Intrinsic markedness relations in segment structure\textsuperscript{1}

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0. Introduction.

This paper is a discussion of the relationship between coronal consonants and theories of segment structure, markedness and underspecification. Much recent research has suggested that the unique, unmarked status of coronals derives solely from an absence of place features (Paradis & Prunet 1989; papers in Paradis & Prunet 1991). I demonstrate, however, that markedness asymmetries between places-of-articulation persist even when they are identical in their structural complexity. As a result, I argue for inherent markedness relations encoded into the segment structure.

The data that I use are the coronal phonotactics in Australian languages that have four contrastive coronal series. I examine the phonotactic behaviour of the coronals in word-initial and word-final positions. I demonstrate that within the CORONAL constituent there are markedness asymmetries which cannot be derived from structural complexity. In particular, I demonstrate that the laminals are preferred over apicals in word-initial position and apicals are preferred word-finally despite the fact that they are identical in structural complexity. I refer to this preferential status as PRECEDENCE. The empirical content of the notion of precedence will become clearer as the discussion of the coronal phonotactics progresses.

The outline of this paper is as follows. I begin in section 1 by briefly discussing two approaches which have been taken towards accounting for markedness asymmetries in current theories of segment structure. Section 2 is an illustration of the coronal series that contrast in the languages under discussion in this paper and the segmental representation of these contrasts. In section 3 I introduce the coronal phonotactics data which form the basis for the account for markedness proposed here. In section 4 I present the analysis and discuss additional motivation for it in sections 5, 6, 7 and 8. A summary and conclusion are given in section 9.

1. Approaches to accounting for markedness assymetries in segment structure.

There are two main approaches to accounting for markedness relations in segment structure. The first is UNDERSPECIFICATION. The various theories of Underspecification (Archangeli 1984; etc.) have in common the assumption that

\textsuperscript{1}An earlier version of this paper was presented at the 1993 annual conference of the Canadian Linguistic Association in Ottawa, Ontario. The ideas and argumentation presented in this paper have benefited considerably from discussions with Keren Rice, Greg Lamontagne and Elan Drescher. Any errors remain the exclusive responsibility of the author.
certain features have a default status, and so are absent from underlying representations. Coronals, which are focused on in this paper, have been of central interest in Underspecification theory, since they have been proposed as being the unmarked place of articulation (e.g. Avery & Rice 1989; Paradis & Prunet 1989; papers in Paradis & Prunet 1991). In this account markedness is based on COMPLEXITY, or amount of structure. That is, marked versus unmarked status is derived from presence versus absence of segment structure. The special, unmarked status of coronals cross-linguistically would fall out from their lack of structure; in a simple /p, t, k/ system, the labial and dorsal would have feature content dependent on the PLACE node, but the coronal would not. In some Radical Underspecification views, the coronal would even lack a PLACE node; moreover, in a language with more than one coronal series, one would still be completely underspecified (Paradis & Prunet 1989). In theories which recognise that the feature CORONAL must be present underlingly under certain conditions (Avery & Rice 1989), no attempt is made to account for markedness facts between coronals and non-coronals and within the coronals.

The second approach derives markedness from VALENGENCY-from the "+" values of binary features. An instantiation of this type of approach in current feature geometry is Clements (1990), where the number of positive values in the set of binary major class features he proposes derives a sonority hierarchy from obstruents to vowels. In this approach, all of these features are fully specified and the number of positive values produces an incremental scale of ascending sonority. The evidence discussed in this paper necessitates a VALENGENCY account of markedness by showing that markedness asymmetries exist between structures of identical complexity.

2. Coronals and coronal segment structure.

My argumentation in this paper is based on evidence from the phonotactic patterns of coronal segments in the Australian aboriginal languages that contrast four coronal places of articulation. All of the languages referred to in this paper contrast all four coronal series. A typical inventory of coronal segments contrasted in these languages is shown in (1).

