A Note on Velar Nasals: The Case of Uradhi

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1. Default Dorsal vs. Coronal Insertion
In the past few years, a number of articles have argued that the default articulator for consonants is Coronal (see, for example, Kiparsky 1985; Iverson and Kim 1987:187; Shaw 1988; Avery and Rice 1989; and the contributors to Paradis and Prunet 1991). Paradis and Prunet (1993b), with a view to strengthening and formalizing this proposal, have expressed the Weak Coronal Hypothesis (WCH) in (1).

(1) Weak Coronal Hypothesis:
There is only one universal default articulator, i.e., Coronal.2

Though there has been substantial evidence in favour of the WCH, this hypothesis faces a few problems. In some cases, the velar articulation has been

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2The WCH is to be distinguished from what Paradis and Prunet (1993b) call the Strong Coronal Hypothesis, which maintains that the Coronal articulator is universally absent from underlying representations unless it dominates a marked feature value.
claimed to act as a default articulation (see Paradis and Prunet 1993b for detailed discussion). However, most of these cases involve the velar nasal [ɣ] (or angra). Angra sometimes behaves as if its velar articulation were absent from underlying representation (UR) or as if it were the weakest of all nasal consonants. This fact has often been interpreted as indicating that velars in general lack place features in UR. The following list is representative of the most typical arguments found in the literature in favour of the placelessness status of velar nasals.3


b. Nasal consonants in coda position are often limited to consonants homorganic with the following consonant word-internally, or to a velar articulation word-finally (Creissels 1989:93; Goldsmith 1990:131; Yip 1991:69). Similarly, nasal vowels are sometimes followed by a weak nasal consonant homorganic with the following consonant word-internally, or by a weak velar articulation word-finally (see Durand 1988:31).


The velar nasals involved here are systematically located in coda position. Nonetheless, if they are indeed placeless in UR, the question arises as to how they receive their velar articulation during derivations, and how this can be reconciled with the evidence for a default Coronal articulation. One can posit that default rules are not universal (see Yip 1989:359 on consonants and Abaglo and Archangeli 1989 on vowels). Thus the default articulation would have to be parametrized, instead of being universal. Another answer, put forth in Trigo (1988:53) and to some extent in Czyżewska-Higgins (1992:146), consists in claims that default rules insert a Velar/Dorsal articulator in coda position, while retaining the WCH for consonants in onset position. One problem with this view is that there is evidence that the default Coronal articulation can be inserted also in coda position (see, for example, Davis 1991 and Yip 1991).

3Yip (1989:358) reports the case of velar nasals in Cambodian which behave as articulatorless consonants with respect to Morpheme Structure Constraints. However, the two examples she mentions, [kông] ‘goose’ and [kong] ‘bent’, as well as the other cases she refers to, can perhaps be viewed as cases of “fused” consonants, though she mentions that for some reason nasals with another articulation cannot co-occur with their homorganic stops. Other factors must be considered too, such as what combinations of consonants are actually complex segments. See also Paradis and Prunet (1993a) who question the very status of Morpheme Structure Constraints.

2. Velar Nasals in Urduhi

Urduhi has a rule inserting a segment at the end of the last word of an utterance when this word ends in a vowel. This epenthetic segment alternates between nasal and oral variants, under conditions to be discussed below. Trigo (1988:57–59) proposes an analysis of this segment based on a description in Hale (1976). Because Hale’s description is very condensed, we base our analysis on the more detailed descriptions in Crowley (1980) and especially Crowley (1983), which is a monograph-length description of three Urduhi dialects (Atampaya, Angkamuthi and Yadhaykenu).

The facts concerning the nasal variants of the epenthetic segment are described by Crowley (1983) as shown below. Note that all three dialects have identical vowel (a, i, u) and consonant inventories, and that the phoneme /ɣ/ does not appear word-finally (except when inserted by the rule which concerns us here). Unless stated otherwise, page numbers refer to Crowley (1983).

