ON THE DISTINCTION BETWEEN PHARYNGEALISATION HARMONY AND UVULARISATION HARMONY IN ST'AT'IMCETS (LILLOOET SALISH)

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0. Introduction*

'Retraction' in St'at'imcets (Lillooet Salish) is illustrated in (1), specifically, by the 'retracted' Cs ɭ ʂ and 'retracted' Vs ɔ ʌ .[1] Each of these forms shows 'retraction' harmony between two or more segments.

(1) a. ɭɔt-ɔn' 'to squash, tr.' b. qʌɭ 'bad' c. ɭʌʂ 'to cave in'

It has been assumed that St'at'imcets 'retraction' is a single phenomenon (Bessell 1992; van Eijk 1985; Remnant 1990; Roberts 1993; also Bessel & Czaykowska-Higgins 1991; Czaykowska-Higgins 1987; among others): certain segments can be 'retracted' in a root or word, and certain Cs induce 'retraction' harmony on Vs. In this paper I will argue that St'a'timcets 'retraction' is not simplex, but comprised of two postvelar harmonies: pharyngealisation harmony (PH) and uvularisation harmony (UH) (Shahin 1995).[2] PH is tongue-*root*-retraction harmony; UH is tongue-*back*-retraction harmony. Thus reanalysed, St'at'imcets 'retraction' is clarified, certain data which are problematic under the simplex analysis become routine, and St'at'imcets becomes classifiable in an emerging typology of postvelar phonology based on study of Niger-Congo (Archangeli & Pulleyblank 1989, 1994, Clements 1985a, 1991; Ka 1988; Odden 1991; Stewart 1967; among others), Salish (Bessell 1992; Bessell & Czaykowska-Hggins 1991; among others), and Semitic (Bessell 1992; Ghazeli 1977, McCarthy 1991, 1994; Shahin 1995; Younes 1982, 1993; among others).

§1 will present the St'at'imcets phonemic inventory. It will then summarise the simplex analysis of St'at'imcets 'retraction' and lay out the problematic data. §2 presents the distinction between PH and UH using data from Palestinian Arabic. [RETRACTED TONGUE ROOT] ([RTR]) will be identified as the feature of PH and arguments will be presented supporting the feature [RETRACTED TONGUE BACK] ([RTB]) as the feature of UH. Representations of Arabic pharyngealised and uvularised segments will be given. §3 reanalyses St'a'timcets 'retraction' in terms of PH and UH and shows how the reanalysis better fits the St'at'imcets and cross-linguistic facts. This includes a retake of the St'at'imcets phonemic inventory and proposed representations for its postvelar Cs and Vs. §4 places St'at'imcets within a rudimentary postvelar typology.

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[1]My St'at'imcets data is taken from van Eijk (1985). Additional (Fountain dialect) forms are taken from my fieldnotes gathered during a UBC fieldmethods course, fall 1993; I thank St'at'imcets consultant Alice Adolph for providing her data. A 'retracted' C (to be clarified as uvularised in §3) is indicated by a dot under the symbol.

[2]I will not discuss the epiglottal/lower pharyngeal constriction realised on St'at'imcets Vs in the context of ʕ (van Eijk 1985:13-14). Based on van Eijk's description, I see no evidence that this is not a phonetic effect. However, such Vs occur phonologically in Tsakhur and Udi (Catford 1983), and are discussed by Halle & Vaux (1994). Within the distinctions to be drawn in this paper, they are not the same as simple tongue-root-retracted Vs, although they no doubt involve tongue-root retraction (see §2.2).

1. St'at'imcets 'Retraction'

1.1 St'at'imcets Inventory

The St'at'imcets underlying consonantal inventory has 20 obstruents and 20 resonants (van Eijk 1985), as seen in (2a). The size of this inventory is due in part to the use of superimposed ejective airstream (glottalisation, as on *k'*) and labialisation secondary articulation (as on k^w), which can be combined (as on k'^w). The output inventory has an additional four 'retracted' Cs, as seen in (2b). The Vs are presented in (3). Each of the four underlying Vs has a plain ('unretracted') and a 'retracted' output variant, as shown.[3]

(2) a. St'at'imcets underlying Cs

labial	dental	palatal	velar	uvular	pharyng'l	glottal	
OBSTRUENTS							
p	t		k k^w	q q^w			STOP
p'			k' k'^w	q' q'^w			
	ƛ'	c					AFFRICATE
		c'					
	ɬ	s	x x^w	χ $χ^w$			FRICATIVE
RESONANTS							
	l						LATERAL
	l'						
m	n						NASAL
m'	n'						
						ʔ	
	z	j	ɣ w		ʕ $ʕ^w$	h	GLIDES
	z'	j'	ɣ' w'		ʕ' $ʕ'^w$		

b. St'at'imcets output 'retracted' Cs

ʂ	ʐ	ɭ	ɭ

(3) St'at'imcets Vs

underlying		output	
i	u	e ɛ	o ɔ
ə		ə ʌ	
æ		æ	ɑ

1.2 Simplex Analysis of St'at'imcets 'Retraction'

St'at'imcets 'retraction' is formalized by Remant (1990). Remant, who draws her data from van Eijk (1985), identifies two cases of 'retraction'. The first is segmentally conditioned and strictly local. When a

[3]For articulatory descriptions of St'at'imcets Cs , see van Eijk (1985), also Kinkade (1967). The underlying nonlow Vs are traditionally represented as *i u*. Although there are some exceptions (van Eijk 1985), their plain outputs are usually *e* and *o*, respectively. §3 will present evidence that these Vs are underlyingly high.