(1) lamino-
dental lamino-
alveopalatal apico-
domal (retroflex) apico-
alveolar

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The coronals are phonologically organised into two apical and two laminal articulations. For the structural representation of the coronal contrasts, I follow Hamilton (1993, to appear) in assuming a structure of the CORONAL node with two dependent active sub-articulator nodes APICAL and LAMINAL. Each of these in
turn dominates a bivalent place-of-articulation feature (2). The two apical series are
distinguished by the feature [±R], "retroflex," and the two laminal series by the
feature [±D], "dental." Under this structure the four coronal series are represented
as shown in (3).

(2) COR
   /
  APIC  LAM
   |    |
[±R]  [±D]

(3) lamino-
    lamino-
apico-
apico-
dental alveopalatal domal alveolar
(retroflex)
COR  COR  COR  COR
|    |    |    |
LAM  LAM  APIC  APIC
|    |    |    |
[±D]  [-D]  [±R]  [-R]

This structure makes some obvious predictions. First, that all four series constitute
a natural class by virtue of their common defining node, CORONAL. Second, that
laminals and apicals each pattern as a natural class as well. These predictions are
borne out in the phonological patterns of coronals in Australian. For full illustration
of these patterns from Australian languages, see Hamilton (1993). The evidence used
in arguing for these representations comes from phonotactic constraints,
neutralisation processes, OCP-effects, feature co-occurrence constraints, and
phonological alternations in derived environments. All of these demonstrate APICAL
and LAMINAL natural classes of coronals.

The fact that the apico-alveolar series patterns in a fashion consistent with the
apico-domal series, and ultimately with all of the coronals, does not readily fall out
within a theory of coronal underspecification where the retroflex series would have
a CORONAL node with dependent structure but the alveolar series would lack a
CORONAL node, or even a PLACE node. The high degree of symmetry in the
patterning between the two apical series implies that they are segmentally
represented as a natural class, captured here by the use of the APICAL node. Since
the place phonotactics are conditions on the structure within the PLACE node,
instead of the attested high degree of symmetry between the two apical series
observed by Hamilton (1993, to appear), one would expect consonants lacking a
PLACE node to be invisible to these constraints (see Yip 1991, where it is argued
that coronals are transparent to the "Cluster Condition," a constraint on the number
of PLACE nodes in a consonant cluster). The majority of morpheme structure
evidence, however, does not seem to treat coronal consonants as if they are
unspecified; and in languages with more than one coronal series morpheme structure
constraints tend to group them together as a class (Yip 1989; McCarthy & Taub
1992). This is also the case in Australian.
3. **Coronal phonotactics.**

I will now demonstrate the markedness asymmetry between the coronal sub-articulators. In spite of the overall unity of the apicals and laminals together because of the CORONAL node which defines them as a natural class, there are also markedness asymmetries between them apparent from the place phonotactics. In this paper I focus on the phonotactic asymmetry between the LAMINAL and APICAL nodes in word-initial and word-final positions. I will show that laminals are precedent over apicals in word-initial position and that apicals are precedent over laminals in word-final position.

3.1 **Word-initial position.**

First, I will discuss the phonotactic patterns for coronals in word-initial position. All Australian languages allow both the labial and dorsal series in this position. Most, however, allow only a subset of the coronal series. There are four patterns which are attested, illustrated by the languages Baagandji (Hercus 1982), Panyjima (Dench 1991), Kalkatungu (Blake 1979a) and the Djapu dialect of Dhuwal-Dhuwal (Morphy 1983). Some of these patterns are more common than others, but each is demonstrated in a good number of representative languages in Australia in addition to the ones discussed here.

I will name each phonotactic pattern with two numbers, both either "0," "1" or "2," separated by a hyphen. The first integer refers to the number of laminal series that contrast in the position in question, and the second to the number of apical series that do. "0" means that no members of the class are permitted; "1" means that the class is permitted, but the contrast between the two series is neutralised; "2" means that both series contrast in that position.

Baagandji has the most restrictive pattern, 1-0. In this language no apicals are permitted initially, and the contrast between the two laminal series is neutralised. I refer to this neutral laminal series with the digraph DH. Therefore, although Baagandji contrasts four coronal series in other phonotactic positions in the word, only one occurs in word-initial position. Panyjima shows pattern 2-0. In other words, both laminal series contrast in initial position, but no apicals. Kalkatungu allows laminals and apicals word-initially, but the contrast between the two apical series is neutralised. Therefore Kalkatungu has pattern 2-1. I use the capital symbol D to represent the neutralised APIC series. Finally, Djapu contrasts all four coronal series in word-initial position, showing pattern 2-2. These patterns are shown for comparison in the table in (4).

