

How I discovered Proto-Indo-European glottalic stops

My study of Slavic accentuation started in 1972 with a critique of Ebeling 1967, which offered a first detailed relative chronology of Slavic accentual developments. It became clear that Dybo's law presupposes two types of long vowel, one that lost the accent to the following syllable and one that did not, e.g. Russian *naród* 'people' < **nāròdō*, *pripráva* 'seasoning' < **pripráva*, which were originally stressed on the prefix, versus *kráža* 'theft', *lípa* 'linden'. Ebeling was unable to determine the phonetic nature of the difference (1967: 586). Since falling vowels lost the accent to the preceding syllable, e.g. *zá ruku* 'by the hand' < **zā rōkø*, it is reasonable to suppose that the other vowels were rising and therefore liable to lose the accent to the following syllable. I therefore suggested that the accent shift to the following syllable was blocked by a laryngeal feature, viz. glottalization. This also explains the fact that the reflexes of the long vowels that did not lose the accent are short in the modern languages unless they were subject to secondary lengthening, e.g. Serbo-Croatian *kràđa*, *lípa*. Since the large majority of these vowels have an Indo-European laryngeal origin, I proposed that the PIE laryngeals were not lost at an early stage but preserved as a glottal stop [ʔ] in Balto-Slavic. In Early Slavic they were lost with complementary lengthening of an adjacent vowel in pretonic and post-posttonic syllables, later they were lost without complementary lengthening in the first posttonic syllable, giving rise to new timbre distinctions (*i, ě, a, u, y* versus *ɨ, e, o, ɔ*) and to glottalized vowels in the stressed syllable, and eventually they were lost yielding a short rising tone in stressed syllables between Dybo's law and Stang's law (see e.g. Kortlandt 2011: 163-172). In Baltic, glottalization was preserved under certain conditions in Latvian and in the Žemaitian dialects of Lithuanian up to the present day.

While Balto-Slavic long vowels of Indo-European laryngeal origin became glottalized ("acute" in traditional terminology), most other ("lengthened grade" and contracted) long vowels did not (cf. Kortlandt 2009: 51-57). Besides, there are Balto-Slavic long vowels that have acute reflexes but did not originate from the PIE laryngeals, e.g. Lith. *ėsti* 'eat', *sėdėti* 'sit', *sėsti* 'sit down', *úosti* 'smell', *bėgti* 'run', *obelis* 'apple tree', *pėdà* 'footstep', *púodas* 'pot', *vėdaras* 'stomach', *vėdys* 'fiancé', *núogas* 'naked', *úoga* 'berry', *ožkà* 'goat', OCS *pasti* 'fall', *naglɔ* 'sudden', *agnɛ* 'lamb', *jazɔ* 'I'. The origin of this type has been clarified by Werner Winter (1978: 439): "In Baltic and Slavic languages, the Proto-Indo-European sequence of short vowel plus voiced stop was reflected by lengthened vowel plus voiced stop, while short vowel plus aspirate developed into short vowel plus voiced stop". These instances are traditionally regarded as lengthened grade vowels, in spite of the fact that they do not fulfill the conditions established by Wackernagel (1896: 66-68) and therefore remain unexplained.¹ The full material of Winter's law is presented in Dybo 2002 (cf. also Kortlandt 2009: 65-76).

¹ Other instances are the result of mistaken analysis. Two hackneyed examples are the alleged instances of *vṛddhi* in Lith. *várna* 'crow' and *vilkė* 'she-wolf' beside *vařnas* 'raven' and *vilkas* 'wolf'. The former pair can hardly be separated from Latin *corvus*, *cornix* and Greek *κόραξ*, *κορώνη* and the latter pair is identical with Sanskrit *vṛkas*, *vṛkīs*. While the latter words have a zero grade root that is incompatible with *vṛddhi*,

When in the course of 1975 I received a preprint of Werner Winter's contribution to the historical phonology conference of the following year at Ustronie (Poland), I immediately realized that the PIE unaspirated voiced stops must have been preglottalized in Balto-Slavic, e.g. **d* [ʔd]. Around the same time, my friend and colleague Aert Kuipers told me that his Georgian friend and colleague Tamaz Gamkrelidze had suggested on typological grounds that the PIE unaspirated voiced stops might have been voiceless and glottalized, e.g. **d* [tʔ].² If this was correct, it followed that the Balto-Slavic system could have developed from the Indo-European system by a simple voicing rule (cf. Kortlandt 1978a). I then took the next step, claiming that voicedness was not a distinctive feature in Proto-Indo-European, so that we have fortis **t* [t:], glottalic **d* [tʔ], and lenis **d^h* [t^h], which among other things accounts for the apparent merger of the three series in Hittite (Kortlandt 1977: 319, cf. also 1978c).³ I was now left with three questions:

- (1) Is there comparative evidence for glottalic stops in the other branches of Indo-European?
- (2) If so, why did nobody ever notice this before?
- (3) What was the status of aspiration in Proto-Indo-European?

