

The Typology of the Gutturals
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Back(ing)

Glottal and Guttural Patterns in Onsets and Nuclei

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1. **General Remarks.** The “gutturals” or “back” sounds are one of the last frontiers of phonology. We are not even certain of the number of points of articulation that are possible in the back of the mouth, that is at the posterior margin of the oral cavity and “beyond,” that is, the various pharyngeals, adyals or epiglottals, and laryngeals. The phonetics of these sounds have been studied, but not fully understood, in part because of a general failure to distinguish points or zones of articulation in a consistent way (note Alwan 1986) so that these points may be linked to their acoustics. The phonology of these sounds, both as it is exhibited among these sounds and with other articulations is also understudied. As a consequence historical studies of languages that have such sounds, for example Afro-Asiatic, or might have had them (Proto-Indo-European) are plagued with uncertainties and competing hypotheses.

To compound the difficulties presented by the pharyngeals in general their occurrence is restricted to a small number of families. The most familiar group is the Afro-Asiatic phylum, but matters here are obscured because among these languages or even within them there is considerable variation in the realization of what appear to be simple phonemes. Northwest Caucasian (NWC) and Northeast Caucasian (NEC) exhibit rich arrays of such sounds, as do Wakashan and the Interior branch of Salishan. Elsewhere the occurrence of such sounds is restricted to a few languages within a family otherwise devoid of pharyngeals. This is the case with Athapaskan where only Chilcotin exhibits pharyngealized dentals (Cook 1983, 1989). In Chukotko-Kamchatkan (Luoravetlan) both Alyutor, and Koryak have a voiced pharyngeal (epiglottals) (Léonard, this volume). The Sayan Turkic languages Tuvan and Tofa show a “glottal element” signaling a fortis following consonant (Schönig 1998, p. 404; Johnson 1998, pp. 31,

98). Many Altaicists interpret this element as pharyngealization of the vowel (Uli Schamiloglu, personal communication).

One implication of the work of Lieberman (1984, 1991, 2006) on the evolution of the vocal tract, specifically on the lowering of the larynx and formation of a pharynx, is that, with the exception of the laryngeals, back sounds generally may be phylogenetically recent in language. In some way their recent origin may explain why they are rare across the globe, but are used profusely by languages that have them. At some species level they are “hard” or marked, but at the level of the speech community they are quite natural simply because we are all modern versions of *Homo*

2. **Points of articulation.** There seem to be at least four distinctive points of articulation in the “back” of the mouth, as in (1)

(1) Points of Articulation

- a. uvulars /R, q, G, χ, ʁ/ [± sonorant]
- b. pharyngeal /ħ, ʕ/
- c. “adrytals,” or epiglottals /ħ̣, ʕ̣/
- d. laryngeals. /h, fi, ʔ, ʔ̣, ʔh/

These non-oral sounds (1, b, c, d; but not the uvulars) all serve to form sonorants. A voiced (lax and nasalized) glottal stop, /ʔ̣/, is reported for the Samoyedic language, Enets, while a glottal affricate, /ʔh/, was reported for a dialect of Hakka Chinese by the structural linguist Yuen Ren Chao, as a reflex of the normal Chinese /k'/ (aspirated).

The uvula and larynx are commonly attested points. Sounds made there are well understood by and large. Nevertheless, the laryngeals (see the summary in 2) seem underspecified as to their status (as to their Root, R, in feature geometry), as to whether or not they serve as consonants (2, c) or glides (2, d).

2. Laryngeals [+sonorant]

a. point of articulation = vocal cords

b. [\pm continuant],

/h/, /ɦ/ (Bengali), /ʔ/, /ʔh/ (Hakka Chinese)

c. underdetermined: default realizations of a consonant node, [+C] or C⁰.

i. palatalized laryngeals:

Abdzakh West Circassian (WC) /ʔ^yaλe/ ‘youth’, /ʔ^ye/ ‘earth, under’

English *heat* [x^yit^c]

ii. non-lowering:

Bzhedukh WC /ə-ʔ/ his-arm/hand, /ʔe/ ‘arm/hand’

d. [+low] ([\pm C])?

i. as with low vowels, /æ, a/

ii. lowering: [+low]

Kabardian /-he/ → [ha] plural suffix (WC /-he/ → [x^ya])

WC /ʔeše/ ‘weapon’, for expected */ʔaše/, where /-a-/ is [2 low],

and */ʔa-/ would be [3 low] for syllable

Note in (2, d, ii) that ‘weapon’ is an exception to the *vrd̥d̥hi* or full grade, /-a-/, of words with two adjacent low syllables, as would be normal in such words as /pśaše/ ‘girl’. It is as though /ʔ/ brings too much lowness to the initial syllable.

Their potential to take [+low] links them with the “pharyngeals,” which we shall see also can take [+low]. They can be [+C] and [+low] as (2, d, ii) shows. They need not be [+low] even when a glide: the English example of *heat* in (2, c, i) might best be treated as a laryngeal glide, [-C] Root, that is unspecified as to place, and so can take place feature, either [high] or [low]. In Kabardian East Circassian (3, a) /h/ undergoes metathesis the same as /y/, that is both are [-C], whereas neither glottal stop does, both being [+C] and immune to metathesis, nor does /h/ act like a glide when it is the plural suffix on a noun (2, d, ii).

(3) Glide laryngeal opposed to consonantal laryngeal in Kabardian

a. Metathesis of glides, including /h/

- i. /ø-y-e-pλ-ye-ś/ → [yepλāś]
he-it-at-look-past-affirmative
- ii. /ø-q'-y-e-pλ-ye-ś/ → /q'eypλehś/ → [q'ēpλāś]
he-horizon-it-at-look-past-affirmative
- iii. /ø-y-he-(e)-pλ-ye-ś/ → /yehpλehś/ → [yāpλāś]
he-it-plural-at-look-past-affirmative

b. Consonantal character of glottal stops (no metathesis)

- i. /ø-q'e-s-ʔabe-ye-ś/ → [q'esʔābāś], *[q'esāʔbāś]
it-horizon-I-grab-past-affirmative
- ii. /s-q'-f-ʔə-t-ś/ → [səq'əfʔútś], *[səq'əfúʔtś]
I-horizon-you.plural-before-stand-affirmative

Laryngeals serve as a crucial mechanism for supra-segmentals, whether tonal, percussive, or of voice quality, whereas pharyngeals play a limited supra-segmental role. No other articulatory zone exhibits such complex, multi-functional behavior as does the larynx.

