

# The nature of the Proto-Indo-European laryngeals

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## 1. The number of laryngeals

Essential, of course, is the question of how many laryngeals Proto-Indo-European had, i.e., how many laryngeals we have to identify. We limit ourselves to the comparative evidence, leaving aside considerations based on the structure of this part of the phonological system. Such considerations must come later, after we have identified the laryngeals attested by the comparative evidence. Also, such considerations can only lead to speculations about the possible existence of more laryngeals (unless we would find confirmatory evidence later).

I think that we can be very short about the evidence for the number of laryngeals: there is evidence for three, there is no certain evidence for more.

Three laryngeals are required for Greek. My position on this point is well known. Recent attempts to deny this conclusion, by Lindeman (1982) and by Bammesberger (1984), are entirely unconvincing: on the contrary, they show clearly that we cannot do with less than three laryngeals and a 'triple reflex' in Greek. (Cf. my review of Bammesberger's book, which will appear in *Kratylos*.) This triple reflex is now clear for the Armenian prothetic vowel (see my forthcoming article on 'name' in *Die Sprache*). Hittite certainly points to two laryngeals, the *a*-coloring laryngeal showing a different reflex from the *e*-coloring one. It is less clear whether a third laryngeal can be identified on the basis of Hittite alone.

For more than three laryngeals evidence has been presented from Hittite. There are two considerations: there would have been a second *a*-coloring laryngeal which is not represented by *h*, as is the other; and there would be a distinction between a voiced and a voiceless laryngeal expressed in writing by single vs. double *h*.

As to the second *a*-coloring laryngeal, the factual evidence adduced for it is not convincing. I refer to Keiler's comments (1970:27 n.76). In recent times the idea has found little support.

As to the single versus double *h*, there now is an alternative explanation which says that the distinction is a Hittite development, depending on the position of the accent, or rather on the length of the preceding vowel. In this case we have to do with Hittite allophones. This explanation is now being seriously studied and, though as yet far from certain, it stands a good chance of

being correct. Here the conclusion must be that it has not been proven that the distinction goes back to Proto-Indo-European, and that it probably is an internal development of Hittite.

Hamp assumes a fourth laryngeal on the basis of Albanian; see, e.g., his article in this volume. I cannot regard this as decisive.

Thus, as far as the comparative evidence goes, we have three laryngeals and no more. Of course there may have been more, but the only thing we can do is to reckon with what is certain or probable.

## 2. Phonetic properties of the laryngeals

There is general agreement on the following points:

1. The laryngeals were consonants, which behave, according to their patterning in the root, like resonants or *s*; and they were later vocalized in some positions (differently in the different languages). Keiler (1970:70ff.) is correct in stressing that the vocalization of the laryngeals is based on an inherent property of the laryngeals themselves; there was no phonological prop vowel with which one could explain away this property of the laryngeals.
2. They caused aspiration in Indo-Iranian. There has been no complete study of the relevant evidence, but it is certain that both voiced (*ahám*, *máhi*) and voiceless stops were aspirated, and that not only *h*<sub>2</sub> caused aspiration (2pl. active ending Skt. *-tha* < \**-th<sub>1</sub>e*).
3. Before or after a vowel the laryngeals mostly disappeared as separate phonemes in the separate languages.
4. The first laryngeal does not color an adjacent *e*, the second and third change it into *a* and *o*, respectively.
5. In Hittite one or more of the laryngeals are, at least in some positions, represented by a sound which indicated in Akkadian a (voiceless) velar fricative. (Compare the interchange in modern Hebrew, mentioned in the Appendix.) In Armenian *h*<sub>2</sub> and *h*<sub>3</sub> are in some cases represented by *h*-.

Other supposed properties are uncertain or improbable. Thus a development into a velar stop, supposed for the Greek kappa-perfect, is almost certainly wrong. The so-called Germanic Verschärfung I consider as uncertain (see Kortlandt (1988) who assumes *H* > *k* before *w*). Nor is there certain evidence for a development to *y* or *w*; and there is very good evidence that they were not liable to such a development.

