Default Variability: The Coronal-Velar Relationship

Keren Rice
University of Toronto

Given a theory incorporating hierarchical feature structure and underspecification, the question arises of just how a given representation can be interpreted phonetically. Two extremes are possible: one could argue that when a segment is not specified for a particular realization of an organizing node such as Place, any feature could be filled in as a default realization for that node, depending on the language. Alternatively, one could argue that the only features that can be absent from an underlying representation are those that are universally unmarked, and thus that only a single default interpretation is possible for any particular configuration universally. The first of these theories, where any feature could be filled in as default realization, predicts essentially unlimited variation in default between languages, while the second predicts no variation between languages. In this paper I propose that the relationship between an underspecified phonological representation and a phonetic representation is not totally fixed, as the second alternative might suggest, nor is it completely free, as the first would allow: some variability in the interpretation of a unspecified organizing node is possible, but that variability is of a highly limited nature.

In work on SV (Sonorant or Spontaneous Voice), Rice & Avery 1989 and Piggott 1992 argue that SV, which replaces [sonorant], can be realized variably, either as a nasal if the default feature Nasal is filled in or as a voiced obstruent, if the default feature fails to fill in. This analysis is motivated by different types of phenomena. The absence of Nasal underlyingly is argued for on the basis of the fact that nasals assimilate to manner qualities of other sonorants. The relationship between the representations of nasals and voiced obstruents is argued for on the basis of the fact that many languages show variation between voiced obstruents and nasals, either conditioned or unconditioned, and that languages that appear to lack nasals have voiced obstruents that function as sonorants in the system. Rice & Avery 1989 and Rice 1993 propose that nasals and voiced obstruents may have the same representation underlyingly, with a bare SV node being realized as voicing.

While this analysis is intriguing, it raises many questions about SV. Rice & Avery 1989, 1991a argue that SV is an organizing node, parallel to the better known Place node. However, there appears to be a major difference between the SV and Place nodes, namely that SV is phonetically interpretable as voicing while Place has been regarded as strictly classificatory. If SV is the only organizing node that itself can receive a phonetic interpretation, then it appears that phonetic interpretation of organizing nodes is probably not a step in the right direction.

In this paper I examine the structure of Place, arguing that it must be regarded as parallel to SV: in a representation where Place has no dependent either the universally unmarked feature can be filled in, in which case a coronal segment, the place of articulation that is generally considered to be unmarked, arises, or, in apparently rarer instances, the unmarked feature fails to be filled in, requiring that the realization of the segment be through interpretation of the inherent content of the Place node itself.

The specific area that I examine concerns the relationship between coronal and velar consonants. Phonological processes, synchronic and diachronic, are frequently found that

* Earlier versions of this paper were presented at the Montreal-Ottawa-Toronto Phonology Workshop and in colloquia at MIT and the University of British Columbia. I would like to thank Peter Avery, Carole Paradis, Glyne Piggott, Jean-Francois Prunet, and Moira Yip for their help and advice. The members of the phonology reading group, Elan Dresher, Carrie Dyck, Mirco Ghini, Philip Hamilton, Rachel Walker, and Yuwen Wu have also given me extensive and useful comments. Work on this paper was partially supported by SSHRCC research grant 410-92-0885.
involve coronals and velars to the exclusion of labials. I argue that this relationship is best accounted for in the following way. First, the place of articulation that is labelled Dorsal within feature geometry tradition (e.g. Sagey 1986, McCarthy 1988, Clements 1990) must be represented in two ways: these consonants may have the representation of what is generally thought to be a dorsal, with a Dorsal node as a dependent of the Place node, or they may be represented without a specification under the Place node, a representation often thought to be assigned underlyingly to coronals (see, for example, papers in Paradis & Prunet 1991b). I differentiate these types by calling the one with structure below the Place node ‘dorsal’ and that without such structure ‘velar.’ Second, coronals and velars frequently have identical underlying representations. Finally, the difference between coronals and velars is a consequence of whether the Coronal default rule applies or not. Thus, I argue that at an underlying level the coronals and velars under discussion are the same thing, a Place node without a dependent. A coronal results when a bare Place node receives the default feature Coronal while a velar results when a bare Place node does not receive a default feature and is itself phonetically interpreted; what I call velars thus result from the absence of features at the surface rather than from the presence of features.

I thus claim that variation must be accounted for by a different mechanism than those normally thought to be part of phonological theory. In addition to representational means (constituency) and rules to account for variation, the interpretation of organizing nodes is required to account for types of alternations. Different realizations of an underspecified structure thus do not involve different default rules applying at a node, but simply implementation or failure of implementation of a single universally available default feature.

The paper makes two basic contributions; first, it offers a new account of how variability can arise from a single underlying representation, while allowing the maintenance of the assumption that markedness is directly encoded in representations, and second, it proposes a different perspective of organizing nodes, suggesting that they themselves serve not just an organizational function but are phonetically interpretable.

I begin with theoretical preliminaries (section 1) and then survey the evidence that both Coronal and Dorsal can function as if they were absent underlyingly (section 2). I then turn to the account that I propose and evidence for this hypothesis (section 3 through 5). Section 6 examines possible alternative hypotheses. Section 7 surveys a number of implications of the analysis proposed.

1. Background assumptions
1.1 Feature organization

I assume that features are part of a hierarchical structure, as argued in Clements 1985, Sagey 1986, McCarthy 1988, and many other sources. In detail, I follow the proposal of Rice & Avery (1991a, b), where the structure is universally fixed as in (1).
The Air Flow node is proposed in Rice & Avery (1991a, b) as the superordinate node dominating stricture features, and is not relevant to this paper. SV (Sonorant or Spontaneous Voice, Avery & Rice 1989, Rice & Avery 1989, 1991a, Piggott 1992, Rice 1993) replaces the feature [sonorant]. It serves as the superordinate node for the sonorant features, indicates voicing in sonorants, and may indicate voicing in obstruents as well; see Rice & Avery 1989, Rice 1993. The Root, Laryngeal, and Place nodes are roughly equivalent to those cited in the literature. However, while the Place dependents, Labial, Coronal, Dorsal, and Pharyngeal, are generally displayed in a fan-type structure (e.g. Sagey 1986, McCarthy 1988, Hume 1992, etc.), I suggest, following Avery & Rice 1989, that binary branching exists within this node, and that the highest division is between Coronal and non-coronal, or Peripheral; this node itself divides into Labial and Dorsal. Evidence for this organization is discussed in section 6.

1.2 Organizing vs. content nodes

Following Avery & Rice 1989, I assume that two major node types exist, organizing nodes and content nodes. The organizing nodes, Root, Laryngeal, Air Flow, SV, and Place, define major constituents. In addition, I argue that they can be interpreted phonetically if no dependent is provided. The second set of nodes are content nodes, which serve to further define the organizing nodes. They include Labial, Coronal, and Dorsal at the Place node; Nasal and Lateral (and perhaps others, see Rice & Avery 1991a, b) at the SV node; and so on.

1.3 Markedness

I assume, following Kaye, Lowenstamm, & Vergnaud 1985, van der Hulst 1989, and others that markedness relations are encoded directly in segmental representations, with universal markedness conditions guaranteeing that unmarked content features are generally absent from underlying representation. This is indicated in (1) through the use of parentheses, which enclose the unmarked content feature at a particular node. The universally unmarked Place dependent is Coronal and the unmarked SV dependent Nasal. Generally, these unmarked features are absent in underlying representation and are supplied by default rules. See Avery & Rice 1989 and Rice & Avery 1989 for discussion of cases where the unmarked value is present underlyingly; see also section 7.

While unmarked features are generally absent from underlying representation, organizing nodes are present underlyingly if they define a property inherent in a segment. For instance, a nasal consonant does not usually have the feature Nasal present underlyingly, but it does have the organizing node SV, which defines it as a sonorant. A coronal consonant usually is missing the feature Coronal, but the node Place is present nevertheless, indicating that it has a place of articulation. A coronal nasal has, in the unmarked case, the structure in (2), with Laryngeal and Air Flow structure omitted.

\[ \begin{array}{c}
\text{Root} \\
\text{SV Place}
\end{array} \]

1.4 Rules

I assume that the phonology is restricted to a small set of operations, of which only spreading is important for this paper. The basic assumptions regarding spreading are summarized in (3).

(3) a. Spreading can occur only if a structural target is present.
    b. A feature or node can spread only to an empty position.
These restrictions on spreading disallow node generation by spreading and rule out cases of spreading triggering delinking; in other words, only structure-building, not structure-changing, rules are allowed. See Mascaro 1987, Avery & Rice 1989, and others.

2. The coronal-velar connection: exemplification

In this section I examine a range of languages in order to establish that coronals and velars have a privileged relationship. First, coronals and velars have both been argued to be underspecified, lacking a Place dependent underlyingly. In this sense, they bear a special relationship: the other Place dependents (Labial, Pharyngeal) have not been argued to be absent at any level to my knowledge. Second, and more importantly, coronals may become velars, either shifting to velars historically or alternating synchronically with velars, often under dissimilatory conditions. In this sense, coronals and velars bear a special relationship in that coronals can shift to velars but not shift to other places of articulation. In this section I present a number of examples substantiating the above claims.

2.1 Coronal as underspecified Place

Many arguments have been advanced for treating coronal consonants as lacking a Place dependent underlyingly, with the unmarked feature Coronal inserted by a default rule; see, for instance, Kiparsky 1985, Paradis & Prunet 1989, Avery & Rice 1989, and many of the articles in Paradis & Prunet 1991b for discussion. Avery & Rice 1989 and Cho 1988, 1991 argue that the Place node has no Coronal dependent in a range of languages based on asymmetries in assimilation between coronals and other places of articulation: they fail to spread their place of articulation and they constitute preferred targets for place assimilation. Shaw 1991 uses coronal harmony evidence to argue a similar point. Yip 1991 argues from coda and cluster conditions for the lack of specification of place of coronals. Paradis & Prunet 1989 examine coronal transparency to vowel harmony processes. In the following section, I summarize some of the assimilation and distributional evidence that argue for Coronal being the unmarked Place dependent.

