Role of the Root in the Representation of Segments: Yawelmami *

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0. Introduction

Floating features and latent segments (“ghosts”) are traditionally considered to be distinct entities whose differences correlate with the presence or absence of an underlying root node. The floating feature’s lack of a root node (1) allows it to escape being parsed in contexts where full segments must surface (following Leben (1973), Goldsmith (1979)). Latent segments, such as the Slavic yers or final consonants in French, likewise have a special immunity from regular parsing constraints. However they are thought to require root nodes primarily because of two other traits which distinguish them from floating features: (a) Floating features can move around to find a place to dock while latent segments are restricted to a single position (MOBILITY) and (b) Floating features attach to existing segments while latent segments surface independently (AUTARCHY). This distinction has necessitated the use of diacritics or the largely redundant X-tier1 to capture the defective parsing properties of the latent segments (Hyman (1985), Kenstowicz & Rubach (1987), Rubach (1993), Archangeli (1991), Clements & Keyser (1983), Szpyra (1992), Bethin (1989)).

(1) SEGMENT
    Root
    features

FLOATING FEATURES
    features

In this paper I present one of the central cases which demonstrates that the potential mobility and independence of a phonological entity do not correlate either with each other or with the presence or absence of a root node. I propose instead a unified underlying representation for both latent segments and floating features (2), thus allowing a unique characterization of their immunity from the demands of regular parsing, and show that their surface differences follow straightforwardly from a grammar utilizing constraints which are necessary independently of the subsegmental phenomena.

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*I am grateful to Larry Hyman, Sharon Inkelas, Armin Mester and Alan Prince and the workshop participants for their comments.

2. The Problem

Two of the major reasons why latent segments have been considered to need a root node to distinguish them from floating features are repeated here in (3).

(3) \begin{tabular}{ll}
\textbf{Floating features} & \textbf{Latent Segments} \\
\textbf{MOBILITY} & \\
Floating features can move around to find a place to dock & Latent segments are restricted to a single position \\
\textbf{AUTARCHY} & \\
Floating features attach to existing segments & Latent segments always surface as their own segment
\end{tabular}

These differences are illustrated by the prototypical cases of latent segments and floating features in (4-5). In Chaha (4), for example, the third-person singular object is indicated by labialization on the verb (McCarthy (1983), Rose (1994), Archangeli and Pulleyblank (1994)). It associates to the rightmost labializable segment, either a labial or a dorsal consonant. If there is no such consonant the labialization fails to show up, and crucially it never heads a segment on its own.

(4) \begin{tabular}{llll}
Chaha object labialization & (McCarthy (1983: 179)) \\
\textit{no object} & \textit{with object} \\
a. final & dænæg & dænægw & hit \\
nækæb & nækæbw & find \\
b. medial & mækær & mækærw & burn \\
syæfær & syæfærw & cover \\
c. initial & qætær & qwætær & kill \\
mæsær & mwsæsr & seem \\
d. none & sædæd & sædæd & chase
\end{tabular}

This contrasts with cases such as the Yawelmani latent vowel in (5) (Noske (1984), Zoll (1993b)). This vowel surfaces only as a full segment and only in one position. It is parsed just when it becomes necessary to rescue an otherwise unsyllabifiable consonant (Kisseberth (1970)).
(5)  -m(I)  precative  (Data from Newman (1944: 135))

a.  /amic-mI/  amic-mI  *amic-m*  having approached
b.  /panaa-mI/  panam*  *panaa-mI  having arrived

The problem with accounting for the differences between these two types of cases with
the representations in (1-2) is that the dividing line between the two classes of phenomena is not
clear cut, and the properties listed in (3) do not always correlate with each other. For example,
some mobile floating features will under certain circumstances appear as independent segments.
We find one example of this in Yawelmani, where suffix-induced glottalization floats into the
stem and surfaces as the release of a post-vocalic sonorant (6a-b). If there is no such target in a
triconsonantal root, glottalization will fail to surface (6c). Thus far the glottal looks simply like a
well-behaved floating feature. But in a biconsonantal root which contains no glottalizable
sonorants, glottalization will emerge as a suffix-initial glottal stop (6d), with subsequent
shortening of the vowel in the now closed syllable which preceeds it (Archangeli (1983), (1984),
Noske (1984), Newman (1944), Archangeli and Pulleyblank (1994)). A feature's mobility then
does not preclude manifestation as an autarchic segment.