It has often been assumed that one or more of the laryngeals were voiced. The only piece of evidence was the verb for ‘to drink’, Skt. *pibāti* < \**pi-ph<sub>3</sub>*-. However, there is an alternative explanation of this form (Kortlandt apud Beekes 1985:215 n.1), who thinks that the root had originally initial *b*-, which became *p*- (later) in Proto-Indo-European. The same explanation was given by Thurneysen (IFAnz. 22:165). But even apart from that, it is evident that ‘this isolated example can hardly be taken as evidence for the “caractère phonologique” of *H<sub>3</sub>*’ (Keiler 1970:34). There is, however, a more serious objection against assuming distinctively voiced laryngeals, viz., the fact that Proto-Indo-European did not have distinctive voice. It has been shown that the supposed voiced stops were glottalized, probably preglottalized. Several developments can be explained through this assumption. A survey of the evidence is given by Kortlandt 1985. (I follow Kortlandt in assuming plain, glottalized, and aspirated stops.) Therefore an opposition voiced: voiceless is very improbable, not to say excluded for Proto-Indo-European.

### 3. Earlier interpretations

I will be brief about earlier interpretations, one reason being that they were discussed by Keiler (1970:30–46). The systems which have more than three laryngeals—and most of them do—are not interesting as systems.

3.1 A first point is that some authors assume the laryngeals to have been velar fricatives, either all of them or only some of them, while others assume only laryngeals and pharyngeals. Lindeman (1970:100) assumes that they were all velar fricatives, and he puts them beside the palato-velar, the plain and the labio-velar stops:

ḱ	ǵ	ǵ <sup>h</sup>	ǰ
k	g	g <sup>h</sup>	x
k <sup>w</sup>	g <sup>w</sup>	g <sup>wh</sup>	x <sup>w</sup>

I think that there is a general objection to velar fricatives, and one against this particular version. The general objection is that they are not the most probable candidates for a group of sounds, the ‘laryngeals’, of which one of the most remarkable things is that they were often vocalized. This phonetic property of the laryngeals makes it rather improbable that they were velar fricatives. (For uvular fricatives the same objection holds.)

The specific objection to Lindeman’s reconstruction is that the plain, i.e., nonpalatalized and nonlabialized, velar fricative (*h<sub>2</sub>*) is the most frequent one,

while plain velar stops in Proto-Indo-European either did not exist at all or were very restricted in number (and of recent origin).

3.2 Notably Martinet (1955:217ff.) thought that the third, *o*-coloring laryngeal had lip-rounding, and differed from the *a*-coloring laryngeal only in this feature. Keiler remarks (1970:42) that this would fit in nicely with the fact that lip-rounding is a distinctive feature in the Proto-Indo-European phonological system.

3.3 The assumption of a palatized laryngeal for the *e*-coloring laryngeal is improbable. First, palatalized laryngeals or pharyngeals are very rare in the languages of the world. Then, the '*e*-coloring' laryngeal is rather a non coloring laryngeal, as it did not affect a PIE \**e*.

Keiler remarked that describing  $h_1$  'as a glottal catch may help to account for the first laryngeal's lack of colouring power on adjoining vowels' (1970:40). It was especially Martinet (1958:42) who observed that coloring of vowels is mostly caused by nonglottal sounds, whereas the absence of coloring is explained by assuming a glottal articulation.

