Initial stops in Hittite
(with an excursus on the spelling of stops in Alalah Akkadian)*

by Alwin Kloekhorst – Leiden

In this article it is argued that in Hittite the members of the sign pairs TA vs. DA, KA vs.
GA and KE/I vs. GU/I represent phonologically distinct sounds in word-initial position. The
signs TA and DA represent a normal fortis and a glottalized fortis stop, respectively: TA =
/tA/ vs. DA = /tA/. The signs KA and KE/I, on the other hand, and GA and GE/I, on the other,
represent a fortis and a lenis stop, respectively: KA and KE/I = /k/ vs. GA and GE/I = /g/.
The distribution of the fortis and lenis stops in word-initial position in Hittite is then com-
pared to the situation in the Luwic branch. Moreover, it is argued that the phonetic values
of these signs directly reflect their value as attested in the Old Babylonian texts from Alalah
VII.

The linguistic interpretation of Hittite is seriously hampered by the fact that several details regarding its orthography are still unclear. For instance, one of the issues that has remained controversial is the interpretation of spelling conventions regarding initial stops.

It is commonly held that the Hittitians have taken over the cuneiform script from the North Syrian region and that the typical Hittite ductus best resembles the ductus as found in Old Babylonian texts from Alalah (Tell Aşana, level VII; cf. e.g. Rüster/Neu 1989, 15). The cuneiform syllabary that was in use there possesses in its CV series separate signs to distin-
guish voiceless from voiced stops, e.g. KA versus GA, TA versus DA, PA versus BA, KU
versus GU,TU versus DU, etc.1 Nevertheless, the Hittite scribes seem to have a
strong preference for only one variant of some of these pairs when writing
Hittite words phonetically. For instance, in order to spell a velar stop + ū, the sign GU
is practically never used,2 instead one always finds the sign KU;

---

*I would like to thank Jan Gerrit Dercksen, Mark Weeden and especially Theo van den Hout for valuable comments on earlier drafts of this paper.

1 On the use of these signs for spelling the stops in Alalah Akkadian, cf. the excursus.

2 The only exceptions are [ãa-an-gu-iaš ‘assembly (nom.sg.)’ (KBo 16.71 obv. 9, OS) and
the gloss wedged, probably Hurrian word ḫa-qa-hi-in ‘?i’ (KBo 13.46 obv.1 r.col. 10,
OH/NS, dupl. ƙa-ƙa-hi-in) (KBo 22.6 iv 3, OH/NS), cf. Catsanos 1994, 318). Note that the form p-'an-gu-iaš cited by Ünal (1974, 17129) and Catsanos (ibid) in 2157c, 10 (= KBo 41.202, 11), in fact should be read p-'an-gu-iaš (p.c. Theo van den Hout).

Otherwise, the sign GU only occurs in Akkadograms, e.g. ƙi-ƙa-ag-gu-mar ‘he is sum-
moming’ (KUB 31.64 ii 25, OH/NS), or Semiticograms, e.g. ƙu-ƙa ‘throne’.
the sign RA is in its phonetic value extremely rare, instead the sign PA is used. Of other pairs, however, both signs can be found in phonetically spelled Hittite words. For instance, both TA and DA, KA and GA, KI and GI, etc., are in use.

Already in the beginning of Hittite studies it was noticed that many words are sometimes spelled with one member of the pair, and sometimes with the other: e.g. an-da next to an-ta, ka-yu-at-ta next ku-yu-ad-da, Du-u-ta-la-ia-next to Ta-u-ta-la-ia. On the basis of these examples, Weidner (1917, 13 f.) concludes that “der Hethiter ... einen Unterschied zwischen Lenis und Fortis in der Schrift nicht zu kennen [scheint]” (o.c. 24). Hrozný (1917, 199) reacts to this statement, however, that in some words the signs do not interchange at all. For instance, the verb dăi, danzı ‘to take’ is practically always spelled with DA, whereas the sentence connector tā is always spelled with TA. Moreover, since Hrozný had shown that Hittite was an Indo-European language (which Weidner did not know yet), and since for Proto-Indo-European three types of stops are reconstructed, namely a row of ‘voiceless’ stops, *p, *t, *k, *q, a row of ‘voiced’ stops, *b, *d, *g, *g, and a row of ‘voiced aspirated’ stops, *bh, *dh, *gh, *gh, one could now ask the question whether in cases where Hittite uses both members of a sign pair, their usage corresponds in any meaningful way to the etymological value of the stop they represent. According to Hrozný, this question needs a “systematische Untersuchung”.

One such systematic investigation was performed by Goetze (1933, 271 f.), who examined the distribution of the signs KA and GA.3 His results are somewhat ambivalent, however: on the one hand, it seems that the usage of the signs KA and GA sometimes reflects an etymological difference between voiceless and voiced (aspirated) stops, but, on the other, it cannot be denied that some variation in use is found as well. He therefore suggests that “dem Hethitischen das Gefühl für den Unterschied zwischen Media und Tenuis verloren zu gehen begann, wenn nicht schon verloren gegangen war”. His proposal to transliterate the sign GA as kā shows, however, that he ultimately considered the distinction between KA and GA irrelevant.

In 1932 it was discovered that in Hittite, etymological voiceless stops (*t, etc.) are word-internally spelled with a geminate stop, Vt-tV or Vt-dV, whereas etymological voiced and voice aspirated stops (*q, etc.) are spelled with a single stop, Vt-V or Vt-dV (Sturtevant 1932). This distribution, called Sturtevant’s Law,4 indisputably shows that in word-internal position a distinction was present between two types of stops. Yet, since this distinction was not expressed by the voice opposition present in sign pairs like TA vs. DA, but rather by geminate vs. single spelling, it is likely that phonetically the distinction was not one in voice, but rather one in length, cf. Kloeckhorst (2008a, 21–5). We therefore use the terms ‘fortis’ (= the geminate spelled stops that correspond to *t, etc.) and ‘lenis’ (= the single spelled stops that correspond to *q, etc.) to describe this distinction.

This discovery shifted the focus of the question about the interpretation of the difference between signs for voiceless stops vs. voiced stops to the word-initial position. The nature of the cuneiform script makes it impossible to use geminate writing at the beginning of words. So if the distinction between fortis and lenis stops was retained in word-initial position as well, this distinction could not be indicated by geminate vs. single spelling. So could it then be that the difference between fortis and lenis stops in word-initial position, if it existed at all, was expressed by the voice distinction present in pairs like TA vs. DA? In other words, is there any correlation between the word-initial use of e.g. TA vs. DA to the etymological presence of *t vs. *q?