In search of comparative evidence I first looked at Armenian (Kortlandt 1978b) because this language has glottalized reflexes of the glottalic series, e.g. *t* [tʔ] < **d* beside *d* [d] < **d^h* and *tʔ* [tʔ] < **t*. In the western dialects (e.g. Sasun, Trabzon, Sivas, Malatia), the glottalic series became voiced and lost its glottalization, e.g. *t* [d], unlike the eastern dialects (e.g. Van, Agulis, Erevan). In the central dialects (from Erevan to Sivas), the voiced series became aspirated, e.g. *d* [d^h], unlike the northern (Agulis, Tiflis, Artvin, Trabzon) and southern (Van, Sasun, Dersim, Hadjin) dialects. Since the two series did not merge in the western central dialects (e.g. Sivas), the rise of aspiration in the voiced stops must have preceded the voicing of the glottalic stops. Since the northern and southern dialects together with the dialects of Karabagh surround the central dialects, it is clear that the rise of aspiration in the voiced stops is an innovation of the central dialects and does not continue the alleged aspiration of the PIE "voiced aspirates". The devoicing of the voiced series in the southeastern dialects (e.g. Van, Xoy) did not yield a merger with the glottalic stops because the devoicing gave rise to a low tone on the following vowel (cf. Allen 1950: 200). The

the former pair must rather be compared with Russian *sérna* 'roe deer' and Latvian *mēl̃ns* 'black' beside Lith. *šīrvas* 'grey', *mul̃vas* 'reddish' (cf. Kortlandt 1985a: 121). Actual *vřddhi* formations in Balto-Slavic do not have an acute root vowel, e.g. Serbo-Croatian *jáje* 'egg', *měso* 'meat', Lith. *mėsà* (4), Žemaitian *męsà* (4), Latvian *miesa*, Greek *ᾠόν*, Vedic *māmsám*. On the other hand, Lith. *vilkė* 'she-wolf', *zūikė* 'she-hare', *šėrnė* 'wild sow' beside masc. *vīl̃kas*, *zūīkis*, *šėr̃nas* have regular *métatonie rude* as a result of the accent retraction from a prevocalic **i* < **iH*, analogically Latvian *siēva* 'wife' (cf. already Trautmann 1923: 301). For the preservation of glottalization after the rise of the new timbre distinctions in Slavic cf. also Upper Sorbian *wróna* 'crow', *ślódki* 'sweet' beside Polish *wrona*, *śłodki*, with the same lengthening as in Czech *vřána*, *sládek* beside Slovak *vřana*, *sladký*.

² Cf. Gamkrelidze and Ivanov 1972. Kuipers also told me that in the late 1960-s he had given a course in Caucasian linguistics at the University of Texas that was attended by Paul Hopper, who later took part in the discussion on the glottalic theory.

³ For the development of preglottalized stops, e.g. [ʔd] < [tʔ], see Fallon 2002: 258-288.

distinctive character of the glottalic series is also clear from the fact that 19th century Russian loanwords show aspirated plosives in Armenian, e.g. *p'eč'* < *peč'* 'stove', *manet'* < *moneta* 'coin'.

After Balto-Slavic and Armenian, the third branch of Indo-European to be examined was Indo-Iranian, where the reflexes of the glottalic series are preglottalized voiced stops in Sindhi (cf. Kortlandt 1981), e.g. *'ḍ* < **d*. Dissimilation of the voiced aspirates before aspirates of recent origin has given rise to a plain voiced series, e.g. *'gāh^u* 'bait' < *grāsa-* versus *gāh^u* 'fodder' < *ghāsa-*. It follows that the unaspirated voiced stops were glottalic at the time of the dissimilation. The glottalization cannot have originated in anlaut and from gemination because we find intervocalic *-j-* < *-yy-* versus *-'j-* < **-Hy-* [*ʔy*] and dissimilation of initial *'j-* to *j-* before a following **-H-* [*ʔ*] (cf. Kortlandt o.c.).

