§1 Introduction

Prefix-stem phonological domain boundaries are found in many languages, including: Polish (Booij & Rubach 1984), Hungarian (Nespor & Vogel 1986), Indonesian (Cohn 1989), Itelmen (Bobaljik & Wurmbrand 2001), Bantu languages (Hyman 2008).

(1) Prefix [Stem Suffixes]

In some cases the stem+suffixes do not form a morphosyntactic constituent, giving rise to a bracketing paradox.

(2) a. Morphological structure [[un[happy]]er]
    b. Phonological structure [un][happy-er]

The paradox can often be resolved through a representational analysis in terms of the Prosodic Hierarchy, e.g. stipulating that prefixes are independent PrWords (Booij & Rubach 1984), or deriving their “non-cohering” status from Late Adjunction (Newell 2008).

- On most analyses, prefix invisibility follows from the lexical properties or hierarchical position of a morpheme, rather than directly from its prefixal status.

Claim of this paper: in San Francisco del Mar Huave (isolate; Oaxaca State, Mexico), prefix invisibility is tied to linear position. “Mobile affixes”, which surface in some contexts as prefixes and in others as suffixes (Noyer 1994, Kim 2010), provide evidence against the viability of either a cyclic or affix-specific prosodic analysis.

In this variety of Huave (henceforth “Huave”; all data from fieldwork in S.F. del Mar between 2004 and 2013), prefixes are invisible to a vowel copy process determining epenthetic vowel quality.

(3) a. ʎehk-j-et ‘it opened’  
    open-cpl
    but b.  t-e-htʃ-in ‘you (pl.) gave it’
    cpl-2-give-1/2pl

Q: What kind of morphosyntax-phonology mapping mechanism is needed to derive...

(4) a. [u.ʎehk]-et ‘it opened’  
    open-cpl
    but b. t-e-[u. htʃ-]in ‘you (pl.) gave it’
    cpl-2-give-1/2pl

… that can also account for phonological well-formedness influences on prosodification? I will provide evidence that Minimality considerations affect the formation of prosodic constituents.

(5) a. [u. t-e-htʃ]  
    cpl-2-give
    not b. *t-e-[u. htʃ]  
    cpl-2-give

Relevant technology exists in the syntax-phonology interface literature:

Match Theory (Selkirk 2011) – Violable constraints demand syntax-phonology isomorphism...
(6) a. Syntactic clause ↔ Intonational phrase (ι)
b. Syntactic phrase ↔ Phonological phrase (φ)
c. Syntactic word ↔ Phonological word (ω)
   … but can be outranked by phonological well-formedness constraints.
   • Prediction: non-isomorphism arises only where syntactic constituents are ill-formed phonological ones (see also Nespor & Vogel 1986:135).

Edge-based Alignment (Selkirk 1986, Downing 2010, Cheng & Downing 2012) – mapping is asymmetrical; only one edge (left or right) of a syntactic constituent needs to map to the edge of a phonological domain.

(7) ALIGNR[PHASE, IntPh]: “Align the right edge of every CP with the right edge of an Intonation Phrase” (Downing 2010:363)
   • Prediction: non-isomorphism is possible since no phonological boundary is required on one of the edges
   • Huave shows this kind of fundamental non-isomorphism, supporting an edge-based theory along the lines of Cohn’s (1989) analysis of Indonesian.

§2 A Huave bracketing paradox

Huave has the typologically unusual phenomenon of “mobile affixes” (Noyer 1994), which are prefixes in some contexts, and suffixes in others.
   • Roots (usually CVC) are bound. Transitives and some intransitives take a prefixal “theme vowel” a-.
   • SUB = “subordinate” (nonfinite/irrealis), TV = theme vowel

(8)
<table>
<thead>
<tr>
<th>Prefixal realization</th>
<th>Suffixal realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subordinate (SUB) -m-</td>
<td>m-a-ɾ帐号</td>
</tr>
<tr>
<td></td>
<td>sub-tv-do</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>First person (1) -s-</td>
<td>s-a-ɾ帐号</td>
</tr>
<tr>
<td></td>
<td>1-tv-do</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Morphological principles: affixes have a fixed hierarchical order of attachment and occur at a fixed distance from the root relative to other affixes (Kim 2010).

(9) “Layer model” with flexible direction of branching:

```
[Stem] L1  [L2] L3  [L4]
```

a. a-ɾ帐号 (g) | ‘s/he does (it)’
   tv-do
b. t a-ɾ帐号 as | ‘I did (it)’
cpl tv-do
   1

c. tʃut ut us | ‘I sat’
sit cpl
   1
d. s i n a-ɾ帐号 (g) | ‘I will do (it)’
   1 fut lᵯᵯᵯ tv-do
e. s i tʃut un | ‘I will sit’
   1 fut sit lᵯᵯᵯ

CPL = completive, FUT = future
Phonological principles of linear order: Within this morphological order of attachment, prefixal vs. suffixal realization of mobile affixes (L1, L3 only) is conditioned mainly by phonological properties of the base.

