A reanalysis of velar transparency cases

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1. The coronal versus velar underspecification issue


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Most of these authors view coronal underspecification as the result of coronals (generally, the anterior ones) being the least marked consonants. However, this relative consensus should not lead one to believe that this view is the only possible or existing one. In fact, the literature contains at least three distinct answers to the following question: Is there a universally valid asymmetrical markedness opposition between the three universal consonant articulations, that is, labial, coronal, and velar? The first possible answer is that none of these three articulations is unmarked with respect to the other two. Such a position can be found in, for example, Jakobson (1972: 309), Trubetzkoy (1969: 135), Chomsky and Halle (1968: 413), Anderson and Ewen (1987: 237), Mester and Ito (1989: 265), Mohanan (1991). The second possible answer is that there is such an asymmetrical opposition, but opinions diverge here. Beside those who view coronal as the unmarked articulation, other phonologists view velar as the unmarked or least complex one; examples include Williamson (1977: 698), Paradis (1986: 73, 1987: 333), Trigo (1988: 53), Kaye, Lowenstamm and Vergnaud (1989: 74), Harris (1990: 264), Angoujard and Hassan (1991: 42) and, to some extent, van der Hulst and Smith (1989, 1990: 7). We do not know of a theory considering the labial articulation to be universally unmarked. A third possible answer is that there is an asymmetrical opposition between consonantal articulations but that it is parametrizable, that is, in some languages velar can be the unmarked articulation while in others it can be the coronal one. Such a view is expressed in Yip (1989: 352, 358): it matches the position of Abuglo and Archangeli (1989) on language-specific vowel underspecification.

There are essentially two types of problems for the position that coronals are universally unmarked and unspecified for place features in underlying representation: (i) instances where coronals seem to be specified in underlying representation, which are problematic for what we call the Strong Coronals Hypothesis, in (1a); and (ii) instances where other consonants, for example velars, seem to be underspecified in underlying representation, which are also problematic for what we refer to as the Weak Coronals Hypothesis, in (1b).

(1) a. Strong Coronals Hypothesis:
The coronal articulator is universally absent from underlying representations unless it dominates a marked feature value.

b. Weak Coronals Hypothesis:
There is only one universal default articulator, that is, Coronals.

The Strong Coronals Hypothesis claims that consonants surfacing as anterior (unmarked) coronals are always underspecified in underlying representation (see for example Paradis and Prunet 1989a). Only those coronals that are specified for a marked feature value, such as [-ant] (for example [ʃ], [ʒ]), would have an underlying Coronals articulator. This view is in line with Kiparsky (1982, 1985), Grignon (1984) and Pulleyblank (1986), for whom only marked feature values are present underlyingly, regardless of phonemic inventories. The Weak Coronals Hypothesis, on the other hand, holds that when a consonant receives a default articulator it must be Coronals, but it says nothing about the universal absence or presence of any articulator in underlying representation. Thus, language-specific considerations could allow all coronals in some languages to have an underlying articulator. Because the Weak Coronals Hypothesis is less restrictive than the Strong Coronals Hypothesis, it is compatible with a wider range of underspecification theories. For instance(707,104),(978,978), the Weak Coronals Hypothesis is compatible with the already-mentioned theories (that is, Radical Underspecification as viewed for example by Kiparsky 1982, 1985; Grignon 1984 and Pulleyblank 1986) and with contrastive specification theories (for example Steriade 1987a; Clements 1988; Avery and Rice 1989). Both the Strong Coronals Hypothesis and the Weak Coronals Hypothesis are incompatible with labial or velar underspecification, that is, the view that the Labial or Dorsal (velar) articulators may be absent from underlying representation and derivationally inserted by default rules. However, the Weak Coronals Hypothesis, but not the Strong Coronals Hypothesis, is compatible with a language in which all consonants would be specified in underlying representation. Thus the Weak Coronals Hypothesis is a weak version of the Strong Coronals Hypothesis since any language falsifying the Weak Coronals Hypothesis also falsifies the Strong Coronals Hypothesis, but the reverse is not true.

This paper is dedicated to the defense of the Weak Coronals Hypothesis; it reanalyzes processes that have been interpreted as arguments for velar underspecification, that is arguments for a default Dorsal articulator. We list below what we believe to be an accurate summary of the existing arguments for velar underspecification.

(2) a. Vowel Place node spreading sometimes treats only velars as transparent (see Trigo 1988: 84; van der Hulst and Smith 1989; 1990 and van der Hulst 1991).

b. The unmarked and default articulator for the coda position is Dorsal, especially for nasals (see for example Trigo 1988: 53; Czaykowska-Higgins 1992: 146).

c. Place assimilation is sometimes caused by labials and coronals, but not by velars (see Trigo 1988: 84).
d. Place assimilations sometimes target only velar nasals (see Trigo 1988: 89).

e. Obligatory Contour Principle restrictions (for example Morpheme Structure Constraints) may group together velars and glottals (see Trigo 1988: 84), or treat velar nasals as if they were placeless (see Yip 1989: 358).

f. Velars and glottals sometimes alternate: if glottals are placeless, then maybe so are velars (see Trigo 1988: 45).

g. Some place alternations indicate that velars are less complex than dentals (see Angouard and Hassan 1991: 42).

Among these arguments, the strongest is, we believe, (2a) that is velar transparency to vowels, on the assumption that transparency is the least theory-dependent of all arguments in favor of the underspecification of any segment (see for example Paradis and Prunet 1991a: 10). The importance of this argument, and the fact that it has been based on detailed analyses of several languages, is why this paper is dedicated to a systematic reanalysis of the velar transparency cases. This decision takes nothing away from the interest of the other arguments. There is much merit in the idea that velar nasals often display typical placeless consonant behavior, some of which was identified as early as Westermann and Ward (1930/1990: 130), but these properties are complex enough to warrant separate studies (see Paradis and Prunet 1991d, 1992, 1993b and Rice 1991). In fact, not only (2b) but also all arguments for (2c, d) involve velar nasals, which suggests, in our view, that these properties are related to their mode rather than just their place of articulation. Argument (2e) is based on Morpheme Structure Constraints, a topic we discuss in Paradis and Prunet (1993a). As for (2f, g), it appears that more documented cases are needed to determine whether they represent more than isolated processes.

Because coronal underspecification has been the object of numerous publications, we do not justify it here. The only argument for coronal underspecification we discuss, in section 2, is V(owel)-spreading through coronals, a choice motivated by the focus of this paper on alleged instances of V-spreading through velars, some examples of which are given below.

(3) a. Chinook
i-k'ásk̲'s̲k̲ 'boy' but u-k'ásk̲'s̲k̲ (*u-k'ásk̲'s̲k̲) 'girl'
t̲ʃ-a̲ť̲-a̲u̲-ná̲n̲a̲ 'virgins' but u̲-̲ʃ-a̲ť̲-a̲u̲ (*u̲-̲ʃ-a̲ť̲-a̲u̲) 'virgin'

b. Choctaw
/hokli/ → hok̲li 'to catch'
/i'okso/ → i'ok̲so 'to make'

c. Luganda
English park [pak̲] → Luganda paaka
English book [bak̲] → Luganda buku

We will maintain that none of these cases is due to velars lacking an articulator in underlying representation. In section 3.1, we argue that Chinook is more adequately accounted for by a labialization process targeting velars first and surrounding vowels later, a labilization process that patterns on that of Inor, discussed in section 3.2. Choctaw and Luganda will be reanalyzed in sections 3.3 and 3.4 in terms of terminal-feature spreading. Although we will argue against previous analyses of these data, and consequently end up disagreeing with a number of positions, we believe that the discussions which these phenomena have caused have led to significant progress in our understanding and refinement of the debates about the content and form of underlying representations. Extensive discussion of problems for the Weak Coronal Hypothesis can also be found in Rice (1991).

2. Theoretical assumptions and consonantal transparency

We assume that segments have a hierarchical internal structure, where articulator nodes are unary and unordered since they stand on different tiers, while terminal features (between square brackets), which also stand on separate tiers, are maximally binary. In this article, we adopt McCarthy's (1991, to appear) feature geometry, shown in (4):

(4) (Simplification)

- Root node
- Laryngeal node
- Supra-Laryngeal node
- [nasal]
- Place node

Articulators:
- Labial
- Coronal
- Dorsal

Terminal features: [round] [anterior] [high] [back]

The most significant difference between Sagey's (1986) model, the most standard one, and this model consists in the Oral node and Pharyngeal node which McCarthy (1991, to appear) introduces and justifies on the basis of transparency effects in several Semitic languages, an issue to which we will return. The Dorsal articulator is somewhat special in this geometry: it is dominated by the Oral node in vowels and velars, by both the Oral node and the Pharyngeal node in uvular stops, and by the Pharyngeal node only in uvular continuants. This draws a distinction between those segments having an Oral node at the surface (labial, coronal and velar consonants, uvular stops and vowels) and those which do not (uvular continuants, pharyngeals and glottals, that is the class of gutturals, which all have a Pharyngeal node and lack an Oral node). What motivates the
presence of both a Dorsal articulator and a Pharyngeal articulator in uvular stops is their often dual behavior: they sometimes pattern with velars, with which they share a Dorsal articulator and an Oral node, and sometimes with gutturals, with which they share a Pharyngeal node. Uvulars and glottals have the following structures (pharyngeals are not relevant to this paper). Both gutturals in (5b, c) lack an Oral node, a point to be justified soon.

