\text{1p} \text{pro}_i \\
\text{C} \quad \text{(ni)} \\
\text{TP} \\
\text{t}_i \\
\text{T'} \\
\text{T} \quad \text{voiceP} \\
\text{PAST} \quad \text{gi;:} \\
\text{t}_i \quad \text{voice'} \\
\text{voice} \\
\text{vP} \\
\text{a\text{gamose:}}
\]

The syntactic structure in (22b) readily accommodates some of the categories in the verb template in (13). 'Subject' pronominal affixes emerge in the C-head position, the manifestation of agreement with little-\( pro \) in [Spec, CP], and, not surprisingly, tense
morphemes occupy the head position in TP. Notice, however, that we still have to account for the appearance of modifiers. This issue is taken up in the next section.\(^7\)

**3.1 Lexical categories within words.** Conventional descriptions of Algonquian languages (e.g. Bloomfield 1957) postulate that verbs contain a post-radical morpheme called an abstract Final. This type of morpheme displays the characteristics of a morphological head; it is category-defining. Algonquian languages therefore provide compelling evidence for one of the central tenets of DM. Roots are not lexically marked as verbs or nouns, and the addition of a Final to a root is required to form such lexical categories. In the case of verb formation, Finals provide not only the category label but also information about transitivity and the gender (animate/inanimate) of one of the arguments of a verb (cf. Piggott 1985). For example, the Ojibwa root *wa:b*, which probably has the more basic meaning 'light reflection', appears in an intransitive verb (23a) with an animate agent; this type is called an animate intransitive (AI) verb. The same root appears in a transitive verb (23b) with an animate theme, a traditional TA verb.

(23) a. \(wa:b\) \textit{\textordmasculine see}'
\(wa:b\) - i
\textit{\textordmasculine see-AI Final}'

b. \(wa:b\) \textit{\textordmasculine see someone}'
\(wa:b\) - am
\textit{\textordmasculine see-TA Final}'

In addition to their category-defining function, Finals may also contribute more concretely to the meaning of a verb. For example, Bloomfield (1957: 98) assigns the gloss 'by hand' to the TA Final \(-\text{in}\); the latter appears in verbs such as \textit{ga:ndin} 'push someone', \textit{da:ngin} 'touch someone' and \textit{wa:gin} 'bend someone'. Obviously, then, there is more than one Final (\textit{Fin}) morpheme. The choice depends on the features associated with the position in which a Final appears. Every verb contains such a morpheme, although it is not always overt.

In a recent paper, Brittain (2003) presents an analysis of Algonquian verbs in the DM framework. She associates Finals with category-defining little-\(v\). She also suggests that at least some abstract finals have the status of light verbs. From such a perspective, the two verbs in (23) have the structures illustrated in (24a) and (24b), respectively.

(24) a. Intransitive verb
\(v\) \(v\)
\(\sqrt{} \text{SEE \textit{Fin}} \sqrt{} \text{SEE \textit{Fin}}\)
\(wa:b\) \(i\)

b. Transitive verb
\(v\) \(v\)
\(\sqrt{} \text{SEE \textit{Fin}} \sqrt{} \text{SEE \textit{Fin}}\)
\(wa:b\) \(am\)

---

\(^7\) It is not crucial to our analysis that the proposal by McGinnis be correct in all its details. Any proposal that generates 'subject' morphemes and tense markers outside of \(vP\) while other verbal affixes occur within \(vP\) could serve as the basis for the analysis developed for this paper.
The root position in each of the above examples contains a single morpheme, but this is not always the case. A verb stem like *ma:da:pi* 'start laughing' (25a) or *wa:ba: bikisi* 'be white (rigid object)' (25b) contains two roots.

(25)  
\[
\begin{array}{c}
\text{a.} & \quad \text{vP} \\
& \quad \text{v} \\
& \quad \text{FIN} \\
& \quad \sqrt{\text{START}} \\
& \quad \sqrt{\text{ma:d}} \\
& \quad \text{P} \\
& \quad \text{LAUGH} \\
& \quad \sqrt{\text{a:p}} \\
\text{b.} & \quad \text{vP} \\
& \quad \text{v} \\
& \quad \text{FIN} \\
& \quad \sqrt{\text{WHITE}} \\
& \quad \sqrt{\text{wa:b}} \\
& \quad \text{RIGID} \\
& \quad \sqrt{\text{a:bik}} \\
\end{array}
\]

The above structures represent one of two types of Ojibwa compounds. A crucial property of this type is that the item that realizes the second root belongs to the set introduced in (10); its occurrence is dependent on the presence of a preceding root morpheme. A simple or compound root c-commanded by a single category-defining FINAL constitutes a single lexical category.

Given the meanings of the verbs in (25), the first constituent of the compound modifies the meaning of the second constituent. However, these constructions do not provide examples of the modifier category in the verb schema in (13). Constructions involving verbal modifiers or preverbs are illustrated in (26).

(26)  
\[
\begin{array}{c}
\text{a.} & \quad \text{ma:wi} & \quad \text{mawi} & \quad \text{'cry'} \\
& \quad \text{ma:di-mawi} & \quad \text{'start to cry'} \\
\text{b.} & \quad \text{we:j:in} & \quad \text{we:j:in} & \quad \text{'paint someone'} \\
& \quad \text{wa:bi-wei:j:in} & \quad \text{'paint someone white'} \\
\end{array}
\]

In each of the above pairs, the first citation is a well-formed verb that is preceded by a preverbal modifier in the second. The preverb *ma:di* 'start' in (26a) is obviously related to the root *ma:d* 'start' in (25a) and *wa:bi* 'white' (26b) is related to *wa:b* 'white' (25b).

We readily infer from this evidence that preverbal modifiers are morphologically complex. As indicated earlier, every preverb ends in a vowel. Even a cursory survey of sources (e.g. Baraga 1853, 1878; Bloomfield 1957; Piggott & Grafstein 1983) reveals that the vowel /i/ is the most common termination for this category. The following examples may be added to those already encountered.

(27)  
\[
\begin{array}{c}
\text{a.} & \quad \text{nitami} & \quad \text{'first'} \\
& \quad \text{e.} & \quad \text{bo:ni} & \quad \text{'stop'} \\
\text{b.} & \quad \text{dimi} & \quad \text{'deep'} \\
& \quad \text{f.} & \quad \text{ma:di} & \quad \text{'start'} \\
\text{c.} & \quad \text{ginibi} & \quad \text{'quickly'} \\
& \quad \text{g.} & \quad \text{gitji} & \quad \text{'big great'} \\
\text{d.} & \quad \text{ombi} & \quad \text{'upwards'} \\
& \quad \text{h.} & \quad \text{aga:j:} & \quad \text{'small'} \\
\end{array}
\]

Note that a root with the shape *wa:b* is glossed 'see' in (24). We assume that these are different instances of the same morpheme (i.e. LIGHT REFLECTION).
The privileged status of final /i/ in preverbs makes sense if it is the exponent of a morpheme. The attachment of this affix to the root  

\[ \text{ma:di} \] 'start' yields the surface form  

\[ \text{ma:di} \]. The palatalization that emerges in the preverb  

\[ \text{ma:di} \] is a clear signal that the final /i/ is not a root segment (see Kaye & Piggott 1973; Piggott 1978).

The final element of a preverb must be the exponent of the head of a category, identified as little-\textit{a}. In contrast with verb structure, there seems to be evidence for only one modifier \textit{FINAL}; it is normally represented by the suffix /-i/, but this vowel is not realized when the root itself ends in a vowel.

(28) Basic modifier/preverb structure

<table>
<thead>
<tr>
<th>( \text{aP} )</th>
<th>( \text{vP} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{WHITE} )</td>
<td>( \text{AROUND} )</td>
</tr>
<tr>
<td>( \text{FIN} )</td>
<td>( \text{FIN} )</td>
</tr>
<tr>
<td>( \text{wa:b} )</td>
<td>( \text{biba:} )</td>
</tr>
</tbody>
</table>

The features of little-\textit{a} should be construed as covering a category that subsumes both adverbs and adjectives. Sometimes, the same form appears as either a preverbal (29a) or a pronominal (29b) modifier.

(29) a. git\textit{\textipa{\text{j}}}i-inenim
    'think highly of someone'

b. git\textit{\textipa{\text{j}}}i-naja\textipa{\text{\textipa{\text{j}}}i}
    'have keen eyesight'

b. git\textit{\textipa{\text{j}}}i-ogima:
    'great chief/leader'

b. git\textit{\textipa{\text{j}}}i-mo\textipa{\text{j}}koma:n
    'big knife, American'

In Ojibwa and, perhaps, other Algonquian languages, there is no formal difference between elements that might be construed as adverbs or adjectives.

Prima facie, the combination of a modifier and a verb stem is a compound. However, these are different from root-root compounds, since each component of a modifier-verb construction contains a category-defining little-\textit{x}.

(30) Modifier-verb compounds (e.g.  

\[ \text{wa:bi-we:zi:n} \] 'paint someone white')

<table>
<thead>
<tr>
<th>( \text{vP} )</th>
<th>( \text{aP} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{WHITE} )</td>
<td>( \text{PAINT} )</td>
</tr>
<tr>
<td>( \text{FIN} )</td>
<td>( \text{FIN} )</td>
</tr>
<tr>
<td>( \text{wa:b} )</td>
<td>( \text{we:zi:n} )</td>
</tr>
</tbody>
</table>

Modifier-verb combinations have some resemblance to English compounds like 'dry-clean', 'cold-rinse' and 'half-close', but the Ojibwa pattern is more productive. The crucial feature of the Ojibwa type is that it contains more than one category-defining morpheme and therefore constitutes more than one lexical category.

Given that (30) is a well-formed representation of a modifier-verb combination, a verb like (31a) would be represented by the structure in (31b).
The sequence [a:n] at the end of this verb is actually the realization of two inflectional endings. One is the suffix /a:/ which identifies the 'object' of the verb as 3rd Person. The second inflection is the obviative suffix /an/ which indicates that the referent of the 3rd Person object is disjoint from the 3rd Person subject. Hence, the combination /a:-an/ surfaces as phonetic [a:n] as a result of vowel loss.

The 'object'-referring suffix /a:/ is one of a set of post-Final affixes that sort out the thematic relations between the various arguments of a transitive verb. The thematic affixes may be followed by other verbal suffixes that express a variety of functions. Post-theme affixes include morphemes that identify the referent of the pronominal 'subject' prefix as plural and affixes that mark verbal aspect such as preterite, dubitative, etc.