(10) Mobile affix generalizations, with mysterious [-root] condition (Kim, in press):

a. Completive allomorphs:  
   t- t
   Context [V_{[root]} ] (elsewhere)

b. 1st person allomorphs:  
   s- s
   Context [V_{[root]} ] (elsewhere)

In vowel-copy epenthesis (Kim 2008: ch. 4), epenthetic vowels are a copy of the previous vowel.

- San Francisco del Mar Huave has the 5-vowel system /i e a o u/. I abstract away from diphthongization.
- The contrast between C (non-palatalized “back” consonants) vs. Cj (palatalized “front” consonants) interferes with this process. Vowel copy is only successful if the intervening consonant matches the original vowel for frontness or backness.

(11) Front vowels
   Back vowels
   a. t-a-j’hp ‘I bathed’ c. t-a-pal-as ‘I closed (it)’
      CPL-TV-bathe-1      CPL-TV-close-1
   b. t-a-reh ‘I touched (it)’ d. t-a-n’dok-os ‘I fished (it)’
      CPL-TV-touch-1      CPL-TV-fish-1
   e. t-a-mut-us ‘I wrote (it)’
      CPL-TV-write-1

In cases of front-back VC mismatch, a default vowel is inserted according to whether the C is palatalized/front (→ default [i]) or non-palatalized/back (→ default [a]).

(12) Front vowels with plain C
   Back vowels with palatalized C^ or inherent palatal
   a. t-a-mit-as ‘I buried (it)’ c. t-a-k’a-is ‘I waited, stayed’
      CPL-TV-bury-1      CPL-TV-enter-1
   b. t-a-n’dek-as ‘I spoke (it)’ d. t-a-kotʧ ‘I fished (it)’
      CPL-TV-speak-1      CPL-TV-fish-1
   e. t-a-un ‘I bought (it)’
      CPL-TV-buy-1

We can now look at the relevance of the prefix-stem boundary for vowel-copy epenthesis. Huave has a handful of very short roots such as h’tʧ ‘give’ or w’ ‘borrow’.

- The theme vowel a- does not surface with 2nd person prefix e- (even though hiatus is otherwise tolerated).

(13) a. m-e-h’tʧ ‘that you (sg.) give’ b. t-e-w’ ‘you borrowed (it)’
    sub-2-give      CPL-2-borrow

When suffixes are added, an epenthetic vowel is needed. Because the preceding VC sequence spans a prefix-stem boundary, it is possible to test whether the prefix vowel is within the domain of the process.

(14) a. /m-e-h’tʧ-n/ → m-e-h’tʧ __ n  b. /t-e-w’-n/ → t-e-w’ __ n
    sub-2-give-1/2pl. CPL-2-borrow-1/2pl.

Default [i] is epenthesized, instead of expected [e]. The prefix vowel is invisible.

- NB metrically identical environment to (11): stress in Huave is always on the final syllable.

(15) a. m-e-h’tʧ ‘m-e-h’tʧ-en  b. t-e-w’ ‘t-e-w’-en
    sub-2-give-1/2pl. CPL-2-borrow-1/2pl.
An analysis based on cyclicity/morphological constituency is not possible. The invisible prefix vowel is in Layer 1, but vowel epenthesis takes place late, upon Layer 4 suffixation.

(16) a. \[\text{[[[L1-]Stem]-L4]} \quad \text{b. \quad [[[L1-]Stem]-L4]} \]
\[\text{[[m-e]-ht]-in]} \quad \text{[[t-e]-w]-in]} \]
\[\text{sub-2-give-1/2pl.} \quad \text{cpl-2-borrow-1/2pl.} \]

Suffix vowels trigger vowel copy epenthesis on following suffixes, so we cannot appeal to root-control mechanisms. Example (17b) shows that only the immediately preceding VC sequence matters.

(17) a. t-a-ndok-\textit{os}-on
\textit{cpl-tv-fish-1-1/2pl.}
‘we (excl.) fished (it)’

b. t-a-\textit{up}-\textit{is-an}
\textit{cpl-tv-buy-1-1/2pl.}
‘we (excl.) bought (it)’

Huave morphology conspires to prevent us from demonstrating perfect asymmetry, i.e. the scenario where the exact same 2nd person affix \(e\) participates in the vowel-copy process when it is suffixal. In suffixal position, it is obligatorily followed in by the intransitive affix \(-u\), so there is no context for epenthesis.

