Why there is no backness

The case for dismissing both [coronal] and [dorsal][1]

A large body of evidence has led many scholars to assume that "the consonants surfacing as (anterior) coronals lack an articulator in underlying representations and acquire one at the surface by means of redundancy rules" (Paradis & Prunet 1994: 101; see references therein,[2] as well as Kean 1975, Mohanan 1993, Hume 1996, Scheer 1998 and Wilson 2001). Although defended by a smaller number of scholars, the same assumption has been made about (velar) dorsals, on the basis of a similar array of facts such as distribution, assimilation, epenthesis and transparency (see, for instance, Trigo 1988, Avery & Rice 1989, Kaye, Lowenstamm & Vergnaud 1990, Harris 1990, Rice 1996 and Clements 2001).[3]

But how can a coronal and a dorsal contrast with each other if they are both placeless consonants? Based on (partly new) evidence for dorsal underspecification and coronal/velar asymmetry, I will propose an answer to this question, whereby the contrast between coronals and dorsals no longer depends on the articulator, the features [coronal] and [dorsal], unlike [labial], being replaced with hierarchically ordered elements characterised by resonant cavity and aperture.[4] As will be seen, this allows a straightforward account of the whole set of 'back' segments, from dorso-palatals to laryngeal consonants.

1 Why should velars be underspecified?

1.1 Transparency to vowels is one of the arguments most frequently invoked in favour of velar underspecification (cf. Trigo 1988, van der Hulst & Smith 1989, 1990, van der Hulst 1991). However, as shown by Paradis & Prunet (1994), it is perhaps one of the most doubtful ones. In particular, several cases of alleged velar transparency may actually be explained without recourse to placelessness. For this reason, transparency will be left aside here.[5] I will focus on two aspects which, in my opinion, have not received sufficient attention up to now: assimilatory power and unidirectionality of sound change.

Underspecified segments are natural favourite targets for assimilation. Thus, hiatuses, which involve an empty onset position, tend to fill this gap by melody spreading: /eo/, for

[1] I am indebted to Michela Russo and Ali Tifrit for their input on a previous version of this paper.

[2] Some of which can be found in Paradis & Prunet (1991).

[3] Not surprisingly, much of the discussion is centered on scholarship from the 80's and 90's: until very recently, issues concerning representations were largely outside the mainstream of research interests in subsequent constraint-based theories.

[4] As velars are the unmarked type of dorsals in the world's languages, the terms 'velar' and 'dorsal' can be viewed as synonyms to a certain extent. Thus, in what follows, both words will be used indiscriminately. The relevance of my proposal on the status of velars for the whole set of dorsals will be made clear in § 4.

[5] For similar reasons, I will not discuss epenthesis as an argument for place underspecification. Several facts cast doubt on the epenthetic character of many reported cases of *coronal* (and front vowel) insertion, as opposed to glottal (and *schwa*) epenthesis. For the sake of brevity, let us say that, while the latter is clearly phonological, the former is largely lexically-driven, and only lends support to coronal (and front) *unmarkedness*; as shown, among others, by Huber (2008), unmarkedness and underspecification are not strictly correlated.

example, may be realized either as [e^{j}o] or as [e^{w}o], while such propagations fail to occur whenever the intervocalic slot is already filled by a consonant. If it is assumed that velar dorsals are underspecified, a certain number of phenomena can be explained. I will group them under the term 'dorsal *colorability*', which has two main realizations, according to whether it concerns purely allophonic phenomena or the very shape of phonemic systems.

Velars seem to be much more prone to coarticulation with vowels than any other type of consonants. For example, velar palatalization by front vowels is universal. In all languages, indeed, /ki/ is realized [k^{j}i], whereas [t^{j}i] for /ti/ remains optional, coronal palatalization being clearly perceived by speakers when it characterizes a dialectal variety of a language.[6] According to the phonetician (cf. Hardcastle & Hewlett 1999), this is because the back of the tongue is a particularly slow articulator, which is involved in the production of both consonants and vowels; thus, whenever /k/ and a vowel are coarticulated, they maximally overlap, so that /k/ shares the vowel's place of articulation. The phonologist's task will be to search for the formal property of which slow articulation is the substantive manifestation. Clearly, underspecification is a tentative hypothesis: melodies are supposed to spread onto accessible positions; hence, any empty portion of a segment may be filled, context permitting.