While a detailed analysis of verbal inflection is beyond the scope of this paper, an important assumption for us is that the inflectional morphemes merge with little v in the syntax, probably through head movement, before the transfer to the PF and LF interfaces. This assumption does not appear to be controversial, given the grammatical functions of the inflectional morphemes.

Assuming the general picture of how the morpho-syntactic system provides for the elements of the verb template (13), consider next the elements of the noun template (16). Like verbs, every noun contains a Final, a category-defining little-\( n \). Two exponents of the latter are /win/ and /igan/, respectively, illustrated below.
These words are the realizations of the respective structures in (33).

\[(33)\]

\[\begin{align*}
\text{a. } & nP \\
& \sqrt{\text{SLEEP} ~ \sqrt{\text{win}}} \\
\text{b. } & nP \\
& \sqrt{\text{SLEEP} ~ \sqrt{\text{igan}}} \\
\end{align*}\]

Compound nouns, consisting of a prenominal modifier and a noun stem, are possible; some examples are cited in (29b).

\[(34)\] Modifier-noun compounds (e.g. gitSiogimaÜ: 'great chief/leader')

\[\begin{align*}
\text{aP} & \rightarrow nP \\
& \sqrt{\text{GREAT} ~ \sqrt{\text{git} \ i \ \text{ogima}: \ O}} \\
\end{align*}\]

Further parallels between the structure of nouns and verbs may be drawn, if it is assumed that the pronominal prefixes that appear in possessive constructions emerge in the D-head position, the identity of the prefix being determined by the features of little-pro in [Spec, DP]. The structure of (35a) would then be, roughly, as indicated in (35b) (with allowance for the possibility that DP structure may be richer).

\[(35)\]

\[\begin{align*}
\text{a. } & \text{nigo:ko:fim} \\
& \text{'my pig'} \\
& \text{ni-go:ko:f-im} \\
& \text{'1P-PIG-POSSESSIVE'} \\
\text{b. } & \text{DP} \\
& \text{[+Poss]} \\
& \text{(ni)} \\
& \sqrt{\text{PIG} ~ \text{go:ko:f-im}} \\
\end{align*}\]

The nominal inflections that occur after noun finals include a set that identifies the referent of the pronominal prefix as plural. Simple and possessed nouns may also be inflected for obviation and/or (plural) number. Inflectional morphemes of nouns (like
those of verbs) must merge with the category-defining element (little *n*) in the syntax before phonological or semantic interpretation occurs.

The structures attributed above to Ojibwa nouns, verbs and modifiers are generated by the morpho-syntactic computational system. As indicated earlier, the abstract structures are transferred to the two interface components, PF and LF, where they are provided with phonological form and meaning. The PF component provides the morphemes with phonetic substance and imposes other requirements that are relevant to the surface realization of a word. The LF component associates the structure with a meaning. Assuming phase theory, we expect to find phonological and/or semantic evidence in Ojibwa that the derivation of words is a phase-by-phase process. The relevant phases are the lexical categories *nP*, *vP* and *aP*, and the functional projections CP and DP. We argue in the following section that these categories constitute independent domains of syllabification in Ojibwa, and that restricting constraints on syllable structure and syllabification to phases explains why the language displays two superficially contradictory properties - avoidance of *V-V* sequences and tolerance for such sequences.  

3.2 Syllabification and derivation by phase. When a phase is transferred to the PF component to be spelled out, lexical items must be inserted into the terminal positions of the abstract morpho-syntactic structure. Since the abstract elements of a phase are spelled out as phonological entities, it is not unreasonable to assume that a spelled-out string must contain licit segments, syllables and, where appropriate, feet (cf. Marvin 2002). Hence, we postulate that the following principle is always respected.

(36)  *Phase Integrity*/PF

Conditions on the well-formedness of prosodic categories are imposed on all elements that emerge within a phase *a*, if the elements are solely within phase *a*.

This constraint is proposed as a codicil to the *Phase Impenetrability Condition* (Chomsky 1999), which renders elements spelled out in one phase inaccessible to elements that emerge in a later phase. If *Phase Integrity* were not imposed on the spell-out of abstract elements, it would theoretically be possible for categories within a phase to be ill-formed with the expectation that the ill-formedness would be corrected during the spell-out of a later phase. This possibility is not sanctioned by the *Phase Impenetrability Condition*; it would undermine the strict cyclicity of phase-by-phase spell-out.

*Phase Integrity* is considered to be universal and inviolable. It therefore regulates the effects that a ban of vowels in hiatus would have on a language. Following current descriptive practice in phonology, this ban is attributed to the satisfaction of the constraint labeled *No-Hiatus*.

(37)  *No-Hiatus*  

*V-V*, i.e. vowels belonging to different syllables cannot be adjacent.

---

9 The reader is reminded that Ojibwa word structures cited in this paper are not purely syntactic. They often reflect morphological adjustments (e.g. the determination of morpheme order) that occur at the PF interface, before vocabulary insertion.
Consider now how this constraint affects the spell-out of the elements of the phase in (38a). Vocabulary items must be supplied for the elements of this representation, and the Ojibwa lexicon provides the root name: and the possessive Final -im. Insertion of the full lexical forms produces ill-formed (38b), while the correct output (38c) contains only part of the possessive suffix.

(38)  
\begin{itemize}
  \item a. \texttt{[STURGEON-POSSESSIVE\_nP]}
  \item b. *\texttt{name::im\_nP]}
  \item c. \texttt{name::m\_nP]}
\end{itemize}

A conventional derivational approach would assume that (38c) is derived from (38b) by an active process of vowel deletion. For the moment, it is sufficient to assert that the grammar converges on (38c) to ensure that the demands of NO-HIATUS are met.

The two roots in a root-root compound also fall within a single phase. Therefore, they would be subject to the requirements of NO-HIATUS. The enforcement of this constraint underlies the selection of the appropriate allomorph. Consider how the vocabulary pieces in (39) are put together to form a root-root compound.

(39)  
\begin{itemize}
  \item a. \texttt{biba::biba\_m} 'around'
  \item b. \texttt{ose:\_} 'walk'
\end{itemize}

Given the terminal elements in (40a), the selection of \texttt{biba\_m} and \texttt{ose:\_} as the respective realizations of the first and second root morphemes results in an output (40b) that satisfies NO-HIATUS.

(40)  
\begin{itemize}
  \item a. \texttt{[AROUND-WALK-FIN\_vP]}
  \item b. \texttt{[biba\_m-ose::\_\_\_vP]}
  \item c. *\texttt{[biba::ose::\_\_\_vP]}
\end{itemize}

Notice that, if the first root were spelled out as \texttt{biba:\_}, the well-formed but incorrect output *\texttt{biba::se:} could still emerge from the process of vocabulary insertion. However, the selection of the V-final allomorph from (39a) would clearly be less economical, because it would require the loss of a vowel from one of the vocabulary choices in order to conform to the demands of NO-HIATUS.

Vowel loss in a root-root compound would be expected, if a V-V sequence would otherwise emerge from the selection of the available vocabulary items. For example, (41a) is spelled out as (41b).

(41)  
\begin{itemize}
  \item a. \texttt{[GO HOME-WALK-FIN\_vP]}
  \item b. \texttt{[gi::we::se::\_\_\_vP]}
  \item c. *\texttt{[gi::we::ose::\_\_\_vP]}
\end{itemize}
Ojibwa provides only gi:we: 'go home' and and ose: 'walk' for insertion into the two root positions. Consequently, when the available pieces are put together, the satisfaction of NO-HIATUS is achieved by blocking the full realization of the second root morpheme.¹⁰

The discussion so far has focused on the spell-out of morphemes within a single phase. Let us now consider the derivation of (42a), to which the morpho-syntactic system assigns the structure in (42b) (sans vocabulary items). The two vP phases are distinguished by subscripts for expository purposes only.

(42) a. nigi:inia:gamose: 'I walked there in snowshoes'
   ni-gi:-ini-a:gam-ose:
   '1P-PAST-AWAY-SNOWSHOE-WALK'

b. 

Derivation-by-phase requires that the elements of aP and vP₂ be spelled out first. The results of vocabulary insertion are shown in (43a) and (43b).

(43) a. [AWAY-FINₐP]
   [ini-ØₐP]
   b. [SNOWSHOE-WALK-FINvP]
   [a:gam-ose:-ØvP]

The assignment of prosodic structure to the inserted items incurs no constraint violations. Hence, the outputs in (43) are phonologically well-formed. Note that, according to Phase Integrity, the effects of constraints on syllable structure can only be visible on vocabulary

¹⁰ In most cases of vowel loss, the deleted vowel is short. However, there is some evidence that a long vowel can be deleted. The combination of gi:we: 'go home' and a:daga: 'swim' yields gi:wa:daga: 'swim home'.
items that are solely contained within a phase. Consequently, NO-HIATUS cannot regulate the V-V sequence that emerges at the vP1 phase in (42b), because [ini] and [a:gamose:] are not solely contained in vP1.

\[(44)\]  
\[\text{[AWAY-FIN}_{aP}\text{][SNOWSHOE-WALK-FIN}_{vP2},vP1]}\]  
\[\text{[ini-O}_{aP}\text{][a:gam-ose-}_{vP2},vP1]}\]

The next phase in the derivation of (42a) is CP. The Past tense affix is spelled out at this stage of the derivation, yielding (45a). Subsequently, the appropriate pronominal prefix is inserted in C, resulting in (45b).

\[(45)\]  
\[\text{a. } [\text{PAST}[\text{[AWAY-FIN}_{aP}\text{][SNOWSHOE-WALK-FIN}_{vP2},vP1]}]\]  
\[\text{[gi:[[ini-O}_{aP}\text{][a:gam-ose-}_{vP2},vP1]}]\]  
\[\text{b. } [\text{1P-PAST}[\text{[AWAY-FIN}_{aP}\text{][SNOWSHOE-WALK-FIN}_{vP2},vP1]}]\]  
\[\text{[ni-gi:[[ini-O}_{aP}\text{][a:gam-ose-}_{vP2},vP1]} - \text{Output: [nigi:inia:gamose:]}}\]

Notice that the insertion of the Past tense marker also produces a superficial V-V sequence that is tolerated because the vowels are introduced in different phases. Assuming that NO-HIATUS is the only (relevant) constraint on syllabification, Ojibwa must tolerate vowels in hiatus that emerge at a juncture between phases.