(18) tʃut-\textit{um-\textit{e-r-u}-n}
\textit{sit-sub-2-itr-tr-itr-1/2pl.}
‘that you (pl.) sit’

But the two affixes are analyzable as both occupying Layer 1 (i.e. are attached at the same time, are in a sisterhood relation; Kim 2010), as they appear in the same linear order on both sides of the verb:

(19) \textit{m-e-r-u-tl}
\textit{sub-2-itr-tr-itr-eat}
‘that you eat (intransitive)’

The intransitive \(u\) is active in vowel-copy epenthesis when suffixal, so we infer that the invisibility of prefixal \(e\) to vowel-copy epenthesis cannot be due to its position in morphological structure.

(20) pahk-a\textit{u}-s\textit{un}
\textit{face.up-itr-tr-1-1/2pl.}
‘we (excl.) lie face up’

Instead, due to the bracketing paradox, only a representational analysis is feasible. Desired mapping: P-Word boundary at the left edge of the root.

(21) L1 \quad \text{Root} \quad L4
\[\text{t-e \quad [w]-in} \]

§3 Analysis

In Match Theory, unexpected phonological mappings are the result of high-ranked phonological well-formedness constraints such as BinMin (constituent must be minimally binary).

(22) From Selkirk (2011)

\[
\begin{array}{ccc}
\text{clause} & \text{[verb [noun ]VP]} & \text{BinMin}(\varphi, \omega) & \text{Match (Phrase, } \varphi) \\
\text{a.} & (\varphi(\text{verb (noun)})) & * & \\
\text{b.} & (\varphi(\text{verb noun})) & * & \\
\end{array}
\]

However, there is nothing phonologically wrong with CVCCVC domains in Huave, as shown by phonotactically similar words (with different morphological structure), where vowel copy epenthesis applies as expected.
(23) a. mohk-ot ‘s/he lay face down’  
     face-down-cpl  
   b. ñehk-ët ‘it opened’  
     open-cpl  
   c. t-e-hfj-in ‘you (pl.) gave it’  
     cpl-2-give-1/2pl

An asymmetrical Alignment analysis, fixing one edge only, allows “outer” material to be included in the PrWd.

(24) OT constraints

\texttt{ALIGN (Root, L; } \omega, \texttt{L): Align the left edge of the root with the left edge of the PrWd.}

\texttt{ALIGN (}\omega, \texttt{L; Root, L): Align the left edge of a PrWd with the left edge of the root.}

(25)

<table>
<thead>
<tr>
<th>t-e-w^i-in</th>
<th>ALIGN (Root, L; } \omega, \texttt{L)</th>
<th>ALIGN (}\omega, \texttt{L; Root, L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [a t-e-w^i-in]</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>\cell[-1] b. t-e-[a w^i-in]</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>c. t-[a e-w^i-in]</td>
<td>*!</td>
<td>*</td>
</tr>
</tbody>
</table>

An intuitively similar analysis, in a phase-based derivational framework, is offered by D’Alessandro & Scheer (2013). They propose that phonological boundaries can be inserted at Spellout, as marks on phase heads or their complements. These marks are inserted at one edge only. Under this type of approach, spellout of the root could insert a phonological boundary at the root’s left edge.

(26) Root  

<table>
<thead>
<tr>
<th>L1+Root</th>
<th>L1+Root+L4</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. #htʃ→ t-e-#htʃ→ t-e-htʃ-in</td>
<td></td>
</tr>
<tr>
<td>b. [a htʃ→ t-e-[a htʃ→ t-e-[a htʃ-in</td>
<td></td>
</tr>
</tbody>
</table>

One issue is that we actually do see prefix-stem phonological interactions in heterosyllabic monosyllables. Front vowels undergo fission before non-palatalized coda consonants.

(27) /t-e-mb/ → tjam(b) ‘you (sg.) go’

This phonological unity, combined with the subminimality of (29ac), motivates the prosodifications in (29bd).

(28) a. *? t-ja-[a m(b)]  
     b. [a t-ja-m(b)]  
     c. *? t-e-[a w^i]  
     d. [a t-e-w^i]

While I am not aware of language-specific evidence for the subminimality of [a m] other than general markedness considerations, Huave does have strategies for dealing with other minimality-type violations, and those are conspicuously not implemented in forms like (29bd). My interpretation of this is that Huave prefers to adjust PrWd boundaries rather than repair the existing monosegmental constituent.

- The Root must not be tautosyllabic with outer (L3/L4) affixes.
- Repair: vowel epenthesis.