'retraction' trigger, i.e., one of z z' q q' qʷ q'ʷ χ χ', is present in a root, the immediately preceding V surfaces 'retracted'. Thus, i ə æ u → ɛ ʌ ɑ ɔ /__ z z' q q' qʷ q'ʷ χ χ. Examples are seen in (4).

(4) a. mɛχæl 'bear' b. mɔzmet 'pitiful' c. ɬɛq' 'to steal'

The second case is less restricted and occurs in forms with no apparent segmental source for the 'retraction'. Remnant analyses these as involving a 'retraction' morpheme (van Eijk 1985:40 refers to 'retracted roots'). The targets for morphemic 'retraction' are the Cs c s l l', and all underlying Vs. Thus, s l l' i ə æ u → ç ʂ ɭ ɭ' ɛ ʌ ɑ ɔ /{..., 'retraction'}. This is seen from (5). The 'retracted' suffixal segments in (5d,e) show that 'retraction' harmony is not blocked by a (right-edge) root boundary.

(5) a. qʌɭ 'bad' b. ɭʌç 'to cave in' c. ʔɑlʂ 'sick'
d. qʌɭ-wɛɭ'χ 'to get spoiled' e. ɭɔt-ɔn' 'to squash (tr.)'

Remant actually divides forms showing morphemic 'retraction' into (i) roots with a 'retraction' morpheme and (ii) roots with an 'adversative morpheme', which is phonologically realised as 'retraction'. Van Eijk (1985) notes the negative connotation of several 'retracted roots', but a positive connotation for others, furthermore stating [p.42] "[t]o be sure, not all words with retracted phonemes have a connotative value".

Dale Kinkade (personal communication) suggests a different analysis. Consultant intuitions expressed during his Salish fieldwork identify a 'retracted' C3 somehow present in forms involving 'morphemic retraction'. Assuming this C3, the two cases of St'at'imcets 'retraction' are united. The only difference between the 'morphemic' and segmentally-triggered cases is that for the former the trigger is a 'ghost' C (Zoll 1993) (the proposed characterisation in terms of a ghost is mine). To my knowledge the ghost is never supplied with a root node (see §2.4), although further research may show that it is. Its 'retraction' feature, however, is mandatorily parsed (realised) within the root.[4]

In sum, St'at'imcets 'retraction' is triggered by z z', the uvulars q q' qʷ q'ʷ χ χ', and a ghost C (assumed to be one or more of the Cs just listed, but with undetermined exact identity). The result is a set of output 'retracted' segments, ç ʂ ɭ ɭ' ɛ ʌ ɑ ɔ. 'Retraction' in the context of z z' q' qʷ q'ʷ χ χ' affects only the immediately preceding V. In the context of the ghost, all eligible targets in a word are affected. Why 'retraction' from a corporeal source should be more constrained is interesting, but will be left for study elsewhere.

1.3 Problematic Data for the Simplex Analysis

Problematic data for the account just sketched are seen in (6).

(6) a. scɔʕʷ 'stripe' c. lɛʔɛʕ' 'to disperse' e. cɛʔɛʕ 'to bleed'
b. ʕʷɔlɛn 'stomach' d. pɛʔæʕ 'faded in colour' f. pəʕp 'dull, faded (of colour)'

Retracted Vs occur in (6a-e) despite the lack of any source, according to Remnant's analysis. None of z z' q' qʷ q'ʷ χ χ' appears in these forms. The 'retraction' cannot be due to the ghost trigger either. This is because s l do not surface as ʂ ɭ in forms of this type, as seen from (6a-c). (5) has shown that in the context of

[4]Further study may show that the ghost C3 never surfaces. In that case, a morphemic analysis may have to be readopted, although problems surrounding it (Dale Kinkade (personal communication) cited in van Eijk 1985:42, n.2) would have to be investigated. Alternatively, the characterisation of a 'ghost' might be revised. (After Zoll 1993, a ghost surfaces on a spare root node.) However, these issues do not impinge on the aim of this paper, the clarification of St'at'imcets' PH/UH distinction.

the ghost they do. Furthermore note that in (5d,f) æ and ə do *not* surface 'retracted'. The simplex analysis of St'at'imcets 'retraction' thus fails to account for all the data. Van Eijk [p.17, n. 13] describes data like (6c-e), but does not integrate it, nor forms like (6a,b,f) into his analysis of 'retraction' [p.1, 40-42]. Remnant [p.17-18] considers data like (6c-e) outside her 'retraction' analysis and does not mention forms like (6a,b,f). §2 and §3 will show how, on the contrary, the facts in (6) are key to opening up St'at'imcets postvelar phonology. The distinction between UH and PH shows why e and o 'retract' in the context of the pharyngeal glide, but æ and ə do not.

2. Pharyngealisation Harmony vs. Uvularisation Harmony

I will use data from Palestinian Arabic (PA)[5] to illustrate the distinction between PH and UH (see Shahin 1995 for fuller PA data and discussion). Although PA and St'at'imcets are of different language families, Bessell (1992) has shown that their postvelar phonologies are typologically similar.

2.1. Palestinian Arabic Inventory

The PA underlying Cs are seen in (7).

(7) PA underlying Cs

			t	ṭ			k	ḳ				ʔ
b			d									
			r	ṛ								
					č							
					ǰ							
f	θ		s	ṣ	š				χ		ħ	h
	ð	ḏ	z						ʁ		ʕ	
			l									
m		n										
w					j							

PA has 11 postvelar Cs. 'Postvelar' means 'involving articulation at a point in the vocal tract posterior to the velum' (Bessell 1992:3). The postvelars are the 'gutterals' (Gs) ʔ h ʕ ħ ʁχ (McCarthy 1991, 1994) and the secondarily uvularised Cs (Younes 1994:216) ('Ç's) ḳ ṭ ṣ ð ṛ (secondary uvularisation is denoted by a dot under the symbol). Gs are "consonants produced with a primary constriction in the posterior regions of the vocal tract" (McCarthy 1994:191). Ṣs are referred to by Semiticists as 'emphatics'. Dolgopolsky (1977:1) states, "[i]n Arabic the "emphatics" are pronounced as uvularized consonants. Uvularization is the modification of consonants or vowels by moving back the rear part of the tongue towards the uvula and the back wall of the pharynx". The description of Ṣs as uvularised is echoed by McCarthy (1994), also Czaykowska-Higgins 1987:12-13; (see §2.2).