The analysis that accommodates V-V sequences within verbs is readily extended to nouns. The modifier-noun compound in (46a) must be derived as sketched in (46b-d).

\[(46)\]  
\[\text{a. } \text{git}fjiojima: 'great chief/leader'}\]  
\[\text{b. } [\text{BIG-FIN}_{aP}][\text{git}f-i_{aP}]}\]  
\[\text{c. } [\text{LEADER-FIN}_{nP}][\text{ogima-}:_{nP}]}\]  
\[\text{d. } [\text{[[BIG-FIN}_{aP}][\text{LEADER-FIN}_{nP}]}_{nP}][\text{[[gitf}i_{aP}][\text{ogima-}:_{nP}]}_{nP}]} - \text{Output: [gitf}jiojima:]}\]

In (46d), the modifier ends in a vowel and the noun-root begins with a vowel. Modifier-noun compounds are the only nominal constructions in which V-V sequences may occur.

So far, we have attributed hiatus avoidance in Ojibwa to the enforcement of well-formedness conditions within a phase. We have also explained how and why V-V sequences are tolerated; a vowel at the end of a phase is invisible to a vowel at the beginning of another phase at the stage when each is spelled out. The theory that sanctions derivation by phase identifies the contexts in (47) as those in which heterosyllabic vowel sequences should be encountered in Ojibwa.

\[(47)\]  
\[\text{Contexts of V-V sequences}\]  
\[\text{a. Juncture between any pair of lexical categories (}_{aP}, _{vP}, _{nP})\]  
\[\text{b. Juncture between a tense marker and a following morpheme.}\]

---

\[11\] The assumption that there are two stages in the spell-out of the elements in CP is discussed later.
However, we would also expect to find vowels in hiatus at the juncture between a pronominal 'subject' prefix and the exponent of a lexical category. The latter possibility arises, because we accept the thesis that 'subject' morphemes are spelled out in a C-head (for verbs) or a D-head (for nouns) and should therefore be in a different phase from one where elements of aP, vP or nP are spelled out. Derivations like those in (48) and (49) are expected.

(48)  
a. [SNOWSHOE-WALK-FINvP]  
[a:gam-ose:-OvP]  
b. [1P[SNOWSHOE-WALK-FINvP]CP]  
[ni[a:gam-ose:-OvP]CP]  
    Output: *[nia:gamose:] 

(49)  
a. [LEADER-FIN-POSSnP]  
[ogima:-O-mnP]  
b. [1P[LEADER-FIN-POSSnP]DP]  
[ni[ogima:-O-mnP]DP]  
    Output: *[nio:gam:ma] 

Neither of the predicted outputs coincides with the attested form. The correct equivalent forms are given in (50a) and (50b), respectively.

(50)  
a. nida:gamose:  'I walk in snowshoes' (attested)  
b. nido:gam:ma  'my leader/chief' (attested)  

In each of the above, Ojibwa employs the epenthesis strategy to resolve the hiatus, thereby signaling that the demands of NO-HIATUS are imposed on the combination of a pronominal prefix and a following morpheme. Given the Phase Integrity principle, we would not expect an item inserted at either the CP or DP phase to display any phonological sensitivity to the an item inserted at an earlier phase. This problem for our analysis is addressed in the next section.

3.3 The PF status of subject affixes. The behaviour of pronominal 'subject' affixes introduces an apparent paradox. Assuming McGinnis (1995), these morphemes are in a syntactic position external to the vP and nP phases when they are spelled out. Nevertheless, hiatus resolution provides evidence that a pronominal prefix is in the same phase as the morpheme that follows it; according to our analysis, strategies for avoiding vowels in hiatus are only employed phase-internally. Our solution to the problem presented by the pronominal prefixes begins with the observation that the position of an abstract element as determined by syntax does not always coincide with the position of the exponent of that element at PF. For example, McCarthy and Prince (1995:341) cite the Nicaraguan language, Ulwa (based on original data from Hale and Lacayo Blanco (1989)), as providing a clear case where the affix marking the possessor in noun forms is located to the right of a stressed syllable. The location of the stressed syllable is determined by parsing of syllables at the left edge of a word into an iambic foot. Given the possible manifestations of such a foot, the affix follows the first syllable if it is heavy (51a); otherwise, it occurs after the second syllable (51b).
Evidently, occurrences of the possessive affix conform to a subcategorization requirement that can only be met at PF, where foot structure is determined. The implication for phase theory is that elements may be moved from their syntactic position to satisfy a PF requirement. We refer to this movement as cliticization.

The PF factors that underlie the cliticization of Ojibwa pronominal prefixes reflect restrictions on stress assignment. The location of stressed syllables is determined by a left-to-right iambic parsing of syllables into feet (Kaye 1973; Piggott 1980, 1983; Halle & Vergnaud 1987; Hayes 1995). As a result, the left edge of every word coincides with the left edge of a foot. Moreover, because foot parsing is exhaustive, degenerate feet must sometimes be constructed. However, Ojibwa, like most languages, displays an aversion to such feet and limits where they may occur; only the rightmost syllable in a phrase may be parsed as a degenerate foot. Satisfaction of the following conditions is responsible for the emergence of degenerate feet and their possible location within a word.

(52) Two conditions on Ojibwa prosodic structure
   a. Syllables are parsed into feet (i.e. PARSE-σ).
   b. Degenerate feet are permitted only at the right edge of a phase.

Notice now that each pronominal prefix contains a single short vowel and is therefore monomoraic. When it is inserted in at the CP or DP phase, it cannot be assigned foot structure in situ and also meet both of the conditions in (52). The inserted item must therefore move, if it can, to save the derivation.

Phase-by-phase assignment of stress is discussed in more detail in §3.5. For the moment, we limit the focus to the consequences of the restrictions in (52) for the footing of vocabulary items inserted at CP. Let us consider how the derivation of (53a) proceeds from the structure in (53b).
When the elements that make up the vP phase (54a) are transferred to the PF interface, lexical insertion yields (54b), and foot construction produces (54c). (All stresses are considered to be equal, until primary stress is determined at the word level.)

(54)  

a. \[ \text{AROUND-WALK-FIN}_{vP} \]  

b. \[ \text{biba}^{\text{Ü}} \text{-mose}^{\text{Ø}}_{vP} \]  

c. \[ (\text{biba}^{\text{Ü}})(\text{mose}^{\text{Ø}})_{vP} \]  

- Stress assignment

At the final spell-out stage, the 1st Person affix /ni/ is inserted, yielding (55b).

(55)  

a. \[ 1P[\text{AROUND-WALK-FIN}_{vP}]\text{-CP} \]  

b. \[ [\text{ni}](\text{biba}^{\text{Ü}})(\text{mose}^{\text{Ø}})_{vP}\text{-CP}] \]  

Condition (52a) requires that the pronominal affix be incorporated into prosodic structure, but, since it is monomoraic and at the left edge of the phase, it cannot be parsed as a degenerate foot. Furthermore, Phase Integrity prohibits the formation of a binary foot that spans a phase boundary. This is the stage in the derivation where cliticization is triggered. The process converts (56a) into (56b), and the stress assignment to the latter yields (56c). (The original site of the clitic is embossed.)

(56)  

a. \[ [\text{ni}](\text{biba}^{\text{Ü}})(\text{mose}^{\text{Ø}})_{vP}\text{-CP}] \]  

b. \[ [:[:\text{ni}-(\text{biba}^{\text{Ü}})(\text{mose}^{\text{Ø}})_{vP}]\text{-CP}] \]  

- Cliticization  

c. \[ [:[:([\text{nibi}^{\text{Ü}})(\text{bà}^{\text{Ü}})(\text{mose}^{\text{Ø}})]_{vP}]\text{-CP}] \]  

- Stress re-assignment

Both of the prosodic conditions in (52) are satisfied by (56c). Moreover, because cliticization moves the pronominal prefix inside the vP phase, foot construction conforms
to the requirements of *Phase Integrity*. Note that cliticization triggers re-footing of material that was prosodically organized at an earlier stage of the derivation. This re-footing is required, because new phonological material has been added to a phase and must be integrated into prosodic structure to conform to the demands of *Phase Integrity*. We return to this issue in §3.5.

The preceding characterization of cliticization is crucial to understanding why pronominal 'subject' prefixes trigger C-epenthesis to avoid vowels in hiatus. Let us return to the derivation in (48), repeated here as (57a, b) with the addition of foot structure and stress. After lexical insertion, the pronominal prefix must undergo cliticization, thereby yielding (57c).

(57)  a. \[SNOWSHOE-WALK-FIN_{n\text{P}}\]
     \[\langle:\hat{a}:\rangle\langle\text{gam-ð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\]
  
  b. \[1P\langle\text{SNOWSHOE-WALK-FIN}_{n\text{P}}\rangle\text{...CP}\]
     \[\langle\text{ni}\rangle\langle\text{\hat{a}:}\rangle\langle\text{gam-ð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\text{...CP}\]
  
  c. \[1P\langle\text{SNOWSHOE-WALK-FIN}_{n\text{P}}\rangle\text{...CP}\]
     \[\langle\text{ni}\rangle\langle\text{\hat{a}:}\rangle\langle\text{gam-ð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\text{...CP}\]
     - Cliticization

Cliticization creates the conditions for the application of C-epenthesis in Ojibwa by juxtaposing two vocabulary items that were spelled out in different phases.

(58)  a. \[\langle\text{nìdå:}\rangle\langle\text{gam-ð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\text{...CP}\]
     - C-epenthesis
  
  b. \[\langle\text{nìdå:}\rangle\langle\text{gamð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\text{...CP}\]
     - Re-footing

The conditions for C-epenthesis are clearly different from those for vowel loss. The latter affects vocabulary items at the point of insertion into the morpho-syntactic structure, while the former applies to items after they have been inserted. The significance of this difference is addressed in the next section.

Cliticization does not specifically target pronominal prefixes. Given the triggering conditions in (52), this process would apply to any morpheme that undergoes spell-out at the CP phase and is realized by a monomoraic vocabulary item. The prefixes /gi:/ (Past tense) and /wi:/ (Future tense) are inserted at the CP phase, but these are bimoraic and are therefore not subject to cliticization. The insertion of these items produces surface V-V sequences.