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Contrastive word-initial series</th>
<th>Language</th>
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<tbody>
<tr>
<td>1-0</td>
<td>b g DH</td>
<td>Baagandji</td>
</tr>
<tr>
<td>2-0</td>
<td>b g d d</td>
<td>Panyjima</td>
</tr>
<tr>
<td>2-1</td>
<td>b g d d D</td>
<td>Kalkatungu</td>
</tr>
<tr>
<td>2-2</td>
<td>b g d d d</td>
<td>Djapu</td>
</tr>
</tbody>
</table>
The inventories of structures under the CORONAL node permitted in these patterns are shown in (5).

\[
\begin{array}{cccc}
1:0 & 2:0 & 2:1 & 2:2 \\
COR & COR & COR & COR \\
LAM & LAM & LAM & APIC \\
\end{array}
\]

In pattern 1-0 within the CORONAL node word-initial position can only license an "empty" LAMINAL node (i.e., the LAMINAL node itself cannot take a dependent, and so there is no contrast between the two laminal series). In pattern 2-0 initial position licenses the LAMINAL node as well as its dependent feature. Therefore the LAMINAL node is "full." In pattern 2-1 initial position licenses a full LAMINAL node and an empty APICAL node, and finally in pattern 2-2 both coronal sub-articulator nodes are licensed as full. A comparison of these four patterns indicates that word-initial position elaborates CORONAL structure incrementally, beginning by fully expanding the LAMINAL node before elaborating to the APICAL node and its dependent structure.

3.2 Word-final position.

I will now discuss the phonotactic patterns for coronals in word-final position. The phonotactics on place of articulation are exactly mirror image to what is attested for word-initial position. First, while the presence of initial apicals in a language requires the presence of initial laminals, laminals imply apicals in word-final position. Also, in contrast to word-initial position, coronals are preferred over labials and dorsals in this position. (The most common pattern is for ONLY coronals to be permitted word-finally; non-coronals imply coronals in this position.) There are four attested patterns of coronal phonotactics word-finally. These are illustrated from the languages Garawa (Furby 1974), Lardil (Hale 1973), Panyjima (Dench 1991) and Yir-Yoront (Alpher 1991).

In the most restrictive pattern, 0-1, only a single, neutralised apical series is permitted. This is a quite uncommon pattern for word-final position. It is attested for the nasals in Garawa. Of all of its nasal segments, Garawa permits only a single neutral apical nasal, "N", finally. (Garawa does, however, permit both of its apical laterals in this position.) This pattern is attested more commonly as a constraint on initial members of heterorganic clusters word-externally. The same patterns of place phonotactics attested for word-final position also constrain place contrasts in the first position of heterorganic clusters. In other words coda positions, both word-externally and -finally, draw upon identical inventories of possible phonotactic patterns for place of articulation (see Hamilton 1989). To cite just one example, Pitta-Pitta (Blake 1979b) contrasts both apical laterals in the first position in heterorganic clusters, but neutralises the contrast for the nasals.
Pattern 0-2 is attested in Lardil, a language well-known for allowing only apicals finally (complemented by a phonological rule deleting word-final non-apicals in derived environments, Hale 1973). Panyjima shows pattern 1-2. This language contrasts both apical series in word-final position as well as allowing a neutral laminal series. Finally, Yir-Yoront contrasts all four coronal series in word-final position, showing pattern 2-2. An overview of the four constraints is presented in (6). The inventories of structures under the CORONAL node permitted in these patterns are shown in (7).