(6)  Glottalization in Yawelmani  (Archangeli and Pulleyblank (1994))

a.  caaw-(ʔ)aa-  caawʔaa-  glottalizes R-most post-vocalic sonorant
b.  ?elk-(ʔ)aa-  ?elʔkaa-  fails to surface

c.  hogn- (ʔ)aa  hognaa-  surfaces in biconsonantal root as stop
d.  max- (ʔ)aa  maxʔaa-  

The dual behavior of the glottal contrasts with that of other latent segments in
Yawelmani. A list of the suffixes containing other latent consonants, shown in parentheses, is
provided in (7).

(7)  Yawelmani suffixes with latent segments  (Archangeli (1984))

(h)nel  passive adjunctive
(m)aam  decedent
(l)saa  causative repetitive
(n)iit  decedent

Like the floating glottal these latent segments are distinguished from regular consonants
in that they delete rather than trigger epenthesis to avoid forming an illicit cluster. The data in (8)
illustrate this constrast. The suffix-initial h in hin is a full segment. In (8a) suffixation results in a
triconsonantal gnh cluster which must be resolved, since the maximal syllable in Yawelmani is
CVX. Because all three are full segments they must all be parsed, and therefore a vowel is
epenthesized.2 In (8b) suffixification of (h)nel likewise has the potential to produce a triconsonantal
cluster, but since here h is a latent segment, like the glottal above, it fails to appear, rather than
force epenthesis. It is the hallmark property of these latent segments as well as the glottal stop

that they never trigger epenthesis of a vowel to save themselves, although as we can see again in (8c) vowel length will be sacrificed to spare a latent segment. What distinguishes these latent consonants from the glottal, however, is that they never manifest themselves as release features on an existing segment.

(8) (Data from Archangeli (1991))

a. -hin /hogn-hin/ ho. gin-hin
b. -(h)nel /hogon-(h)nel/ ho. gon.-nel *ho. ghon. -nel
c. cf /maxaa-(h)nel/ ma. xa-h. nel

Yet a third kind of behavior is exhibited by latent vowels, exemplified in (9). Latent vowels, like the latent consonants, sometimes fail to surface. Unlike the consonants however these vowels are parsed only when necessary. In (9a) the final vowel is required to facilitate syllabification of the suffixal m. In (9b), on the other hand, this m becomes the coda of the preceding open syllable. There is room for the vowel, but as it is not necessary for any other reason it does not materialize.

(9) Vowel/ø alternation: Latent vowels surface only when they are necessary

-m(I) precative (Data from Newman (1944: 135))

a. /amic-mI/ amic-mI *amic-m* having approached
b. /panaa-mI/ panam* *panaa-mI having arrived

This is not simply a vowel deletion rule, since it is not the case that all expendable final vowels are deleted (Noske (1984)). As shown in (10), for example, the indirect object suffix ni holds on to its final vowel even suffixed to a vowel final root.

(10) Not Final Vowel Deletion: (Noske (1984))

Compare ni ‘ indirect object ‘ (Newman, p.201)

a. /talaap-ni/ talapni bow-IO
b. /xataa-ni/ xataani *xatan* food-IO

Superficially it appears then that there are three different kinds of latent segments in Yawelmani: (i) glottals which show up wherever they can either as full segments or secondary features (ii) other latent consonants which only come to light as full segments when there is room for them and (iii) latent vowels which turn up only when they are absolutely necessary, these latter two always as independent segments. All three of these contrast with full segments which are always parsed even if it requires epenthesis. Despite these surface differences I propose that all three be represented as underlyingly rootless bundles of features, as shown in (11).

