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Markedness and Coronal Structure

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MARKEDNESS AND CORONAL STRUCTURE*

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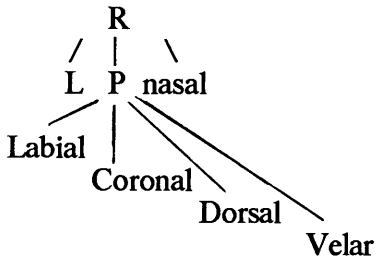
I. Introduction

In this paper we attempt to determine in what respects coronal articulation differs from other places of articulation. Having related some of the properties of coronals with the absence of place features at the level of Underlying Representation (UR), we address two issues: i. do coronals lack a Place Node in UR, or do they simply lack an Articulator Node?, ii. can coronal articulation be underspecified in a language in which [anterior] is contrastive for the class of coronals? We argue that both questions should be answered in the affirmative. To situate the discussion of segmental structure, let us adopt the following representation.

(1)



This model of segmental structure incorporates insights from Mascaró (1983), Clements (1985), Sagey (1986), among others. We assume that i. every node appears on its own tier, Articulator Nodes being unordered, ii. the Dorsal Articulator is restricted to vowels (cf. Steriade 1987, Lieber 1987) and iii. there is no need for a Supra-Laryngeal Node if nasal branches off the Root Node (RN), as Piggott (1987) argues (see also McCarthy 1988). We will not be concerned with laryngeals.

Proposals to the effect that coronals differ from other consonants, either because they appear in nearly all languages or because of their tendency to assimilate, have often been put forth. We assume with others (e.g. Kean 1975, Kiparsky 1985, Avery and Rice 1988a, b, and Shaw 1988) that coronals represent the unmarked place of articulation and, hence, have no specification for place features at the level of UR. There are two ways to formally express the absence of place features in a model such as (1): either coronals lack a Coronal Articulator or they lack a Place Node (PN) as well, two possibilities which were already envisaged by Kiparsky (1985:98, 135). We will argue that the second position, formulated below as Hypothesis 1, is the only correct one.

Hypothesis 1: coronals have no Place Node

While other phenomena affecting coronals as a class, i.e. assimilation and coronal harmonies, are compatible with both alternatives, we will discuss one phenomenon, viz. the transparency of coronals to vowels, which provides empirical proof of the inadequacy of the first position.

We further claim that the absence of a PN results from a principle of Universal Grammar, not from a parameter[1].

Hypothesis 2: unmarked coronals universally lack a PN. (if anterior is contrastive, [+ant] is unmarked).

Note that coronals are here assumed to lack a PN even in languages with two classes of coronals, as will be shown to be the case in Fula. We will attempt to determine what differentiates languages which clearly respect Hypothesis 2 from languages which appear to violate it. Vowel features being dominated by both a Dorsal Node and a PN, two nodes can, in principle, be involved in vowel spreading (V-spreading) through a consonant. Given these two possibilities and model (1), our analysis predicts the following typology of V-spreading rules.

Hypothesis 3: There are two possible types of vowel spreading through consonants: 1) Dorsal spreading which occurs through all types of consonants, 2) Place Node spreading which occurs through coronals only[2].

We shall consider two types of empirical evidence. First, we consider examples from Fula in which vowels spread through coronals and, second, evidence from Guere showing that the PN of identical vowels in adjacent syllables are fused in UR when separated either by no consonant or by a coronal. If V-spreading in these two languages were Dorsal Node spreading, it would incorrectly treat all consonants as transparent, since no consonant has a Dorsal Node, and, as mentioned above, since articulators are unordered (i.e. transparent to each other). To single out coronals as the only class of transparent consonants, it must be the case that V-spreading is PN-spreading, a level at which all consonants but coronals are represented. More detailed discussion of the evidence discussed below is presented in Paradis & Prunet (1988b).

II. Vowel Spreading

The consonantal inventory of Fula, a West-Atlantic language (cf. Labouret 1952, Arnott 1970, Labatut 1976, McIntosh 1984 and Paradis 1986a), is given in (2). Note that anterior is contrastive for the class of coronals[3].