3 Insert a [ɣ] after a word-final [a] or [u]. Insert a fronted velar nasal [ɣˤ] after a word-final [i]. Data from Crowley (1980:243–244):

<table>
<thead>
<tr>
<th>UR</th>
<th>Utterance-internal</th>
<th>Utterance-final</th>
<th>Glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ama/</td>
<td>[ama]</td>
<td>[amaɣ]</td>
<td>person</td>
</tr>
<tr>
<td>/yuku/</td>
<td>[yuku]</td>
<td>[yukuɣ]</td>
<td>tree</td>
</tr>
<tr>
<td>/iwi/</td>
<td>[iwi]</td>
<td>[iwiɣˤ]</td>
<td>morning bird</td>
</tr>
</tbody>
</table>
Yadhaykenu (p. 329):
A word-final vowel V is pronounced either unchanged (i.e., V) or with an added [u] (i.e., V[u]). Data from Crowley (1980:249):

<table>
<thead>
<tr>
<th>UR</th>
<th>Utterance-final</th>
<th>Glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ama/</td>
<td>[ama]</td>
<td>[ama], [amaŋ] person</td>
</tr>
<tr>
<td>/yuku/</td>
<td>[yuku]</td>
<td>[yuku], [yukuŋ] tree</td>
</tr>
<tr>
<td>/ipi/</td>
<td>[ipi]</td>
<td>[ipi], [ipiŋ] water</td>
</tr>
</tbody>
</table>

Angkamuthi (p. 327):
A word-final vowel V is pronounced either unchanged (i.e., V), with an added [u] (i.e., V[u]) or nasalized (i.e., V). Data from Crowley (1980:252):

<table>
<thead>
<tr>
<th>UR</th>
<th>Utterance-final</th>
<th>Glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ama/</td>
<td>[ama]</td>
<td>[ama], [amaŋ], [ama] person</td>
</tr>
<tr>
<td>/yuku/</td>
<td>[yuku]</td>
<td>[yuku], [yukuŋ], [yukū] tree</td>
</tr>
<tr>
<td>/ipi/</td>
<td>[ipi]</td>
<td>[ipi], [ipiŋ], [ipi] water</td>
</tr>
</tbody>
</table>

Crowley concludes that the inserted segment is nasal, not oral, since it can be nasal whether or not the first preceding consonant is nasal, while the oral variant can show up only when the first preceding consonant is oral. Crowley reports that this distribution is not limited to epenthetic nasals: as shown in (4), if the preceding onset consonant is oral, a final nasal, be it epenthetic or underlying, can be optionally denasalized.4

(4) Atampaaya/Angkamuthi (p. 329):
A final nasal consonant is realized optionally as its oral counterpart when the consonant to the left is oral, e.g., an underlying /n/ can be realized as [t], and an inserted /ŋ/ can be realized as [k].

- underlying nasal after oral C:
  /atin/ → [atin], [atit] cover-PAST
- underlying nasal after nasal C:
  /aŋan/ → [aŋan], *[aŋat] dig-PAST
- inserted nasal after oral C:
  /luwu/ → [luwuŋ], [luwuk] stonebird
- inserted nasal after nasal C:
  /ama/ → [ama], [amaŋ], *[amak] person

Because of the oral variant distribution just mentioned and because of the fact that underlying nasals can also have oral variants, as shown in (4), we follow Crowley in concluding that the oral allophones in (3) and (4) are due to a denasalization process, not a nasalization one.5

The velarity of the inserted nasal is problematic because underived word-final consonants in Uradhe are strictly limited to coronals: dental, alveolar, palatal nasals and the liquid l (Crowley 1983:321). Given this, it is, for one thing, unlikely that a language would insert a word-final velar consonant in spite of the fact that it normally has no word-final velars. For another thing, the fact that the epenthetic nasal can be realized on the preceding vowel (e.g., /ama/ → [ama] in Angkamuthi) indicates that the epenthetic nasal does not always acquire an articulator of its own, namely a Dorsal one.

We suggest that the inserted segment is in fact a placeless nasal consonant, i.e., a consonant lacking a Place Node (PN). For greater clarity, we assume in this article a simple feature geometry, represented in (5), where articulators are directly attached to the PN (Sagey 1986) and the binary feature [nasal], to the Root Node (Piggott 1987).6

The inserted nasal is noted N in all three dialects but there is a small difference in the exact form of the UR. In Atampaaya, this PN-less nasal has a skeletal slot, i.e., it is an anchored consonant, while in Angkamuthi and Yadhaykenu the PN-less nasal can also be floating, i.e., without a skeletal slot (6).

