ON THE DISTINCTION BETWEEN PHARYNGEALISATION HARMONY
AND UVULARISATION HARMONY IN ST'AT'IMCETS (LILLOOET SALISH)
Kimary N. Shahin
University of British Columbia

0. Introduction
'Retraction' in St'at'imcets (Lillooet Salish) is illustrated in (1), specifically, by the 'retracted' Cs /t/ and /d/ and 'retracted' Vs [a] and [e]. Each of these forms shows 'retraction' harmony between two or more segments.

(1) a. 1st-2nd 'to squash, tr.' b. 4th 'bad' c. 1st 'to cave in'

It has been assumed that St'at'imcets 'retraction' is a single phonological process (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'at'imcets 'retraction' is not simplex, but comprised of two postvelar harmonies: pharyngealisation harmony (PH) and uvularisation harmony (UH) (Shahin 1995). 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; among others), Salish (Bessell 1992; Bessel & Czaykowska-Higgins 1991; among others), and Semitic (Bessell 1992; Ghazeli 1984, 1991; among others), and Serbo-Croatian (1967; 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 uvulatised segments will be given. §3 reanalyses St'at'imcets '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. 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 /w/), which can be combined (as on /kw/).

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

<table>
<thead>
<tr>
<th>label</th>
<th>dental</th>
<th>palatal</th>
<th>velar</th>
<th>uvular</th>
<th>pharyng'</th>
<th>glotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBSTRUENTS</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>t</td>
<td>k</td>
<td>/k/</td>
<td>q</td>
<td>/q/</td>
<td>STOP</td>
</tr>
<tr>
<td>p'</td>
<td>c'</td>
<td>k'</td>
<td>/k'/</td>
<td>q'</td>
<td>/q'/</td>
<td>AFFRicate</td>
</tr>
<tr>
<td>+</td>
<td>s</td>
<td>x</td>
<td>/x/</td>
<td>X</td>
<td>/X/</td>
<td>FRICATIVE</td>
</tr>
<tr>
<td>RESONANTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>LATERAL</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>m</td>
<td>NASAL</td>
<td></td>
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<td></td>
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<tr>
<td>m'</td>
<td>n'</td>
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</tbody>
</table>

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

(3) St'at'imcets Vs

<table>
<thead>
<tr>
<th>underlying</th>
<th>output</th>
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<tbody>
<tr>
<td>i</td>
<td>U</td>
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<tr>
<td>u</td>
<td>e</td>
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<tr>
<td>o</td>
<td>a</td>
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<td>ə</td>
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<tr>
<td>ɔ</td>
<td>ɔ</td>
</tr>
</tbody>
</table>

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

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2 This research has been supported by SSHRC grant #410-94-0035 and a UBC HSS grant, both to Douglas Pulleyblank. I thank Douglas Pulleyblank, Patricia Shaw, Dale Kinkade, and Myles Leitch for helpful discussion, also E. Czaykowska-Higgins for making her 1987 paper available to me. All errors, including those of interpretation, are my own.

3 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 It will not discuss the epiglottal/lower pharyngeal constriction realised on St'at'imcets Vs in the context of /f/ (van Eijk 1985:13-14).

3 Based on van Eijk's description, I see no evidence that this is not a phonic effect. However, such Vs occur phonologically in Nazar and Udi (Carroll 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).

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Further study may show that the ghost $C_3$ never surfaces. Thus, $i\, e\, u\, -\, e\, a\, a\, o\, /\, z\, z\, 'o\, a\, d'\, a'\, \lambda\, X\, \chi\, \chi'$. Examples are seen in (4).

(a) "mexəl" bear b. mozəmlət 'pitiful' c. əə' 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, $s\, l\, l'\, e\, u\, -\, e\, a\, a\, o\, /\, z\, z\, 'o\, a\, d'\, a'\, \lambda\, X\, \chi\, \chi'$. 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.