2.1.1 Assimilation

A major argument that coronals lack a Place dependent comes from their assimilatory patterning: a segment may be coronal when final and prevocalic, but take on the place of articulation of an adjacent consonant. This is shown in (4) for Ponapean (Rehg & Sohl 1981) and in (5) for Korean (Cho 1988).

(4) Ponapean
underlying phonetic
nan-par na[m]par ‘trade wind season’
nan-puɡara na[m’p]uɡara ‘between them’
nan-sed na[n]sed ‘ocean’
nan-kep na[nk]ep ‘inlet’
kisin pakas kisi[m p]akas ‘small species of fish’
tihn kidi tihn [k]idi ‘bone of a dog’

(5) Korean
han-kaŋ h[anɡ]kaŋ ‘the Han river’
han-ben ha[mb]en ‘once’
pat-ko pa[kk]o ‘to receive’
kotpalo ko[p]alo ‘straight’

While coronals assimilate to labial and dorsal places of articulation, the reverse is not true: labials and dorsals do not assimilate to coronals, as in (6). In Ponapean, labial-coronal and dorsal-coronal clusters do not occur but such clusters that arise through morpheme
concatenation are broken up by epenthesis (6a); in Korean, no assimilation happens in these clusters and the distinct places of articulation are maintained (6b).

(6a) Ponapean
tep-tep --> tepetep
  *teptep, *tettet  'cut'
tik-tik --> tikitik
  *tiktk, *titit   'small, little, young'

(6b) Korean
papto --> papto
  *patto        'rice also' (Iverson & Kim: 1987:186)
kapto --> kando
  *kando        'robber' (Iverson & Kim: 1987:186)

Based on such asymmetries, it has been argued that (a) coronals lack a Place node underlyingly and (b) Coronal is a default feature that is inserted to interpret a bare Place node. In lacking a Place dependent, coronals can serve as targets for spreading rules; they do not trigger spreading rules as they have nothing to spread. The hypothesized underlying structure for a coronal consonant is as in (7), with irrelevant structure omitted.

(7) Root
   |
   Place

The Coronal default rule is given in (8).

(8) Place
    :
    Coronal

This rule provides the feature Coronal if a Place node has no content feature beneath it.

2.1.2 Distribution

Distributional evidence lends support to the claim that Coronal is the unmarked place. First, if a language has a single nasal consonant, that consonant is coronal. See Maddieson 1984 for discussion. In addition, with a single exception, the languages in Maddieson’s survey include a coronal stop, either alveolar or dental. Under the assumption that frequency of distribution bears a relationship to markedness (e.g. Kean 1975, Paradis & Prunet 1991c), the frequency of coronals lends support to the claim that it is the unmarked place of articulation.

Second, in several languages, consonants in rhymal position are restricted to the coronal place of articulation. The Athapaskan language of Koyukon offers one case (Thompson 1977, Axelrod 1990). While both /m/ and /n/ occur in Koyukon, only /n/ is allowed in syllable-finally. Finnish is like Koyukon: while both /m/ and /n/ occur in the language, only the coronal can appear in rhymal position (e.g. Yip 1991). Based on the assumption that neutralization positions such as rhymal position are more likely to house unmarked than marked segments, the fact that coronal is the place of articulation found in positions with restrictions on them suggests that Coronal is the unmarked place feature. See Yip 1991, Rice 1992a for additional discussion.

2.2 Velar as unspecified place

While arguments that Coronal is unmarked are common, it is not the only Place dependent that has been proposed to be absent underlyingly. Trigo 1988 argues that placeless consonants receive a default feature Dorsal rather than Coronal when they fall in coda position (1988:53). Williamson 1977, Kaye, Lowenstamm, & Vergnaud 1989, Harris 1990, and others argue for the underlying placelessness of velars as well. In favor of this hypothesis, Trigo presents evidence that dorsals may fail to spread their place feature when coronals and labials do, they may constitute preferred targets of place
assimilation, they may fail to block assimilation, and they may behave as though the OCP applies to them and laryngeals together. I concentrate on evidence that velars are assimilation targets; see Paradis & Prunet 1991a for reanalysis of the other types of evidence given by Trigo.

Trigo argues that while Coronal is the default feature in onset position, in rhymal position, the default feature inserted on a bare place node is Dorsal. In the terms that I have been using, this consonant has the representation in (9).

(9) 
\[ \text{Root} \]
\[ \text{Place} \]

This representation is precisely that proposed for the coronal consonant in (7). The default rule that operates in rhymal position is different, as given in (10).

(10) 
\[ \text{Place} \]
\[ \text{Dorsal} \]

A single default feature for place of articulation is not available under this theory; it is instead determined by prosodic factors.

2.2.1 Assimilation

The assimilation arguments given for the absence of Dorsal parallel those given for the absence of Coronal. Velars, like coronals, can assimilate to the place of articulation of a following segment. (11) illustrates this in Japanese\(^1\)\(^2\) (data from Vance 1987) and (12) in Selayarese (data from Mithun & Basri 1986).

(11) Japanese (Vance 1987)

hoN mo
hoN ni
hoN ka

ho[m] mo
ho[n] ni
ho[n] ka

‘book’
‘book too’
‘in book’
‘book?’

(12) Selayarese (Mithun & Basri 1986)

pekaŋ
soroŋ
janaŋ
keloŋ

peka[m]pekaŋ
soro[n]soroŋ
jana[ŋ]janaŋ
kelo[ŋ]keloŋ

‘hook’
‘push’
‘loose’
’sing’

---

\(^1\) I have eliminated some details of Vance’s representations that are not relevant. These include nasalization of a vowel preceding a nasal consonant, consonant length, and lack of release of the nasal N. I use the symbol N employed by Vance to represent the underlying nasal. This is commonly assumed to be a velar nasal; see Vance 1987.

\(^2\) While the assimilation facts in (11) suggest that the velar nasal lacks a place dependent in Japanese, when stops are considered, it is the coronal stop that appears to be unspecified for place. The data in (i) are taken from Itô 1986:153.

(i) bet-kaku \[ \rightarrow \] bekkaku
bet-puu \[ \rightarrow \] beppuu
cf. sek-tan \[ \rightarrow \] sekitan

‘different style’
‘separate cover’
‘coal’

\(/k/\) fails to assimilate to a following consonant, rather it triggers epenthesis. Assimilation in stops provides standard evidence that Coronal is absent in stops. An account relying on prosodic facts alone to determine whether Coronal or Dorsal is inserted is thus insufficient since both default features occur in the same position in a single language.
Midi French (Paradis & Prunet 1992, based on Durand 1988) is another language where the default realization of a consonant is velar. In this French dialect, the creation of a nasalized vowel from a word-final vowel-nasal sequence is not found, as is common in other French dialects. Rather a nasal consonant surfaces. This nasal is homorganic to a following consonant if there is one (13a); word-finally it is velar (13b). The nasal is coronal when it is prevocalic (13c).

(13) a. ba[n]ka
    la[m]pə
    la[n]tәr
    'bank'
    'lamp'
    'slowness'

b. bɔ[y]
    savɔ[y]
    la[y]
    'good (masculine)'
    'soap'
    'slow'
    cf. bɔ (standard French)
    cf. savɔ (standard French)
    cf. lә (standard French)

c. savɔ[n]e
    'to soap up'

In Japanese, Selayarese, and Midi French, the consonant that serves as target for assimilation surfaces as a velar rather than as a coronal, at least in rhymal position. The velar consonant thus patterns as if it were unspecified for place features just as the coronal consonant in the languages discussed in section 2.1 patterns as if it were not specified for place features.

2.2.2 Distribution
Just as distributional evidence lends support to the hypothesis that Coronal is the unmarked place of articulation, similar evidence can be adduced for Dorsal as the unmarked place of articulation hypothesis. In languages like Japanese and Selayarese, there exist severe restrictions on place of articulation of consonants allowed in rhymal position: the velar nasal appears, suggesting its unmarked status.3

In summary, both coronal and velar have been argued to have the same underlying representation based on evidence from distribution and assimilation.

3. A proposal
A paradoxical situation appears to exist: evidence from alternations and distribution suggest that coronals are the least specified consonants and equally suggests that dorsals are the least specified consonants. While one could account for the patterning of two places of articulation as underspecified by relaxing the requirement that markedness is part of the underlying representation, essentially the solution of Trigo 1988, following Archangeli & Pulleyblank 1986, this solution has disadvantages. First, while both Coronal and Dorsal could function as default features, no evidence has been offered for Labial as a default feature. The absence of Labial is arbitrary in an account that abandons markedness.

Second, patterns exist under which only a single default feature, either Coronal or Dorsal, is available. While languages which allow only a single place of articulation in a particular position may choose either Coronal or Dorsal, as in Selayarese and Japanese, this is not true of languages which allow more than one place of articulation in a position. For instance, in languages with the inventory types found in Ponapean and Korean, namely a labial, a single coronal, and a dorsal, only the coronal patterns as if it were underspecified. (Chukchee, as analyzed by Kenstowicz 1986, is the only exception that I have found to this pattern). If either Place dependent could be absent, one would expect to find languages with a three way place contrast in a position in which dorsals patterned as if they were underspecified as well as those in which coronals patterned as if they were underspecified.

Third, in languages in which contrastive coronal places of articulation are found, only dorsals function as if they were unspecified for place of articulation. Again, in a

3 The first half of a geminate is also allowed, as is a glottal stop, in Selayarese. See section 7.3
theory that allows either Coronal or Dorsal to be unspecified, no account of this patterning is available. Such languages are discussed in some detail in section 7.2.

Several reasons exist then for rejecting the hypothesis that either Coronal or Dorsal can serve as default features: it predicts language types that do not appear to exist and it offers no account of why only coronals and dorsals pattern as if they were underspecified, to the exclusion of labials. In the sections that follow, I would like to offer an alternative account. The general proposal that I make is as follows. At an organizing node which has no content dependent in its underlying representation, three possibilities exist for realizing that organizing node. These are:

(14) (i) default fill-in of the unmarked feature
(ii) failure of fill-in of the unmarked feature, with interpretation of the node
(iii) acquisition of a feature by assimilation to an adjacent node

As this hypothesis allows for variation in the realization of a node arising not through the insertion of different default features but through either insertion or lack thereof of a single default feature, I term it ‘default variability.’ With respect to the Place node, under the default variability hypothesis, there is not Dorsal default rule. Velars arise by alternative (ii), the interpretation of the Place node, and coronals by alternative (i), fill in of the unmarked feature Coronal. I focus on alternatives (i) and (ii). Under this hypothesis, the underlying and surface representations of coronals and velars are as given in (15).