(5) a. Uvular stop (g, G) Place node
    b. Uvular continuant (y, θ) Place node
    c. Glottals (ʔ, h) Place node

    Oral node    Pharyngeal node
    Dorsal       Pharyngeal

The uncontroversial part of (5a, b) is the idea that (both [±cont]) uvulars have a Place node. The more innovative dual dependency of Dorsal is compatible with but not crucial to this paper. As for glottals, (5c) holds that they contain a Place node, a point that motivated our choice of this model since it can elegantly explain glottal stop rounding (ʔ → ʔʔ) in Chinook and Inor, discussed respectively in sections 3.1 and 3.2; we posit that rounding results from a Labial articulator, which, like any articulator, can only attach to a place feature node. However, though (5c) allows for a straightforward characterisation of glottal stop rounding, it has no monopoly on this ability, as we will see in section 3.1.

Many proponents of the coronal underspecification hypothesis hold that coronals are Place-node-less in underlying representation. However in model (4), both glottals and coronals have a Place node: coronals now differ from labials and velars in having no Oral node in underlying representation. Except for the replacement of Place-node-less by Oral-node-less, all arguments for coronal underspecification made in previous models hold mutatis mutandis in model (3). We assume two hypotheses concerning feature and class node specifications: (i) only unmarked consonantal values are absent from underlying representation, and (ii) coronals, as the universally unmarked consonants, lack an Oral node in underlying representation, as shown below:

\[ (6) \]

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<th>Labials</th>
<th>Velars</th>
<th>Coronals</th>
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<td>Root node</td>
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<td>Supra-Laryngeal node</td>
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<tr>
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<td>Place node</td>
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<td></td>
<td></td>
<td>Oral node</td>
</tr>
<tr>
<td>Labial</td>
<td>Dorsal</td>
<td>articulators</td>
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</table>

The universal redundancy rule in (7) fills in the articulator of coronals at a later stage.

(7) [Ø Oral node] → Coronal

The missing Oral node between Coronal and the Place node is generated by the Node Generation Convention, proposed by Archangeli and Pulleyblank (1986).

(8) Node Generation Convention:

A rule or convention assigning some feature or node to some node creates a path from x to b.

The claim that consonant underspecification is not open to parametrisation runs counter to Radical Underspecification as viewed for example by Archangeli (1984), Archangeli and Pulleyblank (1986) and Archangeli (1988), where universal markedness is expressed by Redundancy Rules, while language-specific deviations from universal markedness are expressed by Complement Rules. This theory would permit coronals to be universally unmarked but consonant underspecification in underlying representation to vary language-specifically: Complement Rules could designate coronals as underspecified in one language, velars in another, and labials in a third. Because of its premise that underspecification is not tied to markedness, such a model of Radical Underspecification predicts neither the Strong Coronal Hypothesis (since the Coronal articulation can be systematically present underlyingly in some or all languages) nor the Weak Coronal Hypothesis (since Complement Rules could insert a default Labial articulator in some languages). It seems to us that this powerful use of Complement Rules deprives Universal Grammar of much of its predictive power concerning consonants. Claiming that there is universally only one default articulator, at least for consonants, is one step towards a more restrictive theory of Universal Grammar.

3. Rounded glottal stops are attested in languages such as Kabardian (see Maddieson 1987: 215), Adyge Circassian, Ryukyuan, Taishan, Yay (see Ruben 1975), Lower Chinook (see section 3.1 and Silverstein 1974: 89) and Iao (see section 3.2 and Hetzron and Marcos 1966).

4. The cases of glottal transparency to vowel spreading discussed in Steriade (1987b), and which were considered to motivate the Place-node-less structure of glottals, can easily be reinterpreted here by assuming vowel Oral-node-spreading instead of Place-node-spreading. Only consonants lacking an Oral node, that is gutturals (and those that have not acquired one yet, that is coronals), can then be transparent to vowel spreading, as McCarthy (1991) argues in greater detail.

5. To our knowledge, all of the arguments for Complement Rules are based on vowel features. For instance, Pulleyblank (1988b) and Abaglo and Archangeli (1989) argue that the underspecified vowels of Yoruba and Geegbe are i and e respectively, though both languages have the same vowel system: i, e, ɛ, o, ɔ, ə, u. Our position raises the following question, also asked in Iverson (1989: 287): Why would vowels be fundamentally different from consonants in being open to parametrisation? Assuming that one accepts the premise that the underspecification of vowels can vary whereas that of consonants cannot, one can think of at least two possible rationales.
Let us return to (6). These representations predict that vowel Oral nodes in some languages may spread (or be fused) across coronals but not across other articulations. Paradis and Prunet (1989a, b, 1990) show that this prediction is verified in languages such as Fula, illustrated in (9), Gere and Mau.

\[\begin{align*}
\text{(9) } \text{woj-Vre } & \rightarrow \text{ woj-ere} \quad \text{‘hare'} \\
\text{woot-Vru } & \rightarrow \text{ woot-uru} \quad \text{‘unique'} \\
\text{kess-Vri } & \rightarrow \text{ kess-iri} \quad \text{‘new'} \\
\text{sudt-Vta } & \rightarrow \text{ sudt-ata} \quad \text{‘... is hiding (with a topicalized agent)'} \\
\text{sudt-Vto } & \rightarrow \text{ sudt-oto} \quad \text{‘... is hiding'} \\
\text{sudt-Vte } & \rightarrow \text{ sudt-ete} \quad \text{‘... is being hidden'}
\end{align*}\]

Figure (10) shows how the empty V-slot receives its phonetic content by spreading of the following vowel Oral node through the intervening Oral-node-less coronal.

\[\begin{align*}
\text{(10) } \text{V} & \text{ C} \text{ V} \\
\text{ Root node} & \text{ Supra-Laryngeal node} & \text{ Place node}
\end{align*}\]

The rest of the lefthand vowel structure is generated, as shown in (11), by the Node Generation Convention in (8).

\[\text{(11) } \text{V} \text{ C} \text{ V} \rightarrow \text{ Root node} \text{ Supra-Laryngeal node} \text{ Place node}\]

\[\text{Oral node}\]

A reanalysis of velar transparency cases

(12) shows Fula words in which the intervening consonant is labial and V-spreading blocked. Non-coronals are opaque to V-spreading because they have an Oral node. Since filling by spreading is not available here, the empty V-slot is filled in by the epenthetic vowel \(u\).

\[\begin{align*}
\text{wayl-V-be } & \rightarrow \text{ wayl-u-be} \quad \text{(*wayl-e-be) \ ‘blacksmiths'} \\
\text{jolfs-V-be } & \rightarrow \text{ jolfs-u-be} \quad \text{(*jolfs-e-be) \ ‘Wolof people'} \\
\text{awl-V-be } & \rightarrow \text{ awl-u-be} \quad \text{(*awl-e-be) \ ‘girois'}
\end{align*}\]

Similar evidence of coronal transparency can be found in Mau (Bamba 1992) and Gen-Mina (Nikiema 1992). McCarthy (1991) discusses similar effects in some dialects of Bedouin Arabic displaying an interesting twist: in these dialects, coronals and gutturals are transparent to V-spreading. Such natural class patterning can be straightforwardly captured with model (4), assumed here, if it is posited that: (i) V-spreading is implemented through spreading of the vowel Oral node, and (ii) both coronals and gutturals lack an Oral node, the former because they are underspecified for place features (as shown in [6]) and the latter because they lack an Oral node at all derivational levels (as shown in [5b,c]). We assume that the parameters in (13) determine what nodes may spread to an empty nuclear position when a language allows V-spreading. Whether these parameters should be ordered or stand in a relationship of mutual partial exclusion or whether they can be replaced by more general constraints is not relevant here.\(^6\)

\[\begin{align*}
\text{(13) Parameters: nodes which can be spread to an empty nuclear position:} \\
\text{a. terminal features?} & \quad \text{Yes/No} \\
\text{b. articulator nodes?} & \quad \text{Yes/No} \\
\text{c. oral nodes?} & \quad \text{Yes/No} \\
\text{d. root nodes?} & \quad \text{Yes/No}
\end{align*}\]

6. In Paradis (1986, 1988a,b, 1990, 1993) 'Theory of Constraints and Repair Strategies, the feature or node to be spread could alternatively be determined by a constraint violation (see also Paradis and LaCharité 1993 and Paradis and Prunet 1988). In a similar perspective, Goldsmith (1990: 304) claims that harmonies are interpreted as constraint-governed: "Vowel harmony is a term used to describe a restriction on the set of vowels possible within a given phonological domain, typically the word." Propagation is thus construed as a repair strategy, that is a phonological process which applies in order to eliminate a constraint violation. In this view, it is not obvious that parameters such as those in (13) would still be required, a question which is, however, beyond the scope of this article.
Since vowels can have more than one articulator (see for example Lahiri and Evers 1991), systematic spreading of a full vowel can only result from the propagation of a node not lower than the Oral node or the Place node in a system which has more than three vowels like that of Fula (Fula has five). Thus the Fula setting for (13c) is Yes, as is the case for Bedouin Arabic. It follows from this setting that Fula and Bedouin Arabic allow the propagation of a full vowel (that is all the vowel place features) as in (9), and that only Oral-node-less consonants can be transparent to V-spreading, which corresponds to observations: coronals alone in Fula (the language does not have gutturals, except for a h which behaves as a velar), and coronals plus gutturals as a class in Bedouin Arabic, are transparent to vowel Oral-node spreading. Other parameter settings define different patterns. If terminal-feature spreading is exclusively selected, all consonants can be transparent to at least some terminal vowel features. Tiv, as argued by Pulleyblank (1988a), is one such case, and so are Choctaw and Luganda, as we will argue in sections 3.3 and 3.4. If articulator node spreading is selected to the exclusion of the other options, again V-spreading does not necessarily involve the propagation of a full vowel (since, as we have just mentioned, vowels can have more than one articulator), and here only some classes of consonants can be transparent, that is the consonants which do not have the same articulators as the vowel to be spread. Finally, one must also allow for possibility (13d), where the Root node of a vowel is spread, in which case no consonant is transparent and spreading only takes place between two adjacent V-slots. Pulleyblank’s (1988b: 255) Progressive Assimilation rule in Yoruba is such a case of Root node spreading; it is blocked by any intervening consonant because all consonants have a Root node. We will see that most alleged instances of velar underspecification are taken from languages which have selected (13a), with the effect that all consonants can be transparent to vowels, and that V-spreading involves only part of the vowel place features.