For a long time this question was answered negatively. E.g. Friedrich (1940, 6) remarks: “Zwischen der Schreibung von Tenuis und Media scheint völlige Willkür zu herrschen. d und t, b und p, g und q werden, soweit man bisher sieht, völlig promiscue gebraucht”; Sturtevant/Hahn (1951, 26) state that “[t]he pairs k, g; t, d; and p, b are so frequently interchanged that no inference can be drawn as to a distinction between them”; Kronasser (1956, 55) asserts that “bei der Schreibung der Tenue und Mediae so große Unregelmäßigkeit [herrscht], daß auf weitgehende oder völlige Unfähigkeit der Unterscheidung geschlossen werden muß”; and according to Gamkrelidze (1961, 408), “Hittite cuneiform […] fails to distinguish between the signs for corresponding voiced and voiceless plosives”, to name just a few scholars.5

---

3 And GA, but that is less relevant here.
4 Although Sturtevant in his article credits his student C. L. Mudge for discovering this distribution.
5 An interesting exception is Crossland, who states that “although […] most initial stops are written sometimes with a “voiceless-stop” sign and sometimes with a “voiced-stop” sign, the orthography of a few words is exceptional in that stops in them are invariably or very frequently written with signs which would have been used in Mesopotamia […] for writing Akk. stops of the same nature as the pE stops which vary in different stops in question” (1951, 127). Yet, he does not go into details regarding this statement and presents no evidence in favor of it.
Nevertheless, in 1979 Oettinger reopened the debate by looking at all relevant words, discussing their spelling and etymology. He hesitatingly concluded that “anlautende Tenuis ist immer durch ‘Tenuizeichen und anlautende Media meist durch Mediazeichen wiedergegeben wird’” (1979, 551–6). Yet, as e.g. Hart (1983, 112) and Melchert (1984, 69128; 1994, 14) have pointed out, if we look objectively at the material presented by Oettinger, we can conclude that it does not support this alleged distribution. Moreover, the usage of e.g. TA vs. DA seems in certain words to change through time. Hart (1983) therefore systematically investigated the diachronic situation and shows that in the course of time e.g. DA is ousting TA, DU is ousting TU, etc. She concludes that “in the initial position the choice of signs does not correspond in any principled way with the etymologically expected character of the stop, and appears to be dominated by the fashion of the time” (1983, 114–5) and rather assumes that in word-initial position the phonetic distinction between original fortis and lenis stops had been lost. Also Melchert (1994, 13–4) states that the choice of signs for voiceless vs. voiced stops “does not correspond in any meaningful way with the voicing quality of the sounds being indicated, based on their expected inherited values”, and assumes that all initial stops have become voiceless/fortis in Hittite. Although this also seems to have happened in e.g. Lycian, where no words in b-, d-, g- are attested,6 Melchert warns not to push this devoicing of initial stops back to Proto-Anatolian, since several developments in the individual daughter languages show that PAAnat. must still have retained a difference between voiceless/fortis and voiced/lenis stops.7

Nowadays, this seems to be the communis opinio: in initial position, the original distinction between fortis and lenis stops was lost in Hittite, and the two merged into the fortis series. In spelling, the choice between the sign for the voiceless stop and the sign for the voiced stop does not correspond in any way to the etymological value of that stop, and is in principle random. If there seems to be any pattern, that pattern is caused by scribal convention or just by fashion (thus e.g. Kimball 1999, 89–90; Kloekhorst 2008a, 21; Patri 2009, 89).

8 For this research I have used all texts that in Hetkonk are dated as “ah.”. I am aware of the fact that in recent years a discussion has arisen about the absolute and relative dating of OS vs. MS. In 2004, Miller pointed out that some texts that palaeographically are dated as OH (i.e. are written in the OH dactylos = OS) in fact are MH documents (i.e. are written in the historically defined MH period). He therefore argues for a younger absolute dating of OS (“Dactyl I”), namely as spanning “from the beginning of the OH period to the immediate predecessors of Tuthaliya I”, whereas MS (“Dactyl II”) covers “the period from Tuthaliya I through Tuthaliya II (III) or Supplianti A” (2004, 46373). Also Popko (2005) pointed out that some MH documents show a dactylus that rather looks like OS. According to him, the MH period can be divided in three stages. Documents written in the first stage, lasting up to Huzziyi II, are indistinguishable from OS documents; documents written in the second stage, around the time of Muwatalli I, show MS features mixed with OS features; whereas documents written in the third stage, from Tuthaliya I/II until Tuthaliya III, show the traditionally defined MS features. Popko himself concludes on the basis of these observations that “the Old Hittite and early Middle Hittite scripts are very similar” and that “consequently, documents in these scripts cannot be precisely dated” (o.c., 9), but it is better, as Miller did, to extend the

6 Cf. Melchert (2004). Note that the words starting in d̀ ad probably go back to older “t̆d̆”, whereas the one word starting in g̀, gasabalo, is a title that could well be of foreign origin. Neumann (2007) cites a few words starting in b-, d̆- and g̀, but these are either incorrectly analyzed (d̀ ad, daun, dhjaba, delhiba, dem[,])]̆), personal or geographical names (depara, gasé, gisade[mama, gari]), or rather Milyan (Lycian B) words.

7 E.g. the difference in outcome between *di- and *di- in Hittite: the former yielded ʤ, the latter ʤ. Since this is a specific Hittite development (in Luwian both yielded ḫ̆), the difference between initial *t and *d must have still been present in Proto-Anatolian.
fore first search for distributions within the OS texts and try to link these to possible phonetic differences, and then describe the diachronic development.

**TA VS. DA**

The first group of signs I will investigate are those that represent a dental stop. Of these, I will start with the pair **TA** vs. **DA**. I have therefore collected all words starting in **/da/-** in OS texts, counting how often they are spelled with the sign **TA**, and how often with **DA**. This yields the following table:

<table>
<thead>
<tr>
<th><strong>TA</strong></th>
<th><strong>DA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>161</td>
<td>tān ‘second’</td>
</tr>
<tr>
<td>1 123</td>
<td>tankuir-ttankuyai ‘dark’</td>
</tr>
<tr>
<td>1</td>
<td>tankūn- ‘mortality’</td>
</tr>
<tr>
<td>1</td>
<td>tabar, title of the king</td>
</tr>
<tr>
<td>12</td>
<td>tapētēr-tapētēn ‘?’</td>
</tr>
<tr>
<td>1 37</td>
<td>tapu, kind of knife</td>
</tr>
<tr>
<td>9</td>
<td>tapu ‘besides’</td>
</tr>
<tr>
<td>3 1</td>
<td>taŋat ‘to conquer’</td>
</tr>
<tr>
<td>26 1</td>
<td>tarash- ‘to dance’</td>
</tr>
<tr>
<td>1</td>
<td>ōŋtē ‘wood’</td>
</tr>
<tr>
<td>5</td>
<td>tarap- ‘to collect’</td>
</tr>
<tr>
<td>2</td>
<td>ōtunti-h, part of harness</td>
</tr>
<tr>
<td>1</td>
<td>etsinpar, a building</td>
</tr>
<tr>
<td>2</td>
<td>tạoa ‘other, foreign’</td>
</tr>
<tr>
<td>2 1</td>
<td>tōtē ‘to let, to leave’</td>
</tr>
<tr>
<td>2</td>
<td>dasi ‘?’</td>
</tr>
<tr>
<td>1</td>
<td>tōal, a kind of beer</td>
</tr>
<tr>
<td>1</td>
<td>tāyasa, ‘title of queen’</td>
</tr>
<tr>
<td>7</td>
<td>tēka-tān ‘earth’</td>
</tr>
<tr>
<td>2 2</td>
<td>ter-ter ‘to speak’</td>
</tr>
</tbody>
</table>

Especially the numbers of the conjunction **ta** and the verbs **da/-d** and **da/-t**- are telling: they show practically consistent spelling with either **TA** or with **DA**. But also the other words almost all show a clear preference for one of the two signs. This becomes even more apparent when we look more specifically at where the different forms occur. Of the words that show only one or two attestations with **DA**, these forms turn out to appear on two tablets only. In the case of **ta/-a**, which shows 26 attestations