(11) FULL SEGMENT LATENT GLOTTAL LATENT VOWEL LATENT CONSONANT

| Root features | | features | | features |
The absence of an underlying root node for all three types of irregularly parsed segments in Yawelmani accounts straightforwardly for their immunity from normal parsing. Once we have made this distinction between full segments (which have a root node) and latent features (which lack a root node) the diverse behavior of the different latent features follows from the constraints in (12) ranked as in (12e). I will first motivate the ranking for the glottalization case and then show how the same hierarchy makes the right predictions for the other latent segments in Yawelmani.

(12) Yawelmani constraints and ranking
a. SEGMENT STRUCTURE CONSTRAINTS
b. *STRUC(σ): Avoid [unnecessary] syllables (Zoll (1993b))
c. PARSE-FEATURE: Features should be parsed (Prince and Smolensky (1993))
d. ALIGN: Establishes edge affinity for morphemes (McCarthy and Prince (1993))
e. Ranking:
   SEGMENT STRUCTURE CONSTRAINTS, * STRUC(σ) » PARSE - FEATURE » ALIGN

3. Glottalization

First it is necessary to establish the set of appropriate targets for the floating glottal feature. Although there are many different kinds of glottalized segments, derived glottalization is restricted to a "post-vocalic sonorant", either in the onset or coda (Archangeli and Pulleyblank (1994: 305 on authority of Newman (1944:15)). For now we can lay the burden of this on a rough SEGMENT STRUCTURE CONSTRAINT prohibiting the linking of a free [constricted glottis] feature to any segments but those sonorants in in the appropriate position. Because this is unviolated in suffix-induced glottalization, it must rank at the top of the hierarchy. Thus candidates which would violate the constraint will not be depicted to save space, since violation of this constraint would be immediately fatal here.

Since the glottal feature will move to find an appropriate target within a word, PARSE-FEATURE must outrank ALIGN. In this case the alignment constraint wants to line up the left edge of the suffix with the right edge of the root (13b). Any suffixal material which moves leftward away from the root's edge into the root will constitute a violation.

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3This is a manifestation of the "emergence of the unmarked" in derived environments (McCarthy and Prince (1993/4)). See also Archangeli & Pulleyblank (1994: Chapter 3) for a discussion of this in terms of grounding. While the restriction to sonorants might seem strange, it is not otherwise unkown. In many Salishan languages, for example, only sonorants are targets for diminutive glottalization even though the languages do contain glottal obstruents (Nichols 1971).

4The extension of alignment to features was first implemented by Kirchener 1993. For a broadly similar approach to the one taken here see Akinlabi 1994. See also Pulleyblank 1995 with regard to the alignment of unparsed features.
(13)  
\[ \text{a. PARSE-FEATURE} \quad \text{Features should be parsed} \] 
\[ \text{b. ALIGN-[(?)aa]Aff} \quad \text{ALIGN ([(?)aa]Aff, L, root, R)} \] 
\[ \text{c. Ranking: PARSE-FEATURE } \Rightarrow \text{ALIGN-[(?)aa]Aff} \] 
\[ \text{d. Rationale: [c,g] moves to find well-formed docking site} \]

This is illustrated by the tableau in (14). The number of ALIGN violations in the chart reflects the number of root nodes between the segment to which glottalization attaches and the right edge of the root. Note that here the glottal cannot surface as an onset to the suffix since this would create an ill-formed trisyllabic cluster. Alignment cannot be satisfied in this case by the floating feature because the root final consonant is not a licit docking site (14a). In the optimal candidate (14c) glottalization turns up two root nodes to the left, violating ALIGN twice. This is preferable to simply leaving the feature unparsed (14b) however, since PARSE-FEATURE outranks the alignment constraint.