(2)

	LABIAL		CORONAL [+ant] alveolar		CORONAL [-ant] alveopalatal		VELAR	
nasals		m		n		ɲ		ŋ
plosives	p	b	t	d	c	j	k	g
implosives		ɓ		ɗ		ʄ		
fricatives	f		s				h	
liquids			r, l					
glides		w				y		

Under Hypothesis 1, [+ant] coronals lack a PN but all other consonants, including [-ant] coronals, have a PN, as shown in (3).

(3) Underlying representation of transparent and opaque coronals in Fula:

a) /t/ R — [+cons]

b) /c/ R — P — [+cons]; P — Cor [-ant]

Let us first review the various contexts showing the transparency of [+ant] coronals to vowels. It is important to note that V-spreading through coronals takes place both within and between morphemes. Since we assume that all instances must receive a unified explanation, the Morphemic Tier Hypothesis (which can only account for intermorphemic V-spreading) is not considered.

First, there are contexts in which a template containing empty X-slots, is formed by suffixation of voice and aspect morphemes. The vowel of the first suffix, be it a, o or e, spreads through an intervening t to fill the empty skeletal slots of the following suffixes (for further details, see Sylla 1982, Prunet 1986, to appear). For illustration, the imperfect paradigm in the active voice is given in (4a).

(4) Imperfect paradigm:

a. at - x → ata Active voice
ot - x(x) → oto(o) Middle voice
et - x(x) → ete(e) Passive voice

b. yoo Aali suuɗ sawru ⁿdu 'let Ali hide the stick'
maa Aali suuɗa sawru ⁿdu 'Ali must hide the stick'

Aali suudat sawru ⁿdu	'Ali is hiding the stick'
ko Aali suudata sawru ⁿdu	'It is Ali who is hiding the stick'

The examples in (5) illustrate spreading through r within a nominal marker (a detailed derivation will be given later, cf. also Paradis 1986a,b, 1987a,b). In such markers, an initial empty X-slot can be filled by spreading from the following vowel. Examples will be given further on.

(5) Nominal Markers			
	-xru	→	-uru
	-xri	→	-iri
	-xre	→	-ere

While (4) and (5) are cases in which a vowel can spread through an intervening coronal to fill an empty X-slot, other cases exhibit assimilation between two vowels separated by a coronal. Thus, a (usually, but also e) assimilates to the following vowel across d or n in the pronominal system.

(6) Pronouns				
	a-den	→	eden	'we (incl.)'
	a-don	→	odon	'you (pl.)'
	on-en	→	onon	'you (independent pl.)'

The same assimilations are observed across t in (7) between the a of the voice suffix and that of the following object clitic (see Arnott 1970, Prunet 1986 for details).

(7) Imperfect + object clitics				
	at -en	→	eten	1.pl.inclusive
	at -on	→	oton	2.pl.
	at -e	→	ete	2.sg.

Two epenthetic vowels are found in the verbal morphology of Futankoore (a Fula dialect spoken in Mauritania and in Senegal): i and u, both being used to prevent branching onsets and branching codas. The contexts for their insertion is as follows: a) insert u after a verbal domain and b) insert i within a verbal domain. A verbal domain is a verbal root plus any combination of derivative suffixes, such as those given below. Note that most of these suffixes consist of a coronal.

(8) Suffixes			
-n = causative	-t = repetitive	-r = instrumental	
-d = inchoative	-kin = simulative		

Only u is found after a root alone.

(9)			
	dojj-u	'cough!'	*dojj-i
	ekk-u	'teach!'	*ekk-i

While u must appear in final position, i is never final and is only found after two consonants or after a geminate. Given the impossibility of branching onsets and branching codas, three-consonant clusters, as in (10), can only be broken by insertion of i, since u is always final.

(10)	dojj-i-n	'make cough'	*dojj-u-n	*dojj-n-u
	dojj-i-t	'cough again'	*dojj-u-t	*dojj-t-u

When the insertion contexts of both vowels are satisfied, as is the case in (11), u-epenthesis takes precedence, and i-epenthesis is not observed (even though its insertion would also satisfy syllabic requirements).

(11)	wor-ʤ-u	'become infected'	*wor-i-ʤ	*wor-ʤ-i
	as-t-u	'dig again'	*as-i-t	*as-t-i
	ŋaam-t-u	'eat again'	*ŋaam-i-t	*ŋaam-t-i

Thus, u is preferred to i when both are possible. Consider now cases in which the clusters are long enough to require two epenthetic vowels: first i, second either i or u.