---

10 **da/-a** (19x), **ta/-a** (15x), **ta/-a** (15x), **ta/-a** (12x), **ta/-a** (11x), **ta/-a** (10x), **ta/-a** (9x), **ta/-a** (8x), **ta/-a** (7x), **ta/-a** (6x), **ta/-a** (5x), **ta/-a** (4x), **ta/-a** (3x), **ta/-a** (2x), **ta/-a** (1x)  
11 **da/-a** (34x), **da/-t** (34x), **da/-t** (33x), **da/-t** (32x), **da/-t** (31x), **da/-t** (30x), **da/-t** (29x), **da/-t** (28x), **da/-t** (27x), **da/-t** (26x), **da/-t** (25x), **da/-t** (24x), **da/-t** (23x), **da/-t** (22x), **da/-t** (21x), **da/-t** (20x), **da/-t** (19x), **da/-t** (18x), **da/-t** (17x), **da/-t** (16x), **da/-t** (15x), **da/-t** (14x), **da/-t** (13x), **da/-t** (12x), **da/-t** (11x), **da/-t** (10x), **da/-t** (9x), **da/-t** (8x), **da/-t** (7x), **da/-t** (6x), **da/-t** (5x), **da/-t** (4x), **da/-t** (3x), **da/-t** (2x), **da/-t** (1x)
with TA, the only attestation with DA is found in K.Bo 6.2+ iii 23. Of *taiazzi-, the only form with DA is attested on that very same tablet as well, namely *da-[a]-zi-la-ad (K.Bo 6.2+ iv 41). The same goes for *talakā/-talā-, the only form with DA, *da-a-la-i, is attested in K.Bo 6.2+ ii 17. And also the two forms of *taiaqahh- spelled with DA can be found here: *da-šu-ya-ah-hi (K.Bo 6.2+ i 9, 11). Of the verb *tamašš-/*tame/tāšš, the two attestations with DA are both found in K.Bo 22.1: *da-me-eš-ke-ya-an (K.Bo 22.1 obv. 4), *da-me-eš-ke-ti-te-ni (K.Bo 22.1 obv. 19). This is the same tablet where we find the one attestation of *tarupp-* with DA: *da-ra-up-pé-e-d[a] (K.Bo 22.1 obv. 2). This high concentration of singular spellings with DA on these two tablets is quite suspicious, and they are therefore better left out of consideration. If we remove the forms from K.Bo 6.2+ and K.Bo 22.1 from the table, and also, for the sake of convenience, remove the words that are of unknown meaning, we now get the following table:

<table>
<thead>
<tr>
<th></th>
<th>TA</th>
<th>DA</th>
<th>TA</th>
<th>DA</th>
</tr>
</thead>
<tbody>
<tr>
<td>to (conj):</td>
<td>157 – taimu-*tame-‘other’;</td>
<td>6 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>da-/di- ‘to take’;</td>
<td>1 101 tamešš-/*tame/tāšš ‘to (op)press’</td>
<td>1 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>da/i-/ti- ‘to put’;</td>
<td>– 36 tam ‘second’</td>
<td>2 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>taiazzi- ‘thief’;</td>
<td>1 – tanku/-tankusš- ‘dark’</td>
<td>1 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*taiaqahh- ‘to steal’;</td>
<td>8 – tandukišš- ‘mortality’</td>
<td>5 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tališš- ‘barn’;</td>
<td>1 – tappušš- ‘beside’</td>
<td>9 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tiaqahh- ‘two-year-old’;</td>
<td>1 – tar(k)u- ‘to dance’</td>
<td>1 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tagašš- *ešš- ‘earth’;</td>
<td>2 – 08 tārm- ‘wood’</td>
<td>1 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>taki- ‘other, foreign’;</td>
<td>1 – tékan/šakn- ‘earth’</td>
<td>9 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>talakā/-talā- ‘to let, to leave’;</td>
<td>2 – ter-/*tar- ‘to speak’</td>
<td>4 –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>talakši/-talakši- ‘long’;</td>
<td>4 –</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The distribution is perfect: the verbs *da-/di- and da/i-/ti- are both consistently spelled with DA, whereas all other words are consistently spelled with TA. This distribution can only be explained by assuming a phonetic difference between the signs TA and DA. The only true exception to the distribution is the word *tandukišš- ‘mortality’, which shows 5 forms with TA and 14 forms with DA. Since this word may well be of foreign origin, its fluctuation in spelling should not concern us too much: we are probably dealing with a phoneme from another language that was adapted to the Hittite phonemic system in different ways by different speakers.

18 Note that the same tablet contains *da-me-eš-ke-ti-te-ni (K.Bo 22.1 obv. 3).

19 The one attestation of *ta-an-zi ‘they take’ with the sign TA (K.Bo 20.17 obv. 7) is in view of the 101 attestations of da-/di- that are spelled with DA to be seen as insignificant.

20 All attempts to provide *tandukišš- ‘mortality’ and its base-word *tandukiš- ‘mortal’ with IE etymologies (see the references in HEG 3, 110–1) are unconvincing.

Now that we have established that in OS texts a clear distribution can be found, namely that the verbs da-/-di- and da/i-/-ti- are consistently spelled with the sign DA whereas all other words are consistently spelled with TA, we must search for a phonetic explanation for these facts by looking at etymological evidence. Since the verbs da-/-di- and da/i-/-ti- are the only words that are spelled with DA, we must start our investigation with these.

It is universally accepted that da/i-/-ti- ‘to take’ is derived from the PIE root *dēh-, which in the other IE languages has the meaning ‘to give’, and that da/i/-ti- ‘to put’ must be derived from the root *dēh- ‘to put’. The first thing that strikes the eye is the fact that they reflect *d- and *dē-, respectively, the two consonants that are commonly regarded to have merged into a lenis dental stop */d/ in Proto-AN, contrasting with the fortis stop */t/ < PIE */t/. Could this be the reason that they are consistently spelled with DA? Unfortunately, the answer to this question must be negative. Within the group of words that are spelled with TA, we not only find words that reflect */t/, but several ones that reflect */d- or */dē- as well: tar(k)u- ‘to dance’ < */terk-/, ta (conj.) ‘to; tārm- ‘wood’ < */dūrm-, tān ‘second’ < */dutom/, tēkan/šakn- ‘earth’ < */dēk-m-/*g-m-, tanku/-tankuš- ‘dark’ < */d(0)um-*-. It therefore is not possible that the presence of */d- and */dē- in the preforms of da-/-di- and da/i/-ti- is the decisive factor for the spellings with DA.

Another peculiarity is the fact that da-/-di- goes back to an ablating stem *dēh-/*dh-, and da/i/-ti- goes back to an ablating stem *dēh-/*dh-/*dēh-/*dh- (Kloekhorst 2006a), and that therefore in both verbs the initial dental stop is (in at least a part of the inflected forms) followed by a laryngeal. The presence of this laryngeal is crucial. We know that in word-internal position, laryngeals are assimilated to preceding stops. The idea that we are dealing here with assimilation instead of mere loss of the laryngeal is based on the fact that the outcome of the assimilation of a word-internal cluster consisting of a lenis stop + laryngeal is a fortis stop: */DH>T. For instance, the preform *meg₂hi₁-<, which contains a *g that normally in Hittite would yield a lenis /g/, turns up as Hitt. mekk- ‘much, many’, with a fortis /k/. Similarly, the preform *b₂dh₂-i-, containing a *dh which normally would yield lenis /d/, develops into Hitt. pad₂<pad₂ ‘to dig’, with a fortis /t/. This development is well established and generally accepted (Melchert 1994, 76–7; Kimball 1999, 407–10; Kloekhorst 2008a, 79). We can date this
assimilation quite precisely. Unlike clusters of the shape *ti and *dō/ji, which assimilated to ʔ and s, respectively,22 clusters of shape *Hi and *dō/Hi do not show assimilation: *tijanz- ‘they place’ < *dēh1-i-ent, tič/a-ʔ- to step’ < *(ʔ)h2-i-eu-o, etc. Apparently, the laryngeal in *Hi and *dō/Hi blocked the assimilation, which means that it must still have been present at the moment of the latter development, providing us with a terminus post quem for the assimilation of stop + laryngeal. The assimilation of *ti and *dō/ji is specifically Hittite, which means that the assimilation of stop + laryngeal must have been a specific Hittite development as well.23 Moreover, there are indications that the assimilation of *ti and *dō/ji took place relatively recently within the pre-history of Hittite,24 which means that the assimilation of stop + laryngeal must have taken place even more recently.25