(15) underlying coronal/velar  surface coronal  surface velar  underlying/surface dorsal

\[
\text{Root} \\
\text{Place} \\
\text{Coronal}
\]

\[
\text{Root} \\
\text{Place} \\
\text{Peripheral}
\]

\[
\text{Root} \\
\text{Place} \\
\text{Dorsal}
\]

This hypothesis makes predictions regarding the patterning of coronals and velars. In addition to finding that both coronals and velars can pattern as if they were underspecified, as discussed in section 2, it predicts that (a) coronals might switch in place of articulation to velars if the Coronal default rule failed to apply, (b) velars might switch in place of articulation to coronals if the Coronal default rule began to apply, and (c) coronals and velars might pattern together to the exclusion of labials. Strong evidence exists for predictions (a) and (c), and it is this evidence that I turn to next.

4. Phonetic preliminaries

While the focus of this paper is on phonological evidence for the interpretation of the Place node, a brief foray into articulatory evidence for this position is revealing. The articulation of the Japanese nasal (11) has received considerable attention in the Japanese phonetics literature; see Vance 1987:35ff for a summary of the descriptions. The articulation of this consonant in prepausal position is of interest here. The consonant is described as velar or uvular in place, with an oral closure that may not be complete. This nasal is sometimes described as being pronounced with the tongue in its ‘neutral state.’ Vance makes the suggestion that the tongue position is neutral with respect to the articulatory setting for Japanese. The description of the consonant as having no Place features of its own thus seems particularly appropriate. As Yip 1991:69 points out, with no following context, the realization of this consonant is indeterminate.
Phonetic evidence thus suggests that the so-called velar nasal is simply a bare Place node, which is realized as a neutral setting for the language, somewhere near the back of the mouth. This is summarized in (16).

(16) A Place node which is not specified for a particular place of articulation is realized as a sound produced with the tongue in the ‘neutral state,’ which involves a back of the mouth articulation.

Basically, a consonant with a bare Place node must be articulated in the mouth, unlike a laryngeal, but the tongue is in neutral or rest position, raised near the back of the mouth.

An important question that arises from this analysis concerns the relationship between the dorsal consonant and the consonant that I am calling velar, the consonant with just a Place node. Trigo 1988, referring to work by Ohala 1975, states that the distinction between a dorsal and anusvāra (e.g. Japanese N) is acoustically minimal because the acoustic pattern of the dorsal nasal is more like that of a nasalized vowel than is that of any other nasal consonant. As Trigo discusses (p. 190), if Ohala is correct, then it would be easy to transcribe a dorsal nasal for what should be anusvara. Nasals transcribed as dorsal in languages such as Selayarrese and Mid French may in fact be closer articulatorily to the Japanese nasal than the transcription suggests; their phonology certainly suggests that they are velar in my terms rather than dorsal.

As we will see, not only velar nasals arise through the failure of the Coronal default rule to apply; velar stops are also possible. While velar nasals seem to be reported more frequently than velar stops, this may be a result of interpretation of the Place node being more common in rhymal position than elsewhere in the word; nasals are more common in this position than are stops. I am not aware of the kind of detailed phonetic studies on stops that have been done on nasals; it is possible that closer analysis will show that the kind of variation in articulation found in nasals is also present in stops. In nasals, in any case, the articulatory evidence suggests that a neutral setting, realized in the back of the mouth, is a possibility and acoustic evidence indicates a strong acoustic similarity between dorsals and these consonants with neutral articulation, the velars.

5. Coronal to velar shifts

With these phonetic remarks, I am now ready to turn to the predictions made by the default variability hypothesis. One prediction is that coronals and velars show an intimate relationship. In this section I present evidence for this claim: in many languages coronals shift to velars. I outline two types of shifts, spontaneous shifts in place of articulation from coronal to velar and conditioned changes of coronals to velars.

5.1 Spontaneous shifts

In some languages, coronals shift to velars without any apparent conditioning. These shifts may be restricted to rhymal position or may occur regardless of prosodic position. In this section, I examine a number of languages in which coronal consonants have been replaced by velar consonants. In the first group of languages presented, labials are included in the inventory, while in the second group labials are absent.

5.1.1 Chinese

Chinese offers an example in which coronals and dorsals merged at one stage in the historical development of some dialects. Chen 1973, in a study of the development of Chinese final consonants, shows that Middle Chinese had three final nasals, a labial /m/, a coronal /n/, and a dorsal /ŋ/. In the Chaozhou dialect, the coronal merged with the dorsal nasal, with the result being a two nasal system, a labial and a dorsal.

Chinese also provides an example of a shift from a coronal place of articulation to a velar place of articulation in stops. Middle Chinese morphemes could end in /p/, /t/, or /k/. Again in the Chaozhou dialect, /t/ and /k/ merged, yielding a /p k/ system.
I assume the representations in (17) for the Middle Chinese consonants.

(17) labial coronal dorsal
    Root
    Place Peripheral

In Middle Chinese, the Coronal default rule applied, producing a surface labial, coronal, dorsal system. In Chaozhou, I suggest that the Coronal default rule ceased to apply, and the underlyingly placeless consonant was implemented as a velar. This produced a consonant that was very similar acoustically to the dorsal, leading to the merger of these places of articulation.

In Chaozhou, while coronals and dorsals merged, labials remained unaffected. The exclusion of labials is accounted for directly by the default variability hypothesis: they are excluded because they have a unique representation, with a specified Place dependent.

In some Chinese dialects (Fuzhou for stops, Wenzhou, Taoyuan, Shanghai, Fuzhou for nasals), complete neutralization of place of articulation occurred, with a velar resulting. In these dialects complete debuccalization, or loss of remaining Place dependents occurred.\(^4\)

The basic analysis of Chaozhou is summarized in (18).

(18) The Coronal default rule fails to apply in rhymal position, and the Place node is interpreted directly, as a velar.
    The acoustic similarity of the velar and the original dorsal causes them to merge, resulting in the underlying velar representation (i.e. no Place dependent).

5.1.2 Spanish

While the velarization process in Chaozhou is diachronic, some languages have such processes synchronically. Some Spanish dialects offer an example. Trigo 1988 argues that in some dialects underlying coronal nasals surface as velars, as in (19).

(19) a. /tren/ --> [treq] 'train'
b. /desden/ --> desden --> [desden] 'disdain'

Trigo attributes the change in place of articulation to a coronalization process which delinks Coronal from the nasal, followed by a velarization process which inserts Dorsal in rhymal position. Further evidence for coronalization is provided in (19b), which illustrates coronalization of a palatal nasal followed by velarization. Velarization thus involves debuccalization followed by the insertion of the default velar feature.

In addition to the coronal/velar consonant that can occur in rhymal position, labials are found in this position. Trigo points out that in Spanish dialects exhibiting velarization, dentals and palatals regularly surface as velars, but labials do not: ‘only coronal nasals undergo velarization with any degree of regularity’ (1988:78). Labials coronalize and

\(^4\) In some Chinese dialects, labials shifted to coronals, with velars unaffected. See Chen 1973. In most of these dialects, shifts of dorsal to dental also occur under some conditions (following certain vowels); see Zee 1985 for discussion. These cases require further analysis, and do not clearly form counterexamples to the claim that I make that labial to coronal shifts do not occur unless dorsals (if present) also shift to coronal.
velarize only optionally, only in the speech of some individuals, and only in fast speech. As instance of labial velarization is shown in (20).

(20) /album/ -- > [album]                ‘album’
     [album], [albug] (fast speech)

In the account that I have suggested, the exclusion of labials receives an explanation: they have a different representation from coronal/velars. The shift from coronal to velar comes about through the failure of the Coronal default rule to apply (i.e. by doing nothing); for labials to velarize debuccalization must apply. Trigo’s explanation, that in rhymal position the feature Coronal delinks followed by insertion of Dorsal, allows no account of the asymmetric patterning of the labials: it must be stipulated in the grammar that coronals undergo delinking to the exclusion of labials.

The Spanish palatals complicate the situation slightly over that in Chinese. I assume, following Avery & Rice 1989 and Hume 1992 that palatals can be represented as having no Coronal node, but a secondary place of articulation that creates the palatality. Palatals thus have a primary articulation identical to that of coronals, and the failure of the Coronal default rule to apply accounts for the velarization of both coronals and palatals directly.

5.1.3 Vietnamese

Vietnamese is another language of this type. While northern Vietnamese dialects allow coronal consonants in rhymal position, this is not generally true in southern Vietnamese dialects: in the south, velars are found instead. This is illustrated in (21). All data is from Thompson 1965:82-85.

(21) Hanoi (north)              Hue (south)
    biet    biak                    ‘know’
    mot    mok                     ‘one’
    lwât  luâk                   ‘law’
    khen  kheêg                  ‘commend’
    ɳon    ɳog                   ‘tasty’
    xwân  xuãng                  ‘spring (season)’

While labials also occur rhymally, as in (22), they do not shift.

(22) Hanoi          Hue
    tiêt    tîp                  ‘continue’ (83)
    tim kiem    tim kiim        ‘to search’

I offer the now familiar account: the Coronal default rule fails to apply in rhymal position, resulting in a surface velar.

5.1.4 Hawaiian

Hawaiian is perhaps the best known language with a /t/ to /k/ shift. Hawaiian had a consonant system with a /p t k/ opposition historically. However, the synchronic inventory reported by Elbert & Pukui 1979 is as in (23), where *k shifted to glottal stop and *t to /l/.

(23) p  k ?
    m n
    w l h

---

5 The coronals remain after the front vowels /i, e/
What triggers the initial shift from /k/ to glottal stop shift is not clear; see Trigo 1988 for discussion of similar cases. Elbert & Pukui report that glottal stop and [k] alternate in some words in some dialects. Variation between velars and laryngeals (x-h, k-h) is common. In the Ni’ihau dialect, some variation is reported between [t] and [k] (see Elbert & Pukui:24), suggesting that this shift may not be complete.