PA postvelars function phonologically as a class. What binds them as a class is their pharyngealisation, i.e., tongue-root-retractedness (McCarthy 1991, 1994). Because all PA postvelars are tongue-root-retracted, they all

[5]My PA data is from the rural dialect of Abu Shusha (Shahin in press). The properties of PA presented here represent the facts of this dialect. The postvelar phonology of other PA varieties is described by Card 1983; Davis 1993; Herzallah 1990; Younes 1982, 1993, 1994; among others.

induce PH. The Ç̣s, a subset of the postvelars, are bound as a class by their uvularisation, i.e., their tongue-back-rectractedness.[6] All Ç̣s, but no other postvelars, induce UH, a.k.a. 'emphasis spread' (Broselow 1976; Card 1983; Davis 1993; Ferguson 1956; Ghazeli 1977; Herzallah 1990; Lehn 1963, Maamouri 1967; Younes 1982, 1993, 1994; among others). These statements will be supported with PA data in §2.3.

PA has an underlying five-V system plus a length distinction. The output inventory has an additional five full Vs and one reduced V, as seen from (8).

(8) Palestinian Arabic Vs

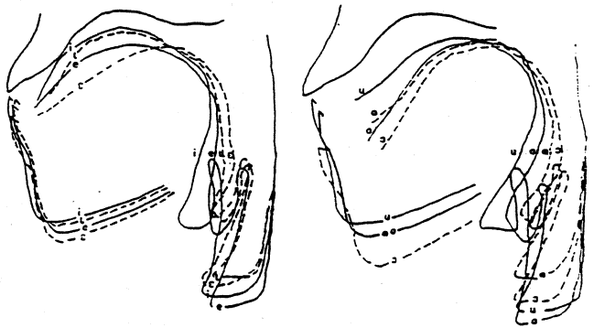
underlying	output full Vs	output reduced V
i: ɪ u: ʊ	i: ɪ ɪ u: ʊ ʊ	ə
e: e o: o	e: e ɛ o: o ɔ	
æ: æ	æ: æ ɑ: ɑ ʌ	

The reduced V is the unstressed output of underlying short æ. I analyse *ə* as a bare syllable ('σ') nucleus ('N') (Shaw 1992, 1993). The Vs *ɪ*, *ɛ*, *ɔ*, and *ʊ* are the tongue-root-retracted outputs of underlying short *ɪ*, *e*, *o*, and *u*, respectively. The tongue-root-retracted output of underlying *æ* is an unchanged *æ*, with one exception to be described immediately below. Back *ɑ*, *ɑ:* are the tongue-back-retracted outputs of underlying *æ*, *æ:*. When underlying short *æ* is both uvularised and pharyngealised, it is output as *ʌ*, but only under closed-σ pharyngealisation (see §2.3). Despite the three height distinctions of the underlying underlying V set (high, mid, low), PA postvelar phonology distinguishes Vs only as short or nonshort, low or nonlow, as will be shown in §2.3. These two dichotomies conjoin with PH and UH to yield the elaborated output V inventory.

2.2. Pharyngealisation vs. Uvularisation

Articulatorily, pharyngealisation is retraction of the tongue *root* (Ghazeli 1977; Lindau 1978; McCarthy 1991, 1994). In (9), superimposed x-ray tracings from Lindau (1978) show this articulation in the production of Akan pharyngealised Vs. I am not aware of any tracings of Arabic pharyngealised Vs.

(9) superimposed tracings showing tongue-root retraction gesture of Akan pharyngealised Vs (from Lindau 1978)



[6] I will use the terms 'tongue-root-retracted' and 'pharyngealised' interchangeably' 'tongue-back-retracted' and 'uvularised' will also be used interchangeably.

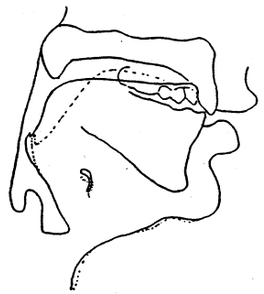
Tongue-root retraction is not restricted to Vs. All Arabic Gs involve this gesture. An x-ray tracing from Ghazeli (1977:38) showing the tongue-root retraction gesture of Arabic *[ʕ]* is given in (10).

(10) x-ray tracing of Arabic *[ʕ]* (from Ghazeli 1977:38; .... *[ʕ]*, ___ shape of pharynx before *[ʕ]*)

Acoustically, pharyngealisation is reflected by a rise in F1, indicating a lowered place of articulation (McCarthy 1994 and references therein).

Uvularisation harmony, on the other hand, is retraction of the tongue *back*. Articulatory descriptions attesting to this include: "uvularization is the modification of consonants or vowels by *moving back the rear part of the tongue* towards the uvula and back wall of the pharynx" (Dolgopolsky 1977:1); [articulation of a Ç̣ involves] "the *back of the tongue body*" (Herzallah 1990:52), consisting of "*rearward movement of the back of the tongue*" (Ghazeli 1977:72); ['emphasis' is] "a secondary articulation involving the *back of the tongue*" (Younes 1994:216) (emphasis added/KNS). In (11), x-ray tracings of Arabic *[t]* and *[ṭ]*, from Ghazeli (1977:69), show this gesture.