(14)  \[ \text{PARSE-FEATURE } \Rightarrow \text{ALIGN from \{?elk, ?aa\}} \]

<table>
<thead>
<tr>
<th>Candidates</th>
<th>SSCs</th>
<th>PARSE-F</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ?elk?-aa</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ?elk-&lt;?&gt;aa</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ə? ?el?k-aa</td>
<td>*</td>
<td>** (lk)</td>
<td></td>
</tr>
</tbody>
</table>

The lack of a sanctioned mooring at the edge of the root thus sends a latent feature leftward to look for one, since its need to be parsed exceeds the importance of alignment. But what sets the Yawelmani glottalization apart from prototypical examples of floating features is that under certain circumstances it does show up as an autonomous segment. Where there is no glottalizable sonorant, it will emerge as a full segment if, in the process, it neither displaces a full consonant nor requires vowel epenthesis. Due to the templatic restrictions on the form of Yawelmani words, this boils down to the statement that [constricted glottis] comes out as a full glottal stop in biconsonantal roots which contain no glottalizable sonorant (Archangeli and Pulleyblank (1994) and references therein).

This is illustrated by the tableau in (15). There is no glottalizable (post-vocalic) sonorant in \textit{maax} so secondary glottalization is impossible. The only way PARSE-FEATURE can be satisfied then is by the insertion of a full glottal stop (15b), despite the resulting vowel shortening. The need to parse the feature outweighs any cost incurred by shortening.\footnote{For discussion of the function of template preservation in Yawelmani see Zoll (1993b) and Broselow (1993, 1995).} Note that the ALIGN constraint operates here to make sure that the resulting glottal stop surfaces as the onset to the suffix. Therefore the logically possible candidate in (15c), where metathesis has taken place, will never be optimal in Yawelmani. ALIGN thus subsumes the place-holding role usually attributed to the root node.

\footnote{For discussion of the function of template preservation in Yawelmani see Zoll (1993b) and Broselow (1993, 1995).}
(15)  PARSE-FEATURE » preserve CVV template, ALIGN

<table>
<thead>
<tr>
<th>Candidates</th>
<th>PARSE-F</th>
<th>preserve CVV template</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. maa.x- &lt;[c.g.]&gt; aa</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. max-?aa</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. ma?x- aa</td>
<td></td>
<td>*</td>
<td>*!</td>
</tr>
</tbody>
</table>

Zoll (1993b) proposed that a constraint which functions to minimize the total number of syllables in a word, *STRUC(σ), plays an important role in limiting the ability of floating features to surface independently (16).

(16)  a.  *STRUC(σ):6 Avoid syllables
       i.e., 'Don't add unnecessary syllables'

When [constricted glottis] manifests itself as a full segment in (15) it does so without adding an extra syllable to the output since it functions as the onset to a pre-existing vowel nucleus. Therefore it does not cause a violation of *STRUC(σ). This is not to say that the constraint plays no role in the system, however. *STRUC(σ) does serve an important function in regulating epenthesis, ruling out insertion of the vowel which would be necessary to allow [c.g.] to surface as a full glottal stop in what would otherwise be a triconsonantal cluster (17).

(17)  Ranking:  *STRUC(σ) » PARSE-FEATURE
       Rationale:  No vowel epenthesis to make room for latent feature as segment

For /hogn-aa/, in the tableau in (18), for example, glottalization fails to surface as the release on an existing consonant since there is no post-vocalic sonorant (18a-c). Yet unlike the example in (17), it also fails to materialize as its own segment. This is because the CVX maximal syllable limit keeps [c.g.] from turning up as a full glottal stop without vowel epenthesis, but epenthesis would lead to a fatal violation of *STRUC(σ) (18d). The most harmonic candidate fails to parse [constricted glottis], thereby avoiding the more serious SEGMENT STRUCTURE and *STRUC(σ) violations which would otherwise ensue.