In Panjabi, the voiced aspirates have become voiceless and unaspirated, yielding a low tone on the following vowel, e.g. *kòrā* 'horse', Hindi *ghoṛā*. Since the voiceless aspirates have been preserved as a separate category, it appears that the *d^h* series was not phonemically aspirated at the time of the devoicing while the glottalic stops were preserved at that stage (cf. Haudricourt 1975: 271). Moreover, the *d* series did not lower the tone of a following vowel. This also points to the preservation of the glottalic feature. The absence of voiced aspirates in Kashmiri and Nuristani may be an archaism in these languages.

Alexander Lubotsky has proposed (1981) that in Indo-Iranian a laryngeal was lost before a glottalic obstruent when the latter was followed by another consonant, e.g. Vedic *pajrá-* 'firm', *pakṣá-* 'wing', *pakṣín-* 'bird', *pákṣas-* 'side' versus *pāpaje* 'stiffened', *pājas-* 'frame', *pājasyà-* 'flank'. This development is understandable if a sequence of laryngeal plus glottalic stop **-Hg-* was realized as a glottal stop plus preglottalized voiced obstruent [*ʔ'g*]. Lubotsky adduced fourteen roots in laryngeal plus glottalic stop with short root vocalism in Old Indic, five of which have Avestan correspondences with a short root vowel.

The traditional reconstruction of the PIE *d* and *d^h* series as plain and aspirated voiced stops is based on the evidence of Sanskrit, Greek and Latin, where evidence for glottalization can only be indirect because their writing systems do not allow for its notation. In Greek, it appears that **dk* yielded **H,k* [*ʔk*] < [*tk*] in the numerals (Kortlandt 1983, see further Kortlandt 2018a: 154-156). In Latin, the glottalic theory offers an explanation for Lachmann's law (cf. Kortlandt 2007b: 87-89, 121-123, 149-151, also 2018a: 150, 2018b: 71). If the **d* series was preglottalized in Greek and Latin, as it appears to have been in Balto-Slavic and Indo-Iranian, there is no evidence against the view that the **d^h* series were plain voiced stops in all of these languages.

In view of the evidence adduced here, it would be unrealistic to expect that nobody ever questioned the traditional reconstruction of the PIE consonant system. The first to propose in print that the PIE voiced stops could be derived from an earlier glottalic series was André Martinet (1953: 70). He was inspired by Holger Pedersen, who had argued (at the age of 84) that there are no reliable etymologies with a PIE initial voiced labial stop **b-* (1951: 10-16). Since the voiceless labial stop *p-* is easily lost in a number of languages, he suggested that PIE **b* was originally voiceless and weak, while the traditional voiced aspirate **b^h* may have developed from a voiceless aspirate. He compared the interchange of voiced and voiceless stops with the West Armenian consonant shift. Martinet compared the absence of the labial stop with the same phenomenon in Proto-Semitic, for which he reconstructed a glottalic series without a

labial member as the origin of the so-called emphatic stops. A few years later, Nikolaj Andreev proposed an Indo-European proto-language without distinctive voicedness (1957: 7). He reconstructed voiceless fortis, voiceless lenis, and voiceless aspirates, corresponding to traditional **t*, **d*, **dʰ*, and suggested that this system is apparently preserved in Hittite. He introduced the incompatibility of fortis and aspirates in the root structure, which he (like Meillet) explained by an assimilation rule, into the discussion of the consonant system. His reinterpretation of the consonant shifts in the separate branches anticipates an argumentation which was put forward much later by the proponents of the glottalic theory. A proposal which looks like an integrated view of the hypotheses put forward by Pedersen, Martinet, and Andreev, is Swadesh's theory that Proto-Indo-European and its neighbors had simple, glottalic, and aspirated stops, and that the difference between voiced and voiceless articulation was a matter of local variation (1971: 127). Since this theory was published posthumously, its origin is difficult to determine. Swadesh remarks that the traditional Indo-European voiced stops are equivalent to the glottalic series of other language families with respect to sound symbolism (1971: 219). Twenty years after the publication of Martinet's suggestion that we may have to reconstruct glottalic stops for Proto-Indo-European, Gamkrelidze and Ivanov proposed the same (1972: 16), again on the basis of Pedersen's reasoning. Haudricourt reports (1975: 267) that as early as 1948 he arrived at the conclusion that the traditional voiced stops of the Indo-European proto-language were in fact glottalic and that the original pronunciation has been preserved in East Armenian. His argumentation was based on the types of phonetic development attested in the Far East. The negative attitude of Bloch and Kuryłowicz toward his view apparently kept him from publication. It is remarkable that the comparative evidence has largely been left out of consideration in the discussion of the glottalic theory (see further Kortlandt 2018a).