Again, I propose the following account: the coronal default rule ceased to apply, yielding a velar. In this case, unlike in the languages discussed so far, no merger between velars and dorsals occurred as the dorsals had earlier shifted to glottal stops.

5.1.5 Samoan


(24)  p  t  q  f  s  m  n  g  v  l

Neffgen reports that ‘in a few places in Samoa’ [t] is not found, but in place of [t] a sound ‘resembling’ [k] occurs. He says that [k] is not present otherwise except in words of foreign origin. The use of the word ‘resembling’ in this quotation is interesting, perhaps providing some evidence that the [k]’s in question are not identical in articulation to those that Neffgen was more familiar with.

Finegan & Besnier 1989:82 state that words may have two forms, casual and formal. Basically, the casual alternant has dentals where the formal alternant has velars, as illustrated in (25).

(25) casual  formal
    teine  keihe  ‘girl’
    tatu  kakou  ‘us all’
    nofo  nofo  ‘to stay’
    tañata  kañaka  ‘man’

Labials are not reported to shift, providing evidence of the closeness of the coronal-velar relationship.

If coronals/velars have the same representation underlingly, the shift can be accounted for: the Coronal default rule fails to apply. Labials escape the shift as they have a specified Place dependent in their representation.

5.1.6 Leuangiua

The Polynesian language of Leuangiua also has undergone a coronal to velar shift. Lanyon-Orgill 1944 presents the following consonant inventory for Leuangiua.

(26)  p  k  q  f  s  m  h  v  l

Lanyon-Orgill points out that historically, the consonant system contained coronal consonants, with /k/ shifting to glottal stop initially and medially (it was lost word-finally) and /t/ shifting to /k/ initially and medially (it too was lost finally). No velar nasal is reconstructed historically; the coronal nasal shifted to velar place of articulation. Again, the account offered above holds: the Coronal default rule ceased to apply, creating a velar.
5.1.7 German

In the Riparian area and some of the northern part of the Moselle Franconian area of Germany, a velarization process occurred, with dental stops and nasals shifting to velar place of articulation, as in the following examples. (See Kuepper 1992, Newton 1990.)

(27) tsikt --> tsik  ‘time’
li:dan --> liga  ‘suffer’
vijn --> vij  ‘wine’
hunt --> huŋk  ‘dog’
braun --> bruŋ  ‘brown’
neun --> nūŋ  ‘nine’

While it has been suggested that this shift takes place only following a high vowel (e.g. McCawley 1967, references in Kuepper 1992), Kuepper, based on work by Heinrichs (1970:45) reports that in some dialect areas the change is independent of the quality of the preceding vowel (although examples are not provided). The account already given is again appropriate: coronals switch to velars due to the failure of the Coronal default rule. Only coronals are reported as shifting; labials never do.

5.1.8 Chipewyan

The languages examined so far have inventories with labials. The next set of languages also illustrate coronal to velar shifts, but in these languages, labials are absent from the inventory so that the asymmetric patterning of labials cannot be illustrated. Nevertheless, the shift of a plain coronal to a velar is systematic, and appears to require the account provided so far.

In some dialects of Chipewyan, an Athapaskan language of Canada, /t/, a voiceless aspirated stop, shifts to [k]. (See Haas 1968, Rice 1978, Cook 1990 for discussion.) The following forms show the type of variation that results from this shift.

(28) standard  shifted

tu  ku  ‘water’
ten  kan  ‘ice’
satá  saká  ‘my father’
yáti  yáki  ‘s/he speaks’

Rice 1978 reports some variation between [l] and [k] within a single speaker. Cook 1990 points out that in the speech of middle-aged and younger speakers in Fond du Lac, Saskatchewan and Snowdrift, Northwest Territories, [t] does not exist, having merged with [k]. However, [t] is heard in the community in the speech of older speakers.

Only the dental stop in Chipewyan shifts to a velar. Chipewyan has a large number of distinctive places of articulation, including several coronal places of articulation, and yet only plain coronals shift to velars.6

This shift can be accounted for given the following representations.

---

6 The other dental stops, a voiceless unaspirated stop and a glottalized stop, do not shift in place of articulation.
For some speakers, the Coronal default rule applies, yielding a coronal consonant. For others, this default rule fails to apply or applies variably, resulting in a velar. The similarity or merger of the velar with the dorsal results from their shared acoustic features.

Chipewyan is missing a parallel labial obstruct, and thus the failure of the rule to affect labials is not an issue here.

5.1.9 Apache

Apache, another Athapaskan language, is reported to exhibit a coronal to velar shift in some dialects. In White Mountain Apache, the shift is sporadic, restricted to certain lexical items, and occurs only stem-finally. Hill 1963:150-151 reports the correspondences in (30) between White Mountain Apache and San Carlos Apache. The only syllable-final stops in Apache are voiceless unaspirated, represented by the symbols /d/, /dz/, /ʃ/, and /ɡ/.

(30) San Carlos  White Mountain
jád  jag  'leg'
lid  lig  'to burn'
dzid  dzig  'to fear'
zid  zig  'spit'
ziid  zig  'work'

Kiowa Apache also exhibits a coronal to velar shift. Bittle 1963:77 shows the inventory of Kiowa as having a gap in the coronal inventory: no [t] is present. However, [k] is found where [t] is expected, as can be seen in the following language comparisons.

(31) Kiowa Apache  cf. Navajo (Young & Morgan 1980)
kóó  tó  'water'
ka-tʃ‘í  tázhi  'turkey'

/t/ in the related Navajo words is reported as being heavily velarized by Young & Morgan 1980. It is possible that the reason that just /t/ shifts to [k] but that /d/ and /ʃ/, the other dentals, do not is a consequence of this velarization. As in Chipewyan, while /t/ shifts to [k], no other changes in place of articulation are recorded.

Apache receives a similar account to Chipewyan, except that in White Mountain the change is restricted to rhymal position: the failure of the Coronal default rule to operate produces a velar consonant.

5.1.11 Summary

Before turning to evidence based on coronal/velar alternations, I summarize the distributional properties observed to this point. In all cases, the languages have a labial, coronal, and dorsal contrast or a coronal and dorsal contrast. Coronals become velar, likely merging with the dorsals due to acoustic similarity. When the Coronal default rule fails to apply, the resulting system resembles one with dorsal underspecification. In languages with labials, these consonants are systematically excluded from the place shifts.
5.2 Evidence from phonological processes

In the languages discussed so far, velars take the place of coronals in the inventory, at least in rhymal position, with the shift from coronal to velar being unconditioned. In the following examples, rule-governed alternations between coronal and velar consonants are found, with coronals becoming velars under phonologically well-defined conditions.

5.2.1 Irish

I will begin with an odd case, one which deserves mention but for which I will offer no particular account. In Irish /d/ lenites to a voiced velar continuant and /t/ lenites to [h], a consonant which Ni Chiosáin 1991 suggests should be represented at an intermediate stage as [x], which then becomes [h]. The primary shift involved in lenition is one of continuity. However, in the lenition environment, a coronal consonant is not allowed, but rather a velar arises. Data is from Kelly 1989.

(32) plain lenition environment
    [t{\text{gem}}] ‘I understand’ [n{\text{hugem}}] ‘I do not understand’ (Kelly:6)
    [d{\text{unemid}}] ‘we close (present)’ [y{\text{unemir}}] ‘we closed (past)’ (Kelly:6)

See Kelly 1989 and Ni Chiosain 1991 for detailed discussion of Irish. I suggest that in the lenition environment the Coronal default rule cannot apply (although I have no account for this), and thus the velar results through interpretation of the bare Place node.

5.2.2 Coronal dissimilations

I now turn to discussion of a relatively common situation in which coronals shift to velars. These cases involve dissimilatory environments, with coronals becoming velars in the environment of following coronals. The basic analysis that I propose is as follows. In a particular domain defined for each language (e.g. onset, syllable, rhyme-onset), the Coronal default rule fails to apply if it would produce a coronal-coronal sequence and a velar-coronal sequence is instead realized.

5.2.2.1 Hare (Slave, Athapaskan)

Hare, a dialect of the Athapaskan language Slave, shows variation between [t] and [k] and [t′] and [k′] when a front vowel follows (Rice 1989:34). Examples are given in (33).

(33) coronal velar
    l{\text{eh}}[t′]é l{\text{eh}}[k′]é ‘bread’
    [t{\text{jinahs}}] [k{\text{jinahs}}] ‘orphan’
    [t{\text{e}}]é [k′]ere ‘mat’
    [t{\text{e}}ṣisi] [k′]eṣisi ‘girl’
    [t{\text{e}}ṣisi] [k′]eṣisi ‘snowstorm’

A single speaker may use both the coronal and the velar form, with the velar form being more common in fast speech.

I propose the following analysis. Coronal consonants and front vowels form a natural class which is captured by the feature Coronal (Clements 1990, Hume 1992). Coronal is absent from the consonants in question underlyingly. Whether it is present or not on the front vowels underlyingly is not clear; if it is absent, I suggest that default rules apply from the nucleus out. Thus, the following representation arises:
Two choices are available: the Coronal default rule may apply, producing the forms in the first column of (33), or it may fail to apply, yielding the forms in the second column. The failure of application of the default rule may be attributed to the Obligatory Contour Principle and antigemination constraints (McCarthy 1986): the OCP disallows adjacent coronals, while antigemination rules out a geminate structure. If antigemination constraints hold, an obvious alternative is to leave the Place node empty, creating a velar.  

This analysis is summarized in (35).

(35)  
a. The feature Coronal is absent on the coronal consonants underlyingly.  
b. This feature is either present on front vowels, or is filled in first on nuclei.  
c. The insertion of Coronal on the consonant would produce an OCP/antigemination violation.  
d. The Place node is interpreted.

5.2.2.2 Cayuga  

In one dialect of the Iroquoian language Cayuga, a /t/ to [k] shift is found in a restricted environment, with /t/ realized as [k] before /y/. Data is from Dyck 1990.

(36)  
ty --> ky:  
     ak-a[t]-ahöʔháʔ?  'I have washed my ears'  
ak-a[k]-yatóʔháʔ?  'I have washed my body'

The account proposed for Hare basically holds of Cayuga as well. Dyck 1990 analyzes consonant-glide sequences in Cayuga as monosegmental. Assuming a Clements/Hume type of representation, such consonants have a representation as in (37).