The true challenge offered by the set of sounds called pharyngeals is the apparent articulatory distinction between three points in the pharynx and neighboring areas, (see the summary in 4). Pharyngeals are consonants, not glides, though pharyngealized glides can occur, note Abzhwi_Abkhaz /y^ʕ/, as in /a-ž^ʕy^ʕan/ the-sky.

4. Pharyngeals and Adytals [\pm sonorant] (Alwan 1986)

a. naso-pharynx =

- i. tongue root retraction [+Constricted Pharynx]
- ii. constriction of the faucial pillars
- iii. [- sonorant] (improtrusible tongue)

- iv. Georgian dialects: /q̄'eli/ 'hand' ~ /q'eli/ 'throat'
- v. Abkhaz /ḥ°a-rá/ say-inf, 'to say'

b. pharyngeal proper

- i. tongue root retraction [+ CP]
- ii. [+ sonorant]
- iii. improtrusible tongue
- iv. Arabic /ḥuk/ 'pork', /ʕarab/ 'Arab'

c. adytus (the opening of the larynx,) [+ CP. + low]

- i. contraction and lowering of the tongue root down onto the epiglottis [+ CP]
- ii. sometimes realized facultatively as pure adytals, [- CP, + low]
- iii. [+ sonorant]
- iv. protrusible tongue
- v. Circassian. /ḥe/ → [ħǎ] 'dog'
- vi. Abaza /ḥa-ḥ°+h°a/ → [ħh°h°ǎ] we-talk+talk, 'let's chat!'
/ḥa-ḥ°+ḥ°ə/ → [ħħ°ḥ°ǎ] we-run+run, 'let's race!'

Sounds made high in the pharynx, near the naso-pharynx (throat immediately in back of the mouth) often involve the faucial pillars, two pairs of ligamentous folds, anterior (palatoglossus muscle) and posterior (palatopharyngeus), forming the posterior rim of the oral cavity, used in swallowing in conjunction with contraction of the upper pharyngeal muscles. The tongue root is also retracted (stylo-hyoid muscle) and the tongue cannot be protruded with such a sound. The resulting consonant, always fricatives, has a gagging quality. Such sounds are rare (4, a) and have a high intensity. They can contrast with laryngeals and with uvulars, and even form a secondary modification of these, as in some dialects of Georgian, but they do not contrast with other sounds made in the pharynx (6, a).

More familiar are the “classic” pharyngeals heard in normative dialects of Arabic (4, b). The tongue root is retracted. The voiceless fricative is equivalent to a stage whisper for English actors. The output is intense and carries far. Such articulations also serve as common secondary modifications to the “more usual” articulations (8, e, f, g).

Perhaps more common in the world are sounds made at what seems to be the epiglottis (4, c). These can also be found in Arabic dialects (Alwan 1986). They have a striking growling quality, setting them apart from the “stage whisper” of true pharyngeals and the gagging effect of naso-pharyngeals. They seem to arise in the course of retracting the tongue root. Such retraction seems also to press down upon the epiglottis if the tongue root is lowered as well (sterno-hyoid muscle). In many languages this facultative effect has come to dominate so much so that these sounds may be made with the tongue extruded (first pointed out to me by Sergo Kadzasov, p. c.). Even though most instances are sonorant continuants, one may even hear epiglottal stops in some dialects of Arabic (Alex Bellem, p.c., who reproduce them for me). Such a stop is entirely plausible, since the epiglottis can close entirely over the adytus (opening of the larynx) in the course of swallowing. Such sounds have become termed emphaticals or epiglottals, but since the epiglottis is the active articulator and the adytus the passive one, I would prefer to meet normal standards of phonetic nomenclature and term such sounds adytals (as with velars, uvulars, etc.).

The uvular point of articulation is wide spread in North America, North Africa, the Caucasus, and southwest Asia (Middle East, Iran, and Afghanistan), and Central Asia. Stops, fricatives, and sonorants can be made at this point (see summary in (6)). In some languages secondary modifications give rise to numerous contrasts at this point (6, b). Some of these contrasts involve secondary pharyngealization, as in Ubykh, and the Interior Salishan language, Coeur d’Alene. Uvulars have low stop bursts and pharyngeal modification serves to lower these, so acoustically a pharyngealized uvular is an odd segment. One might instead expect pharyngealized palatals or velars, as lowering of their higher stop bursts would have more acoustic effect, but curiously, pharyngealized versions of these seem not to exist (but see Cook’s interpretation of Chilcotin [qx] and Jacobson’s of Arabic /q/ in (8, b)). The lack of height in the

uvulars (palatals and velars are assumed to be [+high]) may be an aspect that links them to the pharyngeals.

5. Uvulars

a. back-most oral articulation, [-high, +back]

b. pharyngealized uvulars [+back, +CP] (*contra* Alwan, 1986, p. 126)

i. Ubykh (after Vogt, 1962)

/qa/ cemetery ~ /q̄a/ 'to run'

/q'á/ 'speech' ~ /q̄'ə̄/ 'to notch'

/q'á/ 'son; valley' ~ /q̄'ə̄p̄x'ə̄/ 'foster child'

/q'°a/ 'to know, understand' ~ /q̄'°á/ 'cave'

/x'á/ 'lower part' ~ /x̄ə̄x̄/ 'circle'

/x'á/ 'millet' ~ /x̄'á/ 'pig'

/ɣab'ə̄/ 'hard' ~ /ɣ̄ab'á/ 'force'

/ɣ'á/ 'smoke; hole; yellow; eight' ~ /mə̄ɣ'á/ 'evil, wicked'

ii. Coeur d'Alene (Interior Salishan) (after Kinkade 1967:233)

/sχ'á̄ɣ'χ'á̄/ 'fox'

/č'ǣɣ' / 'prayer'

3. **Contrasts.** While we may distinguish three points of articulation in the pharynx, it seems that no language contrasts all three (6). While it may seem quite marginal it must still be noted that there is one language, the Richa dialect of the Northeast Caucasian language Aghul, that contrasts true pharyngeals with adytals, (6, c). Recordings supplied to me by Aleksandr Kibrik seem to show a similar contrast in the related Dargwa between pharyngealized and adytalized vowels. As I shall discuss, the acoustics for all of these pharyngeal sounds are distinctive.

