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MAJOR CLASS AND MANNER FEATURES

1 *Introduction: manner and major class in feature geometry*

Many current proposals in the area of the geometry of phonological features fail to express the relationships which apparently hold between what are traditionally referred to as MAJOR CLASS FEATURES, such as [sonorant] and [consonantal], and MANNER FEATURES, such as [continuant] and perhaps [voice]. For example, consider two distinct proposals made by Clements (1987), the first concerning major class features and the second feature geometry.

Clements proposes the major class features in (1):

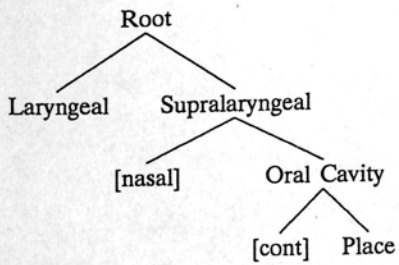
(1)

	O	N	L	G	V
[syllabic]	−	−	−	−	+
[vocoid]	−	−	−	+	+
[approximant]	−	−	+	+	+
[sonorant]	−	+	+	+	+

Notice, crucially for the purposes of this paper, that the particular formulation in (1) is designed to allow the SONORITY SCALE to be defined in terms of what Clements calls 'independently-motivated binary features'. Thus degree of sonority can be associated in a straightforward way with the number of '+' specifications for the segment-type in question.

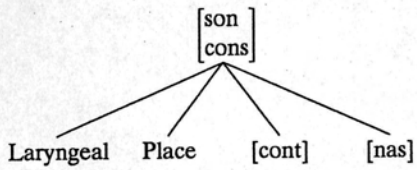
Clements proposes the feature geometry in (2):

(2)



Clements' proposal is but one of many which have been made in recent feature geometry approaches, most of which show a great deal of variation in the way in which the sets of major class and manner features are handled.[1] Notice that Clements makes no proposal regarding the location of major class features in the tree structure. McCarthy (1988), however, proposes, on grounds of their failure to spread, delink or to exhibit Obligatory Contour Principle effects, that the major class features [sonorant] and [consonantal] form part of the root node, while still suggesting no special relationship between these features and the manner features:

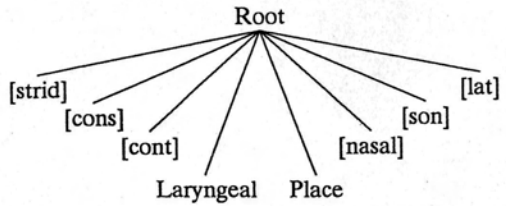
(3)



Notice that, unlike Clements, McCarthy does not suggest any hierarchical relationship between [nasal] and [continuant]. Furthermore, the major class categories are also unordered.

It is interesting to notice that Sagey (1988) offers a geometry in which a number of major class and manner features are attached directly to the root node, although, again, they are not directly related in any way:

(4)



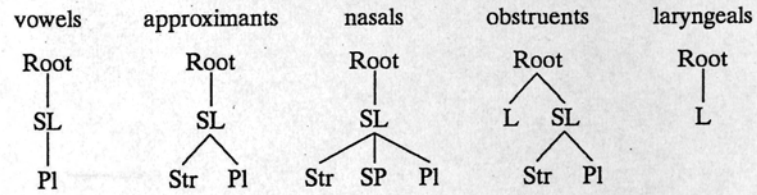
Dogil (1988) offers a different approach to feature geometry, in which manner and major class features are related, although in a rather indirect way. He proposes that the major classes are defined within the geometry itself, and argues that the degree of 'sonority is inversely proportional to the number of nodes that have to be consulted on the way to the first articulator node' (i.e. the first place node). The essential claim, then, is that major class distinctions are epiphenomenal, i.e. derivable from the manner properties of a segment (or, in Dogil's terms, its 'stricture' properties).

We will not investigate Dogil's approach in any detail here. However, the basic aspects of his theory involve the following claims:

- vowels have only place information, and are thus the most sonorous category.
- approximants have stricture features under the Supralaryngeal node.
- nasals have both stricture features *and* a nasal (Soft Palate) node, a separate node under Supralaryngeal.
- obstruents have features under the Laryngeal node and under the Stricture node.

This gives us the geometry in (5):

(5)



Laryngeals are assigned the lowest degree of sonority, because 'if the articulator node is absent, sonority must be missing too'. Thus the least sonorous major class segments have the least complex structure.[2]

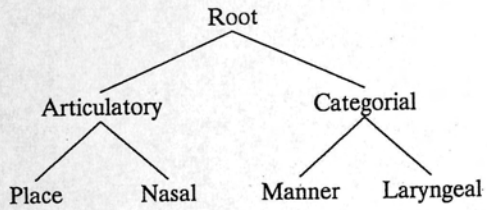
The basic claim of Dogil's account of the representation of major class and manner features, i.e. that the relationship between them must be formally expressed in some way, is very much within the spirit of our own approach to this issue. It is, after all, clear that these sets of features can indeed form a group, as is evidenced by syllabification behaviour, as well as processes involving historical weakening. In general, then, sonority hierarchy-based processes involve not just the major class features, but also manner features such as [continuant] and [voice].

In the analysis which follows, we attempt to make these relationships explicit. The thrust of our argument will be that certain traditional features form groups, not just in the sense that they are dominated by a single node in the feature geometry, but also in that they are themselves realisations of a single, more abstract, segmental primitive. Furthermore, we will argue that the realisation of a primitive as a particular 'feature'

(to which we will ascribe no theoretical status) is determined by the structural location of the primitive in the 'tree' characterising the segment in question.