After examining the evidence from Balto-Slavic, Armenian, Indo-Iranian, Greek and Latin and having found earlier treatments of the problem, I turned to Germanic (cf. Kortlandt 1985b). I identified the following developments that can be explained by assuming a Proto-Germanic series of preglottalized stops that were lenited to preaspirated stops in Scandinavia and under certain conditions developed into geminates or affricates (cf. Kortlandt 2003a):

- (1) Preglottalization in the western dialects of Danish: the so-called *vestjysk stød* (cf. Ringgaard 1960). The classic view that it represents "en ljudaffektion, som inträtt vid tenues i vissa ställningar" (Kock 1891: 368) does not explain the rise of the glottal stop.
- (2) Preaspiration in Icelandic, e.g. in *epli* 'apple', *opna* 'open', *vatn* 'water', *batna* 'improve', *mikla* 'increase', *teikn* 'token', *verpa* 'throw', *elta* 'pursue', *verk* 'work'. These examples show that the preaspirated stops do not reflect clusters but directly represent the voiceless plosives of Proto-Germanic. Since the same reflexes are found in the Norwegian dialect of Jæren (cf. Oftedal 1947), preaspiration is an inherited feature in these words.
- (3) Assimilation of *mp*, *nt*, *nk* to *pp*, *tt*, *kk* in the larger part of Scandinavia. The nasal consonant was apparently devoiced by the preaspiration of the following plosive and then lost its nasal feature.
- (4) Gemination in Swedish, e.g. in *veck*a 'week', *droppe* 'drop', *skepp* 'ship', cf. Old Norse *vika*, *dropi*, *skip*, Old English *wice*, *dropa*, *scip*, Finnish *viikko*. This gemination is unexplained.

(5) Gemination of *k* before *j* and *w*, e.g. Old Norse *lykkja* ‘coil’, *bekkr* ‘brook’, *nōkkvi* ‘boat’, *rōkk* ‘dark. Similarly, gemination of *t* before *j* in a limited area, e.g. Swedish *sätta* ‘set’. (West Germanic geminated all consonants except *r* before *j* and is therefore inconclusive.)

(6) Gemination of *p*, *t*, *k* before *r* and *l* in West Germanic. The same development is found sporadically in Scandinavia; this suggests that we are dealing with the loss of an archaic feature rather than with an innovation.

(7) Standard English inserts a glottal stop before a tautosyllabic voiceless plosive, e.g. *lea’p*, *hel’p*. This is a receding feature (cf. Kortlandt 1997).

(8) The High German sound shift yielded affricates and geminated fricatives, e.g. OHG *pfad* ‘path’, *werpfan*, ‘throw’, *zunga* ‘tongue’, *salz* ‘salt’, *kind*, *chind* ‘child’, *trinkan*, *trinchan* ‘drink’, *offan* ‘open’, *wazzar* ‘water’, *zeihhan* ‘token’. These reflexes suggest a complex articulation for the Proto-Germanic voiceless plosives from which they developed. In the traditional theory, the origin of the gemination is unexplained. Note that the High German sound shift has a perfect analogue in the English dialect of Liverpool, where we find e.g. [kx] in *can’t*, *back* (Hughes and Trudgill 1987: 66).

(9) The Franconian tone accents are partly determined by an original non-final preglottalized stop (cf. Kortlandt 2007a).