The real puzzle is why this contrast is not found more widely or why some language does not contrast all three "pharyngeals." The constraint on contrasts seems to occur at the level of features. A feature analysis in (6, d) permits two sorts

of pharyngeals, as long as one accepts some constriction of the pharynx and lowering as features of the adytals. The pattern in (6, d) prohibits a three way contrast in the pharynx. If one rejects [+low] for the adytals, and posits some other feature, [+covered] or [+adytus], then one can no longer offer an explanation as to why a three way pharyngeal contrast is not found except as a matter of sheer chance.

6. Contrasts

- a. No language seems to contrast faucials with the other “pharyngeal,” only with laryngeals.

Georgian dialects: /q̄ʕeli/ ‘hand’ ~ /horli/ ‘easy chair’

- b. pharyngeals/ adytals ~ laryngeals

Arabic, North East Caucasian, Interior Salishan

Kabardian

/ħe/ ‘dog’

/-he/ ‘plural’

- c. uvulars ~ pharyngealized uvulars ~ pharyngeals ~ adytals (~ laryngeals)

Richa Aghul (NEC) (after Kibrik and Kodzasov 1990, p. 339)

/ʃaʕ/ ‘house’

/x̄aw/ ‘nut’

/ħaw/ ‘winch’

/ħač/ ‘apple’

Dargwa (NEC)

Vowels /i, e, a, u/ : plain ~ adytalized ~ pharyngealized (*ibid.*, p. 334)

- d. features (?)

	uvulars	pharyngealized	pharyngeals	adytals	laryngeals
		uvulars			
back	+	+	-	-	-

CP	-	+		+	(+)	-
Low	-	-		-	+	(+)

e. adyatalized high vowels in Dargwa

/bɨk'as/ 'a little'

The best argument in favor of a new feature is the existence of adyatalized high vowels in Dargwa, (6, e), which must be [+ high] and therefore, without some special theoretical dispensation, such as confining the adyatalization to a separate tree or tier of secondary articulation, cannot be also [+ low]. A complete feature account remains to be fully established for these sounds.

4. **Phonetics.** Amazingly these arcane contrasts in the throat were predicted purely on the grounds of acoustic vocal tract modeling by Ken Stevens and the late Dennis Klatt (1969) (8). I, myself (1988, 1994), and Abeer Abdul-Hussain Alwan (1986) have extended this pioneering work. The summary (7) gives rough average values in kilo-Hertz (kHz) for the first three formants of all series except the naso-pharyngeal one.

7. Phonetics (after Klatt and Stevens 1969, Colarusso 1988, 1994, Alwan 1986)

a. uvulars:

F₁ low, ~0.7 kHz; F₂ mid, ~1.1 kHz; F₃ high, ~2.5 kHz, back coloring

b. pharyngealized uvulars:

F₁ low, ~0.5 kHz; F₂ mid, ~1.2 kHz; F₃ low, ~1.8 kHz, slight front coloring

c. pharyngeals:

F₁ low, ~0.5 kHz; F₂ mid, ~0.9 kHz, loud; F₃ high, ~1.8 kHz, front coloring

d. adytals:

F₁ damped out; F₂ high, ~1.5 kHz, loud; F₃ low, ~1.75 kHz, loud
low, back coloring

e. laryngeals:

F₁ damped out; F₂ mid, ~1.5 kHz; F₃ high, ~2.6 kHz, no coloring,
unless [+low]

The acoustics of these sounds coupled with their articulations leads to complex assimilatory effects that are competing: palatalization as opposed to retraction. The back coloring of the uvulars (7, a) is best seen among the Turkic languages (Johanson, 2006, p. 33).

5. **Phonology.** What was not discussed by Klatt and Stevens, but was first observed by Trubetzkoy as early as 1939 (see 1958 edition), was a sort of odd palatalization that sometimes resulted from a pharyngeal coloring an adjacent vowel. Some indication of this effect is noted by the “coloring” comments in (7). Given the retraction of the tongue for [+CP] and perhaps the lowering [+low] of the adytals, such palatalization, called “emphatic softening” by Trubetzkoy (in German *emphatische Moulierung*, in English also rendered as “emphatic palatalization” or “emphatic umlaut”), seems impossible. There is ample data, however, showing that this effect is real (8, a). It seems to be a form of acoustic assimilation rather than an articulatory one. The strong low F₁ of the true pharyngeals (7, c) and the strong high F₂ of the adytals together mimic the first two formants of high front vowels. By mixing with the formants of a coarticulated vowel the acoustic outcome is amenable to reinterpretation as a front vowel, often with the pharyngeal or adytal then giving way to a simple laryngeal (see the Old Akkadian and Hebrew material in (8, a, iii)).

This effect can combine with the articulatory one of lowering so that the same word can exhibit both, (8, b, i). The factors that favor one form of assimilation over another remain unclear.

8. Phonology

a. emphatic palatalization or umlaut (Trubetzkoy 1958, p. 124)

i. Northwest Caucasian

Abaza /ʕ°ə/ ‘man, person,’ /ʒʕ°and/ ‘sky’

Abzhwi Abkhaz /y°ə/ ‘person,’ /a-ž°y°an/ ‘the-sky’

Bzyb Abkhaz /y°ə/, /a-ž°yan/, /y°/ → /y°/ (with rounding dissimilation)

Ubykh /ʃə́ma/ ‘stranger,’ V₁ : F₁ ~0.85 kHz; F₂ ~1.7 kHz = [ə] ,

/xə́má/ ‘harvest time,’ V₁ : F₁ ~0.5 kHz; F₂ ~1.2 kHz = [e]

ii. Northeast Caucasian (see also Alex Bellem, this volume)

Tsakhur /t°o°x/ ‘rope,’ dial. /t°öx/

Rutul /ga°t°/ ‘cat,’ dial. /gät°/

iii. Semitic (see also various articles in this volume)