Not surprisingly, highly vowel-sensitive consonants are primarily dorsal within phonemic inventories of the world's languages. Let us assume that dorso-palatals, labio-velars and uvulars are composed as in (1a-c), where **I**, **U** and **A** – the three basic vocalic 'elements' of Kaye, Lowenstamm & Vergnaud's (1985) theory of phonological primitives – stand for palatality, labiality and low/RTRness.

(1) a. /k/ + **I** = /c/
b. /k/ + **U** = /k^{w}/
c. /k/ + **A** = /q/

I will make the hypotheses in (2) on the typology of such consonants, which should be confronted with the highest possible number of languages.

(2) In a given system,
a. if there is only one type of labialized consonant, it is a labio-velar;
b. if there is only one type of 'emphatic' consonant, it is a uvular.

In other words, the existence of /k^{w}/ or /q/ in a given language does not imply that of **U**- or **A**-based *correlations* respectively for all places of articulation, that is /p^{w}, t^{w}…/ or /p^{ʕ}, t^{ʕ}…/, whereas the reverse is supposed to be true. These implications also hold for palatalized consonants within Jakobson's system of acoustic features, the class of dorsals being replaced with a 'compact' category including pre-palatal (i.e. [–anterior] coronal) consonants.

The case of Kabardian (cf. Kuipers 1960) is worth mentioning. This language has only two phonemic vowels: /a/ and an empty nucleus (Anderson 1991), of which front and rounded

[6] For example, coronal palatalization is typical of Brazilian Portuguese as opposed to its European counterpart, and occurs when European speakers imitate a Brazilian accent.

vowels are allophones occurring after palatalized and labialized consonants respectively. Besides the glides /j w/, such I- and U-containing consonants are exclusively dorsal (velar and uvular). Interestingly, thus, deprived of a phonemic nucleic site, the vocalic melodies I and U select empty slots (whence /j w/) *and dorsals* as the most suitable places!

1.2 As noted by Trigo (1988: 53), the behaviour of nasal consonants assigns a special status both to the coronal and to the velar, as shown by the Spanish words like *ca*[mp]*o* 'field', *ca*[nt]*o* 'I sing', *ba*[ŋk]*o* 'bank', *pa*[n] or *pa*[ŋ] 'bread'. The nasal is homorganic to a following consonant if there is one. However, if there is no consonant, as is the case word-finally, then coronal and velar nasals alternate according to the dialectal variety: the former characterises standard Castilian, while the latter is common throughout Southern Peninsular and American dialects (Lapesa 1967: 319, 416). Thus, both coronals and velars appear to be 'default' places.[7]

However, seen from a diachronic perspective, this coronal-velar connection shows an interesting asymmetry: the conservative final allophone of the nasal consonant is [n] (cf. Lat. *pane*), which underwent a historical shift. Furthermore, [n] > [ŋ] parallels other changes concerning not only sonorant codas but also any consonant in any position. Typically, it is the coronal that changes into a velar; I have no knowledge of languages where velars have spontaneously changed into coronals. Among sonorants, besides [n] > [ŋ], we have [l] > [ɬ] (> [w], mostly in coda position, but also elsewhere (cf. Carvalho 1989), as well as [r] > [ʁ] (> [ʁ]) in French, German, some Dutch and Portuguese. Regarding obstruents, it is well-known that [t] gave [k] in Hawaiian, but such shifts occur elsewhere: e.g., in other Polynesian languages, in Chinese and Vietnamese (in coda position), and in Athapaskan languages (Rice 1996: 527-528). For example, standard Chipewyan words like [tu] 'water', [tən] 'ice', [sətá] 'my father', [yałti] '(s)he speaks' shifted to [ku], [kən], [səká], [yałki] in certain innovative varieties. Also, the Navajo forms [tó] 'water', [tązhii] 'turkey', and [koˀ] 'fire', which retain Proto-Athapaskan *t and *k, correspond to [kóó], [kàtʃˀíį́] and [kǫˀ] in Kiowa Apache. As to fricatives, the shift [ʃ] > [x] is well attested in the history of Castilian.

Where does this asymmetry come from? Assimilation being excluded in such changes, the simplest explanation is that coronal to velar shifts result from feature loss.