(11) tracing of Arabic *[ṭ]* and *[t]* (from Ghazeli 1977:69; ___ *[ṭ]*, ... *[t]*)

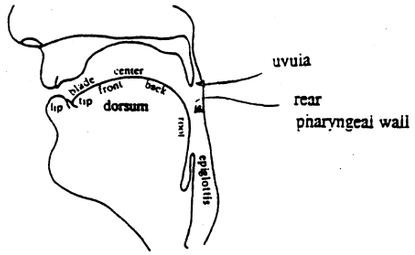


Uvularisation is reflected by a drop in F2, indicating a more back place of articulation (Card 1983; Ghazeli 1977; Herzallah 1990; Younes 1982; among others).

Besides retraction of the tongue back, production of a Ç̣ also involves retraction of the tongue root. This is seen in (11), also in Ghazeli's other Ç̣ tracings. Younes (1982:35, n.5) reports both F2 drop and F1 rise for Ç̣s. This means that Ç̣s are both uvularised and pharyngealised, an unsurprising fact given the proximity of the tongue back and the tongue root in the vocal tract. This proximity is seen from the head cross-section in (12),

adapted from Ladefoged (1993:4). Ladefoged's labelling of the sections of the tongue are preserved, although I have inserted 'dorsum'; arrows identify the uvula and rear pharyngeal wall.

(12) location of the tongue root, tongue back, uvula, and rear pharyngeal wall (adapted from Ladefoged 1993:4)



2.3. Pharyngealisation Harmony and Uvularisation Harmony in Palestinian Arabic

PH occurs when the tongue-root-retraction of a pharyngealised segment is realised on otherwise unpharyngealised neighbouring segments. The underlyingly pharyngealised segments in PA are the postvelars, i.e., Gs and ɕs. Pharyngealisation is also introduced on a closed-σ short V (see Schlindwein 1988 for discussion of closed-σ pharyngealisation in Javanese). By PH with a postvelar C or a closed-σ-pharyngealised V, underlying *i e o u*→ output *ɪ ɛ ɔ ʊ*. Underlying *æ* → *æ*, except under simultaneous closed-σ-pharyngealisation and uvularisation, when it surfaces as *ʌ*. PH affects all short Vs in a word.

UH is observed when the uvularisation of an underlyingly uvularised segment is realised on other normally unuvularised segments. The underlyingly uvularised segments of PA are the ɕs. By UH with a ɕ, underlying *æ(:)*→ *ɑ(:)* and Oral Cs → ɕs. Oral Cs are all Cs which are not postvelars. UH affects all low Vs and Oral Cs in a word, except where blocking is involved (see below). Because a ɕ is both pharyngealised and uvularised, it triggers both PH and UH. The distinct grammatical properties of PH and UH in PA are presented in (13). Data illustrating these properties are provided in (14) and (15).[7]

(13) distinct properties of pharyngealisation harmony and uvularisation harmony in PA

	PH	UH
1. triggers	Gs and ɕs closed-σ-phar'sed V	ɕs
2. undergoers	short Vs	low Vs Oral Cs
3. nonundergoers	long Vs word-final Vs stem-final Vs	non-low Vs

[7]Underlying ɕ s are underlined in (14) and (15). σ-breaks are denoted by a period: '#' denotes a word boundary. Primary word stress is marked. As seen from (14e,m) and (15a-d,g,h,j,k), the reduced V sometimes has phonetic colour. Question marks stand for uvularised *o:* and *ʊ* in (15d,f); the IPA provides no symbols for such Vs.

	PH	UH
4. blockers	(none)	*š* non-root-internal *jj*
5. transparent segments	Oral Cs	Gs
6. domain	word	word

(14) PH triggered by postvelars (Gs and ɕs); short Vs undergo PH; oral Cs transparent; see (15c) for *æ* → *ʌ* by PH

a. hí.bə (girl's name) b. ʁé.nɛ.mə 'goat' c. ɠó.ɾə 'corn' (vegetable)
*hí.bə *ʁéne.mə *ɠú.ɾə

PH triggered by closed-σ-pharyngealised V; short Vs undergo PH; oral Cs transparent

d. kɪ́.šɪr 'peel' (N) e. lɛ́.bæn 'yohgurt' f. mɔn.tɛ́.zə 'park, playground'
*kí.šɪr *lɛ́.bæn *mɔn.tɛ́.zə

long Vs do not undergo PH

g. ʂu:f 'wool' h. ḍɪ.nɑ́:ɾ 'dinar' i. tɪ:n 'figs'
*ʂo:f *ḍɪ.nʌ́:ɾ *tɪ:n

word-final Vs do not undergo PH

j. ɪ́ʁ.lɪ 'boil' (VBSE) k. ǽ.χu 'brother' l. ʄɑ́:.ðɪ 'empty' (ms)
*ɪ́ʁ.lɪ *ǽ.χʊ *fɑ́:.ðɪ

stem-final Vs do not undergo PH

m. [[ʄə.mɪ.]$_{Stm}$ -ɲɑ́:-ʂ]$_{Wd}$ '(2ms) don't feed us!' n. [[fɑ́ɾ.ɾo]$_{Stm}$ -ɪ]$_{Wd}$ 'my fur'
*[[ʄə.mɪ.]$_{Stm}$ -ɲɑ́:-ʂ]$_{Wd}$ *[[fɑ́ɾ.ɾɔ]$_{Stm}$ -ɪ]$_{Wd}$

domain = word

o. ħɪ́.lɪm # sɪ́.do 'grandpa's dream' p. sɪ́.do # ɾɑ:ħ 'grandpa went'
*ħɪ́.lɪm # sɪ́.do *sɪ́.do # ɾɑ:ħ