(b) "wləc 'to cave in' c. "als 'sick'
(d. qəwəl-əlx 'to get spoiled' e. əə-ən-ə 'to squash (ir.)

Remnant 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] "to 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' $C_3$ somehow present in forms involving 'morphemic retraction'. Assuming this $C_3$, the two cases of St'at'imcets 'retraction' are united. The only difference between the 'morphemic' and segmentally-triggered cases is that the former is triggered by 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 $q\, a\, ' q\, a'\, \lambda\, X\, \chi\, \chi'$, 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, $c\, s\, l\, l'$ $e\, a\, a\, o\, /\, z\, z\, 'o\, a\, d'\, a'\, \lambda\, X\, \chi\, \chi'$. "Retraction" in the context of $z\, z'$ 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).

(a) a. scəwə 'stripe' b. pəə-lən 'stomach'

Retracted Vs occur in (6a-e) despite the lack of any source, according to Remnant's analysis. None of $z\, z'\, 'o\, a\, d'\, a'\, \lambda\, X\, \chi\, \chi'$ appears in these forms. The 'retraction' cannot be due to the ghost trigger either. Because $s\, i$ do not surface as $s\, i$ in forms of this type, as seen from (6a-c). (5) shows that in the context of the ghost they do. Furthermore note that in (5d,f) $z$ and $a$ 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 postverbal phonology. The distinction between UH and PH shows why $a$ and $o$ 'retract' in the context of the pharyngeal glide, but $z$ and $a$ 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, Bashell (1992) has shown that their postverbal phonologies are typologically similar.

2.1. Palestinian Arabic Inventory

The PA underlying Cs are seen in (7).

| t 1 | k k |
| b d |
| r f |
| $\xi$ |
| $\theta$ | $s$ | $\delta$ | $\chi$ | h h |
| $\delta$ | $z$ | w | $\xi$ |
| 1 |
| m n |
| w j |

PA has 11 postverbal Cs. 'Postverbal' means 'involving articulation at a point in the vocal tract posterior to the velum' (Bashell 1992:3). The postverbals are the 'gutturals' (Gs) $\gamma$ $\eta$ $\phi$ $\epsilon\alpha$ (McCarthy 1991, 1994) and the secondarily uvularised Cs (Younes 1994:216) ('G's) $k$ $t$ $\phi$ $r$ (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). Gs are referred to by Semiticists as 'emphatics'. Dolgopolsky (1977:1) states, "[I]n Arabic the "emphatics" are pronounced as uvularised consonants. Uvularisation 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 Gs as uvularised is echoed by McCarthy (1994), and also Czyzewska-Higgins 1987:12-13; (see §2.2).

PA postverbals 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 postverbals are tongue-root-retracted, they all

4Further study may show that the ghost $C_3$ never surfaces. In that case, a morphemic analysis may have to be readdressed, 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 surface 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.

5My 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 postverbal phonology of other PA varieties is described by Card 1983; Davis 1993; Herzallah 1990; Younes 1982, 1993, 1994; among others.
induce PH. The Cs, a subset of the postvelars, are bound as a class by their uvularisation, i.e., their tongue-back-retractedness. All Cs, but no other postvelars, induce UH, a.k.a. ‘emphasis spread’ (Broselow 1976; Card 1983; Davis 1993; Ferguson 1956; Ghazeli 1977; Herzallah 1990; Leh 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

<table>
<thead>
<tr>
<th>Underlying</th>
<th>Output Full V</th>
<th>Output Reduced V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 1</td>
<td>U: U</td>
<td>U: U</td>
</tr>
<tr>
<td>e: e</td>
<td>o: o</td>
<td>o: o</td>
</tr>
<tr>
<td>a!: a!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The reduced V is the unstressed output of underlying short a. I analyse a as a bare syllable (‘σ’) nucleus (‘N’) (Shaw 1992, 1993). The Vs t, e, o, and u are the tongue-root-retracted outputs of underlying short i, e, a, and u, respectively. The tongue-root-retracted output of underlying a is an unchanged a, with one exception to be described immediately below. Back a, e are the tongue-back-retracted outputs of underlying a, a. When underlying short a is both uvularised and pharyngealised, it is output as A, but only under closed-C pharyngealisation (see §2.3). Despite the three height distinctions of the underlying V set (high, mid, low), PA postvelar phonology distinguishes Vs only as short or nonshort, low or nonlow, as will be shown in §2.2. 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)

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 C 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 [l], from Ghazeli (1977:69), show this gesture.