(37)  
Root  
\ C-Place  
\ \ V-Place  
\ \ \ Coronal

The presence of Coronal under V-Place in the glide portion of the consonant may be either underlying or derived, an issue of no consequence here. In Cayuga, segments with a secondary articulation cannot have a shared place of articulation between the primary and secondary places, and thus Coronal fails to fill in under C-Place. This account is summarized in (38).

---

7 This antigemination constraint is obviously not hard and fast, since [t]'s are found as well as [k]'s. If this analysis is correct, it suggests that in relatively fast speech constraints such as antigemination may hold that do not hold of normal speech.
(38) a. The feature Coronal is absent on the coronal consonants underlyingly.
b. This feature is either present on the glide portion of the consonant, or is filled in first on this portion.
c. The insertion of Coronal under C-place would produce an OCP/antigemination violation.
d. The Place node is interpreted.

Hare and Cayuga differ largely in that in Hare the domain of the OCP is a syllable, while in Cayuga it is a segment.

5.2.2.3 Romance
In the development of Romance, a similar process of coronal dissimilation occurs.
The chart in (27) illustrates the various intrusive stops found in two consonant clusters.

(39)  C2       r       l
  C1  s       s[t]r   s[k]l
  z       z[d]r   --
  m       m[b]r   m[b]l
  n       n[d]r   g[g]l
  l       l[d]r   --

The intrusive stop is labial if the first consonant is labial (mr, ml). The important cases for
the argument here involve clusters with initial coronals. The intrusive consonant is coronal
if the first consonant is coronal and the second is /t/ (sr, zr, nr, lr), a segment that does not
pattern as a coronal (see, for example, Borowsky 1986). However, when a coronal is
followed by a coronal (the lateral; sl, nl), then the intrusive stop is a velar.

I propose the following analysis. The features of the first consonant are not
relevant, and I ignore them. If the second consonant is noncoronal (r), then the epenthetic
consonant is coronal; if it is coronal (l) then the epenthetic consonant is velar. These
sequences have the representations in (40), with the difference between /t/ and /l/
characterized as presence versus absence of a Place node; see Rice & Avery 1991 for some
discussion.

(40)  coronal-r cluster         coronal-l cluster
      s epenthetic r               s epenthetic l
      Root Root Root
      Place Place Place

I assume that when the Coronal default rule applies, it inserts Coronal on /l/. As /t/ lacks a
Place node, it is not subject to this default rule. At this point, Coronal can be inserted on
the epenthetic consonant before /t/ without producing adjacent like places of articulation,
while the insertion of Coronal on the consonant preceding /l/ would produce like places of
articulation. Assuming that homorganic clusters are disallowed in an onset, the OCP and
antigemination constraints bar the insertion of Coronal on the epenthetic consonant. It
appears that such constraints hold of an onset, assuming that in [mbr] clusters and the like
the first two consonants are heterosyllabic. This analysis is summarized in (41).
(41) a. Coronal is absent underlyingly.
b. /I/ has a Place node, while /I/ does not.
c. Coronal fills in from the nucleus out.
d. Coronal fails to fill in on the epenthetic consonant before the /I/ as it would produce an OCP/antigemination violation, with homorganic place in the onset.

5.2.2.4 Dakota

In Dakota, a Siouan language, a coronal dissimilation process is found, by which a coronal is realized as a velar when preceding a coronal. The following data is from the Teton dialect of Dakota. See Shaw 1976, 1985 for details.

(42) /sut/ *sutšúta suksúta ‘to be strong’ (1985:184)
/žat/ *žatžáta žagžáta ‘to be curved’
/teč/ *tečteča tekteča ‘to be new’
/čeč/ *čeččeča čekččeča ‘to look like’
/nin/ *ninččina nignčina ‘very’

It appears that in Dakota homorganic rhyme-onset sequences are not allowed on the domain at which reduplication takes place. This is shown by the coronal data above and is reinforced by the existence of a degemination process in the language. In at least dorsal-dorsal sequences, degemination is found.

(43) kʰak-kʰak --> kʰakʰâka ‘rattle (Shaw 1985:185)
xux-xux --> xuxúya ‘thunder, be broken’

While Shaw gives no examples of labial sequences, her remarks suggest that they are treated like the dorsal sequences, undergoing degemination. The analysis that I propose is summarized in (44).

(44) a. Coronal consonants lack a Place dependent underlyingly. The palatals have the type of representation illustrated in (37), with a secondary articulation.
b. Within the domain in which reduplication applies, rhyme-onset sequences must have distinct places of articulation.
c. The Coronal default rule inserts Coronal on the second (onset) consonant first.
d. The Coronal default rule fails to affect the first (rhymal) consonant, so as to meet the condition in (b).

Place  Place
    |     Coronal

8 When a coronal precedes a non-coronal, the first lenites to [I]. In clusters of a coronal followed by a non-homorganic consonant, no changes in place or manner of articulation are found.
c. Degemination applies to consonants with specified places of articulation so as to meet the condition in (b).

\[
\begin{array}{c c c c c c c}
\text{Root} & \text{Root} \\
\text{Place} & \text{Place} \\
\text{Peripheral} & \text{Peripheral} \\
\text{Dorsal} & \text{Dorsal} \\
\end{array}
\]

The different patterning of coronals from the other places of articulation is accounted for under the default variability hypothesis. Underlyingly placeless consonants are the only ones that may be realized as coronals or velars: with these there exists a choice as to whether to fill in Coronal or not. Underlying Dorsal sequences do not show dissimilation because the consonants have specified Place structure, and no choice is available. To avoid homorganic sequences, an alternative strategy, degemination, is appealed to.

5.2.2.5 Chukchee

Coronal dissimilation is also found in Chukchee, with /y/, a coronal continuant, becoming /ʔ/ , a velar continuant, before a coronal. This is illustrated in (45). All data is from Odden 1988, based on Kenstowicz 1986.

(45) a. w'e[y]-ak  ‘grass’
    w'e[y]-ti  ‘grasses’
    w'a[y]-ran  ‘grass house’
    b. ča[y]  ‘tea’
    ča[y]-nalk-ək  ‘to make tea’
    c. qe[y]-we  ‘correct’
    qe[y]-lənanyet  ‘truth’
    d. qe[y]-seq  ‘nestling’
    qal[y]-yaʔyaq  ‘young seagull’

Chukchee receives a similar analysis to Dakota with respect to these facts: rhyme-onset coronal sequences are not allowed. Thus, a coronal continuant appears to become a velar continuant preceding a coronal because the Coronal default rule fails to affect the first (rhymal) consonant.

Other homorganic sequences are allowed in Chukchee, unlike in Dakota (Kenstowicz 1986:83). Dissimilation is not possible (without debuccalization) since both consonants in these sequences have content beneath the Place node. Dakota and Chukchee appear to differ in the following way. In Dakota, sequences of like place of articulation are not allowed: they are blocked by doing nothing (failing to fill in Coronal) or by doing something (degemination). In Chukchee, on the other hand, sequences of like place of articulation cannot be created. The Coronal default rule fails to apply, but nothing active occurs to destroy sequences of like places of articulation created through morpheme concatenation.9 While beyond the scope of this paper, I suspect that the third possible type of language, one in which non-coronals degeminate and the Coronal default rule applies, allowing only coronal geminates, does not exist.

---

9 The facts are more complex. A Y-Y sequence results in ky, which is perhaps a single segment. Kenstowicz was unable to find examples of y-k, but interprets the absence of discussion in his sources as evidence of their existence. Kenstowicz does not report on labial sequences.
5.3 Review

In this section, I surveyed cases in which coronal consonants become velar, either spontaneously or in phonologically conditioned environments. Based on this survey, several observations can be made concerning the coronal-velar relationship. These are summarized in (46).

    b. Unidirectionality: The coronal-velar relationship appears to be unidirectional, with coronals become velar. Changes in the reverse direction do not seem to be found unless labials also become coronal.\(^\text{10}\)
    c. Labial exclusion: Labials do not appear to enter into a privileged relationship with coronals.
    d. Underspecification: Both coronals and velars can pattern as if they were underspecified.

I have suggested that these observations receive an account under the default variability hypothesis, namely that coronals and velars are identical in representation underlyingly. Either the Coronal default rule may apply, creating a coronal consonant, or it may fail to apply, creating a velar consonant. The failure of Coronal to be inserted may either be unconditioned, prosodically conditioned, or segmentally conditioned.

In the discussion, I suggested that the hypothesis developed by Trigo 1988 which allows for the insertion of either Coronals or Dorsals\(^\text{11}\) does not account for the observations in (46). In the following section, I outline an alternative hypothesis that may have occurred to the reader, that the coronal-velar relationship is to be accounted for not by assigning them the same representation but by assigning these places of articulation to a single constituent. This hypothesis, though initially appealing, creates other problems and must, I argue, be rejected in favor of the proposed default variability hypothesis.

6. Hierarchy within place of articulation

In (1), I assumed that the primary split at the Place node is between coronals and peripherals. One might consider an alternative hypothesis for the coronal-velar connection, that the Place node has internal structure that groups coronals and dorsals together. It has been assumed that phonological relationships between features are best captured by

\(^{10}\) Given the proposal that coronals and velars have the same underlying representation, differing on the surface by whether or not the Coronal default rule applies, one might expect that a velar could become a coronal if a default rule that originally failed to apply began to apply. I have not found any examples of this sort, but this may be because the examples that I am aware of deal with languages where there has been a general movement towards simplicity of structure; see sections 7.3 and 7.4. While some cases appear to be velar to coronal, in fact this is not true. For example, in Basque (Hualde 1991:83), stem-final dorsals become coronal when they precede a derivational morpheme.

\(^{11}\) Trigo 1988 actually argues that Dorsal insertion is found in rhymes and Coronal insertion in onsets. While many languages show asymmetries between onsets and rhymes in terms of whether a coronal or velar is realized (e.g. Japanese, Midi French), both coronals and velars do appear in rhymes (see section 3), and thus Trigo’s hypothesis reduces to one in which any feature can serve as a default.
constituency (e.g. Clements 1985, McCarthy 1988); thus it is worth pursuing whether a
gometric relationship might account for the relationship between coronals and velars.