3.4 Keiler's system deserves to be discussed because he wrote a full scale study about this problem. He compares the Semitic system, which had four such sounds, a voiceless and a voiced (or tense and lax) pharyngeal,  $h$  and  $\text{ʕ}$ ; and two laryngeals, a glottal stop,  $\text{ʔ}$  and a  $h$ . He identified  $h_1$  with  $h$ ,  $h_2$  with  $h$  and  $h_3$  with  $\text{ʕ}$ . I do not understand this identification, as it is not indicated by his preceding considerations, to which I largely subscribe. First, as mentioned above, there was no distinctive voice (or tense: lax) opposition in Proto-Indo-European. Second, it does not explain the *o*-coloring. And, third, from word-initial  $h$  before consonant one does not expect a vowel (*e*-) in Greek. In the case of  $h_1r$ - one expects aspiration, i.e.  $\text{ʔ}$ -, if  $h_1$  was  $h$ . (It must be noted here that it was thought for a long time that the laryngeals did create aspiration in Greek.) My major objection to Keiler's proposal is that he compares the Semitic system and none other. There is hardly any reference to other languages or language families that have sets of laryngeals and/or pharyngeal sounds, while it is well known that many Caucasian and Amerindian languages do have such sets.

3.5 Bomhard (1979), who gives the most recent treatment of the problem, assumes four laryngeals. The 'fourth' would be 'a voiceless glottal fricative, IPA [ $h$ ].' I disregard it here for the reason just given. The others would be a glottal stop, because languages with a stop system like that of Proto-Indo-European (with glottalized stops) often have a glottal stop; and for  $h_2$  and  $h_3$  a voiceless and a voiced velar fricative, the latter identifications 'by default'. I have objected to velars above. Bomhard rejects pharyngeals as these would not color

vowels in North-West Caucasian. However, this is not true, see, e.g., Smeets (1984:126) on Circassian, and velars generally do color less than pharyngeals (we know that they did not color in Proto-Indo-European). He rejects a labialized laryngeal because you would expect a reflex written *hu* in Hittite, like *ku* from *k<sup>w</sup>*. This argument is not strong, as the labial articulation of the laryngeal may have disappeared earlier than that of the labiovelars. He rejects Martinet's *A<sup>w</sup>*, i.e., a labialized *h<sub>2</sub>*, because he would expect a reflex (i.e. *h*) in Hittite *pāszi* 'drinks'. I think this argument is correct if *pāszi* continues *\*peh<sub>3</sub>s-*, but it could represent zero grade *\*ph<sub>3</sub>s-*.

#### 4. Conclusions

I think that the elements for a correct identification are present in the preceding sections.

1. We have seen that velar fricatives are improbable. Therefore the Proto-Indo-European 'laryngeals' will have been laryngeals and pharyngeals.
2. It is probable that coloring was caused by pharyngeal sounds, and that the noncoloring 'laryngeal' was a glottal sound.
3. It is probable that *a*-coloring was caused by a plain pharyngeal, *o*-coloring by a pharyngeal with lip-rounding. We noted above that lip rounding was a distinctive feature of Proto-Indo-European. The pharyngeals will have been (phonetically, not phonemically) voiced, as they were often vocalized later. Thus *h<sub>2</sub>* was *ʕ*, and *h<sub>3</sub>* was *ʕ<sup>w</sup>*.
4. For the noncoloring laryngeal the glottal stop is the only candidate (as *h* is improbable, as we saw above).

One might object to *ʕ<sup>w</sup>* that, as is mostly assumed, it is represented by zero in Hittite and not by *h*, as one would expect because *ʕ* became (mostly) *h*. However, it is not certain that *h<sub>3</sub>* (*ʕ<sup>w</sup>*) did not become *h*. Some words that have constant *o*-vocalism have *h*. It seems probable that at least some of them had *h<sub>3</sub>*: *hastai-*, Gr. *ostéon*; Luw. *hawi-*, Lat. *ovis*; *harp-*, Lat. *orbis*; *happinant-*, Skt. *ápnas*, Lat. *opus*; perhaps *hasduer*, Gr. *ózos*; *harganau-* 'palm' if from *\*h<sub>3</sub>reg-*. Also, Kortlandt supposes that the development in Hittite is parallel to that in Armenian and—perhaps—in Albanian: *h<sub>2</sub>e-*, *h<sub>3</sub>e-* > *ha-*; *h<sub>2</sub>o-*, *h<sub>3</sub>o-* > *a-*. This would mean that *h<sub>2</sub>* and *h<sub>3</sub>* behaved in the same way. Note that it has always been assumed that the labialized laryngeal was a form of *h<sub>2</sub>*.