(12) /ɓutt-ʤ-t/ → i. ɓuttiʤit (preferred variant)
ii. ɓuttiʤtu 'become large again'

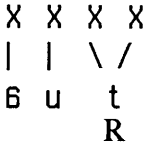
We assume that derivative suffixes form a suffixal domain, i.e. that the structure of /butt-ʤ-t/ is [[butt][[ʤ][t]]]. In forms such as (12), the variant with two i's is preferred to the variant with both i and u, in apparent contradiction with the usual preference for u. We suggest that once the first i is inserted, it can spread freely across these coronal suffixes. Forms such as buttiʤit require i-epenthesis followed by spreading whereas forms such as buttiʤtu require two actual epentheses. The derivation of the former form is given below, but first let us make explicit a convention, drawn form Archangeli and Pullbeyblank (1986), which we have assumed so far.

> (13) Node Generation Convention: A rule or convention assigning some feature or node x to some node b creates a path from x to b.

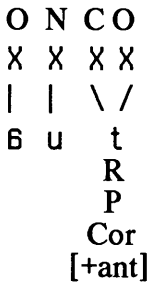
This convention prevents a Place Node from being attached directly to a an x-slot.

(14) Derivation of buttiʤit (simplified version)

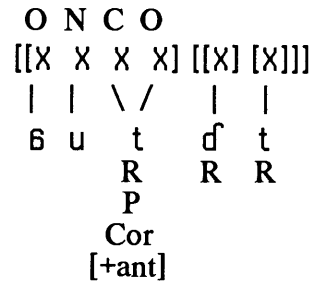
a) UR



b) Structure building rules: syllabification and default specifications.

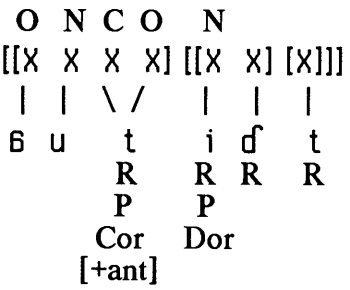


c) Suffixation of the inchoative ɗ and the repetitive t.



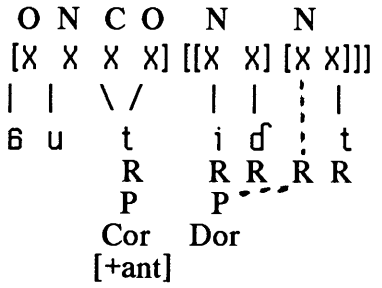
d) Syllabification: blocked (no branching onsets, no branching codas)

e) Creation of a new nucleus and i-epenthesis (simplified version)

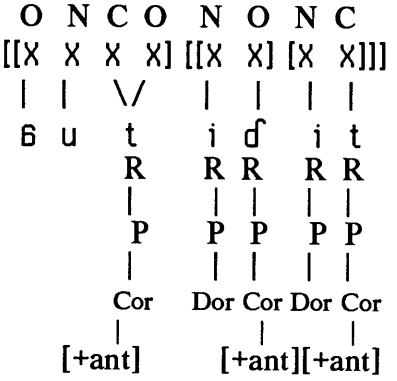


f) Syllabification: blocked (no branching onsets, no branching codas); 2 possible solutions: u-insertion after the suffixal domain, V-spreading within the suffixal domain.

g) Preferred solution: V-spreading and convention (13).



h) Syllabification and default specifications.



On the assumption that inserting segmental material once involves simpler derivations than inserting it twice, the preference for the two-i forms in (12) is explained. Further evidence of i-spreading comes from the examples in (15). These show a sequence of three epenthetic i's in which only the first two i's are syllabically motivated.

(15) raɓɓitiɗikin-o (preferred variant) 'I pretend to shorten again'
raɓɓitiɗkin-o

Since a vowel can spread through a coronal, the preferred variant is not due to the overapplication of i-epenthesis. Epenthesis only applied once, yielding the leftmost i. The following instance of i, including the unmotivated third occurrence, is due to free V-spreading.

All the Fula cases we have discussed so far involve cases of V-spreading through a coronal. Because it only takes place through coronals, such V-spreading must be PN-spreading. If it were Dorsal Node spreading, all consonants would be transparent to vowels. An immediate implication is that coronals must lack a Place Node, not just a Coronal Node. We now turn to an argument for coronal transparency which is not based on spreading but on vowels already fused in UR.