One might propose a node which groups together the tongue body place of
articulations of coronal and dorsal, a node that can be termed Lingual. Such a hypothesis is
made by Clements & Hume 1992, and is formalized in the structure in (47).

(47) Place
     \_/                      
   Labial  Lingual
       \_/                   
   Dorsal  Coronal

If a Lingual node is allowed, the absence of labials from the alternations is not surprising as
they do not form a close constituent with tongue body features. Under this hypothesis, the
Lingual node could be present on the underspecified consonants in rhymal position. The
fact that they are realized as coronal or velar to the exclusion of labial follows: labial is
unavailable as it is not a Lingual dependent. The fact that coronals alternate with velars and
not with labials also receives an account; this is a consequence of the fact that coronal and
velar consonants share a constituent to the exclusion of labials.

This hypothesis is not without problems, however. As observed in section 2, the
coronal-velar relationship is unidirectional: coronals shift to velars but not vice versa. This
does not follow from the geometry in (31); one might expect shifts in either direction.
Thus, the problem remains that sometimes Coronal is filled in as the default value and
sometimes Dorsal is filled in. However, at least labial exclusion receives an account.

This hypothesis encounters an additional problem that is more troublesome. While it
can explain the relationship between coronals and velars, it offers no account of the close
relationship that exists between dorsals and labials, a relationship captured through the
Peripheral node in (1). Several sources of evidence are available for a Peripheral node; I
outline some here.

First consider assimilation in Korean. Coronal consonants assimilate to all places
of articulation, as in (5). However, further assimilation is found: labials assimilate to
dorsals, as in (48). Data is taken from Cho 1988 and Iverson & Kim 1987.

(48) ap + ko --> a[kk]o      ‘carry (person) on the back and …’
kam + ki --> ka[ŋk]i       ‘a cold’
kukmul --> ku[ŋm]ul       ‘liquid part of soup’

In Romanian, Latin /kt/ shifted to /pt/ and /ks/ to /(p)s/, as in (49). See Sala

(49) Latin          Romanian
     la[k]tem      la[p]te            ‘milk’
     no[k]tem      noa[p]te
     pe[k]tus      pie[p]t

Proto-Algonquian *p shifted to Arapaho /k/, along with a general loss of *k. Some
examples from Goddard 1974 are given in (50).

(50) Proto-Algonquian  Arapaho
    *paśipahw    koxukohy       ‘stab’ (107)
    *keʔta:piči  čéto:küθ          ‘big tooth, canine tooth’ (111)

In some Australian languages, phonotactic patterns can be interpreted as supporting
a peripheral constituent. Certain phonotactic positions are restricted to labial and dorsal
consonants, to the exclusion of coronals, both apical and laminal. See Hamilton 1993 for
detailed discussion. If Labial and Dorsal form a constituent, this phonotactic pattern
receives an explanation: only peripherals are allowed in this position. 12

Several arguments for a peripheral constituent are also found based on consonant-
vowel interactions. Hyman 1973 argues based on evidence from Fe’Fe’ Barnileke that
labials and velars form a natural class. Similar arguments can be adduced based on facts
from Danish and West Saxon. See Cho 1991 and references therein for details.

These are the sorts of evidence that suggest the feature [grave] or Peripheral: labials
and dorsals may pattern together to the exclusion of coronals. If a Peripheral node is
present, as in (1), the affinity of labials and velars receives an explanation.

It is impossible to capture the labial-dorsal relationship and the coronal-velar
relationship both in a binary branching tree: these consonants cannot be equally close to
labials and coronals. 13 A flat tree, on the other hand, offers no account of why there is not
a special relationship between labials and coronals: it predicts all three place of articulations
should be equally related. The geometry hypothesis thus cannot account for both
relationships simultaneously. Thus while the geometric approach to accounting for the
coronal/velar interactions is appealing, it fails when the full range of interactions between
the dependents of Place of articulation are taken into account.

7. Choosing the strategy: Coronal default or interpretation of Place?

I have suggested that whether the default Coronal rule applies or not is a fact of a
particular language, unrelated to the system of the language, and provides a means by
which variation can arise from a single underlying representation. In this section I argue
that the choice of strategy, Coronal insertion or interpretation of Place, is not entirely
random. There exist well-defined circumstances under which Coronal cannot be inserted.
These are of three types: the OCP and antigemination constraints may block the insertion of
Coronal, Coronal is not inserted if this would trigger neutralization with an underlying
coronal consonant, and, in languages where rhymal consonants are highly restricted,
Coronal insertion is often blocked. When these factors are taken into account, cases remain
in which either Coronal default may apply or the Place node may be interpreted. These, I
suggest, represent true language variation, but variation of a limited kind: the only places of
articulation that can arise from this representation are Coronal or velar.

7.1 OCP/antigemination constraints

One factor involved in determining whether the default Coronal rule applies or not
was seen in Hare, Cayuga, Dakota, Chukchee, and Romance. In these cases, it was
suggested that the OCP prevented Coronal from being filled in, with default interpretation
occurring just in case a coronal-coronal sequence would arise within a particular domain.
The default variability hypothesis provides a motivated account of these cases.

7.2 Contrasts within coronals

So far, I have assumed that Coronal is universally absent underlingly, arising only
by default. This is, however, an oversimplification. As argued in Avery & Rice 1989,
there are circumstances under which Coronal must be present underlingly. It is present if
underlying place of articulation contrasts exist within the coronal place of articulation. For
instance if a language has distinct dental and a retroflex coronals, Avery & Rice 1989 argue

---

12 Hamilton 1993, in a discussion of a number of Australian languages, shows that phonotactic patterns
cannot necessarily be accounted for by constituency, as in some languages, labials, dorsals, and laminals
can occur in particular positions to the exclusion of apicals. However, considering just the languages in
which labials and velars do occur to the exclusion of all coronals, some evidence for Peripheral exists.

13 Anderson & Ewen 1987, in a different framework, argue for two place of articulation components, lul,
in labials and velars, and lll, in coronals and velars.
that Coronal must be present for both consonants. This can be seen through processes such as assimilation: under such conditions, a dental may assimilate to other coronal places of articulation but fails to assimilate to non-coronal places of articulation. If the Coronal node were missing from the dental, giving it a representation as in (7), it is stipulative why it assimilates only to other coronals; if a Coronal node is present, the patterning receives a natural account as it can be a target only for Coronal dependents.

When a Coronal node is present underlyingly due to the existence of contrasts between coronal places of articulation, the Coronal default rule fails to apply, presumably because its application would create neutralization with a segment of the underlying inventory. In this section I show that one condition under which a placeless consonant must be realized as velar rather than as coronal is when coronal contrasts for place exist within the language.

7.2.1 **Uradhi**

Uradhi (see Crowley 1980, 1983, Hale 1976; with further analysis by Trigo 1988 and Paradis & Prunet 1991a, 1992), an Australian language, has a consonant that is arguably underlyingly placeless but cannot be realized as coronal, only as velar.

Uradhi words can end in an apico-alveolar, lamino-dental, palatal, or velar nasal. Examples showing the word-final consonants (Crowley 1983) are given in (51).

(51) apico-alveolar
    atin  ‘cover (past tense)’ (p. 317)
apun  ‘head, end of something, wallaby’ (p. 404)
akyun  ‘camp’ (p. 403)
lamino-dental\(^{14}\)
rapan  ‘blue dove’ (p. 317)
afimaŋ  ‘sandy’ (p. 404)
lamino-palatal
awuŋ  ‘bark, past’ (p. 317)
akwaŋaŋi  ‘sour white apple’ (p. 402)
velar
yukuŋ  ‘tree’ (with epenthetic consonant) (p. 416)
‘person’ (with epenthetic consonant) (p. 403)
amag

The velar nasal has been argued to be epenthetic, occurring after an utterance-final vowel (e.g. Hale, Trigo, Paradis & Prunet).\(^{15}\) Following Trigo 1988 and Paradis & Prunet 1991a, 1992, the epenthetic consonant has an unspecified place node, as in (52).

(52) Root
\ /
SV Place

This representation leads to a problem: a word can end in both a plain coronal (51a) and a velar (51d). If both consonants have an identical underlying representation, what determines when Coronal is filled in and when it is not? It cannot be context, since both occur in the identical environment. Since they occur systematically and not in variation, one would predict that their underlying representations should be distinct.

\(^{14}\) The lamino-dental is of low frequency of occurrence according to Crowley 1983:321, and is not found in all dialects; the apico-alveolar and lamino-palatal are found in all Uradhi dialects discussed.

\(^{15}\) The epenthetic segment can be a glottal stop, a /k/ or a nasal, although a nasal is always possible (Crowley 1983). I follow Paradis & Prunet 1991a, 1992, who follow Crowley 1983, in assuming that the nasal is the basic variant of the epenthetic segment.
I suggest that the underlying representations of the surface coronal and the surface velar are distinct, and that the unspecified Place node can receive only a single phonetic interpretation, velar. As discussed above, Avery & Rice 1989 propose that when a coronal place contrast exists in a language, the Coronal node must be present for the contrasting sounds. As dental, lamino-palatal, and palatal nasals in Uradhi contrast in final position, Avery & Rice predict that a Coronal node should be present underlyingly in all of them, yielding the representations for place of articulation in (53). I use features under the Coronal node informally; the important point is that the apico-alveolar coronal, the least marked of the coronals, has the feature Coronal present under this assumption. See Hamilton 1993 for discussion of the internal structure of the Coronal node based on evidence from a range of Australian languages.

(53) apico-alveolar lamino-dental lamino-palatal

Root
Place
Coronal

Root
Place
Coronal

Root
Place
Coronal

Laminal
Dental

Since the Coronal node is present in the system, the Coronal default rule does not operate; thus the velar nasal is the only possible surface form arising from the representation in (52). No variation between [n] and [ŋ] is expected in a language like Uradhi.\(^{16}\)

7.2.2 Polish

Polish, like Uradhi, has a velar nasal [w] that appears to lack a specified place of articulation underlyingly. Also like Uradhi, it has coronal nasals at more than one place of articulation. The underlying inventory of Polish nasals is given in (54), from Czytkowska-Higgins 1992.