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Contrastive word-final series</th>
<th>Language</th>
</tr>
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<tbody>
<tr>
<td>0-1</td>
<td>D</td>
<td>Garawa</td>
</tr>
<tr>
<td>0-2</td>
<td>d d</td>
<td>Lardil</td>
</tr>
<tr>
<td>1-2</td>
<td>DH d d</td>
<td>Panyjima</td>
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<tr>
<td>2-2</td>
<td>d d d</td>
<td>Yir-Yoront</td>
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</tbody>
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(7)

<table>
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<tr>
<th>COR</th>
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<tbody>
<tr>
<td>APIC</td>
<td>LAM</td>
<td>APIC</td>
<td>LAM</td>
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<tr>
<td>[±R]</td>
<td>[±R]</td>
<td>[±D]</td>
<td>[±R]</td>
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The following generalisations are apparent from how the places of articulation pattern at word-edges, given in the table in (8).

(8.a) Word-initial position
1. Non-coronals occur before coronals.
2. Laminals occur before apicals.
3. Both laminal series are active before any apicals are permitted.

(8.b) Word-final position
1. Coronals occur before non-coronals.
2. Apicals occur before laminals.
3. Both apical series are active before any laminals are permitted.

3.3 A preliminary formalisation.

I will now describe how these patterns can be represented with phonotactic conditions. First I will discuss the word-initial phonotactics. Both patterns 1-0 and 2-0 allow no apicals, so some condition active in the languages that have these patterns must rule an APICAL node as ill-formed (9.a). This accurately describes the fact that all non-apical coronals and all non-coronals are permitted word-initially in these languages. Second, patterns 1-0 and 2-1 show neutralisation. In the former case, the LAMINAL node is unable to license a dependent feature (9.b) and in the latter case it is the APICAL node that is defective in this way (9.c). Therefore, our provisional grammar of possible word-initial phonotactic patterns has three conditions (9), all optional. The patterns where each is active are given in parentheses. I use POS as a variable over phonotactic positions; here it defines word-initial position. In pattern 2-2 these three conditions are presumably all turned off.
Similar types of conditions are necessary to represent the phonotactic patterns in word-final position. Since only apicals are permitted in patterns 0-1 and 0-2, a condition active in these languages must map POS to APICAL (10), thus excluding all non-coronals and non-apical coronals. Second, we must reflect the fact that APICAL cannot license its dependent in 0-1 and LAMINAL in 2-1, by the same constraints given in (9.c) and (9.b) respectively.

The descriptive model which I have just given, with neutralisation processes and positive and negative constraints on the segmental content of POS, is certainly descriptively adequate but it is unconstrained and completely unexplanatory. First, its descriptive power predicts unattested patterns. For example, both neutralisation constraints (9.b) and (9.c) are available at both word-edges, but there is no attested pattern 1-1 where they are both simultaneously active. Also, conditions (9.a) and (10) predict similar conditions which refer to the LAMINAL node. Thus this model predicts patterns where only laminals are permitted or are not permitted in a certain position, both of which are unattested. In terms of its explanatory adequacy, this account provides no insight into or motivation for the attested coronal phonotactics. The apparent pattern of precedence observed in (8) is produced in this account partially by stipulation and partially by accident.

4. The analysis.

I will begin the analysis of the word-edge coronal phonotactics by giving an overview discussion of the notion of phonotactic precedence. It is apparent from the discussion of the coronal phonotactics in the preceding section that there are two types of precedence, roughly corresponding to numbers 2. and 3. in (8) above. LAMINAL precedence in word-initial position is reflected first of all in the fact that the LAMINAL node may occur exclusive of the APICAL node, but not vice versa (as in patterns 1-0 and 2-0). This could be called implicational precedence. Therefore if the non-precedent node is licensed in POS, this implies that the precedent sister node is licensed there as well. This allows the attested coronal patterns for these two phonotactic positions (11.a) and rules out unattested constraints where apicals but not laminals are permitted word-initially, or laminals but not apicals word-finally (11.b). The integer corresponding to the precedent node is underlined in (11).
(11) a. Word-initial patterns       Word-final patterns
    1-0                           0-1
    2-0                           0-2
    2-1                           1-2
    2-2                           2-2

    *0-1                        *1-0
    *0-2                        *2-0

LAMINAL precedence in word-initial position is also reflected in the fact that the APICAL node is only licensed when the LAMINAL node is full (that is, both laminal series contrast). Likewise, a LAMINAL node is not permitted word-finally unless both apical series contrast in that position. Therefore the precedent node must be full before its non-precedent sister node may be licensed in POS, reflected in the fact that the hypothetical patterns given in (11.c) are unattested. This type of precedence may be termed structural precedence since it reflects the fact that the precedent node is always more complex than the non-precedent node (except in the case of the 2-2 patterns where there is a ceiling effect).