4Our position contrasts with that of Trigo (1988:58), who suggests that the inserted segment is an oral one, actually a glottal stop which velarizes because Uradhe does not have phonemic glottal stops.

5However, nothing particular in our analysis hinges on this choice. Our analysis could also work with more complex and more recent feature-geometry models like that of McCarthy (1991), for instance. In such a model, PN-less nasals would be interpreted as ON-less ones (see Paradis and Prunet 1993b).
Atampaya seems to be the more conservative dialect, with a skeletally anchored consonant only, while Angkamuthi and Yadhaykenu are more innovative and have, in addition, a floating variant of this epenthetic consonant. The situation is similar to that found in the history of French, where final nasals went from full consonants (/bon/ 'good') to floating ones (/bo^n/ → /bɔ̃/), with presumably also a time when both representations were found in the language (on French floating nasals, see, for example, Prunet 1986:227, 1992:53; Piggott 1987:230; Durand 1988:35; Encrévé 1988:207; Paradis and El Fenne 1992:126; LaCharité and Paradis 1993:140; and Paradis 1993a:27–28).

There are two ways (at least) to treat a floating nasal: i) the Catalan solution, where the whole segment is deleted when it is not in onset position, i.e., in liaison context (e.g., [bon amik] 'good-MASC. friend' / [bo] 'good-MASC.'); Joan Mascaro (personal communication; see also Wheeler 1979:271), for example, and the (Northern) French solution, where the [+nasal] feature docks onto the preceding vowel (e.g., [bonam] 'good-MASC. friend' / [bɔ̃] 'good-MASC.'); When faced with their floating nasal, Angkamuthi and Yadhaykenu both optionally use the Catalan solution, i.e., deletion of the floating nasal, but only Angkamuthi also uses the French solution, i.e., nasalization of the preceding vowel. Note that, in Catalan and French, the difference correlates with the independent absence/presence of nasal vowels but this does not seem to be the case in Urdhī, where the vowel inventories are the same, i.e., phonemic vowels are oral in the three dialects.

The Catalan solution is straightforward since it results in complete deletion of the floating nasal. Consider now the (Northern) French solution, which is two-fold: first, [+nasal] links to the previous vowel RN, (7a), resulting in the licensing of part of the PN-less segment, and, second, the remaining unlicensed structure is deleted, (7b).

(7) Vowel Nasalization in Angkamuthi: e.g., /yuku-N/ → [yukĩ] ‘tree’

   a. [+nasal] licensing (spreading)

   b. Deletion of the remaining structure

   Consider now the epenthetic nasal in Atampaya, which is, in contrast with the epenthetic nasal in Angkamuthi and Yadhaykenu, always anchored, i.e., non-floating. Since this nasal is licensed, i.e., it has a skeletal slot, it is not subject to deletion. We suggest that the missing PN of this nasal is provided by the preceding vowel, which spreads its Dorsal articulator to the PN-less nasal.

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7It could also be the case that the resulting nasal vowel has two root nodes, i.e., that deletion in (7b) does not apply. This alternative would have no special bearing on our analysis.
The Dorsal articulator spreading in (8) explains why final nasals are often limited to the velar articulation, a situation which Durand (1988:31) documents for Southern French, a dialect in which nasal vowels have diphthongal properties. The vowel part is invariably nasal, e.g., [aŋ] or [aŋ]. As for the nasal consonant part, which is less prominent than the vowel part, it is velar word-finally (e.g., [lap] lent ‘slow’, [bou] bon ‘good’) and homorganic with the following consonant word-innernally (e.g., [lamp] lampe ‘lamp’, [lantco] leteur ‘slowness’, [bang] banque ‘bank’). There are no nasal vowels preceding a vowel (*Vv and *VV). That the velarity of the floating nasal is derived, not underlying, is shown by pairs such as [savan] savon ‘soap’ vs. [savon] savonner ‘to soap up’, where the nasal surfaces as a dental in onset position. The same distribution of nasal articulations — velar word-finally and homorganic before a consonant — is reported by Creissels (1989:96) in several Manding languages such as Gambia Mandinka, by Goldsmith (1990:131) in Selayarese, and by Yip (1991:69) in Japanese (see also Laa 1984:48 for articulatorless homorganic nasals in Kannada). These facts can be analyzed as in (8): word-innernally the PN-less nasal normally acquires its articulator by anchoring to the following consonant, but word-finally it acquires it by spreading from the preceding vowel.