We assume a feature geometry in which the manner and major class distinctions, at least those which appear to be involved in the kind of phenomena under discussion, are characterised under a single class node Manner, with further class nodes for Place, Laryngeal and, possibly, Nasal. Further, although we shall not pursue this here, we assume that Manner and Laryngeal are also dominated by a single class node, as are Place and Nasal, to give the geometry in (6):

(6)



The organisation of the class nodes in this model shares essential properties with the model proposed in Anderson & Ewen (1987), in which the term GESTURE is used, rather than class node. Their model in turn adopts a notion of segment structure, and, indeed feature geometry, dating back to the work within an orthodox binary feature framework of Lass & Anderson in the mid seventies (Lass & Anderson 1975; Lass 1976).[3]

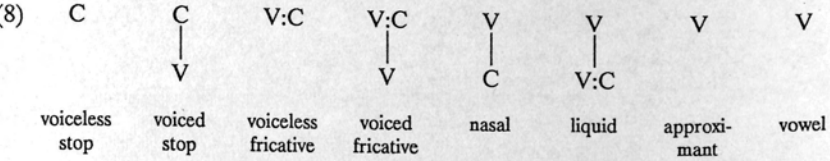
2 *Manner and major class in dependency phonology*

For the rest of this paper, then, we will be concerned with the structure of the Manner gesture. We do this in terms of the approach to this gesture originating in the model of DEPENDENCY PHONOLOGY developed by Anderson & Ewen (1987),[4] who make use of two single-valued features, or COMPONENTS, which can enter into dependency relations. The two features, which by convention are enclosed by verticals, are given in (7):

(7) |C| (consonantal) |V| (sonorant)

The two components, which in isolation represent extremes of the sonority hierarchy, characterise major class and manner distinctions as in (8):

(8)

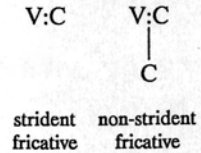


In representations like these, a segment may contain either one or two nodes. Thus the representations for vowels and voiceless stops each contain a single node, labelled |V| and |C|, respectively. Nasals contain two nodes, linked by the relationship of DEPENDENCY, such that the node labelled |C| is dependent on, or is governed by, the node labelled |V|. For voiced stops the reverse relationship holds. Nodes may also be complex, i.e. they can be labelled with a |V| and a |C|, as in the case of the fricatives and liquids. In such a case the two components are said to be 'mutually dependent'.

For a detailed discussion of the motivation of the particular representations in (8), the reader is referred to Anderson & Ewen (1987: §4.1); we note in passing, however, that, given any two representations differing only in the presence *vs.* the absence of, say, a |V| component, the one containing the (extra) |V| will either have a particular 'sonority-increasing' property not shared by the other member of the pair, or will have more of that property. Thus, in comparison with voiceless fricatives, voiced fricatives have an extra sonority-increasing property, realised as vocal cord vibration.

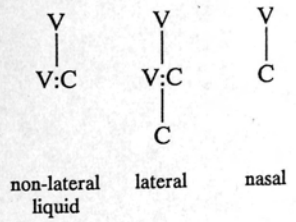
Notice too that Anderson & Ewen also allow for the expression of a number of other oppositions within the manner gesture. Thus the distinction between strident and non-strident fricatives involves the absence *vs.* the presence of an extra dependent |C|, as in (9):

(9)



While the addition to the system of the opposition in (9) does not affect the structural properties of the model (a maximum of two nodes per segment, and two components per node), Anderson & Ewen propose further representations in which these constraints are relaxed somewhat. Thus a system 'in which laterals are categorially distinct from non-lateral liquids' (1987: 164) is assigned the representations in (10):

(10)



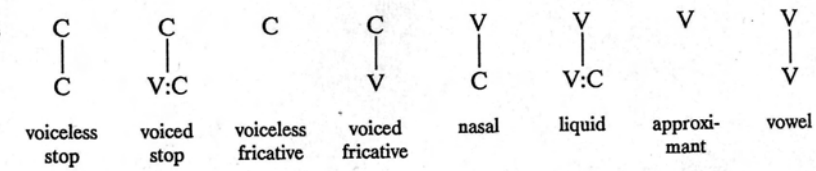
It is claimed that laterals can be shown to form a natural class both with non-lateral liquids, on the basis of their shared |V:C| node, and with nasals, on the basis of their shared |C| node.

It is clear that within this model the relative position of a segment-type on the sonority hierarchy can be determined from the relative prominence of the primitives |V| and |C|; while a voiced fricative is higher on the sonority hierarchy than a voiceless fricative, in that it contains an extra |V|, a liquid is higher still: the liquid contains the same components, but the |C|, which forms part of the governing node for the voiced fricative, now forms part of the dependent node.

Apart from the formal properties of such representations, the crucial insight is that a single component or feature is used to express apparently different phonetic properties, which in more traditional approaches each require a separate feature. Thus the addition of a |V| feature to a representation increases its relative sonority, in that, for example, a [−continuant] segment may become [+continuant], or a [−sonorant] segment [+sonorant]. In classical feature systems there is no *formal* reason to expect [+continuant] and [+sonorant] to share this effect.[5]

Within dependency phonology, alternative interpretations of the representations of the Manner gesture have been offered, some of which have abandoned one or more of the various constraints on representations inherent in the system in (8). One such is developed by den Dikken & van der Hulst (1988), who, while maintaining the standard components of dependency phonology, and some of the formal constraints imposed on the Manner gesture in (8) (a maximum of two nodes per segment-type and two components per node), propose the system given in (11):

(11)