Old Akkadian /ʕebdu-rašap/ ← */ʕabdu-rašap/ servant(.of)-Resheph

/iptē/ ← */iptaḥ/ ‘to open’

/bēlu/ ← */baʕlu/ ‘mister, sir’

Hebrew /beʔel/ ← */baʕ(a)/ ‘lord’

(after Lipinski 2001, p. 149; Brocklemann 1916, 1966)

iv. Columbian Interior Salishan

(after Hoard 1978, p. 63; Colarusso 1985, p. 366))

/ʃəḥim°aʔ/ → [ʃəḥém°aʔ] ‘to detest’ (first vowel)

b. lowering and backing

i. Columbian Interior Salishan

/ʃəḥim°aʔ/ → [ʃəḥém°aʔ] *id.*, (second and third vowels)

ii. Chilcotin Athapaskan

/beken/ → [bəqʰən] ‘her husband’

/beken/ → [beken] ‘her vagina’

iii. Arabic mufaxxama /k/ = /q/ (Jacobson 1962)

iv. Circassian

/xə/ → [x₁] ‘sea’ ~ /x̣e/ → [x̣ə] ‘in a mass, between, among’

/hə/ → [hə] 'to carry outside' ~ /hʌ/ → [hɑ]

One should note the lowered last vowel in (8, b, i), where a glottal stop seems to manifest [+ low].

Pharyngealization in any of its three forms is an extreme articulation (Blevens and Garrett), much as is the case with retroflexion. This makes pharyngeals prone to metathesis, (9, a, b), or even to spreading, (9, c).

9. Pharyngeal metathesis and spreading

- a. Abaza /a-ʕə-ʕ°/ ← /á-ʕ°-ʕ°ə/ the-person-human.plural (with rounding dissimilation) (Colarusso, 2002, p. 513, line 72)
- b. Salishan Nxilxcín (Colville) (after Blevens and Garrett, 2004, p. 132)
/ʕʕac/ 'soak(ed), drip'
/c-k-ʕʕa`c-p/ '(it) still had a drop' [no morpheme glossing]
/c-ʕ-ʕcʕá-p/ '(it) had water on'
- c. pharyngeal spread (after Kibrik and Kodzasov. P. 335)
Dargwa /waʕwas/ → [waʕwaʕs] 'hawk'

6. **Secondary articulations: "pharyngealization"** The type of primary articulations to which pharyngealization may apply also show an interesting restriction. These seem to lack the feature [+ high], that is they all lack tongue raising (palato-glossus and stylo-glossus muscles) (10, a). If a [+ high] segment is [+ CP] (or whatever features may come to best suit these), then it must "decay" into a [- high] segment, (10, b), that is a consonant that is [+ high, + CP] cannot be "visible," or the segment must be a vowel, (10, c), or glide (the Abkhaz segments in (8, a). Pharyngealized glides are the only exceptions if one wishes to have these as [+ C] and the Abkhaz /yʕ°/ does act as a consonant, having come to be dominated by its emphatic softening. Therefore, one can have a redundancy rule: [+ high, + CP] → [+ sonorant].

10. Pharyngealized sounds

- a. pharyngealized Cs [- high, + C, + CP](with traces of [+ voice] or ejection)

Ubykh labials: /p ~ p̄, b ~ b̄, p' ~ p̄', m ~ m̄, w ~ w̄, f ~ v/

/q̄°əp̄x̄ə/ 'foster child'

/bə/ ~ /bəq̄°/ 'big' (← PNWC */bə-ʔwó/ ~ */bə́-ʔwo/, ejective!)

/p̄'əp̄'əž°/ personal name ('grandfather?')

/m̄ə/ 'crabapple'

/á-wa/ 'the-dog'

/-və-/ 'to peer at s.o., spy on s.o.' (← PNWC */-p̄'ə-ʔ-/; ~ /f/, voiced!)

- b. Classical Arabic coronals: /t, s, ɖ, l/ (Note voicing of interdental.)

No: /s̄, š̄, x̄, x̄, ɖ̄, ɖ̄, k̄, k̄, etc./

NOTE: [+ high, + back, + CP] (/k̄/) → [-high, + back, + CP] ([q])

- c. pharyngealized vowels, [± high, - C, + CP]

all vowels can be pharyngealized, even high ones, unlike Cs.

[+ high] and [+ C] are coupled.

An unusual segment consist of the pharyngealized laryngeals (11). These “choked glottal stops” may be the result of synergistic effects involving tongue retraction, lowering of the epiglottis, and adduction of the vocal cords. The Ubykh development in (10, a) shows a shift from what might have been a pharyngealized glottal stop to a pharyngealized ejective uvular: /bə/ ~ /bəq̄°/ 'big' ← PNWC */bə-ʔwó/ ~ /bə́-ʔwo/, with */-ʔwo-/ being an intensive suffix. This would suggest that the glottal stops of Proto-Northwest Caucasian were more like those seen today in the Northeast Caucasian languages, where /ʔ/ is routinely pharyngealized.

Whether one views these sounds as pharyngealized uvulars or ejective pharyngeals would be beyond the resolution of phonetically based phonology and would instead depend upon the sound patterns in the language. An

example would Interior Salishan language Columbian, where sonorants come voiceless, voiced and ejective. This language has ejective pharyngeals, so that Columbian /ħ, ʕ, ʕ', ħ°, ʕ°, ʕ'°/, pattern along with the other sonorants. They are not multiply articulated.

11. Pharyngealized laryngeals:

NEC /ʔ/ → [ʔ], [ʕ']

Interior Salish: voiced pharyngeal sonorants: /ʕ ~ ʕ', ʕ° ~ ʕ'°/

Wakashan: Makah /q'iq'ič/ ~ Nootka /ʔiʔič/, Nitinat /ʔiʔič(i)/ 'eyebrow'

With the possible exception of pharyngealized glottal stop there are no other "laryngealized" segments, that is, multiply articulated segments where one member is a laryngeal.

7. **Historical shifts** . As phonology grows opaque it becomes the stuff of historical shifts, at least in theory, although there are some historical shifts, such as rhoticization (s → r, as in Latin), that seems to be extremely rare if not non-existent as active phonology. The most plausible shift, though one not found in synchronic phonology, is that of uvular to pharyngeal, (12, a, b).