2 Explaining two paradoxes

And yet, albeit presumably underspecified, plosive and fricative velars, along with their coronal counterparts, lose something when they shift to [ʔ] and [h], a process for which either of them may have priority over all other plosives. In Malay, /k/, and only /k/, realizes as [ʔ] word-finally; in Hawaiian, /k/ historically changed into [ʔ], while /t/ shifted to [k].[8] Hence, the paradox in (3a), formulated at the beginning of this article, is coupled with the one in (3b).

[7] Cf. also the well-known case of Catalan. Unlike word-final /m/, /n/ is homorganic to the initial consonant of the following word; this naturally follows from its lacking any place feature of its own (Goldsmith's 1990: 224-232).

[8] It may be worth mentioning that, whatever it is, this feature is particularly prone to disappear in dorsal fricatives: less frequent than its labial and coronal counterparts /ɸ~f/ and /θ~s/ (Lass 1984: 154), the dorsal /x~χ/ often tends to change into a laryngeal [h]. When the three fricatives exist, it may be the case that the dorsal debuccalizes first. At any rate, this is what follows from the modern results of Grimm's law: while /f/ and /θ/ have retained the oral articulation of IE */p/ and */t/, */x/ < IE */k/ has shifted to /h/ in all Germanic languages.

(3) a. How can coronals and velars be placeless and contrast nevertheless?

b. How can coronals and/or velars be placeless and debuccalize nevertheless?

In other words, what feature do coronals and/or dorsals lose, if it does not refer to place?

Two main explanations have been proposed to the paradoxes in (3). They share two characteristics: (a) they assume that features are part of a hierarchical structure, in line with the feature geometries that have been proposed from the mid-eighties on; (b) they are more or less strongly based on Archangeli's (1984, 1988) Radical Underspecification Theory.[9]

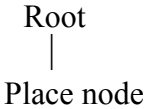
According to the first proposal (Archangeli & Pulleyblank 1986, Trigo 1988), whether coronals or velars are placeless consonants depends on the language. It follows that coronals and velars contrast in that either of their place features is in a privative opposition in underlying representations: [coronal] *vs* Ø in certain languages, [velar] *vs* Ø in others. The unspecified feature is inserted by a 'redundancy rule'. This theory raises two problems.

First, as noted by Rice (1996), it offers no account of why only coronals and dorsals pattern as if they were underspecified, to the exclusion of labials; the absence of a Labial redundancy rule is, thus, arbitrary. This problem is circumvented by Hume & Tserdanelis (2002), who assume that *any* place feature, including [labial], can be absent from underlying representations, the underspecified feature varying from language to language.

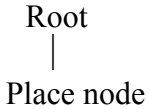
Secondly, whatever the truth of the matter regarding labial underspecification, I think that the burden of proof is upon those who assume that place underspecification is language-specific, and that this is not an easy task. Are we really sure that there is no language in which there is evidence for *both* coronal and velar underspecification?

In any event, if the arguments exposed in § 1 in favour of dorsal underspecification are relevant, then dorsals should be seen as universally underspecified. Admitting with the majority of authors that there is also a strong case for coronal underspecification, the simplest working hypothesis, thus, is that *both coronals and dorsals are universally underspecified*. This is, indeed, at the basis of the second approach to the problem. Rice (1996) makes two assumptions, which are represented under (4).

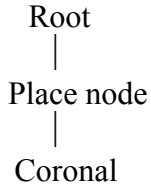
(4) a. Underlying coronal/velar



b. Surface velar



c. Surface coronal



[9] Unfortunately, space does not permit a discussion of Huber's (2008) work on velars, as this would require describing recent developments of the element theory that has sprung from Government phonology. His interesting account resembles my own proposal in § 4, in that both coronality and velarity are radically ruled out.

(i) coronals and velars share the underspecified underlying representation in (4a); (ii) the difference between coronals and velars is a consequence of whether a unique Coronal default rule (henceforth CDR) applies or not, filling in the unmarked feature, whence the surface representations of velars and coronals in (4b,c).

This approach has several advantages. First, it requires only one default rule (inserting only one feature), and thereby avoids rule arbitrariness, as coronals and velars pattern together to the exclusion of labials. Secondly, it elegantly represents the Hawaiian chain shift in terms of loss of dependent components, as shown in (5).