II. Vowel Fusion

Consider the segmental inventory of Guere, a Kru language (cf. Paradis 1983) which, unlike Fula, has only one class of coronals.

(16a)	LABIAL	[+ant] COR.	PALATAL	VELAR	COMPLEX
stops	p, b	t, d	c, j (ɲ)	k,g	kp, gb (ŋm)
implosives	ɓ (m)	ɗ			
fricatives	f, v	s, z			
glides	w (ŋʷ)		ɥ		
liquids		l (r, n)			

b)

[+ATR]		[-ATR]	
i	u	ɪ	ʊ
e	o	ɛ	ɔ
		a	

Guere stems, which are maximally bisyllabic, are subject to a constraint on the relative height of the vowels they may contain.

(17) Constraint: non-high vowel sequences are prohibited within stems (informally: * [-high] (C) [-high]).

Stems such as those in (18) are well formed, since they contain at most one non-high vowel.

(18)

mʊɔ	'cockroach'	ɗʊɛ	'elephant'	kpau	'corn'
bui	'ashes'	yiɓa	'face'	klgʊ	'chameleon'

Stems containing two non-high vowels are well formed if the vowels are identical and no consonant intervenes, as in (19). Such stems do not violate constraint (17) if one makes the uncontroversial assumption that they contain only one vowel, i.e. only one [-high] specification, attached to two nuclei. Let us refer to these as fused vowels.

(19)

baa	'manioc'	ɗoo	'week'	yɛɛ	'to dry'

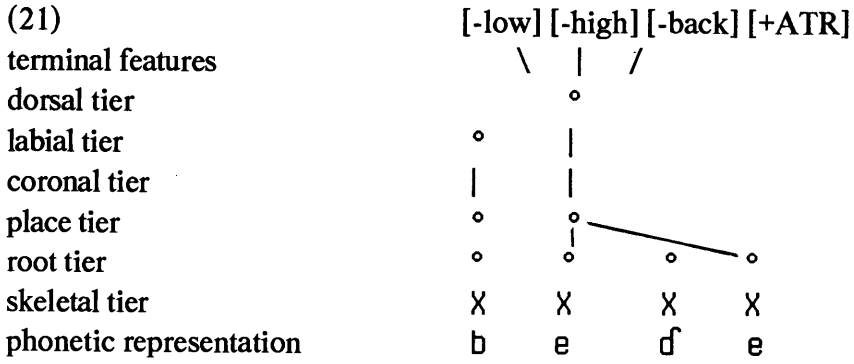
Identical non-high vowels are also permitted when separated by a consonant, but only if the consonant is a coronal.

(20)

wɔɗɔ	'to wash'	sɔlɔ	'to lose weight'
beɗe	'to hang'	sɔsɔ	'bean'

The possibility of intervening coronals is captured if i. fused vowels share a PN and ii. coronals lack a PN, as illustrated below.

(21)



Further evidence for the fused vowels come from stems with l, a free variant of implosive ɗ within words. The intervening consonant can be freely deleted. Were the vowels not fused across this intervening coronal, the deletion of the coronal would also put two identical vowels in contact and produce an OCP violation of the type discussed by Odden (1988).

(22)		
	beɗe/ bele/ bee	'to hang'
	wOɗO/ wOlO/ wOO	'to wash'
	duɗu/ dulu/ duu	'chest'
	sOɗO/ sOlO/ sOO	'bean'

To conclude sections II and III, we have provided empirical evidence for the absence of a PN in coronals (Hypothesis I) by arguing that the absence of a Coronal Articulator alone cannot account for the facts. Indeed V-spreading in Fula and in Guere only occurs through coronals as opposed to any other type of consonant, a logical possibility expressed in Hypothesis 3 but not observed here.

III. Principle or parameter? Evidence from Fula.

The question which is addressed in this section is whether the absence of a Place Node in [+ant] coronals hinges on a parameter or a principle. At first sight, it seems to result from a parameter, since there are languages like Sanskrit, Chumash and Navajo which Avery and Rice (1988b) argue require a Coronal Node. We do not contest the fact that a Coronal Node must be present in some derivations, a claim which is convincingly argued by Avery and Rice. What we maintain in Hypothesis 2 is that Coronal Nodes are universally absent from UR. Cases where a Coronal Node seems to be required underlyingly are cases where default specification rules apply very early in the lexicon.The case of -rV markers in Fula brings strong evidence in favor of this claim.