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6This is an OT implementation of Selkirk (1981)'s Syllable Minimization Principle. See also Broselow (to appear, fn 19). Noske (1984) develops a very different implementation of a similar insight. (cf. Ito (1989) on minimality).
Thus the mixed behavior of the Yawelmani glottal follows from the interaction of a hierarchy of general constraints with the latent (rootless) glottal feature. The ranking of the major constraints is given in (19). The domination of ALIGN by PARSE-FEATURE allows mobility of affixal material. High-ranking *STRUc(6) favors deletion over epenthesis as the resolution of potentially triconsonantal clusters. Finally the effect of the low-ranking alignment constraint is to keep the glottalization as far to the right in the word as possible, subsuming what has been considered the place-keeping function of the root node. In the next two sections I will show how this hierarchy also accounts for the diverse behavior of Yawelmani’s other latent consonants and vowels.

(19) Yawelmani Hierarchy:

<table>
<thead>
<tr>
<th>Candidates</th>
<th>SSCs</th>
<th>*STRUc(6)</th>
<th>PARSE-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>hogn-?aa</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hog?n-aa</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h?ogn-aa</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hogin-2aa</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hogn- &lt;-2&gt; aa</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Latent Consonants

We saw in the previous section that this constraint hierarchy interacts with a latent feature such that it will dock on an existing segment where it can, will minimally disrupt the template and emerge as a full segment if it must, but in the face of impending epenthesis it will fail to be parsed. The only thing that sets the behavior of the other latent consonants apart from the glottal is that they never dock secondarily on an existing segment. I have repeated the list of suffixes with proposed underlying representations in (20).7

(20) Yawelmani suffixes with latent C

<table>
<thead>
<tr>
<th></th>
<th>UR of latent segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (h)nelpassive adjunctive</td>
<td>[SPREAD GLOTTIS]</td>
</tr>
<tr>
<td>b. (m)aamdecedent</td>
<td>[LAB]</td>
</tr>
<tr>
<td>c. (l)sacausative repetitive</td>
<td>[LAT]</td>
</tr>
<tr>
<td>d. (n)iitdecedent</td>
<td>[COR]</td>
</tr>
</tbody>
</table>

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7 Extensive justification for these representations is given in Zoll (in preparation).
Under an account where the latent consonants are represented as floating CPlace or laryngeal features, the role of the SEGMENT STRUCTURE CONSTRAINTS is clear, since there is no secondary articulation in Yawelmani which corresponds to these features (Newman (1944)). The SEGMENT STRUCTURE CONSTRAINTS keep the latent features from turning up anywhere except as the primary articulation on an inserted root node. ALIGN insures that when there is room for the epenthetic root node it will be inserted suffix initially, so we need not depend on underlying root nodes to keep latent features in place. The ranking of *STRUC (σ) above PARSE-FEATURE entails that when there is no available spot in an existing syllable, the features will fail to appear. This is illustrated by the tableaux in (21-22). For the tri-consonantal root hogon- in (21), the only way for the suffix’s latent (h) to surface would be through epenthesis of a vocalic nucleus. The consequent addition of an additional syllable produces a fatal violation of *STRUC, so instead the best choice (21b) is to let the feature go.

(21) hogonnel from /hogon, (h)nel/

<table>
<thead>
<tr>
<th>Candidates</th>
<th>*STRUC(σ)</th>
<th>PARSE-F</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ho.gon. hV nel</td>
<td>****!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ho.gon. nel &lt;$asp$&gt;</td>
<td>***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compare that result to the biconsonantal root maxaa. Here with vowel shortening in (22a) the optimal candidate has room for the latent feature to surface as an independent segment. This candidate beats (22b) where the feature is left unparsed. Note again that a candidate like (22c), which differs from the winner only in that the inserted root appears further to the left, loses on the grounds that it violates ALIGN.