(5) a. /t/ = {[root, place, coronal]} > /k/ = {[root, place]}

b. /k/ = {[root, place]} > /ʔ/ = {[root]}

Thirdly, it explains the paradox in (3b): debuccalization does not involve the loss of the place feature, but that of the place node. Fourthly, it makes an interesting claim, which I will come back to later on: as shown in (4b), such general and 'substance-free' categories as the 'nodes' of feature geometries serve not just an organizational function, but are phonetically interpretable.

Unfortunately, Rice's proposal also suffers from two flaws. The first is that, albeit unspecified for velars, the feature [dorsal] is reintroduced to account for marked types of dorsals (such as palatals, uvulars, etc.). Clearly, this weakens the underspecification hypothesis, since [dorsal] still belongs to the inventory of phonological primes, like the [coronal] default feature. Though this can be partly viewed as an effect of feature geometry, features like [palatal] or [uvular] requiring a node with which they are associated, the nonexistence of a Dorsal default rule seems arbitrary.

But the main problem met by Rice's account resides in the fact that coronals and velars have the same underlying representation, and only contrast in their surface forms. This amounts to saying that phonemic contrasts are not necessarily encoded in the lexicon, and that they may derive from rules. It is doubtful whether default rules have been designed for this purpose in Radical underspecification theory. Thereby, it is also doubtful whether Rice's theory succeeds in explaining the paradox in (3a).

3 From default to nonexistent features

3.1 Considering the previous remarks on Rice's theory, I propose the hypotheses in (6).

(6) a. Coronals and dorsals are *both* placeless.

b. There are *no* such features as [coronal] or [dorsal].

(6a) is in line with Rice's account. However, as follows from (6b), my proposal differs from hers in that there are no articulator-based features, nor default rules inserting these features accordingly.

As a result, coronals and dorsals must have distinct underlying representations, for which I propose to generalize Rice's idea that placelessness does not prevent phonetic interpretation. In what follows, I will be concerned with the nature of such placeless and interpretable objects. If coronals and dorsals are not [coronal] and [dorsal], what are they?

3.2 Let us examine the status of velarity within vowel systems in light of the typology of high vowels. Evidence from the world languages provides the cases in (7).

(7)	a.	/i/			/u/	(*e.g.*, Spanish)
	b.	/i/		/ɯ/	/u/	(*e.g.*, Korean)
	c.	/i/	/y/		/u/	(*e.g.*, French)
	d.	/i/		/ɯ/		(*e.g.*, Japanese)
	e.	/i/	/y/	/ɯ/	/u/	(*e.g.*, Turkish)
	*f.			/ɯ/	/u/	
	*g.		/y/		/u/	
	*h.	/i/	/y/			
	*i.	/i/	/y/	/ɯ/		
	*j.		/y/	/ɯ/		
	*k.		/y/	/ɯ/	/u/	

As can be seen, wherever /y/ exists, so do /i/ and /u/, whereas the reverse is false. Let us then admit the definition of /y/ in (8), where the marked character of this vowel results from its being derived from the 'primary' vowels /i/ and /u/.

(8) /y/ = /i/ ∪ /u/

Now, /y/ has the features in (9).

(9) /y/ = [high/ATR, front, rounded]

Therefore:

(10) /i/ = [high/ATR, front]
/u/ = [high/ATR, rounded]

where there is no [back], i.e. [velar], feature.

What, then, is /ɯ/? /ɯ/ has the complementary properties of those of /y/. Therefore, if (8) is true, then we have:

(11) /ɯ/ = /u/ ∩ /i/ = [high/ATR]

where '[back]' is simply the default realization of [high/ATR], i.e. whenever this feature is not associated with [front] or [rounded].[10]

Crucially, this conclusion, drawn from typology, is supported by two process-based facts. First, /ɯ/ behaves as a functionally asymmetric vowel wherever it exists; as such, it should be featureless according to the principles of Radical underspecification theory (Archangeli 1984, 1988). Secondly, whereas there are many cases of vowel harmony involving [front], [round], [high] and [ATR], there is no clear example of back harmony.[11] Moreover, the existence of velarized consonants is highly doubtful: in any event, while there are numerous cases of palatalized and labialized consonants, no language has been reported to contrast velarized and pharyngealized consonants (Ladefoged 1971: 63 ff.).