(11) c. Word-initial patterns       Word-final patterns
        *1-1                        *1-1
        *1-2                        *2-1

A third type of precedence is apparent in the coronal phonotactics, which I have not discussed to this point. Even languages which allow both apicals and laminals in the position in question still reflect precedence relationships in differences in frequency. Kalkatungu (a word-initial pattern 2-1 language) and Djapu (pattern 2-2) demonstrate LAMINAL precedence in word-initial position by allowing apicals in this position but at a lower frequency than their laminal counterparts. The frequencies of the initial coronal oral stops for these two languages are given in (12) (Blake 1979a, 13 for Kalkatungu; Morphy 1983, 21 for Djapu; the neutral word-initial coronal in Kalkatungu is given as /t/ below, following Blake 1979a). This type of precedence may be termed statistical precedence.

(12)       Kalkatungu   Djapu
            t      7%        10.5% (lamino-dental)
            7      6         6.8 (lamino-alveopalatal)
            7      1         4.5 (apico-domal)
            t      --        0.3 (apico-alveolar)

Having discussed precedence in detail, the question becomes how it is assigned. Precedence clearly is assigned within a phonotactic position since different nodes are precedent in different positions. Providing an account of precedence relies on the laminals and apicals having some structural asymmetry which is crucial in the LAMINAL node being identified as precedent in word-initial position and the
APICAL node being identified as precedent in word-finally. Dixon (1980, 188-189) was the first to identify the crucial asymmetry as one of markedness, observing that "the consonants which are most marked, in terms of place of articulation features, tend to occur in syllable-initial position, and the least marked ones syllable-finally" (see Dixon 1980, 180-189 on his assumption of the laminals as being more marked than the apicals; see also Hamilton 1993).

A structural complexity account of this asymmetry does not appear to be possible since there is no quantitative difference between the APICAL and LAMINAL nodes. Therefore a valency account seems to be appropriate. The generative model of the coronal phonotactics which I propose makes use of the following formalisms. First, I propose that markedness is an intrinsic attribute of nodes. My understanding of markedness relations here is based on binarity. Nodes take a dependent out of a set of two options; the two options are specified with a markedness valency "+" and ",-" relative to each other. I portray the markedness asymmetry between F and G in (13) with superscripts following each. Here F and G are distinct nodes dependent on N. F is marked with positive valency (13.a) and G with negative valency (13.b). Therefore F is more marked than G. In this account these indices are primitive.

(13)  a. N  b. N
      |     |
      F+   G-

Under this approach LAMINAL and APICAL are in an intrinsic markedness relationship, with LAMINAL as more marked (14).

(14)  a. COR  b. COR
      |     |
      LAM+ APIC-

Furthermore, I propose that these markedness indices are visible to the phonotactics component of the grammar. Individual phonotactic positions, which I refer to with the variable POS, may select structure of a specific valency. Structure with the selected valency is phonotactically precedent over structure with the opposite valency, which generates the attested phonotactics asymmetries. Therefore in (15.a) structure marked with positive valency is selected as precedent, and structure with negative valency is selected as precedent by (15.b).

(15)  a. POS  b. POS
      |     |
      "+"  ",-"

In word-initial position structure marked with positive valency is precedent (16.a) while in word-final positions structure marked with a negative valency is precedent (16.b).
There are three aspects to this account of the coronal phonotactics. First, it proposes that markedness is an inherent attribute of nodes rather than derived from structural complexity since there is clear evidence of markedness asymmetries between segments which are identical in complexity. Second, it envisions a phonotactics component which makes crucial reference to the relative markedness of sister nodes. Individual phonotactic positions may stipulate structure with either positive or negative markedness as precedent in that position. Finally, this account relies on the notion of precedence described in detail earlier in this section.