Accordingly, in word-initial position, a cluster consisting of a stop + laryngeal assimilated into a fortis stop, but this development took place only very recently in pre-Hittite times. The question now is: how did word-initial clusters consisting of a stop + laryngeal develop, i.e., in this case, what are the outcomes of the clusters *dḥ2 and *dḥ2? It is generally assumed that in Proto-Anatolian the PIE voiced and aspirated stops *d and *dḥ had merged into a lenis stop, *d/. Furthermore, since the words ta (conj.) < *ter-, tāru- ‘wood’ < *dūru- and tankui-/tankuiait- ‘dark’ < *dō(ʔ)ong- are in OS texts all spelled with the sign TA, it seems that by the time Hittite was first written, the fortis stop /t/ and the lenis stop /d/ had merged in word-initial position into a single stop, which is commonly thought to have been fortis /t/. In the case of the initial clusters *dḥ2 and *dḥ2, we must therefore assume that, through an intermediate PANat. *d/j-i/,26 they yielded pre-Hittite *d/t-. It is likely that just as in word-initial position, also in word-initial position a laryngeal following a stop was eventually assimilated to that stop. In the case of *t/t-, we could imagine that this happened via a stage /t/-/t/, in which the laryngeal had lost its status as a separate phoneme, but was incorporated by the stop, which had now become glottalized. I therefore propose that the spelling of the verbs da-/d<-*dōh1-/dḥ1- and dai-/*dā/i- (with the sign DA) designates the presence of this glottalized dental stop /t/.27 This proposal is even more attractive in view of the fact that in Alalah Akkadian the sign DA was not only used to spell the syllable da containing the voiceless stop /d/, but could also be read TA, i.e. as spelling the syllable ta containing the emphatic stop that is in Semitic studies traditionally rendered as t.28 Phonetically, the emphatic stops were realized as glottalized stops in Akkadian (Kouwenberg 2003, with especially p. 81–2 for t = /t/). In this case, the emphatic stop t must be interpreted as /t/, which is then identical to the /t/ of t. I now propose for da-/*dai- and dai-/*tai-.

To sum up: in OH original texts, a complementary distribution between the signs TA and DA in word-initial position can be found: the verbs da-/*dai- and dai-/*tai- are always spelled with DA, all other words always with TA. This points to a phonetic difference between the two signs, and from an etymological point of view this difference can only have been that the sign TA spells a plain dental stop /t/ whereas the sign DA spells a glottalized dental stop /t/ that developed from a sequence *TH. This matches the origins of the signs as well: in Alalah Akkadian the sign TA is used for writing the syllable ta containing the stop /t/, whereas the sign DA, which can also be read TA, is used for writing the syllable ta containing the emphatic stop /t/.

23 Pace Melchert (1994, 76–7), who regards this development PANatolian since in Pal. *tū-par and C.Luw. *tāuirg (both 2pl.midd. endings) < *dph2,orth(ʔ) also assimilation of *dph2- > /t/ must have taken place (compare Hitt. *tūmairg). These assimilations as found in Hittite, Palaeo and Luwian must now be regarded as independent, parallel developments.
24 This can be inferred from the fact that in the oldest texts we come across a few words containing a 3sg.pres. acc. ending -e and a 3pl.pres. acc. ending -a. Although these are the phonetically regular outcomes of *-i and *-ent, their *-i being lost in the process of assimilation, it is clear that in a verbal paradigm where -i is the main marker of the present tense, this -i would have been almost immediately restored, especially in view of the fact that in this period the *-i of the mi-conjugation is spreading to present forms of the hi-conjugation as well. The presence of these less endings -e and -a in the oldest texts indicates that the assimilation had taken place relatively recently before the oldest attested stage of Hittite.
25 Elsewhere I will argue that the OS hapax nom. p.c. me-e-ek-e-s ‘many, much’ (KBo 25.23 rev. 5) phonologically represents *megę/le-s, still containing the unassimilated cluster /g/l/, which in the rest of the OS texts is spelled with -kk (me-e-ek-k) and therefore must be regarded as having assimilated into a fortis stop /k/. If this is correct, the assimilation of *DH > T must even be regarded as a historical development.

26 Although PIE possessed three laryngeal phonemes, *h₂, *h₂, *h₂, for PANatolian there is evidence for two laryngeal phonemes only, namely */h/ and */H/ (which has a secondarily lenited variant */h/). This means that in the cases where *h₂ and *h₂ yielded PANat. */H/ or */h/ (namely in *h₂-e > */Hae/, *h₂-C > */HC-/, *h₂-a > */Hh, *h₂-e > */Hh/, *h₂-e > */Hh/ or */Hh/ and *h₂-e > */Hh/, *h₂ and *h₂ were merged with *h into PANat. */H/, cf. Kloekhorst (2008a, 75–82).
27 This scenario implies that in da-/*dai- an analagous spread has taken place: the regular outcome of *dōh1-ei, *dēh1-ent must have been */t'i/, */t'ài/, in which the */t'/ of the weak stem forms appears through the paradigm. This assumption seems problematic to me, especially since Hittite hardly tolerates consonantal alterations within a paradigm.
28 Cf. the excursus on Alalah Akkadian.
The distribution between TA and DA as found in the OS texts is not found as such in MS and NS texts: many words that originally are spelled with TA only, show in younger texts spellings with DA as well. In MS texts, we find spellings with DA only occasionally, but in NS texts, the usage of DA has clearly increased in popularity. Let us look, for instance, at the development of the spelling of *tamai-*tame- ‘other’ (numbers refer to the number of attestations with either TA or DA, the ratio represents the percentage of TA-spelled forms compared to the total amount of attested forms):  

<table>
<thead>
<tr>
<th></th>
<th>TA</th>
<th>DA</th>
<th>ratio in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH/OS</td>
<td>7</td>
<td>100</td>
<td>100 %</td>
</tr>
<tr>
<td>MH/MS</td>
<td>22</td>
<td>3</td>
<td>88 %</td>
</tr>
<tr>
<td>NH/NS</td>
<td>55</td>
<td>44</td>
<td>56 %</td>
</tr>
</tbody>
</table>

We see that in MS texts the number of DA-spellings is still very low, whereas in NS texts the number of TA-spellings approaches the number of TA-spellings. This could be interpreted as an indication that in NH times the signs DA and TA come to be used interchangeably and that the functional difference between word-initial DA and TA had ceased to exist. Yet, if we look at the development in other words that are originally spelled with TA only, this seems not to be the case. For instance, if we look at the number of attestations with TA and DA of *tagan* ‘on the earth’ and *tagane/l-pa- ‘earth’, we see that in NS texts the number of attestations with DA is much higher than with TA:  

<table>
<thead>
<tr>
<th></th>
<th>TA</th>
<th>DA</th>
<th>ratio in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>6</td>
<td>100</td>
<td>100 %</td>
</tr>
<tr>
<td>MS</td>
<td>17</td>
<td>1</td>
<td>94 %</td>
</tr>
<tr>
<td>NS</td>
<td>13</td>
<td>62</td>
<td>17 %</td>
</tr>
</tbody>
</table>