Den Dikken & van der Hulst relax one of the formal constraints on the representations of the Manner gesture, but add a further restriction. On the one hand, they allow identical labels on the two nodes, so that vowels, for example, have |V| both on the

governing and on the dependent node.[6] One claim inherent in (11), then, is that the extremes of the sonority scale, i.e. the voiceless stops and vowels, show two occurrences of their characteristic property, while a 'corresponding' less extreme element has only one, thus allowing a formal distinction between approximants and vowels. In this approach, then, voiceless stops differ from voiceless fricatives only in the presence of an extra |C| node. On the other hand, complex nodes with two components are allowed only in dependent position. Governing nodes must have single labels; this is in accord with the widely held view that linguistic constructions in general can only have one head.[7]

Below we will show that the type of representation in (8) and (11) is compatible with – indeed extends – ideas developed within a feature geometry approach. Notice first, however, two ways in which (8) and (11) differ from each other. (11) provides no obvious correlation between complexity of representation and complexity of segment-type. In (8), however, the representations for more complex segment-types are clearly formally more complex than those for simpler types. Thus, in (8), the voiced and voiceless fricatives have a more complex representation than the corresponding members of the simpler class of stops, which require fewer features for their expression. In (11), however, this relationship is no longer apparent.[8] On the other hand, (11) brings out the – apparently equipollent – split between sonorant and obstruent segments more transparently: sonorants have governing |V|, obstruents governing |C|. Indeed, in (11), we can equate |V| with [+sonorant], and |C| with [−sonorant]. We return to this latter point in some detail below.

However, whichever version we adopt – and we will propose an analysis which combines what we see as the virtues of (8) and (11) with recent geometrical proposals – the distinctions made here are in principle no different from those which are expressed by the major class and manner features of traditional systems. That is, we can express natural class membership by reference to the *structural* status of the components in the segmental representation. For example, we might relate the |C|s and |V|s in (11) to classical binary features as in (12):

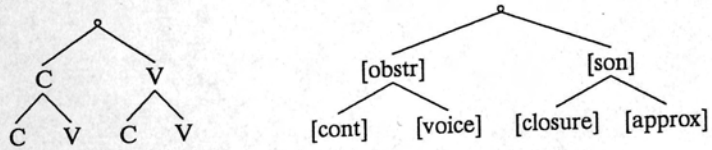
(12) |C| (governing) = [−sonorant]
(governed by |C|) = [−continuant][9]
|V| (governing) = [+sonorant]
(governed by |C|) = [+voice]
(governed by |V|) = [+vocalic]

3 *Dependency and geometry*

Consider now how this type of approach might be related to feature geometry. As in (11), we first make a major binary division in terms of |C| and |V|. Then, we might argue, one obvious approach might be to subdivide both parts further, again in terms

of |C| and |V|. If we were to look at the structure of a segment in this way, we could represent the distinctions in terms of a tree, as in (13), where we again give 'traditional' feature equivalents for each split, but where the correlations are now somewhat different:

(13)

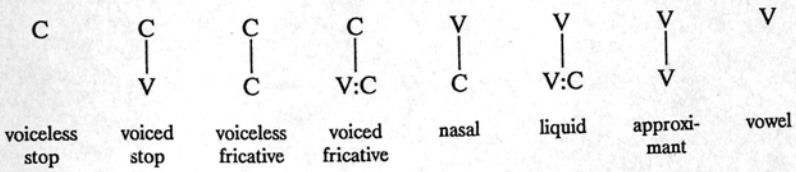


|C|	(governing)	= [−sonorant]	(obstruents)
	(governed by |C|)	= [+continuant]	(fricatives)
	(governed by |V|)	= [+closure]	(nasals)
|V|	(governing)	= [+sonorant]	(sonorants)
	(governed by |C|)	= [+voice]	(voiced obstruents)
	(governed by |V|)	= [+approximant]	(liquids)

Notice that we have introduced one 'feature' in (13) which is not traditional: [closure], rather than [nasal]. We are anticipating here our claim that nasality as such is not part of the Manner gesture; rather, the behaviour of nasals with respect to major class properties is determined either by their inherent sonority, thus allowing grouping with liquids, for example, and/or by the closure in the oral tract, i.e. their lack of continuancy, in *SPE* terms, thus allowing them to group with oral stops, and, in some languages, with /l/ as opposed to /r/.

However, the model in (13) is clearly unsatisfactory in one very important respect, which suggests that the straightforward correlation between a binary-feature based geometry and one in which the phonological primes are both single-valued and linked by dependency relationships cannot be maintained. Consider the segmental representations which would result from the geometry in (13):

(14)



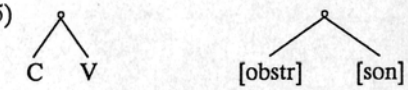
Voiceless fricatives are characterised by the *addition* of a dependent |C| to the representation for voiceless stops, while, similarly, approximants show an extra |V| in comparison with vowels. Why these relationships should hold is anything but clear; if

making a stop continuant has any effect on the degree of '|C|-ness', it is obviously one of reduction, rather than increase.

This kind of problem arises in any variant of (11) which allows a binary split into two 'opposing' components under a higher |C| or |V| node, at least on the assumption that lower-level splits represent successive modifications of the 'purest' form of the component in question. In other words, we need to restrict modification of the highest nodes in such a way that a component under a governor can only 'reduce' the intensity of the property defined by that governor. Thus the modification of a non-sonorant segment should make it more sonorant, and the modification of a sonorant segment would have the opposite effect. On this assumption, it seems reasonable to suggest that a dependent component cannot be the same as the governing component which it modifies.