The discovery of the glottalized stops confirms in many ways that the first laryngeal was a glottal stop. In Balto-Slavic Kortlandt has shown that acute

accentuation originated (only) when a vowel was followed by a laryngeal. But acute intonation is also found when an original short vowel was followed by a non-aspirate voiced stop, i.e., in my view by a glottalized stop. This observation was made by Winter; Kortlandt explained the intonation by assuming that these stops were preglottalized, and that this glottal element had the same effect as a laryngeal. This means that the laryngeals had merged into a glottal stop. Of course, it is then probable that (at least) one of them originally was a glottal stop.

The same situation obtained in Indo-Iranian, and is the basis for Lubotsky's rule. He explained a deviant short *a* in these languages from a sequence short vowel + laryngeal + voiced stop + consonant (VHDC). When the laryngeals had merged into a glottal stop, the latter merged with the glottalic element of the voiced = preglottalized stop (so that the laryngeal that caused lengthening disappeared: VDC).

In Latin, Lachmann's law is explained by the preglottalized stops: in *āctus* the length of the *ā* was caused by the glottalic element of the stop. See Kortlandt's article in this volume. This feature, then, had the same effect on a preceding vowel as had the laryngeal. This again suggests that the laryngeals had merged into a glottal stop, and that one of them originally was a glottal stop.

Further confirmation is given by the Greek numerals for 'twenty' and 'hundred' according to Kortlandt's explanation (MSS 42, 1903, 97–104). The unexplained *e-* of both *eikosi* < \**euīkosi* and *hekatón* is the reflex of the glottal element of the (preglottalized) *d* in \**dui-* and \**dkmtóm*, of which the obstruent, the plosive element, disappeared (through dissimilation). This means that here a glottal stop was vocalized into an *e-*, exactly as happened with *h<sub>1</sub>-*.

I consider it as a support that the result agrees with what most scholars have thought (cf. Hamp this volume!). I have not made statistics, but I think that most scholars thought that *h<sub>1</sub>* was a glottal stop, that *h<sub>2</sub>* was a velar or pharyngeal fricative. I have indicated why a velar is improbable, so the pharyngeal remains. And that *h<sub>3</sub>* was a labialized counterpart of *h<sub>2</sub>*. When we add these up, we get the system proposed here: *ʔ, ʕ, ʕʷ*.

Alternatively we may approach the problem by looking at the sounds that are probable candidates for the Proto-Indo-European laryngeals. (A fuller discussion is given in the appendix.) I exclude velar and uvular fricatives.

The sounds most frequently found, those for which the IPA has separate signs, are the following:

	stops	fricatives		
	–	–	+	voice
pharyngeals		ħ	ʕ	
laryngeals	ʔ	h	ħ	

Most probably, then, we have to find the Proto-Indo-European ‘laryngeals’ here. We can easily narrow this down further. If the third laryngeal was a labialized variant of one of the other two, we only have to determine two of them. As Proto-Indo-European did not have a phonological opposition between voiced and voiceless, only one pharyngeal and one laryngeal fricative is possible; a voiced sound is more probable for a sound that was itself easily vocalized. So we are left with the following sounds:

pharyngeals		ʕ
laryngeals	ʔ	ħ

We have seen that an *h*-sound is improbable. Thus we arrive at ʔ and ʕ as the basic sounds.