This means that we are not dealing with a mere loss of opposition between the signs TA and DA, but that the sign DA has become the more popular one, eventually even outing the sign TA. This observation is supported by the fact that the verbs *da-x/da- and da-x/i*- also in MS and NS texts keep on being spelled with the sign DA only.29 Thus, in MH and especially NH times we cannot speak of merger of the two signs in the sense that they come to be used interchangeably, just randomly chosen by the scribe. Instead, the sign DA is taking over the place of TA, eventually on its way to ousting it completely. This probably indicates that on a phonetic level, the opposition between word-initial /t-/ and /t‘a/-, which was still present in OH times, is disappearing from NH times onwards.30 It follows that the spelling difference between TA and DA in NH times had become an etymological one: the spelling of a certain word either with TA or with DA had now become a convention that was not based on a synchronic phonetic difference anymore, but only on the scribe’s awareness of the word’s ‘correct’ spelling. Nevertheless, we see that the sign DA becomes the more popular one, and is more and more ousting the sign TA. This does not mean that the NS texts are worthless for etymological purposes. Since spellings with TA are the ‘unproductive’ ones, it is still significant if in NS texts a certain word is spelled with TA besides DA. Even when no OS attestations of it are known, we can still predict that its original spelling must have been with TA and that therefore its initial consonant must have been /t-/ and not /t‘a/-.

**TI, TE and TU**

If for dental stop + a an original distribution between TA = /t/a/ and DA = /t‘a/ can be found, we should ask ourselves whether such a spelling difference is present in the sequence dental stop + i, e and u as well. In the

---

29 MS and NS TA-spellings of *da-x/da- and da-x/i*- are very rare. MS examples can only be found in KBo 18.151, MS, where we find *ta-as* (obv. 3), *ta-es* (obv. 6, 8, 9, 12, 13, 14) ‘he took’ and *ta-i-is* (rev. 10, 11) ‘he placed’. Since this tablet shows many spelling aberrancies, it had better be left out of consideration when it comes to determining normal Hittite spelling practices. A real possible MS example is *ta-ar-ta* ‘you (will) take’ as found in HKM 102 rev. 17, MS?. All other examples of TA spellings are from NS texts:  

---

30 The first signs of merging may be found in OH times already, if the use of TA in the OS texts KBo 6.2 and KBo 22.1 for spelling forms that are originally spelled with TA are to be interpreted as an indication of this. Note that KBo 22.1, although dated as “ah,” in Hethkonk, does contain some slanted DA’s (obv. 2, 4, 12, 15, rev. 19, 22, 27, 29) and DA’s (rev. 24, 25, 29) that seem rather characteristic of MS. This text could therefore well be one of the transitional texts (cf. footnote 8) that have to be dated to the time of Muwatalli I, which would fit the occurrence of spellings with DA instead of TA, which in principle seems to be a MH phenomenon.
case of dental stop + i, the answer is easy. Since PAnat. */ti-/ and */di-/ assimilated to Hitt. -z- and -s-, all cases of Hitt. ti- must in principle go back to */ti-/ or */di-/17. Therewith, we would a priori not expect that there is any opposition in being found in dental + i. And indeed, this is what we find: in word-initial position virtually always the sign ti is used.31 The choice for the sign ti might seem surprising, since in Alalah Akkadian the sign di = ti is the normal sign to spell /ti/ with.32 Nevertheless, in absence of a distinction to non-glottalized /t/ in this environment, the Hittite scribes may not have found it necessary to indicate the glottalic feature at all.

In the case of dental stop + e, we would from an etymological point of view expect a glottalic /t/ to be present only in the words te-e-eh-µi 'I place' and te-e-el-µu-im 'I placed' < *pêh₁-ô,ô-h₂-e(í). As we see, these are spelled with the sign TE. Words in which we would expect to find non-glottalic /te/ are spelled with the sign TE as well, however: e.g. te-e-ez-zí 'he says' < *pêh₁-ô, te-e-kân 'earth' < *pêg-m, te-e-pu 'little, few' < *pêg₁-u-. It seems thus that in Hittite no distinction was made between /te/ and /t̪e/ - both are spelled with TE. This coincides with the situation in Alalah Akkadian, where the sign TE is used to spell both the syllable te and te (in which function it is read as TE).33 The absence of a spelling difference between etymologically expected /te/ and /t̪e/ does therefore not mean that these syllables were not phonologically distinct in synchronic OH either: the writing system that the Hittites adopted just happened to write these two syllables with one sign, which then was taken over.

In the case of dental stop + u, we would on etymological grounds only expect the words tumûni 'we take' < *dêh₁-uûnī34 and tuzûl- 'army' < *dêh₁-û-ître35 to have contained initial /t̪e/ -i-. Both words are spelled in OH texts with tu: anômu-tu[u]-ê[zi]- (SBO 25.12 iii 6), tu-me-[e]-ni. Words where we would expect /t̪e/-i, are also spelled with tu, however: tuekk- (a-) /tuek/- 'body' < *tuêk/- 'tuk-, tûrije/a/- to harness < *dêh₁-r-je/a/-, tuân 'to this side' < *dêh₁-m, tuarnî/a/-tuarnî- 'to break' <

31 The only two cases where the sign ti is used in initial position within the whole Hittite corpus are [308]di-ès-su-unî-mi-na (KUB 36.104 obv. 6, OS I) // di-ès-su-me-[ê] (KUB 48.77 obv. 4, OH/NS) 'cup'.
32 Cf. the excursus.
33 Cf. the excursus.
34 It seems that in *dêh₁-uûnni > tu-me-[e]-ni /tomûni/ the laryngeal was 'vocalized' to /o/ and that therefore we would perhaps not expect the laryngeal to have been present anymore at the time of assimilation of /DH/ > T. Yet, since this form is part of the paradigm of dá/-ê where all forms become to contain /t̪e/-i, it is likely that in the 1pl.pres. form this was the case as well: /t̪e/omûni/.
35 If this etymology is correct, cf. Kloekhorst (2008a, 908).

Kê/ê vs. ge/ê

The next group of signs I will focus on are those representing velar stops. Within this group I will start with the pair Kê/ê vs. ge/ê. I have collected all words starting in k/Ge- and k/Gi- in OH texts, counting how often they are spelled with Kê/ê, and how often with ge/ê. This yielded the following table:38

<table>
<thead>
<tr>
<th>kê</th>
<th>ge</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>39</td>
</tr>
<tr>
<td>26</td>
<td>37</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