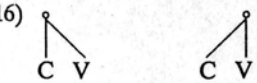
The unsatisfactory nature of (13) is therefore due to the fact that the structure dominated by the Manner node is equipollent at *both* hierarchical levels. Rather, we hypothesise that only the initial split under the Manner node is an equipollent one – the basic sonorant *vs.* obstruent, or |V| *vs.* |C| split. This is essentially in agreement with the evidence adduced in Clements (1987). A governing |V|, then, is equivalent to [+sonorant];[10] a governing |C| to [−sonorant], as in (15):

(15)



We suggest further, however, that the choice between |C| and |V| is not entirely equipollent, even at this, the highest level in the segmental tree. Rather, although we find representations in which only one of the two is selected, it is also possible for both to occur, but only in a configuration in which one of the components is ADJOINED to the other, as in (16):

(16)



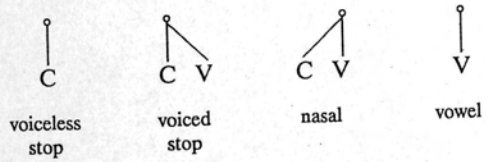
In the representations in (16), |C| and |V| are sisters, with one of the two sisters being the head of the construction.

It is clear, however, that, without some further convention for the interpretation of |V| and |C|, the representations in (16) appear to be conflicting: we assume that a segment cannot be simultaneously obstruent and sonorant. In accordance with the principles of our approach outlined above, then, we suggest that the interpretation of components varies in accordance with their structural position (cf. the approach to vowel features in van der Hulst 1988). In the case at hand, the correlations in (17) seem appropriate:

(17) |C| (governing) = [−sonorant]
(adjoined modifier) = [+nasal]
|V| (governing) = [+sonorant]
(adjoined modifier) = [+voice]

This allows the following four possibilities:

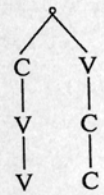
(18)



Thus adjunction of a component to a governor involves the modification of the property characterised by the governor with an 'opposing property'. In the case of governing |C|, adjunction of |V| adds a periodic sound source (vocal cord vibration), while in the case of governing |V|, adjunction of |C| adds a stricture of closure in the oral tract. In more general terms, then, establishing a representation under the Manner node involves first an equipollent choice between |V| and |C| as governor, and then the privative, and thus optional, adjunction of the opposite component to the governor.

Further modification of the governing component is achieved, not by adjunction, but by SUBJUNCTION of the 'opposing' property to the governor. Subjunction can take place at two levels, with, as we shall see, the presence of the component at the lower level 'enhancing' the effect of the (identical) dependent component to which it is subjoined. This gives the possible 'geometry' in (19):

(19)

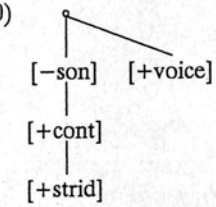


Thus the representation of the segment under the Manner node can be seen as a SPINE, containing nodes which may be modified by particular dependent single-valued feature. As in the case of adjoined components, each dependent component provides the segment with some kind of property which is 'opposite' to that of the governor at the head of the spine. If no such modifier is present, then the phonetic interpretation of the nodes on the spine involves properties which do not reduce the strength of the governing component of the segment. The 'strength' of modification of the governing

property depends on the position of the modified node on the downward projection on the spine: the higher the node, the greater the reduction in the strength of the property of the governor.

What, then, are the properties associated with each of the subjoined nodes in (19)? Turning first to the |C| spine, we can perhaps illustrate our interpretation of the various properties involved in the modification of this spine by drawing a parallel with an approach involving the underspecification of binary features. It seems that at least the equivalents of the binary features [continuant] and [strident] should be located under this node. That is, the binary equivalent of (19) with respect to the |C| spine might be:

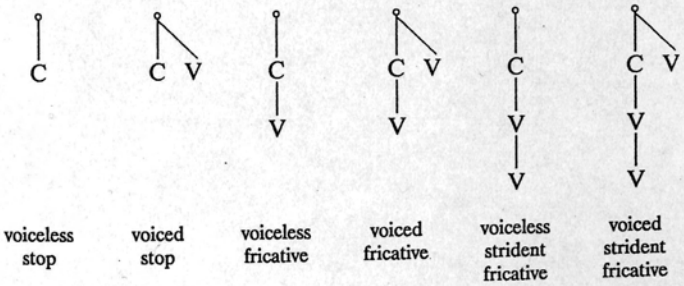
(20)



Thus, an unmodified [−sonorant] segment will be realised as [−sonorant, −voice, −continuant, −strident], i.e. as a voiceless stop. However, within a binary model, even one incorporating underspecification, it remains a formal coincidence that the three modifying feature values contribute to reduction of the 'obstruency' of the consonant, while an interpretation in terms of the unary features |V| and |C|, defined in terms of sonorancy and consonantality, shows this directly.

The various optionally present subjoined |V| nodes on the |C| spine allow us to distinguish the following segment-types:

(21)



The claim inherent in (20) and (21) is that there is a relative ranking in the strength of the 'sonority-increasing' effect of the subjoined phonetic properties which can modify the [−sonorant] head: making a stop continuant has a greater effect than

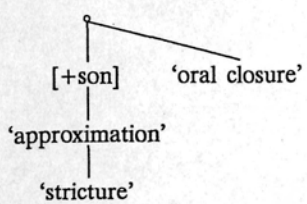
making a stop fricative. We can thus view stridency as enhancing the sonority properties of a continuant, an interpretation which accords well with the greater syllabicity potential of strident fricatives.

At this point we do not address the question of the relationship between adjunction and subjunction in (21), or indeed of the motivation for treating the voicing of a stop in a different fashion from making it continuant. However, we return to these issues during our discussion of lenition processes below.