As shown in (23), -rV markers alternate with -VrV variants, within which vowels are identical in both syllables.

(23)				
a) -rV	am - re	'turtle'		
	sof - ru	'chick'		
	caak - ri	'couscous'		
b) -VrV	woj - ere	*woj - re	'hare'	
	woot - uru	*woot - ru	'unique'	
	kes - iri	*kes - ri	'new'	

The variants in (23b) were described in the second section of the paper as instances of V-spreading through a coronal. At first glance however, these variants tend to provide more evidence in favor of a V-fusion (like that in Guere) than of a V-

spreading, since one could logically posit that the forms in (23a) are derived from those in (23b) by a shortening rule. Actually, such a shortening rule exists in Fula (cf. Paradis 1986a, 1987a):

(24) Shortening Rule: X'] X ...] → X'] Ø ...]
(domain: stratum I) Stem Marker

This rule deletes the first X-slot of a nominal marker at the lexical stratum I, which indirectly causes the deletion of the initial segment of the marker by depriving it of its anchor, the X-slot. The segmental deletion can be observed in (25a). It is important to note that this rule is the first structure changing rule to apply in the lexicon.

(25) a) Shortening (Stratum I)	jim - ol (gol)	'song'
	cell - al (gal)	'health'
	pucc - u (gu)	'horse'
	kuʃ - o (ko)	'herb'
	pucc - i (ʃi)	'horses'
b)Without Shortening (Stratum II)	ɲaam - gol	'eating'
	ceer - gal	'divorce'

The hypothesis in which -rV markers are derived from -VrV URs meets with a serious problem though: it is uncontroversial that -rV markers also alternate in certain contexts with -dV variants as shown below.

(26)	tul - de	'mountain'
	en - du	'breast'
	con - di	'flour'

To understand the facts, we must be aware of three constraints in Fula. The first one, which is informally given in (27), is the OCP (Obligatory Contour Principle) activated on articulators.

(27) OCP: articulator level (*[art]$_i$ [art]$_i$)

Briefly stated, homorganic bisegmental sequences are prohibited in Fula. When two identical articulators happen to be adjacent, they are fused at their Place Node level as the result of a repair strategy (cf. Paradis 1986a, Paradis and Prunet 1988a).

The second constraint, the Sonority Constraint, holds at stratum I. It requires that the first branch of a fused segment (i.e. a hormorganic sequence) be more sonorous than the second branch.

(28) Sonority Constraint (stratum I): the first branch of a fused segment must be more sonorous than the second branch (e.g.. *lr, *nl,

*tr, *bm, *dn, but rl, ln, rt, ^{m}b, mb, nd, lw, ml; Sonority scale: obstruents < nasals < l < r < glides < vowels)

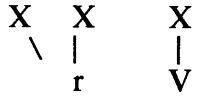
The last constraint prohibits continuant geminates in Fula (cf. Paradis in press).

(29) *ff, *ss, *rr, *yy, *ww (but pp, cc, dd, jj, bb).

When a continuant geminate is formed, it is repaired by hardening; e.g. saɣ-ru 'stick', sof-ru 'chick' alternate with plural cabb-i and copp-i.

If we posit that the UR of -rV markers is the one given below, i.e. a form with an initial continuant geminate, we are now able to derive all the variants.

(30) UR of -rV markers



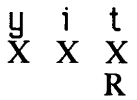
In regular cases at stratum I, that is when the marker-initial consonant does not form a disallowed homorganic consonantal sequence with the final stem consonant, the marker is shortened by the rule in (24), and realized -rV like in (23a).

When the final stem consonant is a homorganic consonant less sonorous than the underlying initial marker consonant, as for example l (which results in *lr), then the continuant geminate at the beginning of the marker is hardened as in (26) before the Shortening Rule takes place. The geminate is subsequently shortened, which accounts for -dV variants.

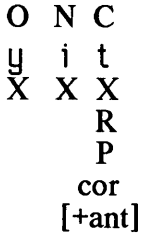
Now if the hardening of r results itself in an impermissible sequence, that is, in this case, in an equally sonorous sequence as for example (*rt → *td), the initial consonant of the marker, r, delinks from its first slot, and the impermissible sequence is broken by V-spreading through the intervening coronal to the free slot. Of course, the Shortening Rule is blocked since its application would always result in a violation of the OCP or of the Sonority Constraint. This accounts for the -VrV variant in (23b), for which a derivation is given below.