(29) a. d-a-h ints  
     \texttt{PROG-TV-cry}  
     ‘s/he is crying’  
   b. d'a-a-w  
     \texttt{PROG-TV-exit}  
     ‘it is exiting’
D’Alessandro & Scheer (2013) argue against diacritic boundary symbols (including # and \[\omega\]), which are not independently motivated phonological objects, and which overgenerate because there are no constraints on what kinds of effects they are able to trigger. Instead they propose that empty skeletal slots are the carriers of boundary information.

(30) \[\text{CV-ht} \rightarrow \text{t-e-CVht} \rightarrow \text{t-e-CVht}-\text{in}\]

If extra X-slots are spelled out at the left edge of the stem, we cannot get the desired prosodification, since the stem constituent is not subminimal (CVC words being allowed in Huave); and cannot account for the diphthongization in (27), caused by a non-local consonant.

(31) \[\text{CV-mb} \rightarrow \text{t-e-CVmb} \quad \text{‘you went’}\]

Back to the diacritic-boundary approach in (26): a subminimal parse can trigger repairs, following Newell (2008:131) and Newell & Piggott (2014:353), who argue that minimality conditions on Prosodic Words cause post-spellout mergers where additional material is incorporated into a subminimal PrWd.

(32) \[\text{[\_ mb} \rightarrow \text{t-e-[\_ mb]} \quad \text{repair} \rightarrow \text{[\_ t-e-mb]} \quad \text{‘you went’}\]

If boundaries are inserted on each cycle/phase as in (26), we may have an explanation for why mobile affixes attach as prefixes only to non-root base-initial vowels (see (10)): mobile affixes need to cohere prosodically.

- No (other) phonological difference between the bases in (33ab). If no boundary were present, mobile affix placement would have to see morphological and phonological information simultaneously.

(33) a. \[\text{[\_ uj + m} \rightarrow \text{[\_ uj-um] \quad \#m-[\_ uj}\]
\[\text{spin + SUB} \quad \text{spin-SUB} \quad \text{sub-spin}\]

b. a \[\text{[\_ mb + m} \rightarrow \text{m-a-[\_ mb]} \quad \#a-[\_ mb-am}\]
\[\text{TV-go + SUB} \quad \text{SUB-TV-go} \quad \text{TV-go-SUB}\]

Circumstantial observation in support of the separate prosodification of prefixes: community members tend to write prefixes separated by a space from the stem+suffixes. In a 2010 story pamphlet Verdades de Ta Luis Vargas produced by the Centro Comunitario de Alfabetización en Lengua Originaria Umbeyats of San Francisco del Mar,

- 28 of 32 Layer 1-prefixed forms are written with separated prefixes, as in (34a)
- The sole monosyllabic Layer 1-prefixed form is written as a single word (34b)

(34) a. ta mulyich wix tiol umbe ta tach ma sap, ubiol ta yak wax mi uj
\[\text{enter,CAUS} \quad \text{hand} \quad \text{in} \quad \text{its.mouth reached} \quad \text{grab} \quad \text{its.tail put on} \quad \text{reverse}\]

b. \[\text{max} \quad (< \text{m-a-hjt}) \quad \text{yow mi wakax}\]
\[\text{gave} \quad \text{(} \quad \text{SUB-TV-give} \quad \text{water} \quad \text{his} \quad \text{cow}\]

§4 Conclusion

Summary of analysis
- Left-edge PrWd boundaries are inserted at the left edge of roots
This asymmetric edge-based mechanism allows GrWd – PrWd non-isomorphism to arise in the course of the derivation, as suffixes are freely incorporated on the right edge.

Subsequent re-prosodification repairs subminimal structures.

Prefixes are different not because the lexicon says so, but because they’re before the root.

Related phenomena

- Can other cases of prefix-suffix asymmetry be attributed to linear structure? (And can the prevalence of left-edge marking be derived rather than stipulated?)
- Edge-based prosodification in higher phonological domains – Phonological Phrases, Intonational Phrases (Cheng & Downing, to appear)
- Asymmetrical edge-based bracketing in the building of metrical structure (Halle & Idsardi 1995)
- Edge Features in syntax (e.g. Kandybowicz 2009)
- Linearity effects on mapping from syntactic to phonological phrases (Wagner 2005: 339)

(35) weil er ihr versprách,
    [zu versúchen] [zu schwéigen]
    [zu schwéigen zu versuchen]
    to try to be.silent to be.silent to try

A prediction

- Prosodic boundaries should be phonetically observable (Turk & Shattuck-Hufnagel 2000).

Acknowledgments

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References