(59)  a. gi:a:gamose: 'he walked in snowshoes'
     \[\langle\text{gi:}\rangle\langle\hat{a}:\rangle\langle\text{gamð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\text{...CP}\]
  
  b. wi:a:gamose: 'he will walk in snowshoes'
     \[\langle\text{wi:}\rangle\langle\hat{a}:\rangle\langle\text{gamð}\rangle\langle\text{sè:-Ø}\rangle_{n\text{P}}\text{...CP}\]

There is, however, a third Ojibwa tense marker, the prefix /ga/. This affix also indicates Future tense, but, in comparison with /wi:/, it seems to have a more indefinite meaning. Affixation of /ga/ always triggers the hiatus-avoiding strategy of C-epenthesis (60a).
(60)  a. nigada:gamose:  'I will walk in snowshoes'
    ni-ga-a:gam-ose:-Ø
    '1P-FUTURE-SNOWSHOE-WALK-FIN'

b. nigabiba:mose:  'I will walk around'
    ni-ga-biba:m-ose:-Ø
    '1P-FUTURE-AROUND-WALK-FIN'

It is not surprising that /ga/ is subject to cliticization; it is too small to be parsed at its insertion site and therefore must move. The relevant steps in the derivation of (60a) are shown below.

(61)  a. Spell-out at vP Phase
    [SNOWSHOE-WALK-FIN_{vP}]
    [a:gam-ose:-Ø_{vP}]
    [((á):(gamó)(sé;){vP}]
    - Vocabulary insertion

b. Spell-out of tense morpheme (CP Phase)
    [[FUTURE[SNOWSHOE-WALK-FIN_{vP}]]_{TP}]
    [[ga((á):(gamó)(sé;){TP}]
    - Vocabulary insertion
    [[ja[[ga-(á):(gamó)(sé;){TP}]
    - Cliticization
    [[ja[[nigá](dá):(gamó)(sé;){TP}]
    - C-epenthesis & Stress

c. Spell-out of pronominal prefix (CP Phase)
    [1P[FUTURE[SNOWSHOE-WALK-FIN_{vP}]]_{TP}]
    [ni[ja[[nigá](dá):(gamó)(sé;){TP}]
    - Vocabulary insertion
    [ni[ja[[nigá](dá):(gamó)(sé;){TP}]
    - Cliticization
    [ni[ja[[nigá](dá):(gamó)(sé;){TP}]
    - Re-footing and surface stress

There are two derivational steps in the spell-out of the CP phase. At the first stage (61b), the future tense affix /ga/ is inserted in the head of TP and undergoes cliticization to ensure that it is properly incorporated into foot structure; cliticization then triggers C-epenthesis. The resulting interpretation is carried over to the next derivational stage (61c) where head of CP is spelled out. At this stage, the 1st Person prefix /ni/, once inserted, must also undergo cliticization.

The postulation of two derivational steps in the spell-out of the CP phase is reflects the conception of derivation by phase, as presented in Chomsky (1999, 2005). The head of a phase first sends its complement to the interfaces to be spelled out. At the next phase, the head is then spelled out. As a result, Ojibwa tense affixes and the pronominal 'subject' prefixes are invisible to each other at the point of lexical insertion. The determination of prosodic well-formedness must follow the derivational steps presented in (61) with regard to morphemes spelled out at the CP phase. The insertion of pronominal 'subject' prefixes after the spell-out of the tense morphemes ensures that /ga/ serves as a host for the cliticization. The other tense markers /gi:/ and /wi:/ also fulfill this role in the position where they are inserted. As illustrated in (62), the 1st Person pronominal prefix is cliticized to the Past tense marker /gi:/.
To complete the story of cliticization, we have to address the issue of how clitics locate hosts. A necessary requirement is that the edges of a well-defined phonological string that emerges on an earlier phase be accessible to elements spelled out later. Such accessibility is not inconsistent with Phase Impenetrability Condition as modified by Linear Edge Condition (LEC) of Nissenbaum (2000). According to the later, phases are not completely impenetrable. The linear edges of earlier phases are accessible to elements spelled out on later phases. The limited accessibility assumed here allows the 1st Person affix in (63a) to interact with the entity a:gamose: spelled out at the vP phase. It also permits the pronominal affix to interact with the vocabulary item ini representing the preverbal modifier but not with a:gamose: in (63b). (The interacting items are in boldface in the following structures.)

(63) a. CP = [nida:gamose:] 'I walk in snowshoes'

(62) a. [1P-PAST[[AWAY-FIN_{aP}][SNOWSHOE-WALK-FIN_{vP}]]_{vP1}]_{CP}
  [ni][[(gì)]((ini-Ø)[(a:)(gamò)(sè:-Ø)]_{vP2})_{vP1}]_{TP}CP

b. [1P-PAST[[AWAY-FIN_{aP}][SNOWSHOE-WALK-FIN_{vP}]]_{vP1}]_{CP}
  [ni]((niği)[(ini)[(a:)(gamò)(sè:-Ø)]_{vP2})_{vP1}]_{TP}CP
The accessibility of affixes spelled out at a later phase to the linear edges of an earlier phase may allow for cliticization, but it is not sufficient to trigger C-epenthesis. The clitic cannot be merely adjoined to the phase; it must be attached to the first morpheme of the phase. This restriction is consistent with the position of Embick & Noyer (2001) on the types of merger operations available after vocabulary insertion has taken place. Post-Vocabulary insertion merger, or Local Dislocation (Embick & Noyer 2001:12), is defined as follows:

(64) The Local Dislocation Hypothesis:
If a movement operation is Vocabulary sensitive, it involves only string-adjacent items

That cliticization in Ojibwa is vocabulary sensitive is evidenced by the fact that it is the phonological weight of the morpheme that determines whether it will be cliticized. While bimoraic items (e.g. the past tense marker /gi:/) are not subject to cliticization, monomoraic items must undergo the process under the appropriate conditions.

Embick & Noyer propose a further restriction on Local Dislocation, mirroring the fact that head movement targets heads and phrasal movement targets phrases in the Narrow Syntax. They divide elements that may undergo Local Dislocation into two categories: morphologically simple elements (S-Words), and morphologically complex elements (M-Words) and propose the following principle (Embick & Noyer 2001:23).

(65) If a Merger operation moves an element A to a target B, then A and the head of B are either both MWds or both SWds.

Assuming this to be a correct generalization, we then can explain why it is that the phonologically 'light' pronominal prefixes and tense markers must cliticize inside a phase.
to their right. Both entities are morphologically non-complex, hence S-Words. Given that the phases previously spelled out are morphologically complex, they cannot be targets for this type of merger. Consequently, affixes that undergo cliticization in Ojibwa must merge with the leftmost S-Word within the phase to their right.

In summary, the analysis of Ojibwa 'subject' prefixes as clitics resolves the paradox that emerges from the syntactic requirement that they must be in the CP or DP position and a phonological requirement that they must be attached to an earlier phase in order to trigger C-epenthesis. Cliticization is not regulated by either a syntactic or semantic condition but by morpho-phonological conditions that are only in effect on the PF side of a derivation.

3.4 Two strategies for avoiding vowels in hiatus. So far, we have seen that, in instances where the insertion of vocabulary items would yield a V-V sequence, the loss of a vowel ensures that the illicit sequence is avoided. However, when such a sequence is produced by cliticization, the C-epenthesis strategy is used. In current phonological thinking, the choice of strategy in a particular context is completely arbitrary; Ojibwa could have employed the strategies in the opposite situations. We take a different position. We propose to link the choice of strategy to the point in a derivation where the violation of NO-HIATUS is detectable. It is reasonable to assume that a derivation is constantly monitored to determine if it conforms to the operative well-formedness conditions. Hence, checking for constraint violations must occur at the point where vocabulary items are inserted into a phase, and it must also occur after vocabulary insertion to determine if a phase is modified by the movement of a spelled-out item (i.e. cliticization). We propose that, in monitoring vocabulary insertion, a constraint has the status of a filter, blocking potential outputs that would be in conflict with its demands. In contrast, when a constraint detects that a violation has occurred after vocabulary insertion, it functions as the trigger for a repair operation.

To see how NO-HIATUS controls vocabulary insertion, let us return to the case of allomorphy selection discussed earlier in §2.1 and §3.2. Recall that Ojibwa has pairs of lexical entries like the following.

(66) C-final V-final
    a. biba:m biba: 'around'
    b. inim ini 'away'

We propose that NO-HIATUS as filter blocks the combination of a V-final allomorph and a V-initial root at the point of lexical insertion, because a better choice is available (cf.

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12 Embick and Noyer propose that morphologically simple elements that are not part of a larger M-Word are M-Words themselves. It is assumed here, following Chomsky (1995), that these elements are both maximal and minimal, and therefore may behave as either M-Words or S-Words. In the data presented here, the phonological restriction that causes cliticization, namely persistent footing, would not be satisfied if the clitics in question were to adjoin to the right-adjacent phase itself, given Phase Integrity/PF. Therefore, if they were to adjoin as M-Words, the derivation would crash.
Steriade 2000). The insertion of the C-final allomorph under these conditions is optimal, yielding (40b=67b).

(67) a. [AROUND-WALK-FIN_{vP}]
b. [biba:m-ose:-Ø_{vP}]

Whenever there is a choice between C-final and V-final allomorphs, the C-final variant is selected as the first component of a root-root compound where the second root is from the V-initial set in (10).\textsuperscript{13}

\textsc{No-hiatus} would also prohibit the simultaneous insertion of a pair of items that would result in an illicit V-V sequence. Earlier we cited (41=68) as an example where this effect emerges.

(68) a. [GO HOME-WALK-FIN_{vP}]
b. [gi:we:-se:-Ø_{vP}]
c. *[gi:we:-ose:-Ø_{vP}]

Since the two morphemes \textsc{go home} and \textsc{walk} are complements of the same head, they are visible to each other at the point when the derivation undergoes vocabulary insertion at the vp phase. The full insertion of the items /gi:we:/ and /ose:/ as the respective realization of these morphemes must be blocked. The initial vowel of the second item is sacrificed (probably, because it is short) to ensure that the output is well-formed.\textsuperscript{14}

The V-final allomorphs in (66) look like the surface realization of these morphemes when they are preverbal modifiers.