Precedence has the following structural characteristics. First, precedent structure is elaborated before non-precedent structure, i.e., the precedent node is licensed in POS before its non-precedent sister. (This corresponds to implicational precedence described above.) But, more specifically, this elaboration proceeds vertically. By this I mean that the segmental content dependent on the precedent node must be licensed before POS may elaborate to the non-precedent sister (structural precedence). Thus, in word-initial position, both laminal series, which are contrasted on the tier dependent on LAMINAL, are both precedent with respect to the APICAL node by transitivity through the LAMINAL node.

5. Additional motivation—lateral inventories.

I will now discuss additional phonological evidence which provides motivation for the analysis proposed here. The proposal of an inherent markedness asymmetry between the APICAL and LAMINAL nodes receives additional support from other areas of Australian phonology.

First, inventories of contrastive sonorant lateral segments in four-coronal languages demonstrate that feature co-occurrence constraints refer to the markedness values of place features, in addition to the phonotactics. Lateral inventories show the same patterns as were attested for the phonotactics on word-final position. In four-way coronal contrast languages, laterals often contrast at all four coronal places of articulation. In many languages, however, laterals are only distinguished at a subset of these. Representative languages here are Bidyara-Gungabula (Breen 1973), Djaru (Morphy 1983), Gooniyandi (McGregor 1990) and Kalkatungu (Blake 1979a). Bidyara-Gungabula has only a single apical lateral against its four coronal oral stops. Djaru has two apical laterals, to which Gooniyandi adds a single laminal lateral. Kalkatungu, finally, contrasts laterals at all four coronal articulations. (I use "L" and "LH" as analogues to "D" and "DH" respectively.)
The special relationship between the feature [lateral] and coronal articulation has received a fair amount of discussion in the segment structure literature. Levin (1988) argued for [lateral] as a dependent of the CORONAL node, but recent work has argued against this structure (Rice & Avery 1991; Shaw 1991). Australian place assimilation facts (where oral stops assimilate to the place of an adjacent lateral without also becoming lateral) mitigate against [lateral] as a CORONAL dependent.

Rice & Avery (1991) give a non-hierarchical account of the lateral/coronal relationship. They propose that the coronality of laterals follows from a restriction on the combined complexity of place and manner features—complex manner specification implies lack of place specification (and vice versa). The question of inventories of multiple laterals then becomes problematic, since the place contrast forces a CORONAL node (McCarthy & Taub 1992, 366; see the Node Activation Condition of Avery & Rice 1989). The proposal made here is that the feature [lateral] is inherently tied to negatively marked place structure. This gives us the parallel between inventories of laterals and the word-final phonotactic patterns as well as preserving the relationship between laterality and coronality.

6. Additional motivation—non-coronal places.

Further motivation for the account of markedness relations presented here comes from the fact that the same asymmetry that is attested between the LAMINAL and APICAL nodes is found between other sister nodes elsewhere in the place structure. Consonants in Australian languages are organised primarily according to four active articulators, and thus into natural classes defined by the relevant articulator nodes, LABIAL, DORSAL, LAMINAL and APICAL. I will assume a peripheral constituent which captures together the non-coronal articulators (see Dixon 1980; Avery & Rice 1989; Rice & Avery 1991), and that it is sister to CORONAL.

As is apparent from the discussion of the phonotactics in section 3, the peripherals are precedent over the coronals in word-initial position and the coronals over the peripherals in word-final position. This is shown in the fact that CORONAL structure is elaborated subsequent to PERIPHERAL structure word-initially, and PERIPHERAL structure subsequent to CORONAL structure word-finally. This pattern is accounted for by assuming that the same markedness relationship that exists between LAMINAL and APICAL also exists between PERIPHERAL and CORONAL (18).