### 5. A new parallel

The nearest parallel to the behavior of the Proto-Indo-European laryngeals is found in a Salish language, Shuswap (Canada, B.C.). It was described by my former colleague Aert Kuipers in 1974. He gives the consonant system as follows (p. 20):

	stops		fric.	resonants		
labial	p	p̥		m	m̥	
dental	t	t̥	λ	n	l	ɲ
dent.-pal.	c	c̥	s	y	y̥	
velar	k	k̥	x	ɣ	ɣ̥	
	k <sup>w</sup>	k̥ <sup>w</sup>	x <sup>w</sup>			
uvular	q	q̥	χ	ʕ	[ʕ̥]	
	q <sup>w</sup>	q̥ <sup>w</sup>	χ <sup>w</sup>	ʕ <sup>w</sup>	ʕ̥ <sup>w</sup>	
laryngeal		ʔ	[h]			
				w	w̥	

ɣ is described as a voiced prevelar fricative; ʕ as a voiced uvular fricative: it sounds somewhat like a pharyngealized back [a]. ‘In the same way ʕ<sup>w</sup> sounds like a pharyngealized [ɔ].’ (2.2). The glottalized ʕ is very rare; in some cases where ʕ is expected, ʔ appears (1.3). In 1.3 it is stated that *h* too is ‘very rare and limited to root-initial position.’

*h* and ʔ are classed as obstruents, but could also be ‘classed as resonants, viz. as the plain (unrounded) counterparts of *w* *w̥* on the one hand, and as the plain (non-uvularized) counterparts of ʕ ʕ̥ on the other hand.’ That is, *h* and ʔ could be put above *w* *w̥* in the table, or above ʕ ʕ̥.

The interesting thing, except the complicated system of pharyngeals and laryngeals, is that the resonants in vocalic position receive an epenthetic vowel of which the timbre is determined by the pharyngeal. Thus, word-initially before consonant,  $\text{ʕ}$  is realized as  $\text{ʕa}$ ,  $\text{ʕ}^w$  as  $\text{ʕ}^w\text{ɔ}$ . (Similarly  $w$  and  $y$  in this position are realized as  $wu$  and  $yi$ ;  $m, n, l$  and  $\text{ɥ}$  appear as  $m\text{ə}, n\text{ə}$  etc.) In inlaut  $\text{ʕ}$  and  $\text{ʕ}^w$  are realized as  $a(:)$ ,  $\text{ɔ}(:)$  resp. ( $\text{ʕ}^w$  as  $\text{ɔ}^w$ ). Before vowel or word end  $e\text{ʕ}$  sounds as  $a$ : (and  $u\text{ʕ}^w$  as  $\text{ɔ}:$ ). Examples are:

- mʕmeʕt* [ma:ma:t] ‘grey’
- ʕʷleʕʷt* [lɔ:leɔ:t] ‘bell’
- xʕʕʷcuʕʷt* [xɔɔ:ɔɔʕʷt, -ɔ:ʔt] ‘leak, drip’
- llʕtupeʔ* [lla:tupeʔ] ‘tips of pine branches’
- yʕʷyuʕʷt* [yɔ(:)yɔʕʷt, -ɔ:t] ‘intensive’

It is clear, then, that  $\text{ʕ}$  becomes  $a$  and colors adjacent  $e$  to  $a$ , and that  $\text{ʕ}^w$  becomes  $o$  (and colors  $u$  to  $o$ ).

If we disregard the glottalized sounds, Shuswap has exactly the Proto-Indo-European system of pharyngeals and laryngeals:  $\text{ʔ}, \text{ʕ}, \text{ʕ}^w$ .

It should further be noted that the sound system reconstructed for Proto-Indo-European could have arisen from the Shuswap system through losses (except that Proto-Indo-European had  $l$  and  $r$ ; these Proto-Salish sounds had merged into  $l$  in Shuswap): loss of the dental palatal stops; loss of the uvular stops; loss of the velar resonants; loss of the fricatives except  $s$ ; loss of the glottalized resonants. There are reasons to suppose that the aspirated stops of Proto-Indo-European are recent.

### Appendix: Pharyngeals and laryngeals in the languages of the world

It may be useful to discuss what sounds of this type are found in the languages of the world. I do not claim to present all possibilities, but more material is given than can be found together elsewhere.