12. Historical shifts

a. Northwest Caucasian (NWC) uvulars → pharyngeals (shift in Abkhaz)

i. Proto-NWC (PNWC) */pa-χu-/ 'young woman'

Circ. /pχ°ə/ 'daughter', Bzyb Abkhaz /pħ°ə(ššba)/ 'woman'

ii. PNWC */-(w-)q'a-/ '-(progressive-)say-'

WCirc. /-ʔ°e-/ 'to say', Kab. /-ž-ʔe-/ '-back-say-', Abkhaz /-ħ°a-/ 'to say'

(Note, PNWC */ʔa/ → Circ. /ʔe/ 'hand', Abkhaz /-q'a-/ '(by) hand (preverb)')

iii. PNWC */γu/, */(w- ~ y-)γə/ 'road, path'

Circ. /γ°ə/ 'road', Abaza /mɣ°ə/ 'road'

- iv. PNWC */(w- ~ y- ~ ø-)q'a/ 'grammatical class prefixes-pear'
WCirc. /q'ə(zə)/, Ubykh /x'á/, Abkhaz /a-ḥá/, all 'pear'
v. PNWC /-xo-/ 'to crawl'
Bzhedukh WC /č'aǰ'e-/ , Kab. /faǰ'e-/ , Abkhaz /-ḥ'á-(za-)/ *id.*

b. Salishan (Kinkade, 1967, p. 233)

- Chehalis /xāy/ 'growl', Columbian /ḥiy/ *id.*
Chehalis /ʔáx' / 'burn', Columbian /ʔáŋ' / 'parch'

Attested in a more complex suite of forms is the shift of pharyngeals to laryngeals, presumably through a stage as adytals, as in (13, a, c). Abkhaz shows this shift as part of its synchronic phonology (13, b).

(13) Pharyngeals → (adytals →) laryngeals or low vowels

a. Northwest Caucasian

- i. PNWC */λaḥá/ 'mountain side'
Proto-Ubykh */λahá/ → */ʔaǰ'á/ → /ʔaǰ'á/ 'mountain, montane forest'
ii. PNWC */ḥa-(w- ~ y-)a/ 'no' →
Circ. /ḥaw/ 'no',
Ubykh /hāy/

b. Synchronic phonology Abkhaz

- i. /də-ḥ-ba-yt' / him/her-we-see-past → /də-ŋ-ba-yt' / → /daabayt' /
ii. Bzyb /ŋaš/ → /aáš/ 'bush'

c. Semitic (after Brame 1972; Sutcliffe 1960):

- i. */ʔatŋ/ 'to cut' → Maltese /ʔata/ 'he cut', /maʔtūh/ 'cutting'
ii. */balŋ/ 'to swallow' → /bala/ 'he swallowed', /miblūh/ 'swallowing'
iii. Syriac dissimilation (Geoffrey Khan, Personal communication)
*/ŋaŋa/ 'wood' → /ʔaŋa/
*/ŋelŋā/ 'rib' → /ʔelŋā/
iv. Cushitic (after Zaborski 1975)

Somali /hoq/ 'to scratch', Galla /hoqu/

Somali /dagah/ 'stone', Galla */dagah/ → /daga/

Pharyngealized uvulars are rare and this seems to reflect the rarity of the shift from a pharyngeal to the uvular zone, as in (14).

14. Pharyngeals → pharyngealized uvulars

i. PNWC */ʕa/ 'ashes, ash colored'

Ubykh /ɣ̣a-q'á/ gray-color.suffix,

Bzyb Abkhaz /á-x̣'a/ *id.*,

Proto-Circ. */č̣'a-x̣'a/ color-gray → /ṣ̌x̣'e/ *id.*, (Ubykh /-c'a/ 'color suffix')

ii. PNWC */ʕánca/ 'digging stick'

Ubykh /ɣ̣á·nca/ *id.*

Circ /ħanzɛ/ *id.*

iii. PNWC */ʕahá/ 'mountain side'

Bzyb Abkhaz /a-ṣ̌xa/ 'mountain',

Ashqarwa Abkhaz /a-ṣ̌qa/ *id.*,

Circ. /ʕ̣ə)ṣ̌he/ 'mountain side',

Proto-Ubykh */ʕahá/ → */ħaχ̣'á/ → /ħaχ̣á/ 'mountain, montane forest'

Finally, combining the effects in (12) and (13) one may posit a shift of uvular to laryngeal. If one assumes that a velar may follow the same path, then one has the unfolding of Grimm's and Verner's laws for the development of Proto-Indo-European (PIE) velars into attested Germanic, (15), with late sonorization to [h].

15. Germanic, Grimm's and Verner's Laws (after Fortson 2010, p. 341)

PIE */k/ → PGmc */x/ (Grimm's) or */ɣ/ (Verner's)

PIE */dékm/ 'ten' → Gothic *taihun* ([texun])

PIE */dekú-/ → PGmc */teχú-/ -ty, as in (*twen*)ty, (*thir*)ty, etc.
PGmc */x/ → /h/ in later languages (via */h/ ?)

8. The Laryngeals of Proto-Indo-European. The preceding survey and discussion now places us in a position to gain some principled insight into the nature of the so-called laryngeals of Proto-Indo-European and their development (Colarusso 1981, 1992, 2003), as opposed to the speculation that now dominates this issue (for a survey of various interpretations see Rose 2006, pp. 123 – 138; also Daniel Petit, this volume).

The PIE laryngeals must have gone through three periods, as in (16), with (16, a) being the oldest, (16, b) being late in the era of unity, and (16, c) being well into the era of early differentiation.