(11) tracing of Arabic [t] and [l] (from Ghazeli 1977:69; [t], [l])

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 C also involves retraction of the tongue root. This is seen in (11), also in Ghazeli’s other C tracings. Younes (1982:35, n.5) reports both F2 drop and F1 rise for Cs. This means that Cs 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),

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

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

[6] will use the terms ‘tongue-root-retracted’ and ‘pharyngealised’ interchangeably. ‘tongue-back-retracted’ and ‘uvularised’ will also be used interchangeably.
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 Cs. Pharyngealisation is also introduced on a closed- ơ short V (see Schlichkeit 1988 for discussion of closed-ơ pharyngealisation in Javanese). By PH with a postvelar C or a closed-ơ pharyngealised V, underlying e œ ø → output e œ ø. Underlying œ → œ, except under simultaneous closed-ơ pharyngealisation and uvularisation, when it surfaces as a. PH affects all short VVs in a word.

UH is observed when the uvularisation of an underlyingly uvularised segment is realised on other normally unvularised segments. The underlyingly uvularised segments of PA are the Gs. By UH with a C, underlying œtːj → œtːj and Oral Cs → Cs. Oral Cs are all Cs which are not postvelars. UH affects all short VVs and Oral Cs in a word, except where blocking is involved (see below). Because a C 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

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

\[
\begin{array}{|c|c|}
\hline
\text{PH} & \text{UH} \\
\hline
1. triggers & \text{Gs and Cs} & \text{Gs} \\
\text{closed-ơ-pharyngeal V} & \text{Gs} & \text{Gs} \\
\hline
2. undergoes & \text{short V} & \text{low V} \\
\text{Oral Cs} & \text{Oral Cs} & \text{Oral Cs} \\
\hline
3. nonundergoes & \text{long V} & \text{low V} \\
\text{word-final V} & \text{non-low V} & \text{non-low V} \\
\text{stem-final V} & \text{non-low V} & \text{non-low V} \\
\hline
\end{array}
\]

7Underlying Cs are underlined in (14) and (15). œ-breaks are denoted by a period: ‘ ’ denotes a word boundary. Primary word stress is marked. As seen from (14c,m) and (15a-d,j,k,l), the reduced V sometimes has phonetic colour. Question marks stand for uvularised œ and in (15d,l); the IPA provides no symbols for such VVs.

(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].

The representations of PA Gs are given in (17) (see McCarthy 1994). All Gs are specified for [RTR]. [RTR] effects F1 rise. Acquisition evidence in Shatin (1994) suggests that the glottals are placeless, with h bearing [CONTINUANT]. I suggest that *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

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

The representations of PA underlying Vs are given in (18). The fact that underlying *a shows no change when it pharyngealises (with the exception of *a \!\!→\!\! *a) 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 ("Na") (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 a in (18).

(18) representations of PA underlying Vs

Since *s, but not Gs, trigger UH, there is some additional feature that *s bear but Gs do not. That additional feature effects uurlarisation. The assumption that [RTR] effects uurlarisation (Goad 1991, 1993) is thus unsupported. Goad's claim that it is [RTR] expresses a recognition that Arabic 'emphasis' and Niger-Congo-type PH, e.g., '[ATR] harmony', are phonologically distinct, also recognised by Czykowska-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 *a, which is specified for [DORSAL], also for (LOW). Since output *a is not yet uurlarised *a, [DORSAL] is not the feature of uurlarisation: some additional feature is responsible for the uurlarisation on a. McCarthy (1994) suggests it is [RTR] along with a redundant feature responsible for the uurlarisation on a. Although *s 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 uurlarisation feature, then *u (also u; e) would be uurlarised. In PA, if a uurlarised segment is present in a word, then all low Vs and Oral Cs surface uurlarised (except where blocked), from left edge to right edge of the word; see (12b,c).