(69) a. biba:-a:gamose: \text{ ‘walk around in snowshoes’}
b. ini-a:gamose: \text{ ‘walk away in snowshoes’}

Earlier, in §3.2, we made a compelling case for considering the vocabulary item that realizes the modifier-Final as /-i/. To account for the realization of the preverbal modifier as \textsc{biba:} and not \textsc{*biba:mi}, we have to refine the conception of vocabulary insertion as presented so far. If \textsc{No-hiatus} as filter blocks selection of V-final allomorphs in constructions where the only exponent of the following morpheme is V-initial, we would expect the C-final allomorph of root meaning ‘around’ to be selected before the modifier-Final. In other words, vocabulary insertion should result in incorrect \textsc{*biba:mi} (70a) rather than correct \textsc{biba:} (70b).

\textsuperscript{13} We would expect the V-final allomorph to be chosen before C-initial roots. Unfortunately, the supporting evidence is unavailable.

\textsuperscript{14} There are cases in the literature that appear to contradict the claim that V-V sequences do not emerge from vocabulary insertion within a phase, when \textsc{No-hiatus} is an active constraint. Examples of these apparent counter examples are cases where V-V sequences undergo processes such as diphthongization and vowel coalescence. We would argue that such repairs are not responses to the very general \textsc{No-hiatus} constraint formulated in (37).
The correct output (70b) could surface, only if the exponent of the category-defining element is invisible to the spell-out of the root morpheme.

A solution to this problem emerges, in part, from the assumption that the spell-out of a complement within a phase has priority over the head. Earlier we adopted the position that this priority is realized within a CP or DP category by the requirement that the head and complement are actually spelled out in different phases. However, some qualification of this approach is required in the spelling out the lexical categories (i.e. aP, vP, nP). Within the latter, heads and complements are spelled out within a single phase, although complement spell-out still takes precedence. This characterization of the spell-out of heads is one of the ways in which 'strong' and 'weak' phases may differ (cf. Marvin 2002). Given this difference, the derivation of the preverb *biba* 'around' proceeds as follows.

(71) a. [AROUND-FIN\(_aP\)] 
   b. [biba:-FIN\(_aP\)] - Spell-out of complement\(^{15}\) 
   c. [biba:-Ø\(_aP\)] - Spell-out of head.

In (71b), when the allomorph */biba:/ is inserted into the root-complement position, NO-HIATUS has no influence on the choice, because vocabulary insertion in the position of the Final is not under consideration. After the spell-out of the complement, NO-HIATUS as filter would not permit the insertion of */-i/, the vocabulary entry for the modifier-Final. In contrast, the vocabulary item for this Final is fully realized in (72), the derivation of the modifier *wa:bi* 'white'.

(72) a. [WHITE-FIN\(_aP\)] 
   b. [wa:b-FIN\(_aP\)] - Spell-out of complement 
   c. [wa:b-\(i\_aP\)] - Spell-out of head.

When a root is C-final as in (72), nothing prohibits the insertion of the modifier-Final */-i/*. A prediction that follows from this conception of spell-out and the role of NO-HIATUS as filter is that the initial vowel of a Final will always be lost after a V-final root. This is, indeed, the case in Ojibwa.

The suppression of the vowel in the plural suffix, cited earlier in (3a), provides another example of the filtering function of NO-HIATUS. The Ojibwa plural morpheme is actually a category-defining element. There are two vocabulary items that mark plural in nouns. The attachment of the ending */-ag/ indicates that the noun belongs to the animate (i.e. [+ANIMATE]) class, while the suffix */-an/ identifies the noun class as inanimate (i.e.

\(^{15}\) The allomorph */biba:/ is considered to be the better choice in this context, because its syllabification is less problematic.
The two nouns in (73) contain the same root morpheme but differ in their class membership.

(73)  a. oda:ba:naq    'cars'
      oda:ba:n-ag
      'VEHICLE-ANIMATE PLURAL'

        b. oda:ba:nan    'sleds'
      oda:ba:n-an
      'VEHICLE-INANIMATE PLURAL'

The fact that plural suffixes have the capacity to determine class membership of nouns can be readily attributed to their status as category-defining elements. When the plural ending is spelled out after a V-final root, the initial vowel would be suppressed, as illustrated in the following derivation.

(74)  a. [STURGEON-PLURAL_{np}]

b. [name:-PLURAL_{np}] - Spell-out of complement

c. [name:-g_{np}] - Spell-out of Plural Final

The full form of the animate plural ending (i.e. /-ag/) would surface only after a C-final root.

In summary, the two strategies for avoiding vowels in hiatus apply phase-internally, but they occur under strikingly different conditions. Vowel loss is essentially an emergent property, an epiphenomenon. It is the result of blocking the full spell-out of a vocabulary item at the point of its insertion into the morpho-syntactic structure of the word. Partial spell-out penalizes an inserted vocabulary item by dissociating it from its lexical form. The penalty is incurred to avoid an illicit V-V sequence. In contrast, C-epenthesis allows for the preservation of identity between an item as inserted and its lexical form, since this strategy applies only after the insertion of vocabulary items; it is a genuine repair strategy.¹⁶

Strong validation of our analysis of the conditions under which the two hiatus-avoiding strategies are employed comes from the phonological and semantic differences between two types of possessive constructions in Ojibwa. Two examples of these constructions were introduced in §2.1 and repeated below.

(75)  a. ni-e:mikwa:n    'my spoon'
      ni-e:mikwa:n-o
      '1P-SPoon-FIn'

¹⁶ Note that consonant epenthesis is not necessarily the only post-insertion strategy for eliminating V-V sequences. Glide insertion, diphthongization and vowel coalescence have similar effect. It is also conceivable that a language might employ V-deletion as a post-insertion repair strategy.
b. no:komis 'my grandmother'
    ni-o:komis-Ø
    '1P-GRANDMOTHER-FIN'

Given the DP structure proposed earlier, (75a) must be the realization of the following representation.

(76)

\[
\text{DP} \\
\text{[P} \text{pro}^{17} \text{D'} [	ext{D} [+[\text{poss}] \\
\text{(ni)}] \sqrt[n]{\text{SPOON} \text{FIN}} \text{nP}}
\]

Note that the pronominal morpheme is not merged into the narrow syntactic structure but is the reflex of agreement between the pro-possessor subject and the possessive D-head (D^0). Given (76), the presence of the epenthetic consonant in (75a) is unproblematic. Since n^0 (the head of nP) and D^0 are different phase heads, the root morpheme SPOON and the 1st Person possessor must be spelled out in different phases. The relevant stages in the derivation of (75a) are illustrated in (77).

(77)

a. \[[\text{SPOON-FIN}_{nP}] [\text{e:mikwam-\text{FIN}_{nP}}] \quad \text{(Spell-out of root morpheme)}

b. \[[\text{SPOON-FIN}_{nP}] [\text{e:mikwam-\text{Ø}_{nP}}] \quad \text{(Spell-out of Final)}

c. \[[\text{1P[SPOON-FIN}_{nP}]...\text{DP}] [\text{ni[e:mikwam-n-\text{Ø}_{nP}]...\text{DP}}] \quad \text{(Spell-out of pronominal prefix)}

d. \[[\text{1P[SPOON-FIN}_{nP}]...\text{DP}] [\text{ni-e:mikwam-n-\text{Ø}_{nP}]...\text{DP}] \quad \text{(after cliticization)}

e. \[[\text{1P[SPOON-FIN}_{nP}]...\text{DP}] [\text{nide:mikwam-n-\text{Ø}_{nP}]...\text{DP}] \quad \text{(after consonant epenthesis)}

Obligatory cliticization of the pronominal prefix would trigger C-epenthesis at the final stage (77e) to resolve the hiatus.

As predicted by phase theory, the structure in (76) also underlies the appropriate semantic interpretation (75a). When the elements of the nP phase are transferred to LF, the root-final combination (i.e. SPOON-FIN) is assigned a meaning (informally 'possessed spoon'). This meaning is carried over to the next phase, where the 1st Person morpheme in D^0 becomes visible and is interpreted as the possessor. Since the noun and its possessor are semantically interpreted in different phases, the possession relation encoded by (76) must be alienable. In other words, the meaning of the noun 'spoon' is not linked to its

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17 Throughout this paper, we have assumed that Ojibwa is a polysynthetic language. This assumption entails that full DPs are not permitted in argument positions in this language (cf. Baker 1996).
being possessed. It should therefore not be surprising that the root morpheme SPOON also appears in the independent word $e:mikwa:n \ 'a/\text{the spoon}'.

Consider now the second possessive construction (75b). In this pattern, the combination of vocabulary items induces vowel loss. We deduce from the phonological evidence that the morphemes 1P and GRANDMOTHER are spelled-out in the same phase. The semantic evidence also points to the same conclusion. The LF interpretation of the pronominal morpheme and the root must be in the same phase, because the possessive relation in (75b) is inalienable. In other words, when the root morpheme GRANDMOTHER is assigned a meaning, the element that is interpreted as its possessor must be present. Grandmothers are always possessed in Ojibwa, as shown by the absence of the independent word $o:komis \ 'a/\text{the grandmother}'. In summary, the phonological and semantic evidence therefore indicate that, in the inalienable construction, the root and prefix morphemes are, in some sense, closer together than they are in the alienable construction. This observation about relative closeness is not unique to Ojibwa. In no case known to us is a possessed noun phonologically, syntactically, or semantically closer to the possessor in the alienable construction than in the inalienable counterpart. We therefore infer that the narrow syntax must reflect the difference in relative closeness of the possesum and possessor morphemes at the point when transfer to the interfaces takes place.

The difference between alienable and inalienable possessive constructions has received considerable attention in the syntactic literature, much of it reviewed by Larson (1999). One proposal by Vergnaud and Zubizarretta (1992: 596) appears to capture the essence of the difference; it requires inalienable nouns, but not alienable ones, to be specified for a possessor argument. Adapting this idea to Ojibwa, we propose that (75b) is the surface realization of the following structure.

$$
(78) \quad \text{DP} \quad \begin{array}{c}
\uparrow \text{1P} \\
\text{pro} \\
\downarrow \\
\text{D'} \\
\uparrow \\
\text{D} \quad \sqrt{ +\text{poss} } \\
\text{GRANDMOTHER} \\
\text{(ni)}
\end{array}
$$

The structure embodies the claim that the possessum (GRANDMOTHER) is selected by and is therefore an argument of the possessive D$^0$. When the morphological pieces of the DP phase are transferred to LF, 1P and GRANDMOTHER are interpreted together and assigned the meaning, roughly, 'grandmother belonging to me' (79a). At PF, since the vocabulary items that are, respectively, associated with the pronominal and the root are inserted in the same phase and are visible to each other, the spell-out process inevitably triggers vowel loss to ensure that the hiatus problem never arises.

$$
(79) \quad \begin{array}{c}
a. \quad [[1P-\text{GRANDMOTHER-FIN}_D]\ldots\text{DP}] \\
\text{LF: 'grandmother belonging to me'}
b. \quad [[n-o:komis-\varnothing_D]\ldots\text{DP}] \\
\text{PF: [no:komis]}
\end{array}
$$

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The fact that the pronominal prefix /ni/ '1st Person' is subject to partial spell-out, as opposed to the root morpheme, is explained, if complements are spelled out before heads (as we claimed earlier).