16. Proto-Indo-European Laryngeals

a. Stable period (velars or uvulars)

PIE */dhug-γter-s/ daughter-esteemed-nominative (**dhug-Ater-s*)

PIE /stx(ə)t-/ ~ /stext-/ 'to stand' (**stAt*)

PIE */senex-s/ 'old, venerable' (**seneA-s*) → Latin *senex* (/senek-s/)

'old', with no coloring (← Proto-Italic */senex-s/, with retention of original laryngeal */x/ before */-s/)

b. Coloring period

i. palatalizing (pharyngeals)

PIE */dhug-γter-s/ → Sanskrit *duhitā*

PIE */stḥ(ə)t-/ → Sanskrit *sthitā*

ii. lowering (adryals)

PIE */dhug-γter-s/ → Greek *thugatēr*

PIE */senex-to-s/ → */seneḥ-to-s/ 'venerable ones' →

Proto-Italic */senaḥtos/ → Latin *senātus* 'senate'

c. Loss with compensatory lengthening (laryngeals)

The era of stable laryngeals, (16, a), must have been one in which they were uvulars or even earlier, velars. No coloring was involved. The Latin *senex* in (16, a) would be an accidental retention of this oldest level, due to a dialectal fricative dissimilation rule, contrasted synchronically with the later coloring laryngeal, inferable from the form in (16, b, ii). We may note that the /-a-/ laryngeal reflex in Greek shows articulatory assimilation where as the /-i-/ in Sanskrit shows acoustic assimilation. We may also confidently dispose of the notion that the o-coloring laryngeal was */ʎ/, and confidently attribute the rounding effects to this laryngeal being [+ round], namely /x° ~ ɣ°, ɸ° ~ ʃ°, h° ~ ɦ°/, depending upon the stage of PIE. The non-coloring *E would most likely have been some sort of original laryngeal, */h/ or */ʔ/, that was unspecified for place, as in (7, e).

As is evident with the forms in (16) and other examples (17) the laryngeals show evidence for at least three source feature contrasts: breathy voicing (17, a), voiceless aspiration (17, b), and voicing (17, c). What is odd is that these effects are not seen consistently across the daughters.

(17) Voice feature contrasts (at the least, “compatibility”) of the PIE laryngeals

- a. PIE */dhug-ʃter-s/ → Sanskrit *duhitā*, but Greek *thugatēr*
- b. PIE */sth(ə)t-/ → Sanskrit *sthita*, but Latin *stātus*
- c. PIE *pə-pHi- → Old Irish *ibim* ‘I drink’ (Proto-Celtic *pibi-),
Russian *pivo* ‘beer’ (not *bivo)

Additionally, an assumed A (*h) will aspirate a preceding /t/, but not other members of its series, /p, kʷ, k, kʰ/, at least not consistently. This apparent variability may underlie some of the “inconsistencies” in the behavior of the laryngeals in Anatolian, (19). While Anatolian itself clearly had a long period of its own development so that Hittite, Luwian, etc., show substantial phonology for the laryngeals (Jasanoff 2003, p. 114; Melchert 1994, pp. 64 - 74), many “details” remain to be explained. What (12) and (13) suggest, however, is that PIE itself may have had more than one generation of “laryngeals,” and that an

“early” or even pre-PIE stage may have had uvulars (velars) and true laryngeals (or even pharyngeals), and that these shifted as in (12) and (13) so that the stable period of (17, a) was itself the product of a long history internal to the parent language.

One might note that voiced uvular stops are the least stable of all voiced stops because they have the smallest supra-glottal cavity for accommodating the trans-glottal airflow of voicing. So, *G and *G° would be likely sources for */ʁ/ and */ʁ°, respectively (via */ɣ/ and */ɣ°/). Some of the dialectal variations would then emerge as inconsistencies within and between the daughters.

In other words if *A could impart aspiration to a voiced segment and not cause it to devoice, which is what we see in (17, a) and what has been discussed for *d + *A → dh by Pulju (1997), then we must assume that it was h-like and voiced (compare Watkins, 1960) and paired with a voiceless correlate: */h ~ ʁ/. We should expect *O to be the rounded correlate of this pair: */h° ~ ʁ°. This simple componential analysis, however, renders as anomalous the form ‘to give,’ (18, i). The Hittite paradigm for this verb also shows the variable attestation of the laryngeal, (18, ii). If however PIE had an earlier generation of laryngeals, some only partially preserved and others lost, such as *E, then a rounded, [+ low] glottal stop would color the vowel *e, but not aspirate the preceding stop in the zero-grade of the noun.

(18) PIE *deO- ‘to give’, *dO-to- ‘gift’

i. PIE */deʔ°-/ ‘to give’ ~ /dʔ°-to-/ ‘gift’ →

Greek *didōmi*, *dotos*, (not **tithōmi*, **thotos*)

Slavic *dar*,

but

ii. Hittite *da-a-i* ‘he takes’, but *da-ah-hi*, ‘I take’

← /dō-i/ ~ /doḥ-ḥi/ ← */deʔ°-ḥe/

(after Held, Schmalstieg, and Gertz 1987, p. 42)

If one were to embrace laryngeal PIE (Gamkrelidze, 1968; Hopper 1982; Colarusso 1981, 1992, 2003), wherein Classical PIE stops emerged later from laryngeal ones: */p ~ (b) ~ bh/ ← */p^h ~ (p^h) ~ b/, etc., */e ~ o ~ a/ ← */ə ~ a ~ (a)/, then a first generation *O' (as opposed to *O'', */h^o ~ ʕ^o/ or */x^o ~ ʁ^o/ of generation 2 or even 3) that would yield the naturally null assimilation in (19), that is nothing would happen to the stop.

(19) Laryngeal PIE and first generation *O'

PIE */t^həʔ-/ 'to give' ~ /t^hʔ^o-t^ha-/ 'gift' →

Classical PIE */də-dō-/ ~ /do-to-/ →

Greek *didōmi*, *dotos*, (not **tithōmi*, **thotos*)

Slavic *dar*,

If a voicing contrast existed among the “laryngeals,” however, then this would imply that the other fricative series was defective, that is. PIE had */s/ but no */z/. Three alternatives emerge. First, this might indeed have been the case. Second, there might be some slight evidence that would point to filling the missing */z/ slot. Third, it is possible that the voicing of the “laryngeals” arose because originally some or all of them were stops, specifically uvular stops, as in (12, a).