We turn now to the |V| spine. Rice & Avery (1989) include the features [nasal], [lateral] and [rhotic] under their Sonorant node, but this is rather misleading, as, indeed, is our identification of an adjoined |C| with nasality. It is not, as we have seen, the nasality as such, i.e. the escape of air through the nasal cavity, which is relevant to the behaviour of a nasal with respect to major class processes, but rather the *closure* in the oral tract. Much the same kind of point is made by Piggott (1989), who investigates the possibility of attaching nasality both to a Soft Palate node and to a Spontaneous Voicing node. Previous proposals within dependency phonology, too, embody a similar claim: thus Anderson & Ewen (1987) characterise the major class characterisation of nasals by means of the representation in (8), but have a distinct component |N| within the articulatory gesture.

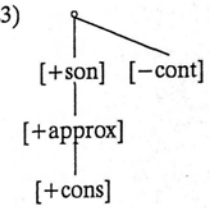
A similar point can be made for those cases in which laterals, for example, class with nasals as opposed to the non-lateral liquids. Here, again, this can be ascribed to the central closure in the oral tract. More generally, then, the properties which may be involved in modifying a |V| spine in the direction of |C| all seem to display some type of closure, or at least increase in stricture, just as those |V| properties which may modify a |C| spine involve an increase in sonority. Given this, we propose something like (22) as a possible gloss of the |V| spine in (19):

(22)



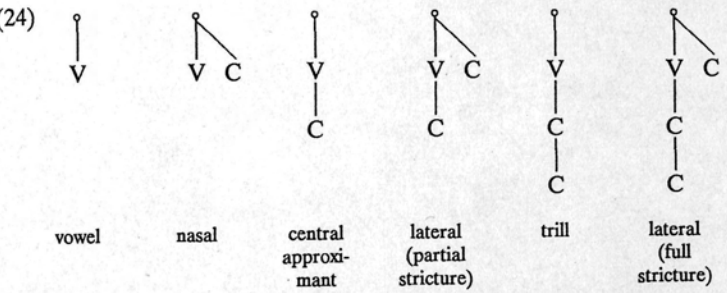
Notice that it is rather more difficult to provide a one-to-one binary equivalent than in the case of the |C| spine in (20). One possibility might be that in (23), where we make use of some of the features proposed by Clements (1987):

(23)



This allows the range of possibilities in (24):

(24)



Nasals are characterised by the addition of an adjoined |C|; non-lateral liquids (approximants) by addition of a subjoined |C|. A segment which has both an adjoined and a subjoined |C| shows oral closure, as in the case of nasals, but is also an approximant. This is the representation for lateral sonorants, with central closure and lateral approximation. Notice that this allows laterals to class either with the nasals as opposed to the central approximants, or *vice versa*.

As in the case of the |C| spine, the subjoined dependent may be 'enhanced' by further subjunction, in this case of |C|. This allows us to distinguish various *r*-types in terms of the severity of the |C|-increasing effect of the stricture, so that trills differ from central approximants in having an extra subjoined |C|. Similarly, as in (24), we might have two representations available for laterals, one for laterals with a full central closure, and one for those with a less severe central stricture.[11] Notice again that the more complex representations will only be found in languages which make phonological oppositions in the relevant areas.

It will be noted the 'enhancing' subjoined |C| in (23) is characterised as equivalent to Clements' [+cons]. It is, of course, true that nasals are also [+cons]. We assume, however, that the [+cons] specification of nasals is non-distinctive, and hence need not be specified in a binary feature account; indeed, a distinctive specification for [+cons] for a [+son] segment is relatively highly marked. This markedness is characterised in the model here by the fact that the lowest |C| is only present in segments which also have a |C| *immediately* subjoined to the governing |V| – this |C|

is then available for the enhancing |C|. Notice that much the same point might be made for stridency, characterised as the enhancing property on the |C| spine.

We return below to a discussion of some of the similarities between the geometries of the |V| and |C| nodes; in the meantime, however, we turn to a consideration of lenition processes, in the light of the model being developed here.

4 *Lenition processes and their representation*

Lenition processes, like other apparently sonority hierarchy-related phenomena, have provided a fertile source of evidence against traditional binary features. Within dependency phonology, criticism of the arbitrariness of binary accounts of such phenomena can be found in Anderson & Ewen (1987: §4.3), among others, while within the framework of GOVERNMENT PHONOLOGY (see e.g. Kaye *et al.* 1990), Harris (1990) considers similar arguments, and observes:

> The phenomenon of segmental weakening is difficult to express in any direct and unified manner using traditional binary-valued feature formalism. Lenition processes can equally well involve shifts from plus to minus values as from minus to plus. One implication of vocalisation, for example, is a change in the specification of [consonantal] from plus to minus. Spirantisation, on the other hand, involves alteration of [continuant] from minus to plus. More seriously, some types of lenition simultaneously affect more than one feature, and the theory provides no single mechanism for directly linking just these features in preference to some other arbitrary conjunction.

We return below to a discussion of Harris's account of lenition within the framework of government phonology. Before this, however, and also before developing our own account of lenition within the model being developed here, we consider both the nature of lenition in some more detail and its representation in the dependency account of Anderson & Ewen (1987).

In this discussion we restrict ourselves to the discussion of intervocalic weakening, i.e. weakening which has traditionally been seen as involving some kind of sonority assimilation of a consonant to surrounding vowels. We do not here pursue issues such as the relationship between lenition and fortition, or between intervocalic weakening and weakening in other structural positions; these are not directly relevant to our proposals for segmental representation.