(22) maxahnel from /maxaa, (h)nel/

<table>
<thead>
<tr>
<th>Candidates</th>
<th>*STRUC(σ)</th>
<th>PARSE-F</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ma.xa-h_ nel</td>
<td>***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ma.xaa- nel &lt;$asp$&gt;</td>
<td>***</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. mah.xaa- nel</td>
<td>***</td>
<td></td>
<td>***!</td>
</tr>
</tbody>
</table>

What differentiates the so-called floating glottal from the other latent consonants then is that the only secondary release possible in Yawelmani is glottalization. The other potentially mobile consonantal features can only turn up as independent segments. Again ALIGN functions to keep the latent consonant at the beginning of the suffix. Thus the behavior of the latent consonants does not entail that they have an underlying root node, since their form and position are completely predictable from the grammar.
5. Latent Vowels

Finally we return to the latent vowels. The relevant data is repeated in (23). Their behavior differs from that of the latent consonants, including the glottal, in that they do not materialize every time there is room for them. Rather they appear only when called upon to rescue an otherwise unparseable consonant, as in (23a).

(23) Vowel/∅ alternation: Latent vowels surface only when they are necessary
    -m(I)  precative  (Data from Newman (1944: 135))

    a. /amic-ml/  amic-ml  *amic-m*  having approached
    b. /panaa-ml/  panam*  *panaa-ml  having arrived

The behavior of the latent vowels, analyzed as floating V-place features, also follows from the constraint hierarchy already established. It is the *STRUC(σ) constraint, which militates against superfluous syllable building, that distinguishes the behavior of the latent vowels from the latent consonants. This constraint had no impact on the consonants themselves, since they emerge by simply slipping into existing syllable structure. The constraint functioned there only to exclude vowel epenthesis whose only purpose would have been to rescue an otherwise doomed latent feature. *STRUC(σ) will limit the realization of latent vowels themselves, on the other hand, because a vowel always heads its own syllable in this language. Every time a vowel comes on the scene, it triggers a violation of *STRUC(σ), so latent vowels only show up when violation of *STRUC(σ) is forced by some higher constraint, in this case the need to parse a full segment. Since the language has no secondary vocalic articulations, SEGMENT STRUCTURE prevents them from otherwise docking on existing full segments. This state of affairs is illustrated by the tableaux in (24-25). The winner, in (24a), succeeds in parsing all the full segments into only two syllables so violates *STRUC (σ) only twice, while parsing the latent vowel in the non-optimal (24b) requires three syllables.

(24) panam from /panaa-m [hi]l/ 

<table>
<thead>
<tr>
<th>Candidates</th>
<th>PARSE-SEG</th>
<th>*STRUC(σ)</th>
<th>PARSE-F</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. pana-m[hi]&gt;</td>
<td></td>
<td>**</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. panaa-ml</td>
<td></td>
<td>***!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau in (25), on the other hand, the latent vowel is needed to rescue the otherwise unparseable m. This causes an additional *STRUC violation but is necessary in order to avoid deleting a full segment. Therefore (25b) is optimal.8

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8The potential candidate amic-im is ruled out independently by other constraints on word shape. See Zoll (in preparation).
Thus in Yawelmani there is no need to distinguish mobile features from those which must remain at the edge, since both their movement and/or possible segmenthood is predictable from the interaction of SEGMENT STRUCTURE with the three constraints ranked as in (26), embedded in the larger templatic grammar of the language.

(26) \text{SEGMENT STRUCTURE} \gg \text{*STRUC} \gg \text{PARSE-FEATURE} \gg \text{ALIGN}

6. Conclusion

The resulting ranking for Yawelmani is given in (27). This paper has provided one argument against the traditional dichotomy between latent segments and floating features. It was shown that the traditional roles associated with the root node---immobility and autarchy---do not correlate with the presence or absence of a root node underlingly, and a grammar based on a hierarchy of violable constraints was developed to account for the independent manifestations of these two functions.

(27) Yawelmani
\text{SEGMENT STRUCTURE} \gg \text{CCONSTRAINTS} \gg \text{*STRUC(\sigma)} \gg \text{PARSE-F} \gg \text{ALIGN}

References