We might also have a principled discussion of two further topics associated with the laryngeals: the failure of *A to color */o/, and the existence of a third vowel, *a. The last is substantiated (Fortson, p. 66, §3.26), but this vowel is anomalous, not merely because a vowel system /e, o, a/ is typologically unknown, but because it fails to enter into apophony. It is also associated with velars (for example, Greek *karpós*, Latin *carp-ō* ‘I harvest’, English *harvest*, or Latin *capt-ō* ‘I grab, seek to have’, English *have*) more than mere chance would support. By contrast the lack of apophony renders */a/ sufficiently peculiar that some scholars go to lengths to deny its existence (Beekes, pp. 138 – 139, §11.7.2).

There are two possibilities for the failure of A to color */o/. The first and simplest would be that captured by the rule for the sequence */o-A/, (20).

(20) Failure of *A to color *o (in Coda).

$$\begin{array}{ccc}
 \text{o} & \text{A} & \rightarrow \quad \bar{\text{o}} \\
 \left[\begin{array}{l} + \text{ back} \\ + \text{ low} \\ + \text{ round} \end{array} \right] & \left[\begin{array}{l} + \text{ back} \\ + \text{ low} \end{array} \right] & \rightarrow \quad \left[\begin{array}{l} + \text{ back} \\ + \text{ low} \\ + \text{ round} \end{array} \right]
 \end{array}$$

In other words, *A brings nothing to */o/ that it does not already have (apart from adding length if in syllable coda. Classical PIE */o/ must have been an open-o phonetically, whatever its phonemic status was.

Alternatively, *A may have in fact colored */o/ to */ā/ or */a/, and then both */ā/ and */a/ collapsed into */ō/ and */o/, respectively. This scenario would only work under two conditions: (1) if the coloring of */e/ by *A (in */eA/ or */Ae/) followed chronologically, and (2) if the emergence of non-apophonic */a/ followed the collapse of */ā/ into */ō/. Despite the complexity of this alternative it has the advantage of linking two seemingly unrelated phenomena, the failure of */oA/ and */Ao/ to produce */ā/ and */a/, and non-apophonic */a/. Non-apophonic */a/ would then have emerged from another source after this loss of contrast, such as a set of pharyngealized uvulars, as in (14), or even with plain uvulars, since both can cause back-coloring (7, a). This source for non-apophonic */a/ would be supported by its frequent link with velars, especially /k/, if one were willing to posit a collapse of a uvular series into the velar (see Kortlandt 2001, p. 4 (cited in Rose, p. 124, n. 116); and Rose 2006, p. 136, where uvulars and laryngeals are linked as allophones). Certainly the unusual contrast between PIE /k°/ and /kw/ might be more plausibly seen, as Kortlandt has suggested, as one between /k°/ and /qw/. Note such odd sets as Latin *vapor*, Greek *kápnos* ‘smoke’, ← late PIE */qwap-/ , English *whiff* ← late western PIE */k°ep-/ ← PIE */qwep-/ (or even */q̄wep-/), the original form (after Eric Hamp, p.c.), which violates the usual correspondences for PIE */k°/ (Latin *qu-*,

Greek *t-*, *p-*, English *wh-*). Other forms, such as PIE **sal-*, English *salt*, etc., might even suggest dark allophones of **/l/* or even distinct lateral phonemes.

If PIE had pharyngeals at some stage, then we should not be surprised to find that it used this feature in other dimensions of its phonemic system. The picture that begins to emerge here of PIE is alien and complex, but the typology of the pharyngeals and related sounds are such that they may provide the most economical and principled explanations for a range of odd details that remain enigmatic. In the future we may see less use of analogy to dispel seeming irregularities while we uncover a typologically more plausible parent language.

References

Alwan, Abeer Abdul-Hussain, 1986, *Acoustic and Perceptual Correlates of Pharyngeal and Uvular Consonants*, MS thesis, MIT.

Beekes, Robert S. P., 1995, *Comparative Indo-European Linguistics*. Amsterdam: John Benjamins.

Blevens, Juliette and Andrew Garrett, 2004, The evolution of metathesis, in Bruce Hayes, Robert Kirchner, and Donca Steriade (eds.), *Phonetically Based Phonology*, Cambridge University Press, pp. 117-156.

Brame, Michael K., 1972, On the Abstractness of Phonology, Maltese ζ , in Michael K. Brame (ed.), *Contributions to Generative Phonology*, Austin, Texas: University of Texas Press, pp. 22-61.

Brocklemann, Carl, 1916, *Semitische Sprachwissenschaft*, Berlin and Leipzig: Göschen'sche Verlagshandlung.

_____, 1966, *Grundriss der vergleichenden Grammatik der semitischen Sprachen*, 2 vols., Hidesheim: Georg Olms Verlagsbuchhandlung (1908, 1913 Berlin editions).

Colarusso, John, 1981, Typological Parallels between Proto-Indo-European and the Northwest Caucasian Languages. *Bono Homini Donum: Essays in Historical Linguistics in Memory of J. Alexander Kerns*, Y. Arbeitman and A. R. Bomhard (eds.), vol. 2, pp. 475-558. Amsterdam: John Benjamins.

_____ 1985, Pharyngeals and Pharyngealization in Salishan and

Wakashan, *International Journal of American Linguistics*, 51, birthday volume
for Eric Pratt Hamp, pp. 366-8.

_____ 1988, *The Northwest Caucasian Languages: a Phonological Survey*. In the series, *Outstanding Dissertations in Linguistics*, Jorge Hankamer (ed.). New York: Garland Publishing, (xxxi + 480).

_____ 1992, Phyletic Links between Proto-Indo-European and Proto-Northwest Caucasian, in Howard I. Aronson (ed.), *The Non-Slavic Languages of the USSR, Linguistic Studies: New Series*, University of Chicago: Chicago Linguistic Society. Pp. 19-54 [reprinted in *The Journal of Indo-European Studies* 25.1-2: 155-187, 1997]

_____ 1994, How to Describe the Sounds of the Northwest Caucasian Languages. H. Aronson (ed.), *Non-Slavic Languages of the USSR, Papers from the Fourth Conference*, Columbus, Ohio: Slavica Publishers, pp. 61-113.