(54) labial m, front labial m’, dento-alveolar n, prepalatal ſ

---

\(^{16}\) Paradis & Prunet 1991a propose another account of Uradhi, which they suggest extends to the coronal-velar relationship generally. They argue for the maintenance of a restricted theory of underspecification, with Coronal as the only possible default feature at Place. They account for cases where Dorsal appears to be the default feature in rhymal position by proposing that the coronals and dorsals in question have the same underlying representation, but differ in prosodic position. Coronal is inserted when the consonant is in a rhyme; when the consonant is in a nucleus it receives Dorsal by spreading from the adjacent vowel. This hypothesis assumes that all vowels have a Dorsal node to spread. Paradis & Prunet 1992 develop a variant of this analysis, arguing that the velars are floating, with a Root node but no skeletal position, and receive a place specification by the spreading of Dorsal from the vowel; the Coronal rule affects non-floating consonants only.

The assumption that vowels require a Dorsal node is controversial (Clements 1990, Hume 1992). While higher prosodic structure could be responsible for the difference in interpretation, I do not know of positive evidence for the coronal and velar consonants occupying different syllabic positions or being differentiated in terms of floating status. Further, even if prosodic organization or floating/non-floating status offers an account for some cases of velar underspecification, others remain mysterious. Coronals may shift to velars regardless of prosodic position. The spreading of Dorsal will not account for apparent velar underspecification in languages such as Chipewyan, where syllable-initial consonants shift and closed syllables occur in the language, nor will it account for dissimilatory cases such as Hare and Cayuga.
Czykowska-Higgins (CH) identifies two types of coda nasals in Polish. N1, illustrated in (55), is realized as a homorganic nasal stop before stops and affricates (55a) and as a labiovelar nasal glide before continuants (55b) and prepausally (55c).

\[(55)\]

\[\begin{align*}
& a. \text{homorganic nasal before a stop} \\
& \text{/rgba/} & \text{r[om]baç} & \text{‘hew’ (1992:140)} \\
& \text{/p’ecz/} & \text{p’[en]lê} & \text{‘five’} \\
& \text{/wstega/} & \text{fst[en]ga} & \text{‘ribbon’} \\

& b. \text{labio-velar glide before a continuant} \\
& \text{/wstażka/} & \text{fst[ow]lska} & \text{‘ribbon, diminutive’} \\
& \text{/wəski/} & \text{v[ow]ski} & \text{‘narrow’} \\
& \text{/wɛx/} & \text{v[ew]x} & \text{‘smell’} \\

& c. \text{labial velar glide prepausally} \\
& \text{/tα/} & \text{t[ow]#} & \text{‘this one, fem.’}
\end{align*}\]

CH proposes that place assimilation applies before noncontinuants and a process of glide formation which provides a placeless sonorant with a [+back], or Dorsal, specification applies before continuants. The important point is that before continuants and prepausally the nasal surfaces as a velar rather than as a coronal, the unexpected feature if the only realization of a placeless consonant is as a coronal.

Some evidence suggests that Coronal is underlyingly present in Polish coronal nasals. First, given the contrast between dento-velar and prepalatal nasals, they both should have a Coronal node in underlying representation, following the reasoning in the discussion of Uradhi. Second, phonological rule evidence suggests that the dento-velar has a Coronal node. Polish also has a nasal identified by CH as /n/, or N2, which can always surface as a dento-velar. (Additionally, this segment can assimilate optionally in the same manner as N1.)

CH proposes the following analysis. N1 lacks place features while N2 is specified for place features, namely Coronal, underlyingly. N2 optionally undergoes debuccalization at the phrase level to remove its coronal specification in coda position; following this the rules of place assimilation and glide formation can apply.

CH concludes that Coronal is not always the unspecified place of articulation, nor is it always the default place of articulation for nasals. She proposes that Polish provides support for Trigo’s hypothesis that the default place specification for coda nasals is Dorsal.

I suggest a slightly different conclusion. The dento-velar nasal must have a Coronal node underlyingly, as proposed by CH, since it contrasts with another coronal nasal. I further follow C-H’s proposal that N1 has a Place node with no Coronal dependent. When default features are filled in, Coronal cannot be called upon because it is already present underlyingly in the nasal system of the language. Thus a velar consonant is the only possible result, as the Place node itself must be directly interpreted. Polish is identical to Uradhi in that both a segment with a specified Coronal node and a segment with a bare Place node exist in the inventory of the language; the segment with the bare Place node must be interpreted as a velar since a coronal exists.

### 7.2.3 Mandarin Chinese

In Mandarin Chinese, a so-called onsetless syllable exists (e.g. Li 1966, Pulleyblank 1983). Despite this terminology, the syllable may begin with a consonant - a velar or uvular nasal voiced continuant, a voiced laryngeal, or (rarely) a glottal stop - suggesting that the syllable is consonant-initial. The following question arises: how can one account for the variable place of articulation? I ignore the nasal/nonnasal alternation and concentrate on place. While the syllable can be realized as [ŋa], [ŋa], or [ŋa], it never begins with a coronal. I suggest that the reason for this is that the consonant in question has a Place node without a dependent, and there is a contrast between coronal sonorants in
Mandarin, forcing Coronal on the alveolar and blocking the Coronal default rule from applying.

Mandarin differentiates the following coronal places of articulation in initial stops, illustrated with the voiceless stops.17

(56) alveolar dental retroflex palatal
    t    ts    tɕ    tr

In the sonorants, the following coronal places of articulation are found in initial position.18

(57) alveolar retroflex
    n, l    r

There are different ways in which one could distinguish the sonorants. /n/ could be characterized as a nasal, /l/ as a lateral, and /r/ as a retroflex sonorant. Each would be a sonorant, with the primary distinction between them being in manner of articulation.

An alternative means of characterizing Mandarin sonorants is available. The lateral may be distinguished from the others by means of a feature like [lateral], and the alveolar nasal and the retroflex sonorant by means of place rather than manner of articulation. R-suffixion suggests evidence for the hypothesis that Nasal is absent underlyingly in Mandarin. When this suffix is added to a stem ending in /n/, the nasal fails to surface, being replaced by a retroflex (see, for instance, Duanmu 1990, Wu 1991). If the nasal is marked as a nasal, this substitution requires a complex process, with loss of Nasal and addition of Retroflex; if the nasal consonant is marked simply as a sonorant underlyingly, with a representation like that in (2), then the substitution is not unexpected: the surface representation is achieved simply by adding the Retroflex feature of /r/ to the representation of /n/. (In stem-final position only coronal and dorsal sonorants occur; thus no contrast exists to force the underlying presence of Coronal stem-finally as it does stem-initially.)

If Mandarin initial /n/ and /r/ are different coronal types, both should have a Coronal node present underlyingly. Representations for Mandarin /n/ and /r/ are given in (58). In the case of /n/, the feature Nasal is supplied by default; this feature is not inserted on /r/.

(58) n    r
       Root    Root
       SV Place   SV Place
       Coronal   Coronal
       Retroflex

---

17 The consonants distinguished as alveolar and dental are sometimes both considered to be of the same place of articulation, differing by manner features. This is not relevant as the presence of the retroflex consonant alone is enough to force the presence of a Coronal node on the /l/.

18 The sound that I have written as 'r' requires some comment. In Mandarin, [r] and [ʐ], a retroflexed sound, are in complementary distribution, with [r] syllable-final and [ʐ] syllable-initial. The consonants are analyzed as allophones, with both sonorant (e.g. Lin 1989). Support for [ʐ] as a sonorant is provided by analyses that allow this consonant into nucleus position, a position otherwise occupied only by sonorants; see, for example, Pulleyblank 1983. If this sound is a sonorant, an explanation is also available for an anomaly otherwise present in the fricatives: all would be voiceless save /ʂ/. Under the sonorant analysis, all fricatives are voiceless. I use the symbol /r/ for this sound, recognizing that it surfaces as [ʐ] in syllable-initial position.
If these representations are correct, the initial consonant of the ‘onsetless’ syllables could have the minimal representation, with a bare Place node. The insertion of Coronal is not possible since Coronals is already present underlyingly in the system; the variable back of the mouth articulation results from interpretation of Place.

7.2.4 Cambodian

Yip 1989 demonstrates that severe constraints on place of articulation exist in initial clusters in Cambodian. The Cambodian consonant inventory is given in (59).

\[
\begin{array}{cccccc}
\text{b} & \text{d} & \text{t} & \text{c} & \text{k} & \text{?} \\
\text{m} & \text{n} & \text{n} & \text{ŋ} & \text{s} & \text{h} \\
\text{w} & \text{y} & \\
\end{array}
\]

Sounds in the classes below cannot co-occur in a cluster.

(60) labials: p, b, m, w  
coronals: t, d, n, c, ɲ, s, ɣ

The velar nasal /ŋ/, unlike the other nasals, is unrestricted in distribution, co-occurring with velars as in the forms in (61).

(61) \text{kaan} \quad \text{‘goose’}  
\text{knok} \quad \text{‘bent’}

The free distribution of the velar nasal makes it appear that dorsal is the underspecified place of articulation in Cambodian: if it were specified, it would be surprising that dorsal-dorsal clusters were possible while clusters of other shared places of articulation were not. Note, however, that a contrast exists between the dental and palatal nasal, suggesting that the presence of Coronal in the dental is forced by contrasts in the inventory. A bare Place node thus cannot be interpreted by insertion of Coronal; rather the Place node must be interpreted, resulting in a velar. The surface velar nasal is not an underlying dorsal consonant in the technical sense; it is rather a consonant without a Place dependent.

7.2.5 Summary

Before concluding this section, I would like to raise two closely related problems. The first involves when the Coronal default rule can operate in a language and the second concerns the issue of whether the presence of Coronal underlyingly can be predicted from contrasts, as is argued in Avery & Rice 1989.

Consider first when Coronal can be inserted on a bare Place node. Following Avery & Rice 1989, I assume that while Coronal is generally absent underlyingly, it is present if contrasts between coronal places of articulation exist in the language. When Coronal is present in underlying representation, I have suggested that the Coronal default rule fails to apply, creating a velar.