However, attributing the velarization of final nasals to the spreading of the vowel Dorsal articulator raises three questions: i) do all vowels have a Dorsal articulator in UR and/or at the surface, as we assume here? ii) why do the Dorsal-dependent vowel features not colour the velar nasal (or do they sometimes)? and iii) since vowels can have other articulators, can these other articulators ever spread?

First, some researchers, such as Clements (1993) and Lahiri and Evers (1991), claim that [−back] vowels have a Coronal node while [+round] vowels have a Labial node. As far as we can see, these analyses would be compatible with the assumption made here that vowels may have two articulators, one of which is always a Dorsal articulator. In a detailed overview of existing harmony systems, Shaw (1991:129) notes that there are few or no known dorsal consonant harmonies whereas coronal and labial consonant harmonies are commonplace. She argues (p. 139) that this gap follows if it is assumed that vowels always have a Dorsal articulator: the presence of intervening vowel Dorsal articulators between velars would prevent the possibility of dorsal harmonies. In the case ofUrdu, one must also recall that the utterance-final conditioning of the nasal insertion rule indicates that it is postlexical. At such a late stage, it is likely that all vowels have received a Dorsal articulator by a redundancy rule if they did not already have one in UR.

Second, if the vowel Dorsal articulator spreads, why is the velar nasal not coloured by the vowel’s Dorsal-dependent features, i.e., [back], [low] and [front]?
Third, as vowels may have more than one articulator, why would spreading always involve the Dorsal articulator? In fact, other vowel articulators can and do spread, so that Dorsal spreading is by no means universal. One such case is the Fula yi, ye and wo, vu word-initial sequences caused by leftward nucleus-to-onset spreading of vowel coronal or labial articulators, documented by Paradis (1987, 1992, 1993b). A second case can be seen in French, where a latent m, as in [parfem] ‘perfume’/ [parfyme] parfum ‘to perfume’, can only be preceded by a round vowel, and a latent n, as in [pén] peint ‘(the) paints’/ [pén] peint ‘(the) paint’, can only be preceded by a front vowel. This restriction is straightforwardly captured if these latent m and n share the Labial or coronal articulator of the preceding vowel. A third case is Japanese, where Yip (1991:69) shows that an articulatorless nasal can acquire one or all of the articulators of the following vowel and become a nasalized high version of it. Thus, [ho:N] ‘book’ can yield [ho:i] ‘need book’, [ho:u] ‘book-DIRECT OBJECT’ or [ho:i] ‘book exists’.

3. Conclusion
In this article, we have maintained that placeless nasals acquire a velar articulation from the Dorsal articulator of the preceding vowel. The fact that the alleged PN-less velars always show up after a vowel supports a Dorsal articulator spreading account rather than an analysis involving a Dorsal default rule or a strictly phonetic solution involving velum movement. Even though the claim that all vowels possess or acquire a Dorsal articulator remains to be more thoroughly justified and although we do not account here for the fact that spreading in Urduhi is limited to Dorsal, as opposed to coronal or labial, the analysis we offer makes clear predictions: an underlying PN-less consonant should not surface as a velar between two non-velar consonants or after a non-velar consonant word-finally. Such a fact would clearly falsify our hypothesis by showing that Dorsal is obtained by a default insertion rule (as opposed to a spreading process) or by a purely phonetic mechanism (e.g., velum movement). We are not aware of the existence of such cases, though it is clear that much of the phonology of velar nasals has yet to be uncovered and understood.

8This situation, which is construed as a “constraint conflict” by the authors, is solved by means of a scale called the Phonological Level Hierarchy, which determines priority among conflicting constraints (see also Paradis 1988a, 1988b; and Paradis and LaCharité 1993). In brief, this scale establishes that segment licensing or articulator filling is more important than the terminal-feature readjustments

9The Dorsal spreading analysis we advocate here differs from the [+back] spreading Trigo (1988:55) briefly considers before opting (p. 88) for a default rule inserting [+back]. In our analysis, it is argued that all vowels have a Dorsal articulator, which accounts for the fact that a velar nasal in Urduhi is generated after all types of vowels. This contrasts with Trigo’s analysis which seems to imply that backness is shared by all vowels, which cannot be the case.
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