_____ 2002, *Myths from the Caucasus: the Nart Sagas of the Circassians, Abazas, Abkhaz, and Ubykhs*. Princeton, New Jersey: Princeton University Press, series
"Mythos." (573 pages)

_____ 2003, More Pontic, Further Etymologies between Indo-European and Northwest Caucasian, in Dee Ann Holisky and Kevin Tuite (eds.), *Current Trends in Caucasian, East European and Inner Asian Linguistics, Papers in Honor of Howard Aronson*, Amsterdam: E. J. Brill. Pp. 41-60.

Cook, Eung-Do. (1983). Chilcotin Flattening. *Canadian Journal of Linguistics*, 28 (2), 123-132.

Cook, Eung-Do. (1989). Articulatory and Acoustic Correlates of Pharyngealization: Evidence from Athapaskan. In D. Gerds & K. Michelson (Eds.), *Theoretical Perspectives on Native American Languages* (Pp. 133-145). Albany: State University of New York Press.

Fortson, Benjamin Lee, IV, 2010, *Indo-European Language and Culture*, second edition, Wiley-Blackwell.

Gamkrelidze, Thomas V., 1968, Hittite and the Laryngeal Theory, in J. C. Heesterman, et al. (eds.), *Pratid a nam: Indian, Iranian and Indo-European Studies Presented to Franciscus Bernardus Kuiper on his Sixtieth Birthday*. New York: Mouton de Gruyter. Pp. 89 - 97.

Hayes, Bruce, Robert Kirchner, and Donca Steriade (eds.), *Phonetically Based Phonology*, Cambridge University Press.

- Heesterman, J. C. et al. (eds.), *Pratid a nam: Indian, Iranian and Indo-European Studies Presented to Franciscus Bernardus Kuiper on his Sixtieth Birthday*. New York: Mouton de Gruyter. Pp. 89 – 97.
- Held, Warren H., Jr., William R. Schmalstieg, and Janet E. Gertz, 1987, *Beginning Hittite*, Columbus Ohio: Slavica Publishers.
- Hoard, James E., 1978, Syllabification in Northwest Indian Languages, with remarks on the nature of syllabic stops and affricates, in A. Bell and J. B. Hooper (eds.), *Syllables, Segments*, Amsterdam: North-Holland Publishing Co., pp. 59 – 72.
- Hopper, Paul, 1982, Areal typology and the early Indo-European consonant system, in Edgar C. Polomé (ed.), *The Indo-Europeans in the Fourth and Third Millennia*. Ann Arbor, Michigan: Karoma Publishers. Pp. 121 – 139.
- Jacobson, Roman, 1962, Mufaxxama, the “emphatic” phonemes of Arabic, in *Selected Writings*, vol. 1, *Phonological Studies*, The Hague: Mouton, pp. 510 - 22.
- Jasanoff, Jay H., 2003, *Hittite and the Indo-European Verb*. Oxford: Oxford University Press.
- Johanson, Lars and Éva A. Csató (eds.), 1998, *The Turkic Languages*. London and New York: Routledge.
- Johanson, Lars, 1998, The Structure of Turkic, in Lars Johanson and Éva A. Csató (eds.), *The Turkic Languages*. London and New York: Routledge. Pp. 30 – 66.
- _____, 1998, The History of Turkic, in Lars Johanson and Éva A. Csató (eds.), *The Turkic Languages*. London and New York: Routledge. Pp. 81 – 125.
- Kibrik, Aleksandr and Sergo Kodzasov, 1990, *Sopostavitel'noe izuchenie dafestanskix yazykov, imya, fonetika*, Moscow University Press.
- Kinkade, M. Dale, 1967, Uvular-pharyngeal resonants in Interior Salish, *International Journal of American Linguistics*, 33, pp. 228 - 34.
- Klatt, Dennis H. and Kenneth N. Stevens, 1969, Pharyngeal Consonants, MIT Quarterly Progress Report 93, pp. 207 – 16.
- Kortlandt, Frederik, 2001, *The Indo-Uralic Verb*. Leiden: E. J. Brill.
- Lieberman, Philip, (2006), *Toward an Evolutionary Biology of Language*. Cambridge, MA: Belknap Press of Harvard University Press.
- _____, 1991, *Uniquely Human, The Evolution of Speech, Thought, and Selfless Behavior*. Cambridge, MA; Harvard University Press.

- _____ (1984), *The Biology and Evolution of Language*. Cambridge, MA; Harvard University Press.
- Lipinski, Edward, 2001, *Semitic Languages, Outline of a Comparative Grammar*, second edition, *Orientalia Lovaniensia Analecta*, Peeters.
- Melchert, H. Craig, 1994, *Anatolian Historical Phonology, Leiden Studies in Indo-European*, vol. 3. Amsterdam and Atlanta: Rodopi.
- Polomé, Edgar C. (ed.), *The Indo-Europeans in the Fourth and Third Millennia*. Ann Arbor, Michigan: Karoma Publishers. Pp. 121 – 139.
- Pulju, Tim, 1997, Indo-European *dA > *dh. *Journal of Indo-European Studies*, 25, 387 – 399.
- Rose, Sarah R., 2006, *The Hittite –hi/-mi Conjugations*. Innsbrück: Innsbrücker Beiträge zur Sprachwissenschaft (vol. 121).
- Schönig, Claus, 1998, South Siberian Turkic, in Lars Johanson and Éva A. Csató (eds.), *The Turkic Languages*. London and New York: Routledge. Pp. 403 – 416.
- Sutcliffe, E. F., 1960, *A Grammar of the Maltese Language*, Valletta, Malta.
- Trubetzkoy, Nikolai, 1958, *Grundzüge der Phonologie*, Göttingen: Vandenhoeck and Ruprecht. (reprint of the 1939 original)
- Vogt, Hans, 1963, *Dictionnaire de la langue oubykh*. Oslo: University Publishers
- Watkins, Calvert, 1960, Componential analysis of laryngeals, in Werner Winter (ed.), *Evidence for Laryngeals*. Austin, Texas: University of Texas Press. Pp. 232 – 238.
- Winter, Werner (ed.), 1960, *Evidence for Laryngeals*. Austin, Texas: University of Texas Press.
- Zaborksi, Andrzej, 1975, Material for a comparative dictionary of Cushitic languages: Somali – Galla comparisons, in Bynon, James and Theodora Bynon (eds.), *Hamito-Semitic*, Mouton, pp. 321 – 31.