Representative data for lenition are not hard to find, although the exact interpretation of what constitutes a 'single' lenition step is somewhat controversial. Harris (1990), for example, treats the alternations between [p] and [w] and between [t] and [r] in the indicative and stative forms of verbs in Korean as a 'vocalisation', and hence weakening, of the stop:

(25)

INDICATIVE	STATIVE	
ətup-t'a	əuw-ə	'to be dark'
ku:p-t'a	kuw-ə	'to bake'
mu:t-t'a	mur-ə	'to ask'
kə:t-t'a	kər-ə	'to walk'

Here a voiceless stop (the segment-type at one extreme of the sonority hierarchy) alternates with segment-types towards the other end of the scale. Similar examples, involving an alternation between voiced stop and approximant, can be found in Dutch, where the alternation is primarily a question of register:

(26)

rode	[rodə]	[rojə]	'red'
goede	[ɣudə]	[ɣujə]	'good'

However, intermediate stages are also common. Thus Lass & Anderson (1975: 154) cite the weakening of Proto-Dravidian intervocalic voiceless stops, which in the daughter languages either fail to lenite (Tamil), or undergo lenition either by spirantisation (Toda) or voicing (Kannaḍa):

(27)

PD	*Tamil*	*Toda*	*Kannaḍa*	
*-k-	akal	oxet	agalu	'spread'
*-t-	mutu	muθ	mudu	'old'

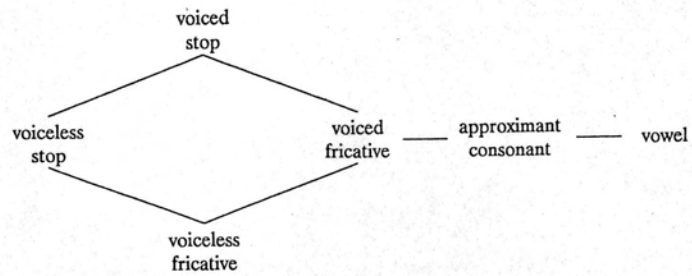
while Old English intervocalic [g] undergoes spirantisation and later, in Middle English, sonorisation (with ultimate deletion), as shown in (28) (cf. Lass & Anderson 1975: 158):

(28)

pre-OE	*OE*	*ME*	*late ME*	
*[aagan]	[aaɣan]	[ɔɔwən]	[ɔɔn]	'own'
*[boga]	[boɣa]	[bowə]		'bow'

Examination of data such as these allows Lass & Anderson to establish an intervocalic lenition schema incorporating individual stages, which we reproduce, in simplified form, as (29):

(29)

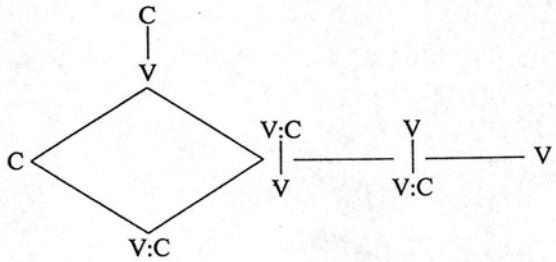


Thus the initial stage in lenition of a voiceless stop is either to a voiced stop or to a voiceless fricative (as shown in the Dravidian data in (27)), and thereafter from left to right along the scale. We assume that any theory of segmental weakening must be able to express the relationships in (29) in some unitary way, and we now move on to consider three approaches to this problem.

5 *Lenition in the dependency framework*

On the basis of the representations in (8), Anderson & Ewen (1987: 176) give the dependency interpretation of (29) as (30):

(30)



Lenition, then, is seen as 'a change in the direction of |V|, or progressive suppression of |C|', as is natural in terms of the primitives of the model. The particular manifestation of lenition depends on the input configuration: each step represents a minimal change in the direction of the |V| end of the scale. The |V| component is therefore added in the structurally weakest position: if there is no dependent |V|, as in the case of the voiceless fricative, it is added in dependent position, while in the case of the voiced stop, where a dependent |V| is already present, the new |V| is added in the next available position, mutually dependent with the governing |C|. As segments in the Anderson & Ewen model can have no more than two occurrences of

a component, weakening of the voiced fricative involves not addition of |V|, but rearrangement of the components so that the output of weakening has more prominent |V| (and hence less prominent |C|) than the input; the ultimate step is deletion of the |C| component.

Such an account provides a natural analogue of the increase in sonority as increase in the prominence of the component defined in terms of that property, |V|. However, the implementation of this is dependent on the particular set of segmental representations in (8), and, as will be obvious, the representations which we have proposed above differ in some important respects from these. Before we consider our own proposals in any detail, however, we turn to the representation of lenition in government phonology.

6 *Lenition in the government framework*

Harris (1990) offers a highly interesting discussion of lenition phenomena within the framework of government phonology. In this model segments are characterised in terms of a set of privative elements, not unlike the ones used in our dependency model. A major difference between the two approaches lies in the fact that within government phonology elements are not hierarchically organised.

In government phonology manner is characterised in terms of three elements:[12]

(31) h°: the noise element: i.e. the 'noise' associated with fricatives and affricates and with the release phase of stops
ʔ°: the occlusion element: i.e. the non-continuant gesture in stops, nasals and laterals
R°: the coronal element

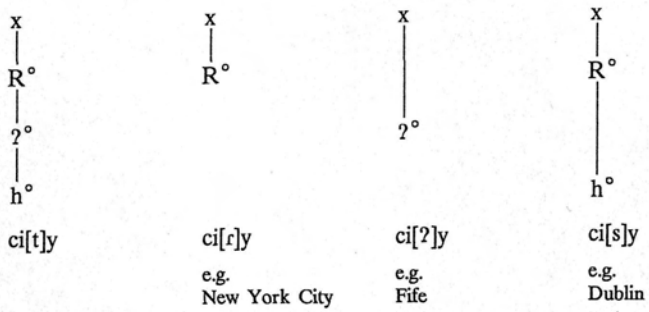
This implies that, in contrast with dependency phonology, voiceless stops have a formally rather complex representation. Harris argues that a voiceless stop may undergo various types of weakening, all characterisable in terms of the *loss* of one or two elements. Thus the vocalisation processes of Korean (cf. (25) above) involve the loss of the occlusion element:

(32) a. x → x b. x → x
U° U° R° R°
ʔ° ʔ°

Similarly, the weakening processes affecting the realisation of /t/ in various dialects of English also involve element loss, as shown in (33), where (33a) represents the input

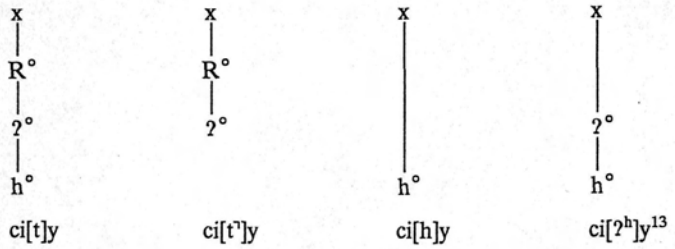
to the weakening process (/t/), while (33b–d) show three possible outputs of the weakening process:

(33) a. plosive b. tapped c. glottalled d. spirantised



Notice that the lenition-type in (32) (loss of ʔ°), is also found in the Brazilian Portuguese processes discussed by Harris, whereby palatal nasals and palatal laterals in the Northern dialects are realised in some Southern dialects as nasalised and oral palatal semi-vowels, respectively. However, the status of other lenition-types which the model appears to predict is not immediately clear:

(34) a. plosive b. unreleased c. glottalled/ spirantised d. glottalled



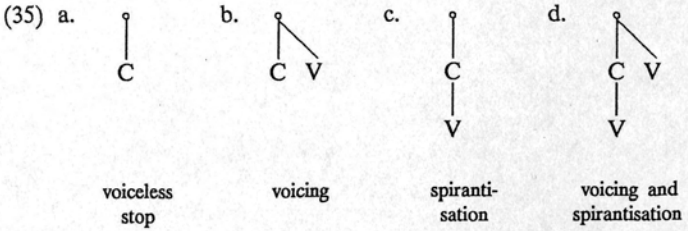
At best, it seems that the set of processes in (34b–d) is a less likely set of candidates for intervocalic weakening (although perhaps not for weakening in other structural positions) than those in (33b–d). The model does not predict, this, though: there is no formal distinction between the two sets of putative processes.

The model thus makes no prediction regarding which type of weakening occurs in particular environments. Rather, weakening is seen as occurring in order to decrease a segment's complexity under specific structural conditions.[14] Such a notion of complexity is quite different from that of dependency phonology, however, where the complexity metric is associated with a somewhat Jakobsonian interpretation of the notion, such that the 'most common' segment-types (e.g. voiceless stops) have formally simple representations, and the 'least common' (e.g. voiced fricatives) have formally complex representations.

7 *Lenition in the dependency framework revisited*

We will now outline the lenition types which are predicted by the model developed here. We view the lenition of consonants *not* as deletion, as in the Harris model, but rather, in the case of intervocalic weakening, as the result of the spreading of |V| from neighbouring sonorant segments. Lenition, then, is the addition of a |V| component, and we give the major lenition-types in (35):

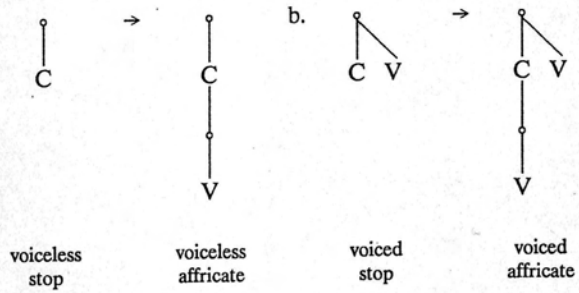
(35) a. b. c. d.



Notice now that the organisation of the lenition schema (29) is given a natural reflection in (35), specifically with respect to the initial stage in the weakening of a voiceless stop. As we have seen, the realisation of this weakening can be either a voiced stop or a voiceless fricative. The structure of the representations in this model reflects this choice, in that |V| can be added either by adjunction, to give a voiced stop, or by subjunction, to give a voiceless fricative. Further weakening gives (35d), i.e. a governing |C| modified both by an adjoined and a subjoined |V|, i.e. a voiced fricative.

We suggest that strident fricatives do not typically participate as a distinct class in such lenition processes; i.e. that lenition of an obstruent involves only the *direct* adjunction or subjunction of a dependent |V| to the governing |C|. However, we should note, as do Lass & Anderson (1975: §5.1.3), that affrication is a common intermediate stage in the weakening of a stop to a fricative, as shown by the realisation [mʊd̪ðə] for *mother* in Cumberland and Westmoreland dialects. One possibility of accounting for this type of 'phonetic' affrication,[15] which appears to involve a minimal modification of the |C| spine in the direction of |V|, might be to allow the spine to have an unspecified node, as in (36), which shows the relationship between stops and affricates under this interpretation:

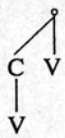
(36) a. b.



We do not pursue this possibility any further here, however.

Let us now continue along the path in (29) to the sonorant consonants. We assume that (35d) represents a 'maximally modified |C|' – there is no segment with a governing |C| which can have a greater 'strength' of |V| segments (we are thus ignoring the possibility of any use being made of representations involving strident fricatives). In the Anderson & Ewen proposal, further lenition was implemented by reorganisation of the components in the direction of greater prominence of |V|, followed by deletion of |C| elements. Here we can restrict the possible processes further. Lenition of a 'maximally modified |C|' involves a shift in headship, so that the adjoined |V| becomes the governor, as in (37):

(37)



However, (37) is ill-formed, in that the now adjoined |C| has itself a dependent element with the same properties as the governor. We are therefore faced with the problem of the appropriate well-formed interpretation of (37).