36 Cf. the excursus.
37 Note that in OS texts the sign du does not occur in word-initial position. Yet, in younger texts (MS and NS) du starts to occur in word-initial position: dugan, duvarû/H, dukk-40, dumûni, etc. It is interesting that zêk/[u]- and tûrije/a/- are also in younger texts never spelled with tu. The rationale behind all this is not yet clear to me.
38 Broken forms that could not be identified as belonging to a specific word are left out of consideration: kî-sa-[ê]-ê [KBO 9.67, 3], kî[e]-ê [KBO 34.1 iv 3] and gi-/sa- 第/ê[ê] (KUB 8.41 iii 2).
39 nom.-acc.sg. kî (4x), kîi (11x), gen.sg. ke-e-ê(i), dat.loc.sg. kîe-da-nî (3x), instr. ke-e-t (13x), ke-e (1x), nom.pl. ke-e (2x), nom.-acc.pl. ke-e (18x), gen.pl. ki-in-ca-an (1x).
40 3sg.prem. mdd. ki-i-sa (6x), ki-i-ça-ri (3x), 3sg.pret.mdd. ki-i-sa-at (2x), 3sg.pret.midd. ki-i-sa-at (1x), 3pl.pret.midd. ki-i-sa-an-ta-ta (1x), broken ki-sa-ê ... (1x).
41 nom.sg. ke-e-tar (1x), dat.loc.sg. ki-i-sa-ri-i (3x), all.sg. ki-i-sa-ra (1x), abl. ki-i-sa-ra-ê (2x), instr. ki-i-sa-tar (2x).
42 3sg.pres.midd. ki-i-ta (25x), 3pl.pret.midd. ki-an-da (1x), ki-an-ta (1x).
We see that the distribution is perfect: all words show a consistent spelling, either with KE/i or with GE/i. This means that these two signs reflect a phonetic difference. We must now look at etymological evidence for determining what that phonetic difference could be. First, I will look at the words that are spelled with GE/I: genu- 'knee', genu- 'lap', gîmera- 'field' and GISgîmestar 'cubit, ell'. Apart from the latter word, which has no good etymology, it is remarkable that all these words go back to an etymonic starting in *gē or *gēh: genu-< *gēnu-, genu-< *gēnu-, gîmera-< *gēm-ro-(Kloeckhorst 2008a, 467-8, 468-9 and 476-7, respectively). We know that PIE *gē and *gēh in Panatonian merged into a lenis stop *g/ and. Could the spelling with GE/I indicate the presence of this lenis stop? And would the sign KE/i then indicate the presence of a fortis stop *k/-/? Of the words that are spelled with KE/I and have a good etymology, there are indeed many that have to be reconstructed with an initial *k̂-: kā-/kē-/kî-/ke- 'this (one)' < kā-, kî-, kē-, kęktar 'on top' < kē-krērh-, kî-mu(m) 'to lie' < kēbh, kimun 'now' < kî-num, kiśan 'thus' < kî-som. Yet, there are also a few that have to be reconstructed with *ĝ or *gēh: kēsār/kēisēr/kēisr- 'hand' < *gēs-r̥/*ĝes-r̥/*gēs-r̥, kiśamu to extinguish < *ĝes-nd, kiśanztge/a(m) 'to suffer famine' < *ĝes-ent-je/a, kiśa(m)/kiś 'to become' < *gēis(?) (Kloeckhorst 2008a, 471-2, 461-3 and 479-81, respectively). It is interesting to see, however, that in the first three of this group of words, the initial *k̂- is directly followed by *s. On the basis of other evidence, we know that *s can cause fortition of a preceding consonant. For instance, the *skē/a-imperfective to ektu/s=aktu = /tegʷs-/lgʷ-/ 'to drink', is akkuške/a = /lakiskē/a/-l, in which the /gʷ/ underwent fortition to /kʷ/. Similarly in the -ske/a-imperfective of lāk̂- = /lāgʷ-/ 'to make fall', lakiskē/a = /lakiskē/a/-l, has become fortis /l/. I therefore propose that in *ĝes-er/*ĝes-r̥/*ĝes-nd and *ĝes-ent-je/a- a similar fortition took place, which first yielded *k̂eser, kēsr, *ksendn̥- and *ksdantje/a-l, and later, with the appearance of the epenthetic vowel /i/, kiśser, kēsr, kēsdr, /ksdtn̥- and /ksdntje/a-l, spelled kiśser-kiśsr, kiśantu- and kiśanstge/a. If this scenario is correct, we would still be able to interpret the spelling of the words keśser-kiśsr-kiśsr, kiśantu- and kiśanstge/a the sign KE/I as an indication of the presence of an initial fortis stop /k/. We are now only left with the verb kiśa(m)/kiś 'to happen, to become', which would show an irregular spelling with the sign KE/I. As is already indicated by the question mark following the reconstruction *gēis-, the etymology of the verb kiś-/kiś- is not fully clear. The reconstruction *gēis- is based on an etymological proposal by Eichner (1973, 78) to connect kiś-/kiś- with OHG keran, ModHG kehren 'to turn', which reflect *gēois-eis-. Although formally and semantically certainly appealing, it is rather awkward that the root *gēis- would only be attested in West-Germanic and in Hitite. Melchert (1984, 103), however, rather derives kiś-/kiś- from *kiś- 'stir, be in motion' seen in Skt. cestāt 'stirs, moves, acts'. Although his etymology is semantically certainly possible and would provide the fortis /k/- that now seems to be required by the spelling of kiś-/kiś- with KE/I, the -r- in Skt. cestāt < *kiśr- remains unexplained, which makes the connection rather uncertain. As we see, both etymologies have their pros and cons, albeit that Eichner's reconstruction of kiś-/kiś- as *gēis- at first sight seems formally and semantically more attractive. Yet, the methodological question of course is: are we willing to abandon this etymology in favor of the explanation of the distribution between KE/I and GE/I as one designating the presence of fortis /k/- vs. lenis /g/-? Personally, I am certainly prepared to do that: the distribution between KE/I and GE/I is so clear, and the assumption that KE/I spells /k/- whereas GE/I spells /g/- so perfectly explains the gross majority of words involved (11 out of 121), that having to reject the idea that kiś-/kiś- reflects *gēis- is only a small sacrifice.

To sum up, the distribution between KE/I and GE/I as found in OS 44 Riemenschneider also noticed the distribution between the signs ki and gi: "Ein Wechsel zwischen GI und ki ist ziemlich selten. Damit scheint die Annahme einer laufenden Differenzierung gerechtfertigt" (1973, 276). Since he presupposes, however, that the Hitite language "Medien und Tenues zumindest im Anlaut nicht unterschied" (p. 273), he has to search for another type of phonetic differentiation. He therefore proposes that although the sign ki can spell both the syllables kiand kē, the sign gi can only spell the syllable ge. Riemenschneider is indeed right that the sign gi is never followed by a plene spelled -i-. Moreover, it is never followed by signs that would prove -vocalism, namely the unambiguous signs ti, tn (except in gi-in-zu [KUB 14.11 iii 22, NH, KUB 14.14 rev. 15, NH], which is a spelling for genu-'lap, abdomen') or ts (except in gi-itsar-je[suk]-[...]) [KUB 8.41 ii 2, OS], on which see note 48), or by ja (except in the place name unii-Za-gi-ta [KUB 5.1.74, NH], which could stand for unii-Zaqgi-je as well). It cannot therefore be excluded that the sign gi only stands for ge (this would mean that words like gi-1m-za-'field', gi-1m-za-1in 'winter', gi-1m-rej-e-a/rie 'to spend the winter' and gi-pē-e-sar-cubit, ell should be read genua, gemnast, gemn, gemanztge/a- and gepesēst, respectively, of which the former ones then all should reflect PIE *gēs-ain). The converse is not true, however: ki can still stand for both ki and ki-e (note plene spellings like ki-te-i = ki-ti and ki-e = ke-e). So even if Riemenschneider is right that the sign gi can only spell the syllable ge, we should still search for an explanation for the distribution between words spelled with gi- and words spelled with ke-, which could then only be other words starting in gi- go back to PANat. *ĝ- and words starting in ke- go back to PANat. *k-.
texts fits the etymological distribution between PANatolian fortis *\(ê\)/ and lenis *\(\text{i}\)/, respectively, which means that this phonological distinction must still have been present in OH. Since in Alalakh Akkadian the signs \(ê\)/ and \(\text{i}\)/ are used to spell the phonetic distinction between voiceless \(\text{k}\) and voiced \(\text{g}\), it is likely that in Hittite the phonetic distinction between word-initial fortis \(\text{k}-\)/, spelled with \(ê\)/, and lenis \(\text{g}-\)/, spelled with \(\text{i}\)/, would then be one in voice as well.  