The IPA has signs for the following basic sounds:

	stops	fricatives		
	–	–	+	voice
pharyngeals		ħ	ʕ	
laryngeals	ʔ	h	ɦ	

Ladefoged (1972:41) states: 'In the pharyngeal area no language uses stops (most people cannot make them), . . . ' The addition seems rather odd to me. In (1975/1982:149) we only find: 'Many people cannot make a stop at this position.' But Pike (1971:7) admits a pharyngeal stop. For some Caucasian languages such sounds are classified as stops by some scholars, e.g., for Bats and Tsez/Dido (*Jazyki narodov SSSR* IV. 229, 405). In Tsez this may be a matter of presenting the phonemic system, but in Bats the pharyngeal stop would be opposed to two pharyngeal fricatives (voiced and voiceless), and a glottal stop (and an *h*). Davis (1984:25; 29) mentions a voiced pharyngeal stop which alternates with the standard glottal stop (in Modern Hebrew), beside a voiceless pharyngeal fricative which alternates with the standard voiceless velar fricative. Another voiced pharyngeal plosive is mentioned for Iraqw, a Cushitic language by Whiteley (1958:7). However, this sound is rather a voiced fricative.

The glottal stop is by nature voiceless, so a voiced one is excluded.<sup>1</sup>

As to *h*, 'the term voiced *h* is sometimes used for this sound, but it is somewhat confusing as there is certainly no voicing in the usual sense. The term murmured *h* is preferable.' (Ladefoged 1975/82:129).

As to secondary articulations, I found the following sounds.

Labial:  $\rho^w$  in West Caucasian; see Smeets (1984:78),  $h^w$  see Hockett (1955:126); Smeets (*ibid.*).  $\varsigma^w$  in Shuswap, Kuipers (1974:20); in Abaza (see the next reference).  $h^w$  in Abaza, a West Caucasian language: Hewitt-Khibia (1979:298).

Palatalized: I only found  $\rho'$ , in Abadzegh; Smeets (1984:78). Among the Caucasian languages this is the only occurrence of this phoneme.

Pharyngealized: A pharyngealized glottal stop ( $\rho$ ) is given by Hockett (1955:126); cf. also Opyt strukturnogo opisanija arčinskogo jazyka, I 1977, 201. (It is hardly probable that this sound is ever opposed to the glottalized pharyngeal mentioned below.)

Laryngealization: Ladefoged (1971:42) mentions a laryngealized pharyngeal for Arabic ( $\xi$ ). I do not know whether this sound differs from a plain pharyngeal. A laryngealized voiceless *h* is reported for Nambiquara by P. D. Price, *IJAL* 42. 1976. 338–348.

Glottalization: A glottalized pharyngeal ( $\xi^0$ ) is posited by Kuipers (1974:20) for Shuswap, but it was realized as a simple glottal stop. See below on combinations.

Combinations: In Abkhaz a laryngeal which is both palatalized and labialized occurs:  $h^w$ . In some dialects the glottal articulation is lost and a labialized *y* ( $y^w$ ) remains. Starreveld (1983:76); Dumézil (1967:9).

A glottalized labialized pharyngeal fricative,  $\xi^w$ , is found in Shuswap; Kuipers (1974:20).

These sounds can be summarized as follows:

plain	labial.	palat.	velar.	phar.	lar.	glott.	comb.
ʔ	ʔ <sup>w</sup>	ʔ'		ʔ			
h	h <sup>w</sup>						h <sup>w</sup>
ɦ							
ħ	ħ <sup>w</sup>						
ʕ	ʕ <sup>w</sup>				(ʕ)	(ʕ̣)	ʕ <sup>w</sup>

I must stress that this chart probably does not exhaust all possibilities.<sup>2</sup>

### Notes

1. Two glottal stops are mentioned for Sgaw, a Karen language, in the thesis of J.-M. Hombert, which is not accessible to me. One would have progressive, the other abrupt opening of the glottis.
2. I am indebted for comments to my colleagues F. H. H. Kortlandt and H. J. Smeets, and to Mr. Claude Boisson (Lyon).

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