Perhaps the most characteristic feature of the Germanic languages in comparison with their Romance and Slavic neighbors is the incomplete voicing in the obstruents. This feature is most striking in the peripheral dialects, especially in Icelandic and Upper German, but also in Danish. I find it very difficult to assume that these dialects have innovated and that the Proto-Germanic system resembled that of Spanish or Greek more than that of the attested Germanic languages. If we take the evidence of the peripheral dialects at face value, we must reconstruct a series of voiceless fricatives, a series of unaspirated voiceless plosives, and a series of voiceless obstruents with a complex articulation which is reflected as (pre)aspiration in the north and (af)frication in the south. Thus, I think that the alleged strengthening of initial obstruents in North Bavarian *prōad* ‘breit’, *tum* ‘dumm’, *tōx* ‘Tag’, *kēm* ‘geben’ and Middle Bavarian *pām* ‘Baum’, *taitš* ‘deutsch’, *tō* ‘Tag’, *krāw* ‘grau’ in fact reflects an archaism. The West Germanic gemination of consonants before **j* gave rise to a sixfold distinction in the obstruents without introducing voicing as a distinctive feature, e.g. in North Tyrol (Imst) *prukkə* ‘Brücke’, *lōxxə* ‘lachen’, *denkkxə* ‘denken’. Thus, I reconstruct for Proto-Germanic the preglottalization that is actually attested in standard British English and offers by far the simplest explanation for the reflexes in the other Germanic languages. Note that this reconstruction of Proto-Germanic glottalization is wholly independent of any theories one may have on its Indo-European origins.

While I generally agree with the common interpretation of the Gothic consonant system (as modified by Roberge 1983), I think that it originated from an early fixation of the stress on the initial syllable which forestalled the devoicing of voiced stops and rhotacism of **z* found in the other Germanic languages. Unlike Gothic, North-West Germanic preserved the preglottalized stops which were inherited from the proto-language and later developed into preaspirated stops in northern Scandinavia and into affricates in High German. I find it difficult to assume that **-z* was retained in Runic (Stentoft) **-wolafR**, (Istaby) **-wulafR**, (Eggja) **fiskR** ‘fish’ and became **-r* in (Björketorp) **-IAusR** ‘loose’, **hAidR** ‘brightness’, **bArutR** ‘breaks’ (thus Nielsen 2000: 96). If **-R** was the voiceless counterpart of **-r**, these

examples receive a natural explanation. The final *-r* of **aftr* ‘after’ was devoiced in (Istaby) **AfatR**, Old Norse *aptr*, perhaps similarly in (Björketorp) **hAidR** [tR], while the final *-r* of **ARutR** [ʔtR], Old Norse *brýtr*, developed phonetically from *-iþ* in (Stentoften) **ARiutip**, with *-iþ* from word-final **-id* with voiceless **-d* [t] < **-ti*. The contrast between /p/ and /d/ [t] in medial position was clearly retained in (Eggja) **moþA** ‘tired’ versus **MAde** ‘rubbed off’, so that the spelling of **nAkdan** ‘naked’ < **nakudan* represents the expected reflex of [ʔkt], not [kð], similarly in final position **nip** ‘waning of the moon’ beside **ob** [op] < **uba*, Old Norse *of* ‘over’. The use of **k** and **t** instead of **g** and **d** in (Eggja) **folk** ‘bird’ and **lat** ‘land’ suggests that preglottalization was lost in western Norway around 700 because it developed into preaspiration at that time. This development must evidently be connected with the rise of the younger futhark.

Preaspiration was often realized as devoicing of a preceding resonant and was thereby dissociated from the following stop. Note that there were also devoiced resonants without a following stop, e.g. (Stentoften and Björketorp) **welA** ‘deceitful’ < **wihla-*, Old Norse *véla* ‘betray’, Finnish (loanword) *vihlata* ‘delude’, also Old Norse *mæla* ‘speak’ < **-pl-*, *ræna* ‘rob’ < **-hn-*, where the weak preterit in *-ta* instead of *-da* points to a voiceless resonant, and of course **-R** for voiceless *-r*, cf. also **rh-** for **hr-* in (Helnæs) **rhuulfR** and (Vatn) **rhoAltR** < **hröþu-waldaz* (Nielsen 2000: 257-259). These developments immediately explain the rise of the younger futhark, which does not denote voicedness because there were no voiced obstruents at that time.⁴ Thus, I claim that all obstruents remained voiceless throughout the Viking Age. The loss of glottal constriction in the preglottalized stops and the concomitant rise of preaspiration can be dated between the earlier and the later syncope. Since the distinction between plain **d** [t], **g** [k] and preglottalized **t** [ʔt], **k** [ʔk] is well preserved in both Stentoften and Björketorp, these inscriptions must be dated before the rise of preaspiration (cf. Kortlandt 2008).

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⁴ The choice of **b** rather than **p** is a consequence of the low frequency of the latter.

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