Now, let us recall the extreme sensitivity of velar consonants to the I A U-melodies (cf. § 1.1). An object which is easily coloured while being deprived of colouring power by itself is empty. Thus, typological and processual evidence show that backness must be ruled out from the set of phonological primes for both vowels and consonants. Hence, as a working hypothesis, on the basis of the definition of /ɯ/ in (11), I will assume the representation of the velar consonant in (12).

(12) /k/ = [high/ATR]

3.3 There is evidence for the assumption in (12), though little attention has been paid to data that show a relation between velar consonants and high/ATR vowels. This may be because, at first sight, such facts resemble those presumably impossible processes of which Chomsky & Halle (1968: §9) provide some examples. Let us consider the evidence in (13), from the Ripuarian dialect of Cologne (McCawley 1972). If (12) is right, then the change in (13) – the so-called *kölnische Gutturalisierung* – is simply a case of assimilation.[12]

(13) a. t, n > k, ŋ / [high V] (N) __

b.

[kiŋk]	'child'	(st. Germ. *Kind*)
[tsik]	'time'	(st. Germ. *Zeit*)
[ligə]	'suffer'	(st. Germ. *leiden*)
[huŋk]	'dog'	(st. Germ. *Hund*)
[lyk]	'people'	(st. Germ. *Leute*)
[viŋ]	'wine'	(st. Germ. *Wein*)
[bruŋ]	'brown'	(st. Germ. *braun*)
[nyŋ]	'nine'	(st. Germ. *neun*)

[10] This is in line with Kaye, Lowenstamm & Vergnaud's (1985) theory of phonological primes, in which no element has [+back] as its 'hot feature'.

[11] The well-known Turkish vowel harmony involves [front], not [back], propagation, despite what is reported in most works, if only because certain consonants can be palatalized by the harmonic feature.

[12] Evidence reported by McCawley (1972) is confirmed by Scheer (2003) *contra* Jakobson & Waugh (1980: 131-2), whose criticism is based on areas around Cologne, where vowels were lowered after (13a), high vowels being maintained in the city of Cologne itself. It is worth mentioning that, as shown by Scheer (2003), *Gutturalisierung* was also triggered by umlaut, that is by the I-element associated with highness.

The Brabantic dialect of Antwerp shows a similar 'crazy rule' (Taeldeman 2001). In (14a), it is [ATR] (associated with length) that seems to play the leading role, in accordance with the definition of velars in (12). In this dialect a coronal nasal velarizes after an underlyingly long vowel, the vowel being shortened at the same time while remaining [+ATR], as in (14c,e); but the nasal does not velarize after underlyingly short, and thus [–ATR], vowels, as in (14d).

(14) a. n > ŋ / [ATR (long) V] __ #

b.	*gr*[yːnə]	'green (pl.)'	c.	*gr*[yŋ]	'green'
	sch[uːnə]	'shoes'		*sch*[uŋ]	'shoe'
d.	*k*[ɪn]	'chin'	e.	*t*[iŋ]	'ten'
	z[ɔn]	'sun'		*z*[øŋ]	'son'

Similar facts can be found elsewhere, and require further research. At the very least, they suggest that such phenomena are more widespread than one would expect, given their apparent oddness. They show an interaction between velar consonants, on the one hand, and high/ATR vowels and glides, on the other, as well as, interestingly, between velars and /i/, in which ATRness is more salient phonetically than in any other vowel.

Thus, in Pirahã (Everett 1986), /h/ surfaces as [k] before /i, u/. Similarly, a dorsal plosive off-glide emerges after high/ATR vowels in Momo, a branch of Grassfields Bantu, (Stallcup 1978: 124-132), two Tibeto-Burman languages, Maru/Langsu (Burling 1966) and Huishu (Mortensen 2003), two Austronesian languages, Lom and Singhi (Blust 1994), and some varieties of Rhaeto-Romance (Haiman 1988: 352-353). In Mamaindé, a Nambikwaran language, high vowels yield an off-glide which is labial after /u/ but velar after /i/ (Eberhard 2002: 20 ff.). The same is reported in languages of the western Lakes Plain in Irian Jaya.[13]

4 Dorsals and coronals as 'cavity states'

4.1 Velar segments are situated at the junction of the oral and pharyngeal cavities; thereby they can be described in both oral and pharyngeal terms, as shown in (15).