To conclude this section, let us briefly consider the following excerpt from Mohanan (1991: 320), who purports to show that, contrary to the view we have advocated so far, consonantal transparency has no bearing on underspecification because any articulation can be transparent to V-spreading.

(...)

There is no discernible crosslinguistic correlation between predictability of information and the three types of asymmetry effects, and yet all the facts in A-H have been interpreted as evidence for underspecification. For example, transparency of both coronals and non-coronals has been attested in the radical underspecification literature (F-H); and yet, for some reason, coronal transparency has been singled out as evidence for radical underspecification!”

Under Mohanan’s reasoning, there is no reason to consider the Fula coronal transparency we have seen above as an argument for coronal underspecification, since other articulations are transparent in Warlpiri (coronals and velars) and Telugu (labials and velars). We claim that this reasoning is flawed because these three cases of V-spreading cannot be equated with the examples of Fula in (9) and (12). In Mohanan’s own formulation, only one feature ([+round]) spreads across Warlpiri and Telugu consonants, whereas in Fula whole vowels (that is the Place node or Oral node of these vowels) are involved. Clearly, the Warlpiri and Telugu cases are instances of terminal-feature spreading which do not require any articulator to be absent, while the Fula spreading cannot be so analyzed. Our point in this paper will be precisely this: the alleged velar transparency of Choctaw and Luganda are cases of Terminal-feature spreading, like the Warlpiri and Telugu cases, while the Chinook case is an instantiation of articulator spreading. But none of these cases are instantiation of Oral node or Place node spreading.

3. A reanalysis of the velar transparency cases

This section offers a reanalysis of cases in Choctaw, Chinook and Luganda where velar consonants appear to be transparent to vowel place features. Let us first give a brief overview of the various versions of the velar hypothesis. As mentioned earlier, Yip (1989: 352, 358) views consonant underspecification as parametrizable under some conditions and invokes Morpheme Structure Constraints as evidence that the velar nasal is underspecified in Cambodian. In a more radical way, Williamson (1977: 698), Paradis (1986: 73; 1987: 333) and Angoujard and Hassan (1991: 42) maintain that velars, not coronals, are unmarked,7 while Kaye, Lowenstamm and Vergnaud (1989: 74), Harris (1990: 264) and van der Hulst and Smith (1989, 1990: 7) claim that velars, not coronals, are the least complex consonants.8 Finally, Trigo (1988: 53) adopts the

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8. Kaye, Lowenstamm and Vergnaud (1989: 74) give the following tentative structures for consonant articulations, where t is the constriction element, R the coronal element, v the identity element (that is no element), I a high front element, and U a high back rounded element.

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<tr>
<th>Head</th>
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<td>Operator</td>
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| p | t | c | k |
syllable-sensitive hypothesis below. As mentioned before, *Place-node-less* in a geometry such as (4), assumed by Trigo, translates as *Oral-node-less* in the model we adopt here.

(15) Syllable-Sensitive Markedness Hypothesis:
Coronals are the unmarked (*Place-node-less*) consonants in onset position whereas velars are the unmarked (*Place-node-less*) consonants in codas position.

This view implies that syllable structure must be systematically erected before redundancy rules apply, an implication which remains to be tested. It also runs counter to Yip (1991), who argues that coronals are often the only permissible consonants in coda position, and Davis (1991), who shows the existence of *Place-node-less* coronals in coda position in English.

3.1 Chinook

Trigo (1988: 91) bases a first argument in favor of velar transparency on Lower Chinook, a Penutian language (on Penutian classification, see Silverstein 1974, 1979: 680). Trigo’s argument is based on Boas’ (1911) grammar, which follows conventions that were in use around the turn of the century and is often difficult to interpret. For this reason, we will provide updated transcriptions which take into account works such as Hymes’ (1955) study of Kathlament, a dialect of Upper Chinook.

In this figure, which is also assumed by Harris (1990: 264), velars are the least marked consonants in the sense that they have the least complex internal structure, *v* being equivalent to 0. Van der Hulst and Smith (1989, 1990), on the other hand, assume that the phonological primes *l*, *l₁*, *l₂*, called components, are grouped in the hierarchical structure below. Labials contain *l₁*, coronals, *l₂* — the least marked component — whereas uvulars contain *l₁*, the most marked component. Velars do not contain any component, which makes them the least complex consonants but, at the same time, the most marked consonants on the assumption that “markedness results from lack of content” (van der Hulst and Smith 1990: 6). This model is elaborated upon in van der Hulst (1989).

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<td></td>
</tr>
</tbody>
</table>

labial labio-dental dental palato-alveolar palatal velar pharyngeal

---

Chinook documented by Boas (1901), and recent articles such as Silverstein (1974). The Lower Chinook segmental inventory is given on the next page (parentheses indicate non-phonemic variants).

(16) a. The Chinook Vowel System: i, u, a, epenthetic ə.
b. The Chinook Consonant System:

<table>
<thead>
<tr>
<th></th>
<th>Labial</th>
<th>Dental-Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Uvular</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>p, t</td>
<td>k, kʷ, q, qʷ, ?</td>
<td>?ʷ</td>
<td>(d)</td>
<td>(g, gʷ)</td>
<td>(G, Gʷ)</td>
</tr>
<tr>
<td>Ejectives</td>
<td>p', t'</td>
<td>k', k'ʷ, q', q'ʷ</td>
<td>x, x'</td>
<td></td>
<td></td>
<td>(y)</td>
</tr>
<tr>
<td>Fricatives</td>
<td>s, s'</td>
<td>k', k'ʷ, q', q'ʷ</td>
<td>x, x'</td>
<td></td>
<td></td>
<td>(y)</td>
</tr>
<tr>
<td>Affricates</td>
<td>c, t</td>
<td>k, k'</td>
<td>x, x'</td>
<td></td>
<td></td>
<td>(y)</td>
</tr>
<tr>
<td>Nasals</td>
<td>m</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td>(y)</td>
</tr>
<tr>
<td>Liquids</td>
<td>l, l'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(y)</td>
</tr>
<tr>
<td>Semi-vowels</td>
<td>(w)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(y)</td>
</tr>
</tbody>
</table>

The Chinook Consoval System for Boas (1911: 564): i, e, u, o, a, E

The English system differs from the Chinook system in several respects: (1) The vowels e and o are allophones of i and u (see Boas 1911: 564 and Silverstein 1974: 51, note 6). The vowel E is described only as epenthetic and obscure by Boas. However, Hymes (1955: 41) shows that it stands for a short (a), the symbol we use in our own transcriptions.

The Chinook Consonant System for Boas (1911: 565):

<table>
<thead>
<tr>
<th>Sonant</th>
<th>Surd</th>
<th>Fortis</th>
<th>Spirant</th>
<th>Semi-nasal</th>
<th>Nasal</th>
<th>Lateral</th>
<th>Semi-vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glottal</td>
<td>ə</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velar</td>
<td>(g')</td>
<td>q</td>
<td>q!</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palatal</td>
<td>g</td>
<td>k</td>
<td>k!</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>palatal</td>
<td>(g')</td>
<td>k'</td>
<td>k'!</td>
<td>x'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alveolar</td>
<td>(d')</td>
<td>t</td>
<td>t!</td>
<td>s, c</td>
<td>n</td>
<td>(l)</td>
<td></td>
</tr>
<tr>
<td>Dento-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>alveolar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>affricative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labial</td>
<td>p</td>
<td>p!</td>
<td>m</td>
<td>m</td>
<td></td>
<td>(w)</td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td>L</td>
<td>L'</td>
<td>t, l</td>
<td>t, l</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boas' terms must be read as follows: palatal = velar, velar = uvular, surd = voiceless, sonant = voiced, fortis = ejective, spirant = fricative. The semi-nasal is an allophone of /m/ with incomplete closure (see Boas 1911: 565).
There are two noteworthy differences between this system and that of Boas: (i) the terms designating velar and post-velar articulations, and (ii) the presence of labialized consonants. We address these differences in turn before discussing the problem at hand.

First, what Boas calls palatal and velar is called velar and uvular, respectively, by more recent works such as Silverstein (1974: 51), a practice followed by Trigo and us. While this is crucial to Trigo’s analysis, it is not based on velar underspecification, it is not so for our analysis, as will become clear, but there are good reasons to interpret Boas in this way. For instance, Boas’ (1894: 7) description of Lower Chinook sounds indicates that “k [is the] English k” while “q [is the] velar k” (the same practice is followed in Boas’ 1901: 7 description of the Kathlamet dialect of Upper Chinook, whose segmental system is essentially identical to that of Lower Chinook). Sapir’s (1909: xiv) description of the Wishram dialect of Upper Chinook, whose segmental system is also essentially identical to that of Lower Chinook, writes of “p, t, k … voiceless stops, approximately as in English” while “q … [is a] voiceless velar stop, like Arabic q”. Clearly, the English k is to be described as a palatal for Boas and Sapir, which entails that their use of velar refers to a more posterior position, now called uvular. Pullum and Ladusaw (1986: 130) also point out that the terminology has changed over time but that the denotations are presumably the same.