(15) UH triggered by ɕs; low Vs and Oral Cs undergo UH; Gs transparent

a. ʄɑ́.zə 'fresh' (ms/fs) b. mə́ʔ.bɑ́:ð 'together' c. ʂəħ.ħ-ʌ́ʈ.-nɪ 'she woke me up'
*ʄǽ.zæ *mæʔ.bǽ:ð *ʂæħ.ħ-ǽt.-nɪ (compare ʂæ:ɾ-ǽt-nɪ 'she saw me')

nonlow Vs do not undergo UH

d. ʂə.ɓó:.nə 'soap' e. ɳ.ðɪ́:f 'clean' (ms) f. ʄoz (expression)
*ʂæ.ɓʔ́:.nə *ɳ.ðɪ́:f *ʄʔz

UH blocked by *š* and non-root-internal *jj*

g. ʕǽ.šə.ɾə 'ten' h. šɑ́ɾ.šæf 'scarf' i. ʂo.ɾɪ-j.j-ǽ:t 'Syrian' (fpl)
*ʕɑ́.šə.ɾə *šɑ́ɾ.šɑf *ʂo.ɾɪ-ɟ.j-ɑ́:t

domain = word

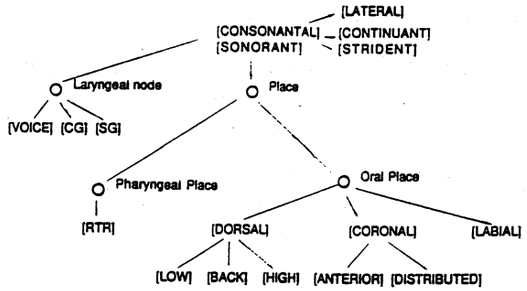
j. fæ:s # ʄə.wɪ́:l 'a long hoe' k. šɑ́.ʔɑɾ # ǽm.nə 'Amna's hair'
*fɑ:ʂ # ʄə.wɪ́:l *šɑ́.ʔɑɾ # ɑ́m.nə

2.4. Representational Issues

I assume that a C or V is structurally a root (organising) node dominating radically underspecified, monovalent privative features (Anderson & Ewen 1987; Archangeli 1988; Archangeli & Pulleyblank 1989;

1994; Clements 1985b; van der Hulst 1989; Sagey 1986; among others). I assume features are hierarchically organised according to the geometry in (16) (see Clements 1985b, Sagey 1986; also Halle 1989, 1992, 1995; Halle & Vaux 1994; Kenstowicz 1994; McCarthy 1994).[8] An additional feature will be proposed shortly.

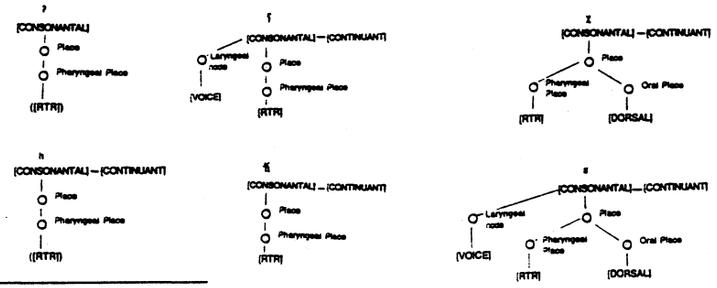
(16) feature geometry (minus an additional feature)



(16) reflects the Articulatory Theory, for which Halle & Vaux (1994) provide much evidence, and includes the bifurcation of Place into Oral Place and Pharyngeal Place (McCarthy 1991). The root node consists of [CONSONANTAL] and [SONORANT]. After Pulleyblank (1994), I assume that [RTR] and '[-ADVANCED TONGUE ROOT]' ([-ATR]) (Archangeli 1988; Archangeli & Pulleyblank 1994; among others) are one feature, and use '[RTR]' as its label. I equate [RTR] with the feature [PHARYNGEAL] (McCarthy 1991, 1994). Activation of Pharyngeal Place implies specification for [RTR].[9]

The representations of PA Gs are given in (17) (see McCarthy 1994). All Gs are specified for [RTR]. [RTR] effects a F1 rise. Acquisition evidence in Shahin (1994) suggests that the glottals are placeless, with *h* bearing [CONTINUANT]. I suggest that *ʔ h* receive their [RTR] specification redundantly by activation of Pharyngeal Place enforced by the constraint (Prince & Smolensky 1993; McCarthy & Prince 1993) 'If no Place, then Pharyngeal Place'. This constraint is highly ranked in PA (also in Nishga, see Shaw 1991). The redundant [RTR] assignment is parenthesised in (17). The primary uvulars are complex dorsal-pharyngeals (McCarthy 1994; Trigo 1991), specified under both Pharyngeal and Oral Place.

(17) representations of PA Gs



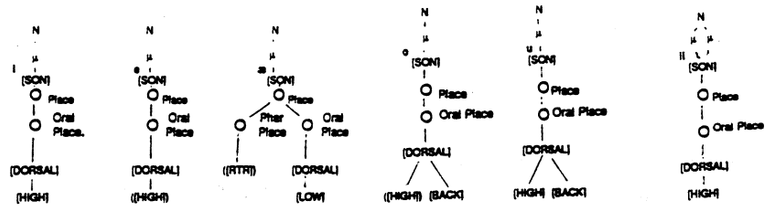
[8] In (16) 'CG' abbreviates 'constricted glottis'; 'SG' abbreviates 'spread glottis'.