There appear to be three possibilities for interpreting (37). One would involve simply delinking of the subjoined |C|, to give a representation in which |C| was adjoined to |V|. However, this would yield the representation in (24) for a nasal, the segment-type which typically does not take part in weakening processes. A second possibility would involve an interpretive convention whereby the presence of the offending subjoined |V| would force 'demotion' of the dependent |C| to subjoined, rather than adjoined, position, with subsequent delinking of the |V|. This would yield the appropriate representation for a central approximant, the expected outcome of weakening. The final possibility would involve delinking of the *entire* adjoined construction, giving simply a |V|. In this case, we might argue, its interpretation as an approximant consonant is then determined by the fact that it occupies a consonantal position in the syllable structure.

At this stage it is not clear to us which of the latter two possibilities is to be preferred; it may well be that this depends on the nature of the phonological system in which the weakening process takes place.

8 *Conclusion*

In this paper we have proposed that manner features group under a single node in the segmental structure. We have also shown that there is no need for an independent set of categorial or major class features. Under our proposal major class distinctions are epiphenomenal, since they are derived from the manner properties of segments. We are not unaware of the fact that there is some evidence for suggesting that certain manner features may play a role in processes in a way which does not directly seem to reflect their categorial properties. This is most striking for the feature [nasal], which we have tentatively suggested occurs under a separate node in the geometry. It seems possible that in the case of other manner features which are implicated in processes on non-categorial grounds, we may also have to propose a 'double specification' in the geometry. To the extent that such claims reflect different (phonetic and phonological) aspects of the features in question, this should not be seen as undesirable. Within the context of this paper, however, we have no specific proposal to make on how these features should be incorporated in the geometry.

Although the model proposed here differs radically in some respects from more familiar approaches to feature geometry, it is interesting to note that many of the claims made here have parallels in various of these models. Thus our model groups together the six features which Sagey (1988) attaches directly under the root node (cf. (4)). Two of those, [consonantal] and [sonorant] (equivalent to the highest |C| and |V| in the manner gesture) are promoted to the root node in McCarthy (1988), leaving the others as dependents of the root node. The |V| branch of our manner gesture can be equated to the Spontaneous Voicing node proposed by Piggott (1989) and Rice & Avery (1989).

The behaviour of manner features which we have considered justifies our claim that they should be dominated by a single node in the geometry, we believe, and also the proposal within dependency phonology that the various categories represent different combinations of the two basic elements |V| and |C|. However, future research must show whether the formal distinction between adjunction and subjunction that we have made here is reflected in the behaviour of different segment-types. One suggestive piece of evidence here is the fact that the traditional features [nasal] and [voice] appear to be much more frequently involved in spreading processes than the other features which we have elected to include under the Manner node.

Footnotes

1. See e.g. Clements (1985), Sagey (1986, 1988), McCarthy (1988), Rice & Avery (1989) *et al.*

2. It is instructive to compare this with a recent suggestion of Rice (ms) that increased sonority corresponds with a more complex, rather than less complex, structure.

3. In the Anderson & Ewen model, what we are now referring to as the Manner features are characterised, rather unfortunately, as belonging to the 'Phonatory' gesture.

4. See also Anderson & Jones (1974, 1977), Lass (1984: ch.11).

5. This point has been made repeatedly in the literature: see, for example, Lass & Anderson (1975), Harris (1990).

6. Such a move is not unprecedented, however. Anderson & Ewen (1987: 248) characterise secondary articulation as involving the representation of the secondary articulation being dependent on that of the primary articulation, so that rounded labials are characterised as involving two nodes, both labelled as |u| (the 'gravity' component in the articulatory gesture).

7. We are ignoring here the specifics of the argument which den Dikken & van der Hulst (1988: 64) offer, which involves the claim that the label V:C represents a third component in addition to |V| and |C|, and should therefore be abandoned entirely. In their model, the label V:C in dependent position is to be interpreted not as a complex label on a single node, but as labels on two distinct dependent nodes. We have not incorporated this in (11), as the proposal which we make below involves a different kind of analysis of the relationship between dependent nodes and/or labels.

8. We assume here that the relative complexity of segments is a coherent notion; for some counterarguments, see Lass (1984: §11.2), who claims that: 'overall I think it's a good idea for *all* markedness considerations to be excluded from phonological characterizations: there is no reason for a particular language to code in its own segment specifications what are in essence facts about language-in-general'. The logical extension of this argument, though, would cast doubt on the representation of the notion of naturalness in general.

9. It will be noticed that no equivalent is given for the configuration '|C| governed by |V|'. This is equivalent to the class of [–continuant], or perhaps [+consonantal], but only for sonorants, i.e. the class of nasals and liquids.

10. Notice that this interpretation of the |V| node is similar to binary analyses which posit a Sonorant or Spontaneous Voicing node, such as those of Piggott (1989) and Avery & Rice (1989).

11. The distinction between two types of 'lateral' in terms of the relative preponderance of |C| in the representation appears to accord well with the typical vocalisation of 'dark *l*' to an unrounded back vowel. A change such as 'full lateral' → 'partial lateral' → vowel would involve gradual decrease in the prominence of the |C| component. Compare this with our discussion of lenition below.

12. The presence of ° in these representations denotes that each of the elements in question is 'neutrally charmed'. We ignore this aspect of government theory here.

13. Harris suggests that this representation may be required to make a distinction between glottal stops 'with and without noise release', as perhaps in Burmese.

14. Specifically, in 'governed' positions; governed segments may not be more complex than their governors.

15. We are not here concerned with the status of affricates as contrastive segments in the phonology of a particular language, which require a quite different kind of representation. Within the spirit of the approach adopted here, but with a different set of primitives under the Manner node, van de Weijer (ms) proposes an analysis of the structure of complex segments, including affricates.

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