Secondly, Boas’ system does not include a series of labialized velars and postvelars while ours does, again following Silverstein (1974: 51). These consonants are attested in dialects of Upper Chinook which are still spoken, such as Wishram-Wasco (for which Hymes 1955a: 51 writes of “phonic labialized palatal [that is velar] and velar [that is uvular] consonants”) and are phonemic in some Penutian languages such as Sahaptin-Nez Percé (which has labiovelars and labio-uvulars), as well as Coos and Takelma (which have labiovelars) (see Ruhlen 1975). In Lower Chinook proper, labialized consonants can be considered phonemic because they reduplicate and voice/devoice as units (M. Silverstein, personal communication). Because the only point which will be essential to our analysis, however, is the existence of labialized consonants at some stage of a derivation, we will not attempt to justify their phonemic status and will simply show their existence as phonetic segments. First, Boas’ Chinook studies are in several places highly suggestive of the existence of labialized consonants. For instance, Boas (1911: 565) states that “short i and u when preceding vowels have always consonant values”, which entails that, for instance, his ūme-pxa-tē ‘elder’ stands for u-ŋi-pxa-ti (o and e are allophones of u and i; see also note 10). In other places (for example p. 594), Boas mentions variants of velars, uvulars and glottal stops having a ūtinge, which suggests a labial coarticulation of these consonants. Finally, Boas’ grammars contain many instances of a superscribed vowel (for example ok’ičk ‘to make net’ on p. 663). Hymes (1955: 40) notes that, with the exception of one instance of superscribed a, only u is ever superscribed in Boas’ (1901) Kathlamet study, and this always occurs after velars and uvulars. We repeated this search in Boas’ (1911) Lower Chinook grammar and found forty superscribed vowels, all of them superscribed u’s occurring after velars, uvulars and the glottal stop. In our view, these represent a labial offglide. Moreover, two of the superscribed u’s occur after an ejective velar: one is noted k’u (p. 640) and the other k’u (p. 662), suggesting that the u is coarticulated with the ejective release. Second, Hymes (1955: 41) notes that “if /u/ and another vowel appear adjacent in the same syllable, the other vowel appears as syllabic nucleus, /u/ as non-syllabic, and if the syllable is stressed, the stress falls on the other vowel.” This patterning is expected if prevocalic /u/ is the labial offglide of an onset consonant rather than a true vowel. For all these reasons, we maintain the existence of labialized consonants in Chinook. Having justified these two departures from Boas’ inventory, we turn to the problem which concerns us here: the alleged Oral-node/Place-node-lessness of velars.

Boas (1911: 569) notes that a u-vowel prefix in Chinook turns a following /a/ or /o/ into /u/ through the consonants he calls K-sounds: velars (g, k, k’, x), uvulars (g, q, q’, q̲), and the glottal stop (?), most instances of which are intervocalic variants of q (see Boas 1911: 568 and Silverstein 1974: 89). This is shown in (17a), where the parenthesized numbers refer to pages in Boas (1911) on which the examples appear. Boas notes that the same u-vowel prefix followed by a K-sound causes the insertion of a u-vowel before a i-vowel. Our transcriptions, given in (17b), show that this u is in fact the labial offglide of the preceding K-sound. Finally (17c) shows that neither change occurs when the intervening consonant is not a K-sound. Vowel length contrasts, which are irrelevant here, are not indicated.

(17) a. Vowel-Harmony through K-sounds (affects a and e only):

<table>
<thead>
<tr>
<th>form after u-prefix</th>
<th>base form</th>
</tr>
</thead>
<tbody>
<tr>
<td>i-k’iška</td>
<td>boy</td>
</tr>
<tr>
<td>i-kánim</td>
<td>canoe</td>
</tr>
<tr>
<td>t-ganakš-i-ma</td>
<td>rocks</td>
</tr>
<tr>
<td>t-xat’au-nma</td>
<td>virgins</td>
</tr>
<tr>
<td>t-ʔakš-ma</td>
<td>days</td>
</tr>
<tr>
<td>i-ʔanakš</td>
<td>stone</td>
</tr>
</tbody>
</table>

b. Vowel length contrasts:

- u-k’iška ‘girl’ (597)11
- u-kánim ‘canoe’ (603)
- u-ganakš ‘rock’ (610)
- u-xat’au ‘virgin’ (597, 603)
- u-ʔakš ‘day’ (609)
- u-ʔanakš ‘large boulder’ (603)

11. Silverstein (1974: 61, note 25) states that u and “a become u under certain conditions. This explains why our interpretation of Boas’ (ok’iška) ‘girl’ in (17a), that is /uk’iška/, is /uk’iška/: after the stem vowel has been rounded, the labial offglide becomes audible. It is common for languages not to distinguish ku and ko from k’u and k’o. Ethiopian Semitic languages, for instance, neutralize the opposition between ku and k’o only before ku and ko, a fact encoded even in the traditional Ethiopian syllabary (see Ullendorff 1955: 87). See also Paradis (1983, 1988b, 1993) for the same neutralization in Gere, which construes as an effect of the Obligatory Contour Principle activated on the labial tier.
This generalization is captured by the analysis we offer. We suggest that V-spread is in fact the spreading of the Labial articulator which targets the place feature node of K-sounds in a first stage (more specifically, the Oral node of the K-sound if it has one, or its Place node if it does not, as is the case with gutturals), and the following vowel in a second stage. In other words, we argue that the vowel harmony observed in (17a) goes through a consonant labialization stage, which creates rounded velars, rounded uvulars and a rounded glottal stop, as shown below. The surface effect of spreading either the feature [+round] or the Labial articulator dominating it would be the same but Bagemihl’s (1987) Highest Node Constraint, which we adopt, predicts that in such a case the Labial articulator (the highest node producing the desired effect) is spread.\footnote{The feature [+round] is nevertheless obligatory since it is underlying in vowels (vowels consist of features in underlying representation), and it is this feature which is responsible for the generation of the Labial articulator.}

\begin{center}
\begin{tabular}{c|c|c|c|c}
& V & C & V \\
\hline
\(u\) & \(\bullet\) & \(\bullet\) & \(\bullet\) \\
\(\cdot\) & \(\cdot\) & \(\cdot\) & \(\bullet\) \\
\hline
\end{tabular}
\end{center}

\textbf{Labial}

\begin{center}
\begin{tabular}{c}
[+round] \text{ for example \(u - k\ a/ \rightarrow u - k^\prime\ a/\)}
\end{tabular}
\end{center}

The Labial articulator of the \(u\)-prefix can attach to the Oral node/Place node of the following consonant if this consonant is a K-sound. All K-sounds have at least a Place node since we assume, as mentioned in 2, that: (i) velars and uvulars are fully specified, and (ii) even the glottal stop has a Place node. When Labial spreads onto the Place node of the adjacent K-sound, it automatically creates an Oral node by the effect of the Node Generation Convention in (8). The result is a doubly-articulated consonant with a primary Dorsal articulator (for velars and uvulars) or a primary Pharyngeal one (for the glottal stop), and a secondary Labial articulator.

A similar reasoning is at the basis of Odden’s (1991: 277) analysis of the Tunica rounding harmony, to which only glottals are transparent, and where he postulates a stage of glottal consonant rounding. Although in Tunica there is no independent evidence for rounded glottals, Chinook (as well as Inoč, to be discussed) supports Odden’s intermediate stage of glottal consonant rounding. Odden’s account, where the glottal stop in Tunica is specified for a [+low] feature dominated by a Place node (with intervening nodes), offers an alternative
to our use of McCarthy’s model in (4). Rounding (as spreading of the Labial articulator) could then target the Place node of the glottal stop (or a class node subordinate to it), with the effect that only minor details of our Chinook analysis, such as the formulation of the parameter settings to be discussed in (20), would have to be modified if a more standard geometry model such as that of Sageny (1986) were to be adopted.

Under our analysis, what distinguishes K-sounds from opaque consonants is not their Oral-node/Place-node-lessness but the fact that they are labialized. We posit that the class of labializable consonants is defined by the parameter settings below.13

(20) Chinook
a. Is secondary [+round] Labial articulator possible? Yes
b. If Yes, what primary articulators can bear secondary labialization?
   i. Labial?
      No
   ii. Coronal?
      No
   iii. Dorsal?
      Yes
   iv. Pharyngeal?
      Yes

These parameter settings determine which consonants can be rounded in Chinook: these are velars (Dorsal articulator), uvulars (Dorsal and Pharyngeal articulators) and the glottal stop (Pharyngeal articulator). In accordance with Silverstein (1974), we believe that these parameter settings also express phonemic generalizations, which entails, if this hypothesis is right, that the labialization of K-sounds is structure-preserving in Chinook. As mentioned above, this point is not crucial to our analysis though. The appearance of vowel harmony is created as follows: once a labialized consonant has been created, its Labial articulator is spread onto the following vowel, (21).

V-rounding is ultimately audible on the first stem vowel but it is not caused by vowel harmony. Rather, the rounding is mediated from the u-prefix to the stem vowel via the intervening labialized K-sound, which creates the apparent effect of vowel harmony. Our analysis, which does not rely on Oral-node/Place-node-spreading through K-sounds, explains why the spread vowel in (17a, b) is always round: only round vowels trigger the apparent V-harmony because only they can trigger labialization.