(15) '[velar]' = [ATR] = open pharynx
= [high] = closed oral cavity

Let us assume that, as suggested by the data in (14), velars are primarily defined by their *pharyngeal* configuration, i.e. by ATRness.

This hypothesis has two interesting consequences. First, defining velars in such a way entails an equipollent opposition whereby the contrast between velar and pharyngeal consonants patterns with the one between /ɯ/ and /ɑ/ in (16).

(16) a. /ɯ/ = [ATR] = open pharynx b. /ɑ/ = [RTR] = closed pharynx

[13] Data from the responses to a question posted by Dave Eberhard on the LinguistList about the phenomenon he found in Mamaindé: cf. http://www.linguistlist.org/issues/13/13-3330.html.

In terms of 'elements' *à la* Kaye, Lowenstamm & Vergnaud (1985), this can be expressed as in Tableau 1, where each element is solely characterised by the state of the pharyngeal cavity.

Element	**ɬ**	**A**
Cavity	PHARYNGEAL	PHARYNGEAL
State	SPREAD	CONSTRICTED
Gloss	'dorsal'	'pharyngeal'

Tableau 1
Pharyngeal elements

4.2 The second consequence of equating velarity and ATRness is that coronality becomes the sole basic lingual gesture within the oral cavity. Hence, no specific articulator-based feature is required for coronals, as they are associated with the default articulation of the tongue in the superior cavities, as follows from the elements of Tableau 2.

Element	**T**	**N**
Cavity	SUPRA-PHARYNGEAL	SUPRA-PHARYNGEAL
State	CONSTRICTED	SPREAD
Gloss	'coronal'	'nasal'

Tableau 2
Supra-pharyngeal elements

4.3 Given those elements, let us assume that there are elements that are defined solely in terms of openness/closure, with no reference to any resonant cavity, as those in Tableau 3.

Element	**ʔ**	**h**
Cavity	–	–
State	CONSTRICTED	SPREAD
Gloss	'plosive'	'fricative'

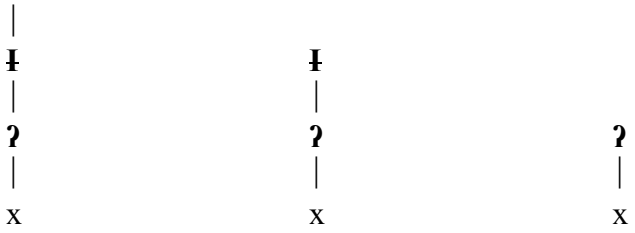
Tableau 3
Manner elements

These elements carry manner properties, in line with Lass (1976), Kaye, Lowenstamm & Vergnaud (1990), Harris (1990) and Harris & Lindsey (1995), at least in languages lacking ejective or aspirated consonants (cf. Jatteau & Carvalho 2012).

4.4 Assuming that supra-pharyngeal elements are dominated by pharyngeal elements, and that both are dominated by manner elements, as shown in the representations under (17), the problematic issues noted above are naturally resolved.[14] First, neither [coronal] nor [velar] are necessary to explain the contrast between coronals and velars; both contain **ɬ**, but the former have **T** as well, coronals and velars being, thus, in a privative opposition. Secondly, coronal and velar debuccalization simply involves the loss of **ɬ**. Thirdly, being dominated by **ɬ**, **T** may be deleted while **ɬ** is preserved, but the reverse is false: thus, coronals may shift to velars, but the reverse is unattested (cf. § 1.2).

[14] Clearly, this supposes some hierarchy between elements, which is not the case in Government phonology, but is an important characteristic of Dependency phonology's 'gestures'.

(17) a. /t/ **T** b. /k/ c. /ʔ/



Fourthly, lacking supra-pharyngeal elements, velars are highly colourable segments (cf. § 1.1), as they have empty place for hosting the supra-pharyngeal vocalic elements **I** and **U**.[15]

As a result, the sole major consonantal articulator is [labial]. It associates with SPREAD-containing elements, that is **H** and **N**, whence /p/ and /m/.[16] In sum, supra-laryngeally articulated consonants are ATR by default; sometimes, they can be also associated with **A**, whence contrastive 'emphasis', as is the case in Arabic and Berber.