[9] The Pharyngeal Place node does not appear in McCarthy (1994), the feature [PHARYNGEAL] ([RTR]) appearing in its place. Arabic acquisition evidence reported in Shahin (1994) suggests the Pharyngeal Place node should be retained. The first-acquired features of that study's subject were [RTR] and [LABIAL], arguably reflecting activation of Place nodes with acquisition of default [RTR] and [LABIAL]. I note the relevance of the 'periphery' proposals of Rice (1994), but defer further discussion.

From §2.3 it is clear that all PA postvelars bear specification for [RTR]. This includes Ṣs, since Ṣs, like Gs, trigger PH.

The representations of PA underlying Vs are given in (18). The fact that underlying *æ* shows no change when it pharyngealises (with the exception of *æ* → *ʌ*) suggests that it is redundantly [RTR]. The facts in §2.3 showed that PA postvelar phonology distinguishes Vs only as short or nonshort, low or nonlow: PH targets short Vs and excludes long Vs; UH targets low Vs and excludes nonlow Vs. Long Vs are those dominated by two nuclear moras ('Nμs') (Shaw 1992, 1993), as shown. Although the inventory has both high and mid Vs, mid Vs are treated as high. This indicates the redundant [HIGH] specification seen for *e o* in (18).

(18) representations of PA underlying Vs



Since Ṣs, but not Gs, trigger UH, there is some additional feature that Ṣs bear but Gs do not. That additional feature effects uvularisation. The assumption that [RTR] effects uvularisation (Goad 1991, 1993) is thus unsupported. Goad's claim that it is [RTR] expresses a recognition that Arabic 'emphasis' and Niger-Congo-type PH, a.k.a. '[-ATR] harmony', are phonologically distinct, also recognised by Czaykowska-Higgins (1987). That distinction is certainly sound.

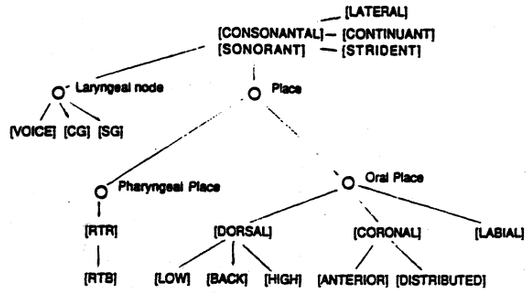
Assuming the Vowel Place Theory (Clements 1989, 1990, among others), Herzallah (1990) proposes that 'emphasis' is effected by [DORSAL]. After the Articulator model in (16), [DORSAL] is not feasible. Consider PA output *æ*, which is specified for [DORSAL], also for [LOW]. Since output *æ* is not yet uvularised *a*, [DORSAL] is not the feature of uvularisation; some additional feature is responsible for the uvularisation on *a*. McCarthy (1994) suggests it is [RTR] along with a redundant specification for [DORSAL]. Although Ṣs are specified for [RTR], [RTR] is not the UH feature, as explained above. And [DORSAL] has already been eliminated. Consider the possibility that the feature is [BACK]. By (16), it should be [BACK], since [BACK] is the only feature effecting a F2 drop. However, consider a segment such as PA *u*, which is specified as [DORSAL], [BACK]. If [BACK] were the uvularisation feature, then *u* (also *u:*, *ʊ*) would be uvularised. In PA, if a uvularised segment is present in a word, then all low Vs and Oral Cs surface uvularised (except where blocked), from left edge to right edge of the word; see (15b,c). Thus, if *u* is uvularised, outputs like *ħæmu:də* (boy's nickname) and *kʊl-t* 'I said' should be ungrammatical. The only grammatical forms should be **ħæmu:də* and **kʊl.t*. As indicated by the asterisks, this is not so; the grammatical forms lack the secondary uvularisation. I conclude that *u* is not uvularised and that [BACK] is not the uvularisation feature.

Czaykowska-Higgins (1987) proposes the features [LOWER PHARYNX] and [UPPER PHARYNX] to express the distinction between '[-ATR]' phenomena and Arabic 'emphasis'. Although [UPPER PHARYNX] encodes the difference in place of constriction between the two, her proposal as it stands does not capture the fact that specification for the uvularisation feature implies specification for the pharyngealisation feature, since Ṣs are

necessarily pharyngealised. Finally, consider [DORSAL] linked under Pharyngeal Place, proposed by McCarthy (1991). With Pharyngeal Place implying [RTR], his suggestion captures the implicational relation we are after. However, [DORSAL] is nonspecific, by itself representing only an active tongue dorsum. It is unclear whether a condition like 'For uvularisation, if [DORSAL], then [BACK]' is plausible. (See the evidence against [DORSAL] and [BACK], above.)

At this point, existing possiblilities for the uvularisation feature have been eliminated. And the articulatory descriptions of uvularisation as involving the back of the tongue (§2.2) are still waiting to be accounted for. I propose that the feature effecting uvularisation and UH is [RETRACTED TONGUE BODY] ([RTB]). The acoustic effect of [RTB] is a drop in F2. Because Cs cannot be uvularised without being pharyngealised also, I infer that a segment specified for [RTB] is redundantly [RTR], and that [RTB] is dominated by [RTR] in the feature geometry in the manner seen in (19).

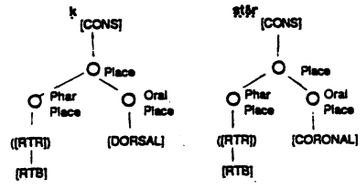
(19) feature geometry



The proposal here is that the tongue dorsum may be moved up, down, forward, or backward from its resting place to execute a primary articulation. The tongue back is used when secondary uvularisation is needed. The tongue back fits alongside the tongue root and epiglottis in the articulator set 'Tongue Root' (Goldstein 1994).