(31) Derivation of yitere 'eye' (simplified version)

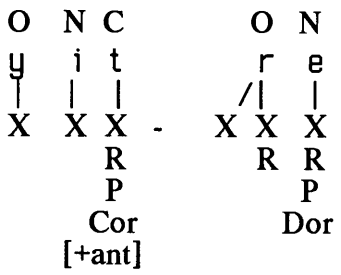
a) UR



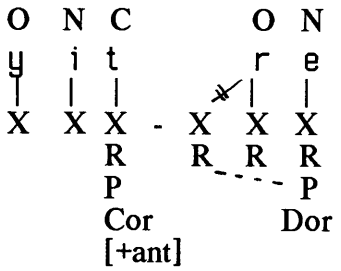
b) Structure building rules: syllabification and default specifications



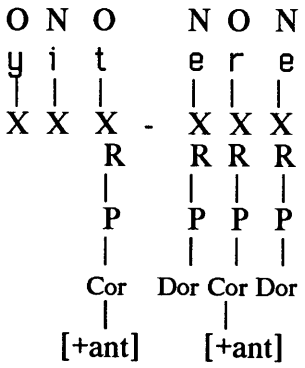
c) suffixation and structure building rules: coronal specification is blocked because of OCP (cf. (27)); fusion (place node spreading) is also blocked because of the Sonority Constraint (cf. (28))



d) r-delinking and V-spreading; Node Generation Convention (cf. (13))



e) Syllabification and default specifications



What is at stake here is the moment at which the Coronal Specification Rule applies in the derivation. As can be observed in (31), V-spreading takes place after the specification of the stem coronal, but crucially before that of the suffixal coronal. Obviously, the stem coronal must be specified before V-spreading applies, otherwise there would not be any justification for blocking coronal specification and fusion in (31c), and ultimately for resorting to V-spreading. Obviously too, the suffixal coronal must be underspecified before V-spreading takes place, otherwise this spreading would be blocked by the Place Node of the suffix consonant. In other words, without positing that the Coronal Specification Rule is cyclic, but not governed by the Strict Cycle Condition (as is expected of a structure-building rule; cf. Kiparsky 1985: 92), -VrV variants could not be handled; their distribution would appear arbitrary, which is certainly not the case.

Nevertheless, no matter their respective ordering, both applications of the Coronal Specification Rule, a **structure building rule**, must occur before the Shortening Rule for markers, a **structure changing rule**, otherwise contexts for hardening and V-spreading would be lost. In a general way, structure building rules

in Fula apply before structure changing rules (cf. Kiparsky 1985 for arguments in favor of this ordering). As the Shortening Rule is the first structure changing rule to apply in the lexicon of Fula, the Coronal Specification Rule must apply very early, otherwise the spread vowel could not anchor anywhere given that the slot to which it propagates would be deleted. We argue that early applications of the Coronal Specification Rule are responsible for counterexamples in other languages to Hypothesis 2, which posits that coronal is universally underspecified in UR.

IV. Conclusion

By and large, we have argued that coronal transparency results from Place Node Underspecification, which is governed by a principle, not a parameter. Languages where a Coronal Node is required in order to block some assimilation or harmony processes are languages where the Coronal Specification Rule applies very early in the lexicon like in Fula.

Before ending, we would also like to point out a consequence of our analysis for underspecification theories, namely for Radical and Contrastive Underspecification Theories, which are summarized below.

> Radical: The unmarked value of a feature F is absent from underlying representations. (cf. Archangeli and Pulleyblank 1986).
>
> Contrastive: In classes of segments for which F is distinctive, both values of F are present in underlying representations; only redundant values are underspecified. (cf. Steriade 1987b).

Given that [anterior] is a distinctive feature for coronals in Fula, our analysis seems to be incompatible with Contrastive Underspecification. In other words, within such a framework, coronals in Fula should be fully specified at the underlying level, a theoretical position which would not allow us to account for V-spreading.

Notes:

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1 This position differs from that we adopted in Paradis and Prunet (1988b) where we maintained that coronal underspecification was the result of a parameter.

2 It is likely that laryngeals also lack a place node.

3 For reasons of simplicity, we do not distinguish here between [-ant] coronals and palatals, and between velars and postvelars.

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