4.5 Finally, assuming that velars and post-velar consonants pattern with /ɯ/ and /ɑ/ respectively allows an interesting correlation between these consonants and vowel height. As follows from theories of monovalent features,[17] mid vowels result from combination of two antagonistic elements carrying high/ATRness and low/RTRness respectively, finer contrasts such as mid high *vs* mid low vowels conferring some kind of headedness on either of these elements.[18] This is broadly represented in (18), where the underlined symbol is the head.

(18) /i u/ = {**H**}
/e o/ = {**H**,**A**}
/ɛ ɔ/ = {**H**,**A**}
/a/ = {**A**}

Let us admit that **H** and **A** maintain the same relationship among consonants. The whole set of 'back' consonants can thus be represented, as shown in Tableaus 4 and 5.

Dorso-palatals		*Labio-velars*		*Velars*		*Uvulars*		*Pharyng.ed uvulars*		*Pharyngeals*		*Laryngeals*	
c	ç	k^w	x^w	k	x	q	χ	$q^ʕ$	$χ^ʕ$	ʔ	ħ/ʜ	ʔ	h
ʔ	**h**	**ʔ**	**h**	**ʔ**	**h**	**ʔ**	**h**	**ʔ**	**h**	**ʔ**	**h**	**ʔ**	**h**
H	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	–	–	–	–
–	–	–	–	–	–	**A**	**A**	**A**	**A**	**A**	**A**	–	–
I	**I**	**U**	**U**	–	–	–	–	–	–	–	–	–	–

Tableau 4
'Back' obstruents

[15] Also, this asymmetry between velars and coronals might partially explain why, being minimally specified, KT is the most widespread cluster of stops, assuming that codas tend to be less specified than onsets.
[16] Interestingly, while there are frequent labial-dorsal and coronal-velar interactions, there is not a special relationship between labials and coronals (Rice 1996).
[17] Government phonology (Kaye, Lowenstamm & Vergnaud 1985, 1990), Dependency phonology (Anderson & Ewen 1987), and Particle phonology (Schane 1984).
[18] Actually, this is the case in Dependency phonology, where dependency relations are phonemic properties, not in Government phonology, in which government is determined by the substantive content of segments.

Dorso-palatal	*Labio-velar*	*Velar*	*Uvular*	*Pharyngeal*
j	w	ɯ̟	ʁ̟	ʕ/ʢ
–	–	–	–	–
ɬ	**ɬ**	**ɬ**	**ɬ**	–
–	–	–	**A**	**A**
I	**U**	–	–	–

Tableau 5
'Back' approximants

These representations account for several characteristics of these segments, e.g., (a) the dual behaviour of uvulars, which sometimes pattern with velars, sometimes with pharyngeals (cf. McCarthy 1994), since they have both **ɬ** and **A** elements; (b) the possibility of contrast between plain and pharyngealized uvulars (cf. Colarusso, this vol.), since **ɬ** and **A** may be in a government relationship. This account also predicts that no contrast should exist between pharyngeal ([ħ, ʕ]) and epiglottal ([ʜ, ʢ]) consonants,[19] and that both sounds tend to alternate, having the same representations; thus, the 'pharyngeals' of Arabic and Hebrew are actually often epiglottal (Laufer & Baer 1988, McCarthy 1994).

5 Conclusion

The views expressed in this article can be summarized as follows. Admitting (a) that both coronals and velars are underspecified as to place, and (b) that contrasts are encoded directly in segmental representations, then (c) underspecifying a feature means to eliminate it, not only from segments, but, more radically, from the set of phonological primitives, and (d) the coronal-velar contrast must be assigned a basis other than place.

This is what I propose by replacing [coronal] and [dorsal] with elements characterised by the state of resonant cavity, so that neither the contrast between coronals and dorsals, nor coronal and velar debuccalization require articulator-based features. Also, assuming that oral and nasal elements are dominated by pharyngeal elements explains why coronals may shift to velars, while velars cannot change into coronals, as well as why velars are the most vowel-friendly consonants. Finally, the parallel drawn between pharyngeal elements and vowel height/ATRness allows for a straightforward account of the whole set of 'back' consonants.

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[19] Laryngoscopic observations of pharyngeal articulations and larynx height show that there is not good evidence for "two distinct places of articulation in the pharynx", i.e. epiglottal and pharyngeal (Esling 1999).

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