(21) • • • Root node
     • • • Supra-Laryngeal node
     • • • Place node
     • • • Oral node
     • | Labial |
     [+round] for example /u - kʷ a/ → /u - kʷ o / (→ [u-kul])

Let us now focus on the data in (17b), repeated below for convenience, which Boas described as the insertion of a u-vowel. These occur when the u-prefix is followed by a K-sound which is itself followed by i.

(22) Insertion of a labial offglide through K-sounds (occurs before i only):
    base form: form after u-prefix:
    t-qi-pxa-ti 'alder woods' u-gʷti-pxa-ti 'alder' (614)
    t-ʔi-tiwa-ʔgi-ti 'bailers' u-ʔit-tiwa-ʔgi-ti 'bailers' (604)
    t-q'i-č automát-sup-kš 'fawns' u-q'it-č automát 'fawn' (606)
    t-kima 'belts' a-k'ima 'belt' (604)
    i-q'iyáq̂ut 'old man' u-q'it-iq̂áq̂ut 'old woman' (597)

In a velar transparency analysis, these facts are decidedly odd: if V-spreading is involved, why would it sometimes result in rounding of the first stem vowel as in (17a) and sometimes in the insertion of u? In our analysis, these data are not surprising: they simply exhibit the labial offglide of the labialized K-sounds, which have become Kʷ-sounds. Boas' ʔogē-'pxa-tē 'alder' is in fact u-gʷt-i-pxa-ti (without length contrasts). The realization of the labial offglide on the consonant itself, not on the following vowel, follows from the assumption that i cannot be rounded in Chinook. This is a reasonable assumption since: (i) Chinook has no attested phonemic or phonetic round counterparts for i (or for its variant ø), that is ü or ø, and (ii) Chinook has no known alternations between i (or its variant e) and round vowels, that is u (or its variant o). Before i, the labial offglide is thus audible on the K-sound itself.

Finally, our analysis accounts for the opaque consonants in (17c): u- pàwil̄ 'bunch of grass' and u-làta-is 'flounder' cannot become *u-p̂-dàwil̄ (*u-µwil̄i?) and *u-ʔátà-is (*u-ʔútà-is) respectively for the simple reason that p and l are nonlabilizable consonants in Chinook. In conclusion, we have reanalyzed the first argument for velar Oral-node/Place-node-lessness by showing that: (i) a velar underspecification analysis misses an important empirical generalization: the spread vowel is always round, and (ii) an alternative analysis is available, K-sound labialization, which does not resort to velar Oral-node/Place-node-lessness. This alternative analysis accounts for the empirical generalization and reflects the phonetic interpretation to which Boas’ transcriptions must independently be subjected.

13. How are K-sounds to be defined phonologically? In a velar transparency analysis, K-sounds are the set of (universally) Oral-node/Place-node-less consonants. In our analysis, they are the set of labilizable consonants, a set which will vary from one language to the other within the limits imposed by Universal Grammar. Feature geometries do not give a unified characterization for the set of labilizable consonants any more than they do for the set of palatalizable consonants, but there are observable typological tendencies (handled by some of the parameters in (20)): velars and uvulars are typically labilizable consonants, and anterior coronals, labials and velars are typically palatalizable consonants (see Maddieson 1987: 37).
3.2. Inor

Though Inor, a South Ethiopian Semitic language also called Eenemor, was never invoked as an argument against the Weak Coronal Hypothesis (that is the hypothesis that Coronal is the universal default articulator), we discuss it here because this language reinforces the plausibility of the analysis we have just offered for Chinook. The transparency facts of Inor are very similar to those of Chinook and we contend that, given this similarity, the Inor analysis should also be adequate for Chinook. Inor, unlike Lower Chinook, is a living language, and consequently can be subjected to empirical tests. We will see that in Inor, as in Chinook, consonant transparency involves round vowels exclusively. But we will also see that Inor adds a problematic twist to a velar underspecification analysis: its transparent consonants include labials, a type of consonant that incovertibly have an Oral node and a Place node in underlying representation. These two facts will lead us to argue that Inor does not, no more so than Chinook, support velar place-feature underspecification.

The phonemic system of Inor includes five peripheral vowels [i, e, u, o, a], two central vowels [i, a] and the consonants below. Detailed discussions of this and related segmented systems can be found in for example Hetzron (1977), Leslau (1983), Lowenstamm (1991) and Petros (1993).

(24) Plain: voiceless p, pʰ, f, fʰ, t, č, s, š, k, kʰ, k', x, xʰ, q, ?, qʰ

 voiced b, bʰ, β, d, j, ž, g, gʰ, g', m, mʰ, n, n̥, r, w, y

t’, č’, k’, k’ʰ

Ejective: Like several other members of the Gurage dialectal cluster, Inor has an impersonal category expressing the meaning of 'someone did' in which obligatory Long-Distance Labialization of some consonants is triggered from the end of the word by the Impersonal suffix, turning for example g into gʰ. Studies of Long-Distance Labialization can be found in Hetzron and Marcus (1966) and Prunet (1991) for Inor, and Leslau (1966) and McCarthy (1983) for Chaha, a related Gurage dialect. The fact that labialized consonants exist in underived contexts makes Long-Distance Labialization structure-preserving. The labialized consonants are the labials (p→pʰ, f→fʰ, b→bʰ, β→βʰ, m→mʰ), the velars (k→kʰ, x→xʰ, g→gʰ, k'→k’ʰ) and the glottal stop (?)→ʔʰ). The Inor facts can be handled by the same parameters as the Chinook K-sounds.

(23) Plain: voiceless p, pʰ, f, fʰ, t, č, s, š, k, kʰ, k', x, xʰ, q, ?, qʰ

 voiced b, bʰ, β, d, j, ž, g, gʰ, g', m, mʰ, n, n̥, r, w, y

t’, č’, k’, k’ʰ

Inor: yes

Chinook: yes

a. Is secondary [+round] Labial articulator possible? Yes Yes

b. If Yes, what primary articulators can bear secondary labialization?
   i. Labial? Yes No
   ii. Coronal? Yes No
   iii. Dorsal? Yes Yes
   iv. Pharyngeal? Yes Yes

(25) Labialization and V-rounding in Inor:

a. no V-rounding of peripheral vowels

<table>
<thead>
<tr>
<th>perfect</th>
<th>impersonal perfect</th>
<th>glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>mesara</td>
<td>mʰesari</td>
<td>'he/someone traded'</td>
</tr>
<tr>
<td>met'ara</td>
<td>mʰet'ari</td>
<td>'he/someone picked out'</td>
</tr>
<tr>
<td>mel'ara</td>
<td>mʰel'ari</td>
<td>'he/someone beurt'</td>
</tr>
</tbody>
</table>

b. rightward V-rounding from the consonant to the central vowel

<table>
<thead>
<tr>
<th>perfect</th>
<th>impersonal perfect</th>
<th>glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>basara</td>
<td>bʰosari</td>
<td>'he/someone cooked'</td>
</tr>
<tr>
<td>min'ara</td>
<td>mʰin'ari</td>
<td>'he/someone changed money'</td>
</tr>
<tr>
<td>mat'ara</td>
<td>mʰot'ari</td>
<td>'he/someone looked nice'</td>
</tr>
</tbody>
</table>

c. rightward and leftward V-rounding of central vowels

<table>
<thead>
<tr>
<th>perfect</th>
<th>impersonal perfect</th>
<th>glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>sapara</td>
<td>sʰapora/sapori</td>
<td>'he/someone broke'</td>
</tr>
<tr>
<td>nat'ak'</td>
<td>nʰat'ak'&quot;h ak'&quot;i&quot;</td>
<td>'he/someone snapped'</td>
</tr>
<tr>
<td>nat'ak'</td>
<td>nʰat'ak'&quot;h ak'&quot;i&quot;</td>
<td>'he/someone helped'</td>
</tr>
<tr>
<td>daʃ'a</td>
<td>dʰaf'&quot;/dʰaf'&quot;i&quot;</td>
<td>'he/someone ate raw corn'</td>
</tr>
<tr>
<td>zaʃ'ara</td>
<td>zʰaʃ'or'zək'ori</td>
<td>'he/someone jumped'</td>
</tr>
<tr>
<td>saʃ'ara</td>
<td>saʃ'or'ʃəf'ori</td>
<td>'he/someone measured'</td>
</tr>
<tr>
<td>ʃək'ara</td>
<td>ʃək'or'ʃək'ori</td>
<td>'he/someone aligned'</td>
</tr>
</tbody>
</table>

d. neither labilization nor V-rounding if the root contains no labilizable consonant

<table>
<thead>
<tr>
<th>perfect</th>
<th>impersonal perfect</th>
<th>glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>šārə</td>
<td>šʰərə/&quot;šərə&quot;/&quot;šərə&quot;</td>
<td>'it/someone wilted'</td>
</tr>
<tr>
<td>tanəɾə</td>
<td>tʰanəɾi/&quot;tʰanəɾi&quot;</td>
<td>'he/someone broke'</td>
</tr>
<tr>
<td>t'anəɾə</td>
<td>tʰanəɾi/&quot;tʰanəɾi&quot;</td>
<td>'he/someone became clear'</td>
</tr>
<tr>
<td>gəʃ'ara</td>
<td>gʰəsəri/&quot;ɡəsəri&quot;</td>
<td>'he/someone beat with a stick'</td>
</tr>
<tr>
<td>nək'ara</td>
<td>nʰək'or'/*nək'ori</td>
<td>'he/someone won by proxy'</td>
</tr>
</tbody>
</table>

The roots in (25a–c) contain labilizable consonants. The labial offglide of the labialized consonant is heard on the consonant itself before peripheral/
non-rounding vowels (i, e, a, o, u), for example /me/ becomes [mʰe] in (25a), but it manifests itself as obligatory rightward V-rounding before central/rounding vowels [i, u] in (25b), for example /har/ becomes /bʱar/, then /bʰar/, and is finally pronounced [bo]. In (25c), the labial offglide is audible on the consonant before the non-rounding vowel i, for example [nasiti], and on the following central vowel, for example [sapor]. (saperi) → [sapʰori] → [sapʰori] → [sapor]. The labial offglide is also optionally audible on the preceding vowel, for example [sapor] → [sapor]. In (25d), the roots contain no labialized consonants; because consonants are the segments targeted by Long-Distance Labialization and because V-rounding is triggered by labialized consonants, no V-rounding can obtain here. Note that the rounding of central vowels before and after labialized consonants is attested in other Ethiopian Semitic languages, for example Tigrinya (see Leslau 1941: 13) and Amharic (see Tubiana 1968: 93).