The morpho-syntactic contrast between the two types of possessive constructions has an additional pay-off; we can now explain a noticeable difference in their surface morphology. We have already noticed that the alienable type may contain an overt realization of the possessive Final /im/ (80a). When an overt exponent of this Final is absent from such a construction, the root seems to end in a nasal. The occurrence of the zero (Ø) allomorph in (80b), therefore, has a plausible morpho-phonological explanation.18

(80) a. nigo:ko:jim
    ni-go:ko:j-im
    '1P-PIG-FIN'

b. nide:mikwa:n
    ni-e:mikwa:n-Ø
    '1P-SPOON-FIN'

In contrast, the Final /im/ never occurs in the surface morphology of the inalienable construction. The explanation is straightforward; there is no nP structure in this construction and therefore no little-n position to serve as the host for a vocabulary item. The derivation of the word *no:komisim 'my grandmother' would be impossible.

Our analysis of possessive constructions is not yet complete. Given the difference between the two possessive constructions, we still have to explain why roots do not freely appear in either construction. In other words, the occurrence of the phonological and semantic anomalies in (81) must be blocked.

(81) a. Alienable
    *[[1P[GRANDMOTHER-FIN_{nP}]]...DP]
    LF: 'a possessed grandmother of mine'
    *[[ni[doo:komis-O_{nP}]]...DP]
    PF: [ni[doo:komis]

b. Inalienable
    *[[1P-SPOON-FIN_{D}]]...DP]
    LF: 'spoon belonging to me'
    *[[n-e:mikwa:n-O_{D}]]...DP]
    PF: [ne:mikwa:n]

While we have not fully worked out the details of the solution to this problem, prima facie, the ineffability of the words in (80) must be linked to the two arbitrary root classes. Speculatively, an inalienable root (e.g. o:komis) bears a feature ([−A]) that is interpreted only if the root is selected by a possessive D0. This requirement is not met in (81a). Hence, the derivation must crash. We must also claim that an argument of a possessive D0 must have the [−A] feature. The absence of the feature in an alienable ([+A]) root morpheme such as SPOON also causes a derivation to crash. As pointed out earlier, the specification of an Ojibwa root morpheme as [+−A] seems to be somewhat arbitrary.

18 The suffix /im/ may also be displaced by noun finals such as /win/ and /igan/.
While the inalienable set includes terms for kinship and body parts, it also includes terms for items such as 'pants' 'socks' and 'lice'. The existence of the two roots /day/ (inalienable) and /anim/ (alienable), both realizations of the morpheme DOG, further underlines the arbitrariness of the classification.\textsuperscript{19}

We have now fully explained why the two hiatus-avoiding strategies have the distribution observed in Ojibwa. Given the enforcement of NO-HIATUS and the morphosyntactic structure of Ojibwa words, the use of two strategies is unavoidable. Moreover, the conditions of their occurrence could not have been the reverse. C-epenthesis could not have been used to resolve a hiatus between morphemes spelled out in the same phase, with vowel loss applying to morphemes inserted in different phases. We now turn to the effects of derivation by phase on the stressing of Ojibwa words.

3.5 Stress assignment by phase. As pointed out in §3.3, the manifestation of stress in Ojibwa provides additional support for derivation by phase. In the literature, there are some differences in the description of Ojibwa stress, but there is general agreement that it is the result of left-to-right iambic parsing. For Kaye (1973) and Piggott (1980b, 1983), foot construction is considered to be exhaustive and therefore degenerate (i.e. monomoraic) feet may arise at the right edge of words. Hayes (1995: 216-218) takes a different position. For him, Ojibwa is among the languages that require words to be minimally bimoraic (cf. Piggott 1980b: 307). He assumes that such languages do not tolerate degenerate feet. Therefore, in his view, foot constructions in Ojibwa cannot be exhaustive. This restriction on stress assignment in Ojibwa results in the patterns illustrated in (82). For the present purpose, we may ignore how primary stress (´) is assigned.

\begin{align*}
\text{(82) a.} & \quad [(bí:n)(dígè):(bátò:)] \quad 'he runs inside' \\
& \quad [(\text{mínwà:})(\text{bami})(\text{nà:})(\text{gožì})] \quad 'he looks beautiful' \\
& \quad [(\á:)(\text{gamò})(\text{sè:})] \quad 'he walks in snowshoes' \\
\text{b.} & \quad [(\wà:)(\text{bimì})(\text{nà:})(\text{zi})] \quad 'it is a pale round object' \\
& \quad [(\wí:)(\text{kwa})(\bò:):(\text{zo})] \quad 'he is carried along by the current' \\
& \quad [(\text{ginwà:})(\text{bikì})(\text{zi})] \quad 'it is a long metal object'
\end{align*}

The final syllables in (82a) are parsed as constituents of licit binary feet, while the enforcement of a ban on degenerate feet blocks parsing of the final syllables of (82b). Hayes argues that the perceived prominence of a final syllable does not have to be attributed to stress but may be regarded as the phonetic enhancement of the right edge of a word. He therefore concludes that final syllables in (82b) are perceptually prominent but not stressed, while Piggott (1980b, 1983) considers such syllables to be stressed.

If we focus only on the status of word-final syllables, it seems that the issues of whether or not Ojibwa permits degenerate feet cannot be settled by any empirical test. It will always be indeterminate whether the final prominence is a purely phonetic

\textsuperscript{19} The phonological difference between semantically related pairs of roots is sometimes quite small. For example, the pair /kon/ 'bone (inalienable)' and /okon/ 'bone (alienable)' was elicited in the Algonquian variety of Ojibwa.
phenomenon or an indication of the head of a foot. However, there is a context where this indeterminacy should not arise. Given the conditions that regulate prosodic well-formedness within a phase, the Phase Impenetrability Condition and Phase Integrity, the relative prominence of the final syllable of a word-internal phase should settle the question of the possibility of degenerate feet in Ojibwa. If degenerate feet are completely forbidden, as Hayes (1995) claims, the final syllable of a phase should be prominent only when it is part of a binary foot. The evidence does not support this position. Consider the location of stress in the following words.

(83)  a. bíizâ: 'he comes 
      (bí)(i3â:)

b. gí:biizâ: 'he came' 
     (gí:)( bí)(i3â:)

The morpheme immediately preceding the verb stem /i3a:/ 'go' in each of the above examples is the preverbal modifier /bí/ 'towards speaker'. It bears primary stress in (83a) and secondary stress in (83b). The assignment of stress to the monosyllabic exponent of this morpheme can be explained only if it is parsed as a degenerate foot. Facts like those in (83) are compelling proof that a ban on degenerate feet cannot be an absolute restriction in Ojibwa.

The stress patterns in (83) are possible only if foot construction is persistent within a phase. Such a requirement would also force the final syllables of the words in (82b) to be parsed as degenerate feet.

(84)  [(wà:)(bímí)(naq̂i)(zì)] 'it is a pale round object'
     [(wì:)(kwà:)(bò:)(zò)] 'he is carried along by the current'
     [(gínwà:)(bìkì)(zì)] 'it is a long metal object'

Consequently, where the empirical evidence is indecisive, consistency in the application of the theory of stress assignment to Ojibwa yields unambiguous results. A ban on word-final degenerate feet in this language would require a special (ad hoc) stipulation.

The satisfaction of the Phase Impenetrability Condition (perhaps, with the Phase Integrity codicil) ensures that the syllables that constitute a foot must be within the same phase. Syllables that are spelled out in different phases are inaccessible for the purpose of foot construction. This inaccessibility would lead to the emergence of degenerate feet within a phase, when persistent footing (i.e. the dominance of the familiar Parse-σ constraint) is enforced. Cross-linguistically, when languages allow degenerate feet, they are usually restricted to the left or right edge of the domain of stress assignment. The latter option is in effect in Ojibwa. In the derivational framework adopted in this paper, the combination of persistent footing and the restriction on degenerate feet force modification to foot structure whenever new vocabulary material is introduced at the left edge of a phase. For example, the derivation of (85a) at PF would proceed as sketched in (85b).
The hypothesis that the domain of stress assignment in Ojibwa is the phase yields a straightforward explanation for the failure of the final syllable of the preverb *bimi* and the initial syllable of the root *gi:we:* to be combined into an optimal iambic foot.

The crucial role of morpho-syntactic structure in explaining stress and syllabification in Ojibwa is underlined by the contrast between the two words in (86).

(86) a. bi:Za~Ü 'he comes
   bi-i:Za~Ü-Ø-Ø
   'HERE-GO-FIN-3P'

b. ni:di:Za~Ü 'I go
   ni-i:Za~Ü-Ø
   '1P-GO-FIN'

In (86a), stress is on the first syllable and the second syllable is unstressed, while stress is assigned to the second syllable of (86b) with the first syllable unstressed. In terms of their phonological content, the overt vocabulary items in (86) are very similar. The *i* element of each word is monosyllabic and monomoraic and it is followed by the same root morpheme. Nevertheless, there is a difference in how the sequences of elements are syllabified and stressed.

The prosodic differences between the words in (86) are correlated with the respective differences in structure, as schematized in (87).

(87) a. [3P[[HERE-FIN\text{\text{a\text{p}}}}][[GO-FIN\text{\text{v\text{p}}}}]_{\text{\text{v\text{p}}}}]\text{CP}]
   [[[bi-O_{\text{\text{a\text{p}}}}][i:Za:=-\text{\text{O\text{v\text{p}}}}}]\text{CP}]
   [[[i:Za:=-\text{\text{O\text{v\text{p}}}}}][i:Za:=-\text{\text{O\text{v\text{p}}}}}]\text{CP}]

b. [1P[GO-FIN\text{\text{v\text{p}}}}_{\text{\text{PCP}}}]
   [ni:i:Za:-\text{\text{O\text{v\text{p}}}}}]\text{CP}]
   [ni:i:Za:-\text{\text{O\text{v\text{p}}}}}]\text{CP}]

As pointed out in earlier (footnote 1), the 1st and 3rd Person affixes differ in their surface location; the latter is a suffix at the surface level. This difference is not relevant to the assignment of syllable structure and stress to words like those in (86), because the 3rd Person affix is phonetically null. Superficially, the items /bi/ and /ni/ are initial in (87a) and (87b), respectively, but they occupy different structural positions. When the vocabulary item /bi/ is inserted at the \text{\text{a\text{p}}} phase of (87a), it is at the right edge of a phase and is not required to move; it may be parsed as a degenerate foot. In contrast, the
pronominal prefix in (87b) must move after insertion, because it is not at the right edge of a phase and it is too small to be footed at the insertion site. Obviously, phonology does not interpret mere sequences of items but is aware of the structural positions occupied by the items.