\[
\text{PLACE} \\
\text{PER}^\times \text{COR}^\times
\]
(21) Baagandji place phonotactics on heterorganic clusters.
   a. ban.\text{bu}\text{\text{u}}a  \hspace{1em} wild cabbage
      ba\text{\text{a}}n.ba  \hspace{1em} neck, throat
      gin.g\text{a}d\text{\text{a}}  \hspace{1em} mouse sp.
      * -C.d-, * -C.d- (heterorganic)
      * -C.d-, * -C.d- (heterorganic)
   b. ba\text{\text{n}}.\text{mu}lu  \hspace{1em} knob-tailed gecko
      ga\text{\text{n}}.\text{mu}  \hspace{1em} to steal
      * -n.\text{\text{n}}-, * -n.\text{\text{n}}-
   c. bun.ba  \hspace{1em} mushroom
      gu\text{\text{l}}.ba  \hspace{1em} fontanelles
      * -n.\text{\text{g}}-, * -\text{\text{l}}-

The picture of the PLACE node that emerges, and how the markedness relations are encoded in it (22.a), generates the markedness scale for the articulators shown in (22.b).
This scale proceeds from left to right, from most to least marked.

(22) a. PLACE
   \begin{align*}
   & \text{PER}^+ \hspace{1em} \text{COR}^- \\
   & \text{LAB}^+ \hspace{1em} \text{DOR}^- \hspace{1em} \text{LAM}^+ \hspace{1em} \text{APIC}^-
   \end{align*}

b. Place markedness scale.
   \text{LABIAL} \hspace{1em} \text{DORSAL} \hspace{1em} \text{LAMINAL} \hspace{1em} \text{APICAL}

This PLACE structure and the scale reflect the phonotactic asymmetry between LABIAL and DORSAL, showing that within the peripheral constituent LABIAL is precedent in syllable-initial position (16.a) and DORSAL is precedent syllable-finally (16.b). Deriving this place markedness scale from the structure of the PLACE node follows by assuming that under PERIPHERAL, the LABIAL node is marked with positive valency while DORSAL has negative valency. Furthermore, DORSAL is more marked than LAMINAL by transitivity through the PERIPHERAL node.

7. Additional motivation--markedness sequencing as a constraint on heterorganic clusters.

To further illustrate the importance of the markedness scale (22.b) in Australian phonology, I will discuss the cluster phonotactics demonstrated in Ritharrngu (Heath 1980). (This pattern is shared by a number of other languages geographically contiguous with Ritharrngu as an areal phenomenon, many of which Ritharrngu is not related to.) In Ritharrngu heterorganic clusters, the first member must be further to
the RIGHT on the articulator scale than the second member. In other words, the segment in the coda position must be less marked than the segment in the following onset position. This produces the following pattern of attested clusters. This is illustrated in the data in (23) showing nasal plus oral stop clusters; the same pattern is attested for other clusters, including oral stops clusters.

(23)  Ritharngu heterorganic clusters.
        APIC+LAB n.b ban.bulara flower sp.
              n.b baŋ.balgu death adder
        LAM+LAB n.b gaŋ.bu string fishnet
        DOR+LAB n.b baŋ.balan brain
        APIC+DOR n.g ban.guša shark sp.
              n.g gaŋ.gi cypress pine
        LAM+DOR n.g biŋ.gur Tectincornia australasia
        APIC+LAM n.d gaŋ.n.daw? bittern sp.
              n.d biŋ.dar to use bad language
              n.d gaŋ.dì stork
              n.d biŋ.dara? axe

It is obvious that the markedness scale (22.b), derived from the PLACE node (22.a), is crucial in defining the permitted clusters in Ritharngu. Since the first member of each cluster is required to be less marked than the second, the coronal plus peripheral clusters (APIC+LAB, LAM+LAB, APIC+DOR, APIC+DOR) are all well-formed by the markedness relation between the PERIPHERAL and CORONAL nodes (24.a). In clusters of two peripherals (24.b) or two coronals (24.c), the dependent articulator nodes must follow the same markedness pattern.