The Impersonal suffix consists of an i vowel and a floating [+round] feature as shown in (26a) (see Hetzron and Marcos 1966; McCarthy 1983 and Rose 1992, for further detail on this suffix). This floating feature initially targets the Oral node of the rightmost labialized consonant in (26b) (if the consonant does not have an Oral node, its Place node is then notified by a guttural in Chinook), automatically generating a Labial articulator (and an Oral node if the consonant does not have one) through the Node Generation Convention (8). In a second stage, the Labial articulator of the labialized consonant (see Bagemihl’s 1987 Highest Node Constraint) is spread to the Oral nodes of adjacent central vowels by obligatory rightward V-spreading in (26c). In (26d), the Oral articulator of the consonant is optionally spread leftward.

(26)

<table>
<thead>
<tr>
<th>Stem</th>
<th>Skeleton</th>
<th>Root node</th>
<th>Super-Laryngeal node</th>
<th>Place node</th>
<th>Oral node</th>
<th>shady vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>z</td>
<td>3</td>
<td>9</td>
<td>k</td>
<td>9</td>
<td>r</td>
<td>i</td>
</tr>
<tr>
<td>C</td>
<td>V</td>
<td>V</td>
<td>C</td>
<td>V</td>
<td>C</td>
<td>V</td>
</tr>
</tbody>
</table>

b. Association of [+round] to the rightmost labilizable consonant:

- skeleton
- Root node
- Super-Laryngeal node
- Place node
- Oral node

<table>
<thead>
<tr>
<th>Cor</th>
<th>Dors</th>
<th>Dors</th>
<th>Dors</th>
<th>Dors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial</td>
<td>[+]round</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/zakʰor-u/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c. Association of Labial to the following central vowel:

- skeleton
- Root node
- Super-Laryngeal node
- Place node
- Oral node

<table>
<thead>
<tr>
<th>Cor</th>
<th>Dors</th>
<th>Dors</th>
<th>Dors</th>
<th>Dors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial</td>
<td>[+]round</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/zakor-u/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

d. Association of Labial to the preceding central vowel:

- skeleton
- Root node
- Super-Laryngeal node
- Place node
- Oral node

<table>
<thead>
<tr>
<th>Cor</th>
<th>Dors</th>
<th>Dors</th>
<th>Dors</th>
<th>Dors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial</td>
<td>[+]round</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/zakor-u/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These facts are not specific to a particular morphological configuration: the same conclusions can be drawn from the Infinitive formation shown below.

14. In the geometric model adopted here, [+round] is necessary because including a plain floating Labial articulator in the impersonal suffix would not account for the rounding of the labial consonant in /safar-i/ → /safar/ "the/someone measured": a floating Labial articulator would simply merge with the Labial articulator of /f/, without turning it into /fʰ/, unless the model is amended and made to distinguish between consonants having a single Labial articulator and those having two. Models eliminating [round], such as Clements (1993) or Kaye, Lowenstamm and Vergnaud (1989), can be entertained but without any apparent advantage here since they reintroduce the distinction between plain and rounded labial consonants in a different form, such as the dual dependency of Labial under C-Place and V-Place nodes in Clements (1993) or the different head-operator relations in Kaye, Lowenstamm and Vergnaud (1989: 74).

15. There is no need to delink Labial from the labialized consonant even in the final stages because the language does not distinguish between labialized and non-labialized consonants before round vowels (see footnote 11).
The 3SG masc perfect form is given on the left to identify the basic root consonants. The infinitive suffix, on the right, includes a /r/ and, like the impersonal suffix, a floating [+round] feature. This floating [+round] is unrealized in the absence of a labializable consonant (for example /stirirt/ in [27a]), and is realized as vowel rounding [i → u] on the following epenthetic vowel i (for example /agurirt/ in [27b]). From there, it can only spread to the immediately preceding vowel (for example /agurirt → agurirt/ in [27b]). It cannot spread across a coronal because coronals are nonlabializable (for example [zsgurt] → [zsgurt] but not *[ozugurt] in [27c]), which again shows that there is no vowel-to-vowel spreading. The rounding is anchored to the velar or labial consonant and serves as a mediator between the two vowels, creating the appearance of vowel harmony.

Let us now examine an apparent alternative for Inor that resorts to velar-underspecification: this alternative would consist in anchoring the [+round] feature onto the vowel to the right, then in spreading a [+round] Labial articulator leftward from the round vowel across an underspecified velar (izugurt/ → [izugurt]) or, as in our analysis, from a [+round] labial consonant (izugurt/ → [izugurt]). However, this analysis would run into several empirical problems. First, when Long-Distance labialization has taken place, the initial bearer of the [+round] Labial articulator is a consonant, not a vowel. This is shown by the fact that: (i) there is no labialization in the absence of a labializable consonant (for example /tanari/ in [25d] which cannot undergo V-rounding), and (ii) the consonant is the initial bearer of [+round] in [matokʷʷ Mourinho], which optionally yields [matokʷʷ][i] in (25c). As a consequence, velar-underspecification is of no use: the apparent vowel harmony must start from a labialized consonant, which by definition cannot be Oral-node/Place-node-less since [round] is a place feature. Second, even if the spreading did start from a round vowel, there would be no logical reason why an Oral-node/Place-node-less velar would be transparent to the spreading of a Labial articulator while coronals (both /ząnt/) would be opaque: velars and coronals both lack Labial and hence both should be transparent to it. Thus the velar underspecification analysis is not viable.

Consider now how the Inor facts resemble the Chinook ones. First, in Inor, spreading of labialization in /ῳ-zigir-t ‘to jump’ yields [zsgurt] and optionally [ozugurt] but not *[zugurt], indicating that rightward spreading is obligatory while leftward spreading is optional. Chinook has the same spreading of labialization, but rightward only: /u-qánakʷ/ → [u-qánakʷ] ‘large boulder’. Second, in Inor, only some consonants can be involved in labial harmony: *[zugurt] cannot yield *[ozugurt] because z is nonlabializable. In Chinook too, only some consonants, Boas’ K-sounds, can be involved in this type of harmony: /u-tak/ ‘father’s sister’ cannot yield *[u-tlk] because k is nonlabializable. The set of labializable articulations is the same in the two languages, with the addition of labial in Inor. Third, in both languages, some vowels cannot be rounded (Chinook: i; Inor: i, e, a), and it is only before these that a labial offglide is heard. Clearly, these descriptions are identical, but for the apparent direction of the vowel rounding harmony. Even the minor difference mentioned above in the spreading direction is explainable: Labial spreading in Chinook cannot apply leftward, as is optionally the case in Inor, because the Labial articulator which propagates in Chinook is attached to a prefix while the suffixal floating [+round] feature of Inor can anchor word-internally. Because of these close similarities, we claim that the apparent vowel rounding harmony in Chinook should be analyzed like the apparent vowel rounding harmony in Inor, that is via the spreading of a [+round] Labial articulator. In other words, velar Oral-node/Place-node-lessness in Chinook should be discounted on grounds of logical consistency with Inor, thereby bringing very similar phenomena in unrelated languages under a unified analysis.

3.3. Choctaw

The second case invoked for velar transparency (Oral-node/Place-node-lessness) is Weak Vowel-Epenthesis in Choctaw, discussed in Trigo (1988). It can be observed in (28a) that a weak vowel is inserted between /i/ or /l/ and a following voiced consonant. The term weak refers to the quality of the vowel, which varies between that of the preceding vowel and a schwa (Ulrich 1986: 149). The process is given in (28b). The phonemes of Choctaw, a Muskogean language, are the vowels a, o, i, and the consonants p, b, f, m, t, s, Ɂ, n, l, k, ?, h, w, y.

(28) a. /tahlili/ → tal̂li ‘to finish’
    /hokli/ → hok̂li ‘to catch’
    /i̱kbi/ → i̱k̂bi ‘to make’

(See Nicklas 1975: 247; Trigo 1988: 97.)

b. Weak V-Epenthesis (optional):
   Insert a weak copy of the vowel preceding /h/ when /h/ is followed by a voiced consonant (see Ulrich 1986: 149).