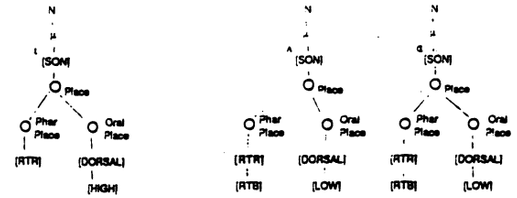
The representations of PA ɋs are proposed in (20). (Specifications not central to the proposal are excluded.) The redundant [RTR] assignment is indicated.

(20) representations of PA ɋs



The representations of PA output pharyngealised and uvularised Vs are seen from (21). A pharyngealised V by definition has acquired specification for [RTR], a uvularised V likewise specification for [RTB] (and, redundantly, [RTR]). Interpolation (automatic assignment/activation) of dominating features and nodes is assumed. Output ʌ, as in *bʌɬ.tə* 'duck', is twice-pharyngealised: from the ɋ *ɬ* and again via a closed σ. The double assignment is indicated by the bolded [RTR], although just how to account for ʌ is unclear.

(21) representations of PA output pharyngealised and uvularised Vs



Finally, the underlying-output pairs in (22) show the relations between representations of PH and UH in PA (impertinent aspects of the representations are excluded). The harmonies result from multiple linking of the harmonic features (vs. harmonic nodes; see Halle &Vaux 1994).

(22) a. hɬ.bæ → hʊ.bə (girl's name)

b. *ɬæ.mɬ* → *ʈɑ.ɳɬ* 'feed' (VBSE)

3. St'at'imcets 'Retraction' Revisited

I propose that the St'at'imcets underlying Cs be reanalysed as seen in (23). Cs presented as primary uvulars in (2) are now classified as ɋs. Thus, *ɋ* is secondarily uvularised *k*, *χ* is secondarily uvularised *x*, etc.. As seen, *ʐ* (also *ʐ'*) has no 'plain' counterpart.[10] St'at'imcets has 12 postvelar Cs: ʕ ʕ' ʕʷ ʕ'ʷ *ɋ ɋ' ɋʷ ɋ'ʷ χ χ' ʐ ʐ'*. [11] The glottals ʔ *h* are not included, since phonological evidence shows that in St'at'imcets they do not involve a postvelar *articulation* (see discussion, below). St'at'imcets has four Gs, ʕ ʕ' ʕʷ ʕ'ʷ, and 8 ɋs, *ɋ ɋ' ɋʷ ɋ'ʷ χ χ' ʐ ʐ'*. Acoustic study of St'at'imcets (Thompson 1993) reports F1 rise on Gs and ɋs. F2 drop is reported for ɋs. Analysing Nxa'amxcin (Moses-Columbia Salish), Bessell & Czaykowska-Higgins (1991) report F1 rise on all postvelars, and F2-drop on Vs in the context of what I have reanalysed as Salish ɋs (see also Bessell 1992). These acoustic facts are commensurate with findings on Arabic (see §2.2) and support the retake in (23).

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[10] *ʐ* (and *ʐ'*) has unusual articulatory characteristics (van Eijk 1985); it derives from Proto-Salish * *ʃ* (Thompson 1979) and sometimes alternates with *ʃ*. It deserves close examination in some more detailed study.

[11] Glottalised Oral Cs do not earn postvelar status since their airstream modification does not constitute an articulation (see Ladefoged 1993).

(23) retake of St'at'imcets underlying consonantal inventory

p	t		k	q		
p'			k'	q'		
			k^w	q^w		
			k'^w	q'^w		
	ƛ'	c				
		c'				
	ɬ	s	x	χ		
			x^w	$χ^w$		
	l					
	l'					
m	n					
m'	n'					
						ʔ
	ʐ	j	ɣ		ʕ	h
	ʐ'	j'	ɣ'		ʕ'	
			w		$ʕ^w$	
			w'		$ʕ'^w$	

However, the reanalysis is indicated especially by phonological data. Consider (24).[12]

(24) a. scɔʕ^w 'stripe'
b. ɬɛqˈ 'to steal'
c. mɛχæl 'bear'
d. mɔzmet 'pitiful'
e. lɛʔɛʕ' 'to disperse'
f. pɛʔæʕ 'faded in colour'
*pɛʔɑʕ
g. pəʕp 'dull, faded (of colour)'
*pʌʕp
h. ƛ'oʔ 'well, but', 'so'

(24a-e) show *i e → e ɔ* immediately before the postvelars ʕ^w *q'* *χ* *ʐ*. This is PH triggered by a G and by Ç̣s. (24h) shows that PH is not observed in the context of *ʔ*. *h* is assumed not to trigger PH either. Bessell (1992) provides evidence that Salish glottals are simply placeless and do not pattern as Gs, i.e., there is no evidence they involve tongue-root articulation. This means that the condition 'If no Place, then Pharyngeal Place' is lowly ranked in St'at'imcets (also in Tigre; see discussion and references in McCarthy 1994). (24e,f) show that PH affects nonadjacent leftward Vs across an intervening *ʔ*. The same is expected for *h*. (24f,g) show there is no observable change in the low Vs *æ ə* under PH. I infer that *ə* is treated as a low V and that, as in PA, St'at'imcets low Vs are redundantly pharyngealised.

The forms in (25) show that *æ ə → ɑ ʌ* in the context of (specifically, immediately preceding) *q* *q^w* *χ* *χ^w* *ʐ*. This is UH, triggered by Ç̣s, affecting low Vs. That *æ ə* do not surface as *ɑ ʌ* in (24f,g) confirms that UH is not triggered by ʕ. The distinction between PH and UH in St'at'imcets thus explains the assymetric 'retraction' in the context of ʕ, shown to be a problem for a simplex analysis of St'at'imcets

[12]Underlying Ç̣s are underlined in (24)-(26).

postvelar harmony in §1. ʕ triggers PH because it is a G, but does not trigger UH because it is not a Ç̣. (25e,f) show that *ʔ* is transparent to UH (see Remnant 1990:69). The same is predicted of *h*. Thus, there is glottal transparency to both PH and UH in St'at'imcets.