In our analysis of Ojibwa, the cliticization of pronominal prefixes is linked to two phonological requirements, persistent footing and a restriction on where degenerate feet are permitted. We would expect to find a different situation in a language where persistent footing was not enforced. Mangap-Mbula, an Austronesian language of New Guinea (Bugenhagen 1995), provides such a situation. The stress foot in the latter is demonstrably trochaic. Normally, when the second syllable of a Mangap-Mbula word is light, the initial syllable bears main stress (88a). However, main stress is attracted to the second syllable, if it is heavy and the initial syllable is light (88b). Trochaic footing produces secondary stress to the right of the main stress syllable.

(88)  
a. mólolo  'long (plural objects)'
   nákabâsi  'axe'
   pâzaŋâna  'something planted'

b. tomo:to  'man'
   kumbü:nu  '3sg. leg'

In these data, the absence of stress on final syllable of a word like mólolo 'long (plural objects)' and on the initial syllable of the words in (88b) is proof that foot construction is not persistent in this language. Well-formed feet in this language must, therefore, contain at least two moras.

In addition to words like those in (88b), the initial syllable of the Mangap-Mbula words in (89) must also be skipped in the course of foot construction. Each begins with a monosyllabic and monomoraic exponent of a subject morpheme.

(89)  
a. ti-mènder  'they stand' *tí-mender
   ti-pömbo:lo  'they cause to be strong' *tí-pömbo:lo
   anŋ-bó:bo  'I call'  *ánŋ-bó:bo

b. anŋ-bó:bo:bo  'I am calling' *ánŋ-bó:bo:bo
   anŋ-garâu  'I approach'  *ánŋ-garâu

Significantly, the first two syllables are skipped in (89b), although routine parsing would yield a well-formed trochaic foot containing two light syllables. Conventional analyses of Mangap-Mbula stress would include a statement that arbitrarily designates subject prefixes as extrametrical. Such a stipulation would not be necessary in a theory that adopts derivation by phase.

Let us assume that Mangap-Mbula subject morphemes are spelled out at the CP phase. Because foot construction is not persistent in this language, the exponent of a subject morpheme would not be required by the phonology to undergo cliticization; they would remain in situ, as unstressed items. The effect is illustrated in the following derivation.
In (90a), the construction of a non-degenerate trochaic foot leaves the first syllable in the vP phase unparsed. When the monomoraic prefix is inserted in the subject position, it does not have to be stressed and does not move. In this position, the assignment of stress to the prefix results in ill-formed representations (90c). In the latter set, the second one is particularly egregious, because foot construction should never cross a phase boundary.

There is one condition under which the exponent of a Mangap-Mbula subject prefix combines with a following syllable to form a foot. This situation arises when the root morpheme is itself monosyllabic and monomoraic.

(91) a. án-bot 'I stay'
   b. tí-la 'they do'
   c. kó-so\textsuperscript{20} 'you(pl.) say'

Stress on the monosyllabic and monomoraic subject prefixes in (91) is proof that they have undergone cliticization. The required parsing would then not violate Phase Integrity. The limited cliticization in these examples is clearly a response to a word minimality (MinW) requirement attested in many languages, demanding that the minimal word contain at least one binary foot. Cross-linguistically, we would expect the MinW restriction to trigger cliticization of affixes that are otherwise separated from the adjacent monosyllabic exponent of a root morpheme by a phase boundary.

4. Implications. It is hardly surprising that the analysis of aspects of Ojibwa phonology presented in this paper has a wide range of implications for current phonological thinking. The derivational framework is fundamentally different from the monostratal approach advocated by the dominant version of Optimality Theory. The implications of our analysis are of two types. First and most obviously, some constraints that have figured prominently in OT analyses must be reconsidered, if the domain of well-formedness is the phase. Secondly, our analysis implicitly makes a claim for the superiority of the derivational approach over non-derivational alternatives.

4.1. Revisiting two constraints. Let us first consider the constraint that disfavours vowels in hiatus. The formulation in (37) is repeated here as (92).

\footnote{The underlying representation of the prefix in this example is /k/. The stressed vowel is therefore an epenthetic copy of the root vowel.}
(92) **No-hiatus**  
*V-V*, i.e. vowels belonging to different syllables cannot be adjacent.

Similar formulations are encountered in the literature (e.g. Raffelsiefen 2004: 104). Nevertheless, it might be argued that our adoption of (92) is self-serving, because we seem to have overlooked another constraint that would also disallow hetero-syllabic V-V sequences.

(93) **Onset**  
A syllable does not begin with a vowel.

If **Onset** instead of **No-hiatus** were responsible for the ban on V-V sequences in Ojibwa, our analysis would be incomplete. It does not explain why the constraint is not enforced phase-initially. For example, the requirement of **Onset** is fully satisfied by (94a) and (94b) but not by (94c), but the latter corresponds to the attested word.

(94)  
a. [1P-PAST[[AWAY-FIN<sub>ap</sub>][SNOWSHOE-WALK-FIN<sub>v</sub>]<sub>2</sub>,<sub>p1</sub>]<sub>1</sub>CP][ni-gi:[Cini-Ø<sub>ap</sub>][Ca:gam-ose:-Ø<sub>v</sub>]<sub>p2</sub>,<sub>p1</sub>]<sub>1</sub>CP]  
Output: *[nigi:CiniCa:gamose:]  

b. [1P-PAST[[AWAY-FIN<sub>ap</sub>][SNOWSHOE-WALK-FIN<sub>v</sub>]<sub>2</sub>,<sub>p1</sub>]<sub>1</sub>CP][ni-gi:[ni-Ø<sub>ap</sub>][gam-ose:-Ø<sub>v</sub>]<sub>p2</sub>,<sub>p1</sub>]<sub>1</sub>CP]  
Output: *[nigi:nigamose:]  

c. [1P-PAST[[AWAY-FIN<sub>ap</sub>][SNOWSHOE-WALK-FIN<sub>v</sub>]<sub>2</sub>,<sub>p1</sub>]<sub>1</sub>CP][ni-gi:[ini-Ø<sub>ap</sub>][a:gam-ose:-Ø<sub>v</sub>]<sub>p2</sub>,<sub>p1</sub>]<sub>1</sub>CP]  
Output: *[nigi:inia:gamose:]  

In (94a), **Onset** violations are circumvented by inserting a consonant (represented by C). Vowel loss serves an equivalent function in (94b). In each illustration, **Phase Integrity** is respected.

The completion of our analysis requires one of two things. We must either invoke some well-formedness condition that prohibits both consonant-epenthesis and vowel loss at the left edge of a phase or argue that there is no **Onset** constraint. The latter turns out to be surprisingly easy. In spite of the conventional wisdom, the evidence that appears to support (93) is quite thin. The strongest source of support comes from languages like Tubatulabal that appear to avoid word-internal V-V sequences by epenthesizing a glottal stop and also use a similar strategy to avoid V-initial words (cf. Lombardi 2002. However, the support is undermined by the pattern of glottal stop epenthesis in Selayarese (Mithun & Basri 1986). The latter displays considerable tolerance for word-internal V-V sequences. For example, the stress shift that is attested in the pair of words in (95a) confirms the occurrence of morpheme-internal V-V sequences where each vowel is a potential bearer of stress, and such sequences may also be hetero-morphemic (95b).
Nevertheless, glottal epenthesis occurs at the beginning of words, notably when these are at the beginning of what Mithun & Basri (1986: 241 refer to as intonation units; we refer to this as initial epenthesis.

There is also a process of medial epenthesis that inserts a glottal stop between identical vowels. Comparison of the following pairs confirms this observation.

We observe in the contrast between the pairs in (97a, b) that, when the final vowel of a prefix is identical to the initial vowel of a verb root, the two vowels are separated by a glottal stop, but there is no epenthesis between non-identical vowels. The examples in (97c) confirm the systematic absence of epenthesis between non-identical vowels.

The appropriate analysis of Selayarese requires us to distinguish between the triggers for medial and initial epenthesis. The former is obviously induced to satisfy an OCP constraint, a ban on adjacent identical vowels. In contrast, the clue to the identity of the constraint that triggers initial epenthesis may be found in the behaviour of V-initial syllables at the beginning of words in a number of languages. Downing (1998) surveys a number of cases where onsetless (i.e. sub-optimal) syllables at the beginning of words are excluded from the domains relevant to prosodic phenomena such as stress assignment, tone assignment and reduplication. The generalization that emerges from the survey is that the organization of initial sub-optimal syllables into a higher prosodic structure is sometimes blocked. In other words, the prosodic licensing of such syllables is often restricted. For example, in the Australian language, Aranda, such a syllable cannot be incorporated into (i.e. licensed by) a foot. If the equivalent restriction in Selayarese holds at the level of the intonational phrase, onsetless syllables would be prohibited at the beginning of this prosodic unit. Initial glottal epenthesis could then be viewed as a repair strategy that avoids the emergence of an illicit representation. A Tubatulabal ban on the

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21 The last vowel in this word is an epenthetic copy of the preceding vowel.
prosodic licensing of sub-optimal syllables anywhere would trigger epenthesis medially and word-internally. Since the licenser of a syllable is a superordinate prosodic category such as a foot, a prosodic word or a prosodic phrase, a restriction on the licensing of a sub-optimal syllable can only be evaluated after foot structure or P-word structure has been projected. In other words, the restriction would not affect the insertion of vocabulary items. Coming into effect only after a V-initial item has been inserted at the beginning of a word, the licensing restriction could only trigger a post-insertion repair strategy (e.g. consonant epenthesis). The steps in (98) illustrate how a derivation would proceed in Selayarese.

\[(98)\] a. \[\text{DOG-n}\text{nP}…\text{DP}\] [ásu-Ø\text{nP}] (after spell-out at nP phase)

\[\text{b. } [\text{DOG-n}\text{nP}…\text{DP}]\]
\[\text{[([?ā:su-Ø]\text{nP})…\text{DP}] (after glottal insertion at word level (i.e, DP phase)}\]

The conditions for glottal epenthesis arise only after the spell-out of the DP phase. Neither of the outputs in (99) could be an alternative to (98b) in Selayarese.

\[(99)\] a. \[\text{DOG-n}\text{nP}…\text{DP}\] *
\[\text{([sū-Ø]\text{nP})…\text{DP}] (no match for vocabulary item)

\[\text{b. } [\text{DOG-n}\text{nP}…\text{DP}]\]
\[\text{*[([ā:su-Ø]\text{nP})…\text{DP}] (violates licensing restriction)\]

(99a) is impossible, because the reduction of the vocabulary item /asu/ 'dog' to the form [su] would have to be determined at the point of lexical insertion and there is no constraint that forces such a choice. The relevant constraint bans (99b) where the degenerate syllable is licensed at the beginning of the word, when this is equivalent to the beginning of the intonational phrase.