(24) a.    C  C
          |   |
        COR- PER+

b.    C  C
          |   |
        PER+ PER+
          |   |
        DOR- LAB+

c.    C  C
          |   |
        COR- COR-
          |   |
        APIC- LAM+
Note that this phonotactic pattern cannot be formulated as independent constraints on the two C slots. This is shown in the fact that the set of place contrasts permitted in one position is dependent on the place of articulation of the other. For example, DORSAL is licensed in the first slot (in DOR+LAB clusters) and LAMINAL in the second (in APIC+LAM clusters), but not simultaneously (*DOR+LAM) because DORSAL is not less marked than LAMINAL. When adjacent C slots have contradictory precedence patterns, i.e., positively marked structure in a syllable-initial C slot and negatively marked structure in the preceding coda (25), the segmental content licensed in each position must satisfy two conditions.

\[
\begin{array}{c|c}
C & C \\
\hline
\cdot \cdot & \cdot \cdot \\
\cdot ' & \cdot ' \\
\end{array}
\]

First, the features licensed in each position must follow the precedence patterns for that position. This is established for each position in isolation. But this is not enough to establish dorsal plus laminal clusters as ill-formed. Therefore I propose an additional condition which compares the two slots, requiring the markedness contour of each individual cluster to conform to the contour of the two slots (25). This rules out *DOR+LAM because, although DORSAL and LAMINAL can independently be licensed in each position, this cluster violates the contour of (25) since DORSAL is more marked than LAMINAL.

8. Additional motivation—Lenition.

I will give in this section one final piece of evidence showing the place contrasts in Australian languages patterning according to the markedness scale (22.b). This evidence comes from lenition rules, where oral stops become a glide or liquid at the same place of articulation, usually between vowels or between a liquid and a vowel. A comparison of lenition rules from a variety of languages shows a pattern of precedence identical to what we saw for the phonotactics on syllable-initial position.

Normally only a subset of the oral stops undergoes lenition and the generalisation that can be made is that consonants with marked place structure is more likely to undergo lenition than segments with unmarked place structure. The most common recurring lenition rule has the two peripherals /b, g/ becoming labiodorsal glide /w/ with the other oral stops unaffected (Rithargu, Heath 1980, 14-15). Occasionally the laminal stops lenite as well, becoming /y/ (Gaalpu, Wood 1978, 71-73). Few languages lenite apical oral stops, and the lenition of apicals implies that all of the other oral stops do as well (Nunggubuyu, Heath 1984, 58-60). What little evidence there is on asymmetry between the two peripheral series indicates that labials are more likely to lenite than dorsals. On the lenition rule in Rithargu Heath (1980, 14) states that it is "virtually obligatory for /b/, optional for /g/." Also, in the historical phonology of Thargari *b in the proto-language descends as /w/ while the other oral stops descend unchanged (Austin 1981, 309-312).

The same pattern of precedence in lenition is attested in the environments where oral stops lenite in Gurindji and its related dialects (McConvell 1988). In these
dialects apicals do not lenite. The laminals lenite, but only between vowels. The peripherals, being more prone to lenite, do so in a less restricted phonological environment—between a vowel, liquid or glide and a vowel. McConvell addresses the issue of asymmetry in lenition between the two peripherals. He observes that there are instances of /b/ leniting in an even less restrictive environment, following another oral stop, with no instances of /g/ patterning in the same way (McConvell 1988, 163).

The evidence for the peripherals, laminals and apicals forming an implicational chain from most to least likely to undergo lenition is very clear and robust in Australian. The implication is that lenition rules target oral stops with positively marked place structure. Admittedly the evidence on the asymmetry between LABIAL and DORSAL is fragmentary, but what little evidence there is is consistent with predictions of the model proposed here.

9. Conclusion.

The goal of this paper is to demonstrate the need for a valency account of markedness. Although there is clear and striking evidence from the phonotactics for markedness asymmetries between apicals and laminals, I have demonstrated that this cannot be accounted for based on comparison of structural complexity. In other words, we cannot appeal to underspecification to account for these markedness asymmetries. The conclusion, then, is that markedness is an intrinsic attribute of nodes. Although the central evidence here comes from coronal phonotactics at word-edges, additional corroborating evidence comes from feature cooccurrence constraints in inventories of laterals, from phonotactics of non-coronals and from lenition rules.

The theory of markedness presented here relies on valency rather than underspecification. A preferable theory of markedness would make use of EITHER valency or underspecification, but not both. The obvious next question, then, is whether underspecification is ever required.

References


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