Since the epenthetic vowel in (28a) is a copy of the preceding vowel, V-spreading through a glottal or a velar seems to be involved. However, we
contend that this case brings little evidence in favor of velar Oral-node/Place-nodelessness because, for one thing, the epenthetic vowel in question is weak, optional and of unstable quality: as just mentioned, it varies between a copy of the preceding vowel and a schwa. We suggest that Weak V-Epenthesis is rather the result of a terminal-feature spreading triggered by a low-level constraint, given below, which is optionally activated at the postlexical level.\(^{16}\)

\[(29)\]

\[ *kC, \; *hC, \text{ where } C \text{ is a voiced consonant (optionally activated).} \]

If V-spreading were not the result of such a constraint, that is if it were due to the mere presence of a velar or glottal, one would wonder why it does not occur in \(kC\) and \(hC\) sequences, where \(C\) is a voiceless consonant. Constraint (29) does not solve anything by itself: it simply identifies a sequence as ill-formed and triggers terminal-feature spreading from an adjacent vowel, to be discussed in more detail. A stronger objection to a velar-underspecification analysis lies in the fact that Choctaw also exhibits Strong V(vowel)-Epenthesis with V-spreading through an intervening glottal or coronal, as shown below. The infix \(-t\)-represents the medio-passive, and the infix \(-h\)-the completive h-grade.

\[(30)\]


\[ \begin{array}{ll}
\text{tak\d\i} & \text{'to tie'} \hspace{1cm} \text{medio-passive: tak\d\i} \rightarrow \text{talak\d\i} \\
\text{ho\d\i} & \text{'to drip'} \hspace{1cm} \text{medio-passive: ho\d\i} \rightarrow \text{holo\d\i} \\
\text{tak\d\i} & \text{'to tie'} \hspace{1cm} \text{h-grade: tak\d\i} \rightarrow \text{talak\d\i} \\
\text{ho\d\i} & \text{'to drip'} \hspace{1cm} \text{h-grade: ho\d\i} \rightarrow \text{hoh\d\i} \\
\end{array} \]

Unlike Weak V-Epenthesis, Strong V-Epenthesis is obligatory and involves a full vowel. The distinction between these two epentheses corresponds to that made by Levin (1987) between ex cresc ent and epenthetic vowels. Pitch-accent (high pitch being indicated by an accent in Choctaw) can be assigned to a vowel inserted by Strong V-Epenthesis, as shown for the h-grade tahak\d\i, hoh\d\i above, but not to a vowel inserted by Weak V-Epenthesis (C. Ulrich, personal communication). Strong epenthetic vowels are present in slow speech and are always indicated in linguistic sources whereas weak epenthetic vowels are not pronounced in slow speech and are usually omitted from the same sources. These three facts indicate that Strong V-Epenthesis takes place earlier than Weak V-Epenthesis. We suggest that Strong V-Epenthesis is triggered by the phonotactic constraints below.

\[(31)\]

\[ *hC_{1}C_{2}, \; *iC_{1}C_{2} \text{ except when } C_{1} = b \text{ and } C_{2} = l \]

These phonotactic constraints may follow from a more general constraint on the segmental content of onsets rather than a constraint on a purely linear segmental

---

\(^{16}\) Nicklas (1972) refers to weak epenthetic vowels as a release of \(k\) and \(h\), which could provide a phonetic alternative to the phonological analyses explored here.
node/Place-node-less in the same language whatever the underspecification framework adopted.

Let us examine the details of this proposal. The Choctaw vowel system can be expressed with at most one specified feature per vowel, and the redundancy rules below:

\[(33)\]

- High: [+low] \(\rightarrow\) [+back]  
- Back: [+high] \(\rightarrow\) [-low]  
- Low: [+low] \(\rightarrow\) [-high]  

The surface effect of spreading a full vowel can be obtained by spreading only one feature. 18 The Node Generation Convention in (8) generates the rest of the segmental structure after an X-slot is inserted. X-slot insertion and terminal-feature spreading take place only when they are triggered by a constraint violation. In (30), they apply because of the formation of a segmentally ill-formed triconsonantal cluster, while they apply in (28) because of the optionally activated low-level constraint in (29). Note that vowel terminal-feature spreading takes place through /h/ in (28) because of the accidental fact that constraint (29) bears on clusters beginning with one of these consonants. One could expect terminal-feature spreading through other consonant types if the constraint bore on clusters other than those beginning with /h/. Terminal-feature spreading, after X-slot insertion has taken place, is represented as follows. It can be observed that velar transparency (Oral-node/Place-node-lessness) is not required.

\[(34)\]

a. V-spreading:  

- Root node:
  - Supralaryngeal node:
  - Place node:
  - Oral node:
  - Dorsal:

b. Node Generation Convention:

- [hokili]
- [hokoli]

- Terminal F: [+back]  

- [hokoli]

One alternative to our proposal must be considered, however. As briefly suggested by Ulrich (1986: 159), the hypothesis may be entertained that the infixes consonants in (30) stand on a separate tier because of the Morphemic Tier Hypothesis, which requires that different morphemes occupy different segmental tiers, subsequently conflated by Tier Conflation (see for example McCarthy 1989: 72). V-spreading across the inserted coronal and glottal consonants in (30) would then be different from the V-spreading across underlying velar and glottal consonants in (28). Thus, true transparency to V-spreading would only be involved in the Weak V-epenthesis in (28), not in the Strong V-epenthesis in (30).

\[(35)\]

- a. V-spreading across tautomorphic consonants: [hokoli]
  - x x x x x x \(\rightarrow\) x x x x x x  
  - h o k o l i  

- b. V-spreading across heteromorphic consonants: [talukel]
  - x x x x x \(\rightarrow\) x x x x x x  
  - t a k ċ i t a k ċ i  

In this view, however, the phonotactic constraints in (31) cannot account for the inserted X-slot in (35b), since no segmentally ill-formed CCC sequence (that is no violation of [31]) is created before Tier Conflation applies. 19 To justify X-slot epenthesis, one would have to resort to a rule that systematically inserts an X-slot after the infixes -l and -h. The problem with this analysis is that X-slot epenthesis only applies with segmentally ill-formed triconsonantal clusters. When the infixes form a segmentally permitted triconsonantal cluster, as in (36a), or a two-consonant cluster, as in (36b), X-slot epenthesis does not

18. In a complex vowel system where each vowel consists of more than one underlying feature, we would rule out the option of spreading two or more features at the same time because this would undermine the standard claim, formulated in Clements (1985: 244), that several features cannot be spread together without spreading their superordinate class node. Thus, in a five-vowel system such as that of Fula and in a six-vowel system such as that of Gere, a full copied vowel cannot simply result from the propagation of a single terminal feature (see the discussion of terminal-feature and full-vowel spreading in section 2).

19. Adopting a CV skeleton such as that of Clements and Keyser (1983), one could think of analyzing the constraints in (31) as a simple prohibition of three skeletal C's, and saying that b/ is in fact a complex consonant. However, this would be incompatible with Ulrich (1987: 385), who shows that /b/ and /l/, when intervocally, always belong to different syllables. This leads us to analyze Cbl as a sequence of three independent consonants, which entails that Choctaw allows triconsonantal sequences, and that the focus of the constraints in (31) involve minor segmental features. A prosodic/syllabic account of V-epenthesis, that is an account not based on minor-segmental-feature visibility, would not account for the presence of Cbl sequences in the native vocabulary. It is also clear that these minor segmental features could not be visible if morphemes laid on distinct tiers.
apply, and there is thus no need for V-spreading. In (36c), it is shown that the
infix -l- is assimilated to the following consonant if that consonant is /h/ or /n/
but, here again, no X-slot is inserted.

(36)           infixation    surface    glosses
a. C-bl clusters (Ulrich 1986: 166):
tiloblih 'he jumped'   tilô-h-blih tilôblih 'he just jumped'
finiblih 'he splashed it'   fini-h-blih finiblih 'he just splashed it'
b. C-C clusters (Ulrich 1986: 133, 165):
abanih 'to barbecue'   a-i-banih abanih 'to be barbecued'
amoh 'to mow'    a-i-moh amoh 'to be mown'
famah 'he was whipped'   fâ-h-mah fâhmah 'he was just whipped'
talowah 'he sang'    talô-h-wah talôwah 'he just sang'
c. Assimilation with l-n and l-h clusters (Ulrich 1986: 133–135):
honih 'to boil'    ho-l-nih honih 'to be boiled'
tanah 'to weave'    ta-l-nah tanah 'to be woven'
ahamnihn 'to smear'    a-i-hamnhn ahamnhn 'to be smeared'

A rule such as the one below, which inserts an X-slot after the infixes -l- and -h-
only when they are followed by two consonants other than bl, would then have to be posited.

(37)   -h, -l-
|    |    |    |    |    |    |
Ø → X X X X
|    |    |
C C where CC is not bl

Such a morphophonological rule would be ad hoc because, as we have already
mentioned in note 17, it does not apply to other consonant infixes, and would
entail problematic minor-segmental-feature visibility between segments lying on
separate tiers, this in order to exclude bl. For these reasons, we reject this
alternative, that is we claim that terminal-feature spreading triggered by
segmental restrictions, not by the Morphemic Tier Hypothesis, is responsible for
the transparency of the infixed consonants to V-spreading in all cases discussed
above. In other words, we maintain that consonant structure — and, more
specifically, velar structure — is irrelevant to V-spreading in both the Weak and
Strong V-Epenthesis of Choctaw.

3.4. Luganda

Van der Hulst and Smith (1989, 1990) and van der Hulst (1991: 71) base an
argument for velar underspecification on Luganda, a Bantu language whose
segmental inventory is given below; parentheses indicate marginal phonemes.

(38) Vowel System:           i, u, e, o, a
Consonant System:     voiceless:  p, f, t, s, (ky), k
                     voiced:      (b), (b), v, m, d, z, n, l, z, gy, j, g, ñ, y, w.