The post-OH period

The words that in OS show a spelling with the sign \(ê\)/, namely \(\text{k}ê-\)/, \(ê\)-\(\text{k}ê-\)/, ‘this (one)’, \(ê\)-\(\text{k}ê\)-\(\text{e}\)/, ‘hand’, \(ê\)-\(\text{kat}ê\)-\(\text{e}\)/, ‘on top’, \(ê\)-\(\text{k}ê\)-\(\text{a}\)/, ‘lie’, \(ê\)-\(\text{k}ê\)-\(\text{n}\)/, ‘now’, \(ê\)-\(\text{k}ê\)-\(\text{a}ê\)/, ‘happen, to become’, \(ê\)-\(\text{k}ê\)-\(\text{n}ê\)-\(\text{a}\)/, ‘thus’, \(ê\)-\(\text{k}ê\)-\(\text{a}ê\)-\(\text{u}\)/, ‘to extinguish’, \(ê\)-\(\text{k}ê\)-\(\text{a}ê\)-\(\text{a}\)/, ‘to suffer famine’, \(ê\)-\(\text{k}ê\)-\(\text{e}\)/, ‘stand, shelf’ and \(ê\)-\(\text{k}ê\)-\(\text{a}\)/, ‘crier’, are also in MS and in NS texts always spelled with \(ê\)/. To my knowledge, for none of these words forms with initial \(\text{i}\)/ are ever attested.  

This also goes for a verb like \(ê\)-\(\text{k}ê\)-\(\text{a}ê\)-\(\text{a}\)/, ‘to perish, to be extinguished’: just like its cognate \(ê\)-\(\text{k}ê\)-\(\text{a}ê\)-\(\text{u}\)/, which is always spelled with \(ê\)/, this verb, too, is always spelled with \(ê\)/. The words that in

---

46 Cf. the excursus. Note that the sign \(ê\)/ can in Alalakh Akkadian also spell the syllables \(gê\)/ and \(\text{gl}\)/, for which see below at the treatment of \(\text{k}ê\)-\(\text{n}ê\)-\(\text{a}\)/, \(\text{g}ê\)/ ‘to open up’.

47 Since in word-initial position the phonetic distinction between fortis \(ê\)/ and lenis \(\text{g}-\)/ is indeed rather one in voice, it would therewith differ from the phonetic distinction in word-final position (cf. also footnote 57 on this matter). This is typologically not uncommon: compare e.g. Modern Icelandic where the phonetic difference between the phonemes \(\text{f} ê\)/ (spelled \(\text{f}\)/) and \(\text{f} ê\)/ (spelled \(\text{f}\)/) is in word-initial position one in aspiration, \(ê\) = \(ê\)-\(\text{e}\)/, whereas in word-final position it is the voice and fricativization, \( ê\) = \(ê\)-\(\text{f}\)/ = \(ê\)-\(\text{a}\)/ vs. \(ê\)-\(\text{f}\)/ = \(ê\)-\(\text{a}\)/. The same difference can be observed e.g. in word-initial position between the phonemes \(ê\)/ (spelled \(ê\)/) and \(ê\)/ (spelled \(ê\)/), whereas in word-final position it is the voice and fricativization, \( ê\) = \(ê\)-\(\text{f}\)/ = \(ê\)-\(\text{a}\)/ vs. \(ê\)-\(\text{f}\)/ = \(ê\)-\(\text{a}\)/.

48 If in KUB 42.97, 3 we would really have to read \(ê\)-\(\text{g}ê\)-\(\text{e}\)-\(\text{a}ê\)/, ‘with the hand’ (thus Oetinger 1979, 558; Puhvel HED 4, 162), this form would be the only exception showing a \(ê\)/-spelling of one of these words. The word for ‘heart’, which goes back to *\(ê\)-\(\text{e}ê\)/, is also, as expected, usually spelled with \(ê\)/ (cf. Puhvel HED 4, 189 f. for attestations), but a spelling with \(ê\)/ is attested twice as well, on one tablet: \(ê\)-\(\text{g}ê\)-\(\text{e}\) (KBO 31.77 1 6, 11, MS).

49 The form \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{t}ê\) (KUB 8.4 iii 2, OS) cited by Puhvel (HED 4, 167) as a 3sg.pres.midd. form to \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{t}ê\) (taken over by Kloeckhorst 2008a, 482) probably does not belong here: the form in fact reads \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{t}ê\)-\(\text{i}\)-\(\text{a}ê\) and is attested without any surrounding context, so that its meaning cannot be independently determined. Moreover, if indeed a 3sg.pres.midd. form to \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{t}ê\), we would have expected a plain spelling of the ending -\(\text{a}ê\).

50 Its derivative \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{t}ê\)-\(\text{a}ê\)-\(\text{m}ê\) (KUB 17.31 i 3, NS), \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{t}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\) \(ê\)-\(\text{g}ê\)-\(\text{a}ê\) (KBO 39.61 ii 4, NS).

51 Note the aberrant plain spelling of \(ê\)/ as well.

52 In CHD (L-N, 21, 371; P, 346), this text is dated as “OS” (although in CHD P, 198, we find “OS?”), whereas Herdotz dates this text as “ah.”. We have not been able to find any specific OS features in the hand copy of this text, however (a photograph was not available to me). Note that the absence of plain spelling in 3sg.pres.act. \(ê\)-\(\text{a}ê\)-\(\text{a}ê\) (ibid. iv 8) ‘she bore’ may point to a younger copy. In the same text we find the hapax \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\) (ibid. iv 2), also spelled with \(ê\), which is taken by Laroche (1983, 131) as a derivative of \(ê\)-\(\text{g}ê\)-\(\text{a}ê\).

53 The same goes for the cognate forms \(ê\)-\(\text{g}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\)-\(\text{a}ê\) ‘to spend the winter’, which are always spelled with \(ê\)/ as well (cf. Puhvel HED 4, 143 f. for attestations).

54 Note the aberrant use of \(ê\)/ as \(ê\)-\(\text{a}ê\).
The only word I know of that shows a considerable amount of spellings with KE/1 as well as with GE/1 is the root *kt-i-. It is attested several times in MS texts. The spelling gi-*nu- is predominantly found in NS texts (only once in a MS text), whereas the spellings ke-e-nu- and ge-e-nu- are only found in (L)NS texts. So here we seem to be dealing with a development *kt-i-nuu > gi-*nu- > ge-e-nu-. How do we reconcile this with our finding that in all other spellings with KE/1 and with GE/1 remain consistent throughout Hititite? Does this mean that only in this word OH /ki/- develops into NH /gi/-? That is hardly credible as in all other words starting in /ki/- the fortis /k/- remains constant through Hititite. Something else must have been going on, and we can only find out what that is by looking at its etymology.