Thus, if *u is uurlarised, outputs like *hawwadu (boy's nickname) and kar-i-t 'I said' should be ungrammatical. The only grammatical forms should be *hawwada and *kar-it. As indicated by the asterisks, this is not so; the grammatical forms lack the secondary uurlarisation. I conclude that *u is not uurlarised and that [BACK] is not the uurlarisation feature.

Czykowska-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 uurlarisation feature implies specification for the pharyngealisation feature, since *s 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 non-specific, 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 possibilities 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 Cs are proposed in (20). (Specifications not central to the proposal are excluded.) The redundant (RTR) assignment is indicated.

(20) representations of PA Cs

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 A, as in (21) 'duck', is twice-pharyngealised: from the C, / and again via a closed /a/. The double assignment is indicated by the bolded (RTR), although just how to account for /a/ 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. h.baa → h.b (girl's name)

b. t.m.mi → t.m '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 Cs. Thus, k is secondarily pharyngealised, /k/ is secondarily pharyngealised x, etc. As seen, /x/ (also /j/) has no 'plain' counterpart. St'at'imcets has 12 postvelar Cs: f t, s' m' n' k' k' k' k' x' x' z' x'. The glottals /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, f s' m' n', and 8 Cs, k' k' k' k' x' z' x'. Acoustic study of St'at'imcets (Thompson 1993) reports F1 rise on Gs and Cs. F2 drop is reported for Cs. 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 Cs (see also Bessell 1992). These acoustic facts are commensurate with findings on Arabic (see §2.2) and support the retake in (23).

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

11 Globalised Oral Cs do not earn postvelar status since their airstream modification does not constitute an articulation (see Ladefoged 1993).
shows that evidence they involve tongue-root articulation. This means that the condition asymmetric 'retraction' in the context of 'Place' shows there is no observable change in the low Vs (24a-e) show that (25a) underling consonantal inventory

| p  | t | k | k |
| p' | t' | k' | k' |
| i | s | x | x' |
| m | n |

(24a-e) show /i /e /o immediately before the postvelars /k' x' z'. This is PH triggered by a G and by Cs. (24b) shows that PH is not observed in the context of /i. 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 ? The same is expected for PH/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 a, and a redundant (RTR) specification for both a and a. The fact that UH targets only low Vs is evidence that output UH targets only 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'imcets. 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 a, and a redundant (RTR) specification for both a and a. The fact that UH targets only low Vs is evidence that output a is underlyingly high. Representing the underlying forms of these 'mid' Vs as /u/ is thus appropriate.
More research into St’at’imctc 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 Néger-Congo (Bendor-Samuel 1989), a language family with no Gs., i.e., no uvulars, pharyngeals, or glottals that act like Gs. Néger-Congo languages, however, have post-velar harmony involving a set of (RTR) Vs like ≠ 2. Under a popular analysis, the (RTR) Vs result from the linking of an underlyingly floating (RT) (see Archangeli & Pulleyblank 1989, 1993, 1994, Clements 1985a, 1991; Pulleyblank 1994; among others). Néger-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 (RT) must be active in its phonology. Three qualifying language families appear in (20), and there are several more (see Bessel 1992 for statistics based on Ruhlen 1975).

(29) a postvelar typology

<table>
<thead>
<tr>
<th>o Place</th>
<th>Vs only</th>
<th>Cs and Vs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTR</td>
<td>Néger-Congo</td>
<td>Salish, Semitic</td>
</tr>
<tr>
<td></td>
<td>??</td>
<td>Salish, Semitic</td>
</tr>
</tbody>
</table>

Néger-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 preliminary work by Bessel (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).

References