While this analysis offers an account of many of the languages considered (Uradhi, Polish, Chinese, Cambodian), cases exist in which Coronal appears to be required underlyingly in a language yet nevertheless Coronal can be inserted by default.

Chipewyan and Apache are such languages. Recall that in these languages a coronal shifts to a velar. Both a coronal stop /t/ and coronal affricates (/tθ/, /tʃ/, /tɕ/ in

\footnote{Yip gives some counterexamples with /cd cŋ ty/ clusters, noting that they are rare.}
Chipewyan; /ts/, /tʃ/ in Apache) exist underlyingly. One might expect that since Coronal must be present on the affricates (Shaw 1991, Avery & Rice 1988), the Coronal default rule should be unable to apply. However, in most Athapaskan languages, [t] occurs phonetically rather than [k], showing that Coronal can be a default feature. The following question then must be addressed: why does the Coronal default rule not apply in languages like Uradhi but can apply in languages like Chipewyan, even though underlying contrasts in coronal places of articulation are found in both cases?

I suggest that a principled account exists. Athapaskan languages differ from Uradhi-type languages in a fundamental way. Coronal consonants in languages like Uradhi differ solely in place of articulation (e.g. (53) for Uradhi, (58) for Mandarin). If Coronal were inserted, neutralization between an underlying segment and the derived coronal would arise. In the Athapaskan languages the coronals in question differ by more than place of articulation. While the affricates and velar stop have fricative counterparts, this is not true of the dental/alveolar stop. A typical inventory (Chipewyan, Li 1946), is given in (62).

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>tθ</th>
<th>ts</th>
<th>tʃ</th>
<th>tʃ</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>aspirated</td>
<td>d</td>
<td>dθ</td>
<td>dz</td>
<td>dʃ</td>
<td>dl</td>
<td>g</td>
</tr>
<tr>
<td>plain</td>
<td>t'</td>
<td>tθ'</td>
<td>tʃ'</td>
<td>tʃ'</td>
<td>k'</td>
<td></td>
</tr>
<tr>
<td>ejecutive</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>x</td>
</tr>
<tr>
<td>fricatives</td>
<td>θ</td>
<td>θ</td>
<td>θ</td>
<td>θ</td>
<td>θ</td>
<td>y</td>
</tr>
<tr>
<td>voiceless</td>
<td>δ</td>
<td>z</td>
<td>z</td>
<td>l</td>
<td>l</td>
<td></td>
</tr>
<tr>
<td>voiced</td>
<td>δ</td>
<td>z</td>
<td>z</td>
<td>l</td>
<td>l</td>
<td></td>
</tr>
</tbody>
</table>

Given that the dental stop does not enter into contrast with a fricative at its place of articulation, its manner is completely determinable, and it need not be marked by Stop (see Shaw 1991 for arguments that Stop is the marked feature) underlyingly; the affricates contrast with the fricatives, and must be marked for manner. Thus, if Coronal is inserted on /t/, it does not neutralize with an existing consonant. Therefore, either Coronal insertion may apply or Place may be interpreted. In the Uradhi-type languages, only interpretation of Place is an allowed strategy as insertion of Coronal would result in neutralization.

The second question raised by this analysis concerns whether the presence of Coronal underlyingly on a plain dental/alveolar is predictable, as argued by Avery & Rice 1989. One might think that the presence of Coronal on the coronal affricates in Chipewyan would be enough to activate this feature on /t/. This is problematic; not only does it make the /t/ to [k] shift difficult to account for, it also leads to problems with sibilant harmony in related languages (e.g. Avery & Rice 1988, Shaw 1991). One might be tempted to account for this problem by taking advantage of the fact that /t/ is a stop and /ts/ an affricate. However, as argued by Shaw 1991, affricates pattern as stops in Athapaskan languages until a late level of the phonology (see also Rice 1992). A solution, that suggested above for why dentals can vary with velars in Athapaskan languages, is available. A manner contrast must be specified for Athapaskan affricates and dorsal stops as they contrast with fricatives, while no manner contrast exists for dentals. Dentals differ from other places of articulation by the fact that Stop is not activated for dentals. How this relates to the Coronal question can be seen by drawing the following analogy. Languages exist in which coronal contrasts occur within stops, forcing the presence of Coronal on all coronal places of articulation in stops, but do not occur within nasals, allowing Coronal to be absent underlyingly on the nasal that surfaces as a coronal. (Maddieson 1984 gives several examples, including Wappo and Kurukh.) The analysis that I propose for Athapaskan languages is parallel; coronal place distinctions within stops force the presence of Coronal on coronal places of articulation within this class. However, dentals, lacking a fricative counterpart, do not form a minimal contrast with coronal stops and are not marked by Stop. Coronal need not be present on these consonants then, as no place contrasts are found within their class.
7.3 Coda licensing

I have not dealt with languages in which velars are preferred to coronals in rhyhmal position: Selayarese, Japanese, Midi French, Chinese finals, German, and Spanish. In this section I speculate on why Coronal might fail to fill in in these languages.

In these languages, an underlyingly placeless representation is realized as velar in rhyhmal position. It has been noted (e.g. Prince 1984, Itô 1986, Goldsmith 1990, Yip 1991), that restrictions often exist on the range of places of articulation allowed in a rhyme. Yip, for instance, remarks that 'coronal consonants can occur in positions in syllables where consonants with other places of articulation cannot occur' (1991:61). She argues that the freedom of occurrence of coronals is a consequence of their lack of Place features. These authors cite cases where coronal consonants must be licensed by the following consonant or by having no structure. In this class of languages, consonants are preferred in rhyhmal position to the extent that they have minimal Place structure.

Under the present analysis, coronal/velars meet this criterion underlyingly: they have no structure below Place. On the surface coronals have Coronal below Place through the operation of the default rule, providing them with more surface structure than underlying structure. A simpler structure is one in which Coron al is not inserted, i.e. a velar, a consonant with minimal Place structure underlyingly and on the surface both. As a velar has the least specified Place structure, it is a likely candidate for a rhyhmal consonant in languages where rhyhmal consonants are dependent on the following consonant.

Selayarese, for instance, has rhyhmal obstruents which are of the same place of articulation as a following consonant (voiceless obstruent follows) or a glottal stop, a consonant with no Place node (voiced obstruent follows); see, for example, Steriade 1987 on this representation. This is illustrated in (63), with data from Mithun & Basri 1986.

(63) a. same place of articulation as following consonant
sappo 'missing from teeth'
tatuta 'bump against' (ta?-tuta)
b. glottal stop
la?ba? 'wide'
ta?do?do? 'be sleepy' (ta?-do?do?)

Rhyhmal nasals are similar: they may share place of articulation with the following segment (see (12)) or they may be velar. Selayarese is obviously a language which disallows independent Place structure in the rhyme; this is met by failing to fill in Coron al.

Japanese is like Selayarese in that obstruent clusters may share place or the first member may be a glottal stop (Vance 1987). The nasals too are like those of Selayarese: nasals are homorganic to the following segment or are velar. Again, if independent place structure is not allowed in the rhyme, one would expect that Coron al might not be filled in.

The other languages (Spanish, Chaozhou finals, Midi French, German) differ in that labials are also allowed in the rhyme. However, a similar explanation might hold; elaborate Place structure in the rhyme is dispreferred. This can be enforced by failing to fill in Coron al, yielding a velar. With labials, a place of articulation with specified structure, it is necessary to introduce a second mechanism, debuccalization, to guarantee that rhymes have minimal structure. The fact that labials may be allowed in rhyhmal position is thus not surprising: velars result from doing nothing to a representation with a bare Place node, while in order to eliminate structure below the Place node, something active must be done.

7.4 The other cases

Not yet considered are the Athapaskan and Polynesian languages with unconditioned shifts of coronal to velar, optional or obligatory depending on language and register. Neither the OCP nor contrasts provide accounts of these shifts. In some cases phonetic plausibility for the change exists; Apachean and Chipewyan [t]'s are reported to be velarized, and it might be for this reason that they shift to velars. In the Polynesian
languages, there has been a shift from more complex places of articulation (those with more specified structure) to less complex places of articulation (those with less complex structure). In these languages, a dorsal to laryngeal shift preceded the coronal to velar shift. Assuming that laryngeals have less structure than dorsals, these languages seem to prefer as little Place structure as possible. They represent true cases of default variability: the Coronal default rule is not blocked for any reason, and it may or may not apply.

8. Conclusions

I set out to show that SV is not the only node that can be realized in two ways, by insertion of a default feature or by interpretation of the node. I have argued that velars result from the failure of Coronal to be implemented at Place. Evidence that coronals and velars derive from a representation without a Place dependent is similar: both may serve as targets of assimilation and both may have limited distribution. This does not directly support the claim that velars arise by implementation of Place rather than by default. Here, the special relationship between coronals and velars and the phonetics and phonology of the velar consonants lend support to the claim.

The approach accounts for several problems and reconciles claims that coronals and velars are both underspecified for place of articulation. It also offers an account for variability found within a language without positing that languages can differ in arbitrary ways, allowing for the retention of a universal theory of underspecification, of markedness encoded in the underlying representation, and of a simple theory of default specification.

Many research questions arise from this work. Among the most important is whether the representation of a velar/dorsal is uniquely determinable, given that it can result from full specification (dorsal) or absence of specification (velar). Further exploration into phonetic properties of the sounds in question may provide insight. As well as raising questions, the research holds a promise: it provides an intriguing way of looking at language acquisition. A pattern in consonant acquisition is to separate first labials from other places of articulation. Given (1), this is surprising: the major division should be between coronals and peripherals. The analysis provides an account of the pattern: labials are distinguished first because coronals and velars are the same thing at this stage. The addition of a single step of structure creates a labial. A bare Place node may be realized as a coronal if the default rule applies, or as a velar if the default rule does not apply. These consonants are not dorsals, which develop stably later in the acquisition process. The hypothesis in this paper supplies a natural account of this aspect of acquisition: coronal/velar variation is predicted, just as variation is expected in adult language.

References


Li, F-K. 1966. The zero initial and the zero syllabic. Language 42.2. 300-302.


Rice, K. 1992b. Laryngeal features in Athapaskan languages. manuscript, University of Toronto.