Because it disallows closed syllables word-finally, Luganda nativizes English
C-final words by adding a final vowel. Katamba and Rottland (1987: 86) point
out that the epenthetic vowel is [i] if the final consonant is a labial (for example
English frame → Luganda fuleemu), and usually [i] if the final consonant is a
coronal (for example English carrot → Luganda kaloti). If the final consonant
is a velar, the inserted vowel is usually [a] (for example English tank →
Luganda tanka), but it can sometimes be another vowel, Van der Hulst and
Smith (1989, 1990) and van der Hulst (1991: 71) note a correlation between the
epenthetic vowel after a velar and the vowel before this velar: the epenthetic
vowel tends to be [e] or [i] if the preceding vowel is [back], and [a] if it is
[front]. They conclude, on the basis of such correlations, that velars are
transparent to vowels. The following list contains all known borrowings from
(British) English with a final velar.

(39) English                   Luganda
    spring       sprîngg            sepuliggi
    boarding     bordîgg (boarding school)
    week         wikî                 wikî
    domestic     domestik (as in domestic science)
    jug          dâggg                gyaaggy

20. Word-internally, only homorganic nasal–consonant clusters are allowed, and even these are
phonetically reinterpreted as prenasalized consonants, which entails that phonetic representations
contain only open syllables according to Katamba and Rottland (1987: 84).
21. In the Luganda word desire and subsequent similar words, we assume with van der Hulst and
Smith (1989, 1990) that [i] is inserted in sC clusters by a later rule because the inserted vowel
after C is identical to the vowel before s in several cases (but not always). Katamba and
Rottland (1987: 96) attribute this insertion to a rule inserting [i] in English sC and Cr clusters.
If [i] were inserted at the same time as, or earlier than, the postcluster vowel, any spreading
from the precluster vowel would be blocked by the intervening [i]. In a velar transparency
analysis, this ordering is necessary to account for the spreading of the a in fushita ‘flask’. Such
ordering is also necessary if terminal features of a are spread in this word, as we will suggest.
So it is possible to say that only lal spreads, but such a stance would be equivalent to the terminal-feature spreading which we advocate, and it would predict the possible transparency of all consonants, not just velars, since neither labials, dentals nor velars contain an lal component. As mentioned in (39) since coronals are fully specified for van der Hulst and Smith, third, there also are a number of consonal-final words, shown below, which are not followed by a regular [i], but by [a] or [e]:

<table>
<thead>
<tr>
<th>English</th>
<th>Luganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>pint</td>
<td>pay(inda)</td>
</tr>
<tr>
<td>teapot</td>
<td>tipota</td>
</tr>
<tr>
<td>post</td>
<td>poosita</td>
</tr>
<tr>
<td>record</td>
<td>likoda/leleka</td>
</tr>
<tr>
<td>second</td>
<td>sikonda</td>
</tr>
<tr>
<td>pound</td>
<td>pawaunda</td>
</tr>
<tr>
<td>card</td>
<td>kaada</td>
</tr>
<tr>
<td>rose</td>
<td>looza</td>
</tr>
<tr>
<td>cent</td>
<td>sense</td>
</tr>
<tr>
<td>commission</td>
<td>kaminsane</td>
</tr>
</tbody>
</table>

It can be observed that, except for English *commission* (which, for reasons unknown to us, has an additional *n* in Luganda), all the words insert [a] after a back vowel whereas [e] seems to be inserted after a front vowel (one case: *sense* ‘cent’). This shows that V-spreading can also go through a coronal or nasal, although this happens less frequently with coronals than with velars. This suggests that V-spreading here results in fact from terminal-feature spreading, since the same language cannot have two sets of Oral-node/Place-node-less consonants, that is velars and coronals, in the same syllabic positions. We will now show that terminal-feature spreading is independently observed in the regular phonology of Luganda.

Katamba (1984) analyzes a vowel harmony in Luganda verbs where height is involved; this harmony is productive and applies across all consonants. The applied extension suffix *-I* agrees in height with the verb stem vowel, as shown below:

<table>
<thead>
<tr>
<th>infinitive</th>
<th>applied</th>
<th>glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ku-simb-a</td>
<td>-simb-Il-a</td>
<td>‘to plant, plant for’</td>
</tr>
<tr>
<td>ku-fumb-a</td>
<td>-fumb-Il-a</td>
<td>‘to cook, cook for’</td>
</tr>
<tr>
<td>ku-lab-a</td>
<td>-lab-Il-a</td>
<td>‘to see, see for’</td>
</tr>
<tr>
<td>ku-tem-a</td>
<td>-tem-El-a</td>
<td>‘to cut, cut for’</td>
</tr>
<tr>
<td>ku-gob-a</td>
<td>-gob-El-a</td>
<td>‘to chase, chase for’</td>
</tr>
</tbody>
</table>

Let us consider the arguments in favor of terminal-feature spreading. First, there are exceptions such as some cases in (39) where the epenthetic vowel is not identical to the preceding vowel (for example bulooka ‘black’ and kyoka ‘chalk’), which is why we call the rule in (40) sporadic. Oral-node/Place-node-spreading would entail exact identity of the two vowels, which is not the case with these words. In a component-based theory, [a] and [e] share an lal component.

Van der Hulst and Smith (1989, 1990) argue that labials create [u], because they contain an lal component, and coronals create [i], because they contain an lal component (see note 8). In contrast, velars would be transparent to vowels in (39) because they lack place properties in their component-based theory, a claim which van der Hulst and Smith recognize as equivalent to velar Place-nodelessness. While we concede that there is a tendency for the final epenthetic vowel to be similar to the one preceding a velar, we suggest that these data cannot be the basis of a conclusive argument for velar underspecification. We will maintain instead that sporadic terminal-feature spreading of [back], illustrated below, is involved, not transconsonantal Oral-node/Place-node-spreading of a full vowel:

(41) Sporadic Terminal Feature Spreading in Luganda Loan-word Adaptation:
There are two height groups: non-mid (a, i, u) and mid (e, o). If the stem vowel is non-mid, the suffixal vowel is [i], and, if the stem vowel is mid, the suffixal vowel is [e]. Katamba (p. 267) notes that it “is sufficient to specify harmonizing vowels for backness” (for example: -ll applied is [−back]), and spread the height features of the stem vowel, a rule he formalizes using Greek letter variables. We do not attempt a reinterpretation of this rule, for doing so would necessitate decisions as to the underspecification of height features. The only essential point here is that the suffixal vowel must have its own invariable [−back] specification and receive only its height features from the preceding vowel, which excludes vowel Oral-node/Place-node spreading. This must be interpreted as partial V-spreading irrespective of one’s phonological model, including in a componential analysis, where a rule such as (43) would be necessary. In this rule, the suffixal vowel contains [i] and receives [i] from a preceding /e/ vowel, which is equivalent to spreading height features onto a vowel specified [−back].

While this height harmony is not responsible for the vowel alternations in loan-words — they need different rules since loan-words show mainly backness spreading while extension suffixes show height spreading — it nonetheless is symptomatic of the existence of productive terminal-feature spreading in the language and strengthens the plausibility that this mechanism is involved in loan phonology.

(43) \[
\begin{array}{c|c|c|c|c|c|c}
\text{Stem} & \text{Suffix} & \text{Stem} & \text{Suffix} \\
\hline
V & V & \rightarrow & V & V \\
\hline
\text{ší, úl} & \text{ší} & \text{ší, úl} & \text{ší} \\
\hline
\text{šal} & \text{šal} & \text{šal} & \text{šal} \\
\end{array}
\]

/e, ol/ \→ [e, o] [e]

To summarize, there are three reasons to doubt the claim that velar transparency to vowel Oral nodes/Place nodes is at work in Luganda loan-words: (i) the epenthetic vowel after velars is not always identical to the preceding vowel (for example: \text{chalk} \rightarrow \text{kyoka}), (ii) there also is V-spreading through coronals (for example: \text{card} \rightarrow \text{kakau}), and (iii) a productive height harmony in native verbs shows the independent existence of terminal-feature spreading. The study of loan-words is not an easy task since these necessarily form a special set (in the case at hand, a relatively small number of words; to our knowledge, we have exhausted the data available in the literature), which does not allow one to clearly evaluate the productivity of a process. Moreover, any argument based on loan adaptation runs into additional difficulties which ought to be addressed. For instance, the influence of a final English orthographic e could be invoked in words such as \text{cake} \rightarrow \text{keeki/keekte}, \text{brake} \rightarrow \text{buleeki/buleeke} and \text{cheque} \rightarrow \text{kypeeke}). A comprehensive study should also show that all relevant words were borrowed directly from the original English form and not from an already-modified Kiswahili version. In a discussion of Arabic, Hindustani and other loan-words in Luganda, Mosha (1971: 290) notes that “it is difficult — if not impossible — to establish whether a given loan-word in Luganda, which is not Bantu in origin but which has a corresponding form in Kiswahili, was borrowed directly from the source language into Luganda or indirectly from the source language through Kiswahili.”

Loan phonology is a valuable source of phonological information but its use is complex and should be accompanied by an examination of possible distorting factors. In the current state of our understanding of Luganda loan phonology, the difficulty of ruling out these factors renders this case less compelling than possible arguments based on internal evidence.

4. Conclusion

This paper was concerned with the possibility that Coronality may not be the only default articulator, a problem for the Weak Coronality Hypothesis in (1b), which states that Coronality is the universal default articulator. We have summarized all of the arguments in favor of velar place-feature underspecification (contra the Weak Coronality Hypothesis) and exhaustively reanalyzed those based on transparency to vowels, that is data from Chinook, Chocotaw and Luganda, in terms of terminal-feature or articulator spreading. Other arguments, which are sufficiently complex to warrant separate studies, have been addressed elsewhere. This is the case of Morpheme Structure Constraints, discussed at length in Paradis and Prunet (1993a), and velar nasals in in-coda position, a subject addressed in Paradis and Prunet (1991d, 1992, 1993b) and Rice (1991).

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