(25) a. kjɑχ 'drunk'
b. mɑqæʔ 'snow'
c. x^{w}ʔɑʐ 'not'
d. q^{w}ɑqˈ^{w}χ 'sick'
e. ʐɑʔxˈ 'thaw'
f. ɬɑʔqs 'to go ashore'

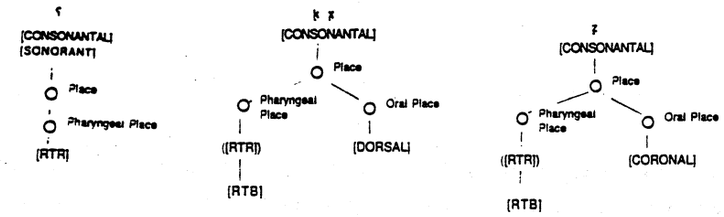
Finally, the data in (26) show that, as expected, the ghost Ç̣ triggers both PH and UH (under an account following Kinkade's analysis of 'morphemic retraction'; see §1). The ghost appears as outlined Ç̣ in these forms. PH and UH induced by a Ç̣ affects all eligible targets, and the harmony extends past a right-edge root boundary, as seen from (25d-e).

(26) a. kʌlÇ̣ 'bad'
b. ɬʌçÇ̣ 'to cave in'
c. k^{w}lÇ̣-ɛt 'brass'
d. ɬɔtÇ̣-ɔn' 'to squash (tr.)'
e. kʌlÇ̣-wɛlˈx 'to get spoiled'
f. kˈlÇ̣-ɔlmˈəx^w 'boundary'

The above reanalysis has shown that St'at'imcets 'retraction' is effected by two distinct harmonies: PH and UH. St'at'imcets PH occurs in the context of its Gs and Ç̣s, which include a ghost Ç̣ that deserves further study. I have assumed that PH targets all Vs, including low Vs. UH occurs only in the context of Ç̣s and targets only low Vs, also Oral Cs. The distinction between PH and UH has shown that data which are otherwise 'exceptional' are in fact regular and predicted. The PH/UH distinction furthermore coincides with acoustic evidence on Salish and relates its postvelar facts to those of Semitic. Both St'at'imcets and PA have robust postvelar inventories. Both have underlying secondarily uvularised Cs. Both have both PH and UH. In both, UH targets low Vs, also Oral Cs. A salient difference between the two languages is the inclusion of glottals as Gs in PA, but not in St'at'icmets. Clearly more research is needed to reveal the full properties of PH and UH in St'at'imcets. Further typological parallels and divergences may then emerge.

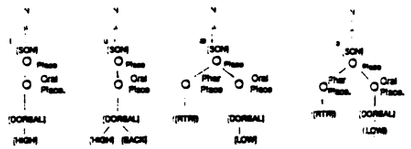
Finally, the representations of St'at'imcets postvelar Cs are proposed in (27) (impertinent specifications are excluded). The representations of underlying and output Vs are seen in (28). I assume a redundant [LOW] specification for *ə*, and a redundant [RTR] specification for both *ə* and *ɑ*. The fact that UH targets only low Vs is evidence that output *e o* are underlyingly high. Representing the underlying forms of these 'mid' Vs as *ɪ ʊ* is thus appropriate.

(27) representations of St'at'imcets postvelars

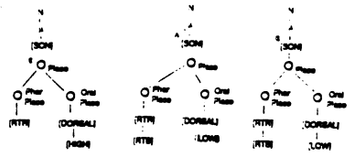


(28) representations of St'at'imcets Vs

a. input Vs



b. output Vs



More research into St'at'imcets PH and UH (maximal domain, possible blockers, etc.) should clarify the relations between representations which effect the two harmonies in specific forms.

4. A Postvelar Typology

In conclusion, consider Niger-Congo (Bendor-Samuel 1989), a language family with no Gs, i.e., no uvulars, pharyngeals, or glottals that act like Gs. Niger-Congo languages, however, have post-velar harmony involving a set of [RTR] Vs like ɛ ɔ. Under a popular analysis, the [RTR] Vs result from the linking of an underlyingly floating [RTR] (see Archangeli & Pulleyblank 1989, 1993, 1994, Clements 1985a, 1991; Pulleyblank 1994; among others). Niger-Congo has no UH. I thus propose the typology in (29). For a language or language family to be admitted into a postvelar typology, the feature [RTR] must be active in its phonology. Three qualifying language families appear in (20), and there are several more (see Bessell 1992 for statistics based on Ruhlen 1975).

(29) a postvelar typology

o Phar. Place	Vs only	Cs and Vs
|		
[RTR]	Niger-Congo	Salish, Semitic
|		
[RTB]	??	Salish, Semitic

Niger-Congo, Salish, and Semitic are classified above according to (i) how far down the Pharyngeal Place geometry their phonologies extend, and (ii) whether a particular Pharyngeal Place feature is active only on Vs, or on both Vs and Cs. This may be a useful reference in further wide-ranging study of postvelar systems, which would extend prelimary work by Bessell (1992). Further features may expand this typology. For example, [EPIGLOTTAL], perhaps the feature of Vs with epiglottal/lower pharyngeal constriction (Catford 1983; see also Halle & Vaux 1994; Remnant 1990; see n.2) may be a candidate for sister to [RTB].

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