We have shown that initial epenthesis cannot be accepted as unambiguous support for an ONSET constraint. Furthermore, the appropriateness of such constraint is undermined by empirical evidence; it generates a prediction that turns out to be false. The postulation of ONSET predicts that the range of strategies for enforcing the constraint word-internally would apply as well in the word-initial context. Since we know that vowel loss often eliminates word internal V-V sequences, we would therefore expect to find cases where the loss of an underlying initial vowel would be the favoured way of insuring that the ONSET constraint is satisfied. In other words, just as there are languages like Tubatulabal that uses glottal insertion in all contexts to avoid onsetless syllables, there should be some language that uses vowel loss as the preferred strategy. No such case has been attested. This problem disappears with the elimination of the ONSET constraint.

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22 We adopt the conception of prosodic licensing as proposed by Itô (1986) and further elaborated by Piggott (1999).
The elimination of the standard Onset constraint leaves the enforcement of No-hiatus (92) or its equivalent as the unchallenged reason why phase-internal V-V sequences are avoided in Ojibwa. We can even provide No-hiatus with a stronger theoretical underpinning. In the theory of Government Phonology (GP) (Kaye, Lowenstamm and Vergnaud 1990; Harris 1994), the requirement that an onset must always be followed by nucleus is a reflection of an asymmetric licensing relation; the nuclear element is the licenser of the onset. Because nuclear elements are inherent licensers and are not themselves licensed, there cannot be a licensing relation between heterosyllabic V-V segments. Adapting the tenets of GP-theory, the No-hiatus constraint can therefore be restated as follows.

(100) **No-hiatus (revised)**
A segment to the left of a nuclear element (i.e. a vowel) is licensed by the nuclear element.

This constraint evaluates pairs of segments one of which is a vowel. To conform to this requirement, the segment that precedes a vowel within a phase cannot be a vowel.

One of the consequences of eliminating the Onset constraint is to undermine the need for a constraint like (101), as adopted by Kager (1999:111) and others.

(101) **Align-L**
The left edge of the Grammatical Word coincides with the left edge of the PrWd.

In optimality-theoretic thinking, the enforcement of this constraint is supposed to sanction the emergence of onsetless syllables at the beginning of words. However, we already know that the context in which onsetless syllables occur in Ojibwa cannot be attributed to the convergence of the left edges of the categories identified in (101). Even if the term 'grammatical word' could be extended to the lexical categories aP, nP and vP, the latter do not constitute prosodic words. Support for the latter claim comes from the location of the main stressed syllable. It may appear within any of categories that make up a word, as confirmed by examples like those in (102).

(102) a. ǧi:išiːjáː;  'he was in a certain state' 
   'Past-in a certain state-be'
   b. ǧiːbimáːɡiːwèː;  'he was on his way home' 
   'Along-go home'
   c. ǧiːiŋáː:gamósèː;  'he walked there in snowshoes' 
   'Past-away-walk in snowshoes'

Main stress appears on the tense marker in (102a), the preverbal modifier in (102b) and the verb stem in (102c). Since main stress marks the location of the head of a prosodic word (Selkirk 1995), we must conclude that the array of elements that make up the full verb complex constitutes a single prosodic word. In other words, each of the words in (102) is a single prosodic word. The latter conclusion entails that the onsetless syllables appearing in (102a) and (102c) are not at the left edge of a prosodic word. Hence,
enforcement of a constraint like ALIGN-L (101) would be insufficient to capture the contexts in which Ojibwa tolerates V-initial syllables.

If the only function of (101) or its equivalent is to account for the fact that words may begin with vowels in some languages, we have rendered it superfluous by eliminating the ONSET constraint. As a result, there is no need to recognize a constraint that commands occurrences of onsetless syllables in any position. These entities would emerge word-internally, unless banned by NO-HIATUS (or the OCP) or word-initially, unless prohibited by a restriction on the licensing of a sub-optimal syllable.

4.2. A non-derivational approach to Ojibwa syllabification. Returning to the main issues addressed in this paper, it is appropriate to give some consideration to a possible non-derivational (e.g. OT) account. It would have to explain (a) why Ojibwa both avoids and tolerates vowels in hiatus and (b) why there are two hiatus-avoiding strategies. The OT answer to the first question would probably postulate a constraint like (103), the alternative to Align-L (101), which specifically exempts phase-initial syllables from having to satisfy the ONSET requirement.

(103) ANCHORPHASE-L
A segment lexically inserted at the left edge of a phase has a correspondent at the left edge of a syllable.

By stipulating that ANCHORPHASE outranks ONSET in Ojibwa, neither consonant epenthesis nor vowel deletion at the left edge of a phase would be sanctioned. For example, given the input in (104a), the grammar must converge on (104b) over its competitors (104c, d).

(104) a. Input: […][ini_aP][a:gamose;_vP]…CP] 'he walks there in snowshoes'
b. […][ini_aP][a:gamose;_vP]…CP] satisfies ANCHORPHASE
c. […][Cini_aP][C_a:gamose;_vP]…CP] violates ANCHORPHASE
d. […][ni_aP][gamose;_vP]…CP] violates ANCHORPHASE

Phase-initial consonants as in (104c) incur violations of ANCHORPHASE, because the allomorph at the beginning of each phase is vowel-initial at the point of lexical insertion. The misalignment in (104d) is induced by the loss of vowels from lexical forms of the phase-initial morphemes. Phase-internally, NO-HIATUS (or its equivalent) would be in play and would disallow V-initial syllables.

Consider next the analysis of vowel loss and consonant epenthesis in a non-derivational framework. In an OT analysis, undominated NO-HIATUS would trigger vowel loss, if the injunction against epenthesis (DEP) outranks the requirement that segments must be realized (MAX). Consonant epenthesis, on the other hand, would emerge form the opposite ranking (i.e. MAX » DEP). Since the required rankings of the same constraints are contradictory, they cannot be part of the same grammar. However, the two hiatus-avoiding strategies could be manifested in a language regulated by the ranking DEP » MAX, if some constraint Q prohibits vowel loss in certain contexts. The ranking Q » DEP » MAX would generate such an outcome, allowing consonant epenthesis to emerge where vowel loss is prohibited in order to satisfy undominated NO-HIATUS. Any
enthusiasm for this option is tempered by the difficulty in formulating the constraint \( Q \) that would limit epenthesis to prefixes that happen to be monomoraic. But the most telling argument against this type of analysis is that it would simply be wrong. Consonant epenthesis in Ojibwa is not triggered by pronominal affixes but by the type of construction in which such affixes appear. The proof of this is that an affix in constructions marking inalienable possession does not trigger epenthesis, while the same affix in an alienable possession construction does. The difficulty of a non-derivational analysis to explain why both vowel loss and consonant epenthesis occur in Ojibwa stands in sharp contrast with the success of the derivational approach adopted in this paper.

We do not wish to claim that an OT description of Ojibwa syllabification is impossible. The challenge for such an analysis is to explain why the Ojibwa patterns are the way they are and not otherwise. We do not see how this test of adequacy can be attained in the standard OT framework.

5. **Summary and conclusions.** This paper adds to the small but significant body of literature that demonstrates the link between word structure and the explanation of certain aspects of phonological well-formedness. We set out to explain two properties of Ojibwa phonology that appear to be contradictory; the language both avoids and tolerates vowels in hiatus. We argue that the hiatus is avoided phase-internally but tolerated at the juncture between phases. The contexts are independently motivated, because phases emerge from the internal syntax of Ojibwa words. Given the way morphological elements are put together by the syntax and interpreted by the phonology, the conditions under which hiatus is avoided and tolerated in Ojibwa could not be otherwise. In other words, there cannot be an Ojibwa-type language that tolerates V-V sequences phase-internally but bans them between phases. The impossibility of such a language follows from the fact that no phonological constraint can be formulated so that it crucially depends on the accessibility of elements introduced in different phases.

The second aspect of Ojibwa phonology for which a genuine explanation is provided is the use of two strategies for avoiding V-V sequences. Of necessity, both strategies apply phase-internally. However, our analysis requires that vowel loss apply at the point where vocabulary items are inserted into a phase and consonant epenthesis apply after insertion. The difference is crucial to explaining why the items that trigger epenthesis are the exponents of tense morphemes or subject agreement affixes. The structural dependency of vowel loss and consonant epenthesis is spectacularly revealed in the difference between the two types of possessive constructions. The semantic difference between alienable and inalienable possessive constructions is indicative of a syntactic difference, and this syntactic difference is exactly what is required to account for the fact that vowel loss applies in one type and consonant epenthesis in the other. Here, again, the theory and analysis developed in this paper predicts that there could not be an Ojibwa-type language in which consonant epenthesis applies in the inalienably possessive construction and vowel loss affects the alienable counterpart.

This paper contains some important messages for phonology and phonologists. First, we have demonstrated that the internal syntax of words may control phonological output. Since phonology spells out properties of words, phonological analysis should always explicitly acknowledge the hierarchical array of elements that constitute a word. The second message is that phonotactic restrictions are not always dictated by phonetic
constraints. The NO-HIATUS condition that plays a crucial role in Ojibwa syllabification is not a phonetic requirement; it cannot be imposed by either the speech perception or speech production system. The explanations for phenomena discussed in this paper are firmly grounded in the abstract grammatical system.

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