Laroche (1963, 59) connected *kt-i-nuu, gi-*nu- to open up' with verbs for 'to yawn, to open up (one's mouth)' as found in other IE languages, which point to a root *gheH2-5i-. 55 Hitt. *kt-i-nuu, gi-*nu- seems to form a -nu-causative to this root,

54 3sg.pres.act. ki-nu-uu (KBo 19.145 iii 35, MS, KBo 22.189 iii 5, OH/NS), ki-nu-uu (KUB 9.22 ii 49, MS, KUB 13.9 + 40.62 ii 5, 7, 8, MH/NS, KUB 4.47 obv. 41, NS), ki-nu-uu (KBo 6.26 130, OH/NS, KUB 58.48 ii 17, OH/NS, KUB 55.58 obv. 15, 17, MH/NS, KUB 41.8 ii 13, MH/LNS), gi-nu-uu (KBo 10.11 i 7, OH/NS, KBo 10.45 ii 2, MH/NS), gi-nu-uu (KBo 40.118 Leol. 7, NS), 3pl.pres.act. ki-nu-uu (KBo 24.45 rev. 11, NS), KUB 15.31 ii 9, 10, 11, MH/NS, KUB 29.4 iv 23, NS), ki-nu-uu (KUB 15.31 ii 9, MH/NS, KUB 10.20 i 39, NS, KUB 27.202, 8, NS), gi-nu-uu (KUB 25.23 i 39, NH, KUB 13.32 obv. 9, NH/LNS, KUB 17.37 i 4, LNS, VSNF 12.1 rev. 11, LNS), ke-e-nu-uu (KUB 25.23 iv 51, NH), ge-e-nu-uu (KBo 2.7 obv. 9, 23, rev. 16, LNS), 3sg.pret.act. ki-nu-uu (KUB 55.58 obv. 25, MH/NS, KUB 24.7 ii 25, NS, KUB 4.47 rev. 11, NS, KUB 30.48 ii 2, NS, KBoT 56 ii 31, MH/NS), 2sg.presp.act. gi-nu-uu (KBo 21.22 rev. 49, OH/NS), 3sg.presp.act. ki-nu-uu (KUB 30.10 obv. 24, 28, OH/MS), ki-nu-uu (KUB 30.10 obv. 25, OH/MS, KUB 13.9 + 40.62 ii 6, MH/NS), 3sg.presp.midd. ki-nu-uu (KBo 49.11 rev. 11, NS), 3sg.presp.midd. ki-nu-uu (KBo 2.7 obv. 9, 23, rev. 16, LNS), part. acc.sg. gi-nu-uu (KUB 35.145 iv 8, NS), ge-nu-uu (KUB 17.37 i 5, LNS), ge-nu-uu (KUB 4.44 + KBo 13.241 rev. 31, LNS), nom. acc.sg. ki-nu-uu (KBo 13.1 iii 7, MH/NS), part. acc.sg. ki-nu-uu (KUB 13.2 iv 17, MH/NS, KUB 17.56 obv. 2, NS), inf. ki-nu-uu (KBo 24.45 rev. 8, MS, KBo 21.34 + 1BoT 17 iv 41, MH/NS, KUB 23.7 i 10, NS, KUB 7.22. 8, NS, KUB 20.60 + i 32, NS), ki-nu-uu (KUB 27.202, 3, NS), verb. noun. gen.sg. ki-nu-uu (KUB 41.34 rev. 6, LNS), LNS, LNS, KUB 42.105 ii 10, LNS), Note that 3pl.pres.act. gi-nu-uu (1BoT 13.6 i 7, MH/MS) as cited by Puhvel (1964, 152) does not exist, cf. Güterbock/Den Henout (1991, 4).

The presence of *gheH as clear from Gr. zahviv, česāns, perf. čεχνην 'to yawn, to open one's mouth' < *gheH2-n, *gheH2-n- and četitī 'yawning' < *gheH2-mebh. The root *gheH as found in OCS četvī 'to yawn' < *gheH2-er, OCS četa 'to yawn' < *gheH2-er-jeiH, OCS četvī, Lith. četū 'to open (one's mouth)' in OCS četvī, O MCS četvī, MHG četvī 'to yawn' < *gheH2-n, OHG četvī 'to yawn' < *gheH2-n- Lat. hicō 'to open up, to yawn' < *gheH2-skeH2- (with laryngeal metathesis), TochB keH- 'to open wide' < *gheH2-riH, probably forms an old pet.

and therefore must reflect *gheH2-neru-. As we have seen above in the case of TA vs. DA, an initial cluster *THV- first yielded pre-Hittite *t/THV- the glottalic element of which was retained into OH, and spelled with the sign DA which in Akkadian could also be read with the emphatic value TA, i.e. TA/1. Only in MH times the glottalic element in /THV/- seems to have been lost. This means that in the case of a preform *gheH2-neru- we could also envisage that it first developed into *gheH2-neru-, the glottalic element of which was preserved into OH, yielding /gheH2-/. If that is correct, how would this /gheH2-1/ be spelled? In Alalāḫ Akkadian, the syllable qa, i.e. lkHz, is spelled with the sign ki = qi.56 It therefore seems quite possible to me that in this word the syllable /gheH2-1/ would be spelled with ki as well. When in MH times the glottalic element eventually was dropped, the result was apparently /gheH2-1/, which then was spelled with the sign gi.57 To summarize, the change in spelling of the root *gheH2-n, *gheH2-neru- namely with the sign ki in the older stages of Hititite, but with the sign gi in the younger stages, does not represent the development of an original initial fortis /k/- to /g/- (which would be inexplicable in view of the retention of the distinction between /keH/- and /geH/- throughout Hititite as attested in other words), but rather as the presence vs. absence of glottalization of the initial stop: /gH2-1/ > /gH2-1/.

55 Cf. the excursus.

56 Note that the outcome of word-initial *t/THV- which on the basis of this example can be determined as /gH2-1/, differs from the outcome of /gH2-1/ in intervocalic position, which is /ki/ (e.g. *mēghi-2 > *mēgH2-1- > /mēkH2-1/) Whereas the development of intervocalic /VH2/ > /VH2/ fits in well with the phonetic interpretation of the distinction between word-final forts and lenis stops as one in consonantal length (cf. Kloekhorst 2000a, 21–25 and footnote 46), so [VH2/VH2] > [VH2/VH2], the fact that word-initial *t/THV- did not yield a forts stop, but rather a lenis one, corroborates the view as expressed above that in word-initial position the phonetic distinction between forts and lenis stops was rather one in voice.

The absence of etymological spellings of this word in later times (unlike in the case of dāv/dā and dār/där) must be due to the fact that the verb ki-nu-, gi-*nu- was much less common than dāv/dā and dār/där.
I have collected all words starting in k/ga- in OS texts, counting how often they are spelled with ka- and how often with ga. This yielded the following table:58

<table>
<thead>
<tr>
<th>KA</th>
<th>GA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ka- ‘this (one)’:</td>
<td>7 – karait-/karett- ‘flood’:</td>
</tr>
<tr>
<td>ninda-kaḫari, a kind of bread:</td>
<td>1 – karap-/karip- ‘to devour’:</td>
</tr>
<tr>
<td>ninda-kaḫari, a kind of bread:</td>
<td>11 – gararag/garau- ‘horn’:</td>
</tr>
<tr>
<td>1lказал ‘in-law’:</td>
<td>– 1 karini- ‘to silence’:</td>
</tr>
<tr>
<td>kakkap, a bird:</td>
<td>– 1 karit ‘early’:</td>
</tr>
<tr>
<td>guršušu, a plant:</td>
<td>1 – lkaršhâla, a functionary:</td>
</tr>
<tr>
<td>kalulupa- ‘finger’:</td>
<td>14 – karulli- ‘former’:</td>
</tr>
<tr>
<td>gynant- ‘crouching’:</td>
<td>– 2 kaša ‘just’:</td>
</tr>
<tr>
<td>gene/iṣṣ- ‘to recognize’:</td>
<td>– 6 kašša ‘in lieu of’:</td>
</tr>
<tr>
<td>kān ‘here’:</td>
<td>1 – gâš- ‘hunger’:</td>
</tr>
<tr>
<td>kânt- ‘to hang’:</td>
<td>4 5 katti ‘along with’:</td>
</tr>
<tr>
<td>gûpin- ‘thread, yarn’:</td>
<td>– 7</td>
</tr>
</tbody>
</table>

Apart from kânt- ‘kânt- and kârinu-59, all words show forms that are either spelled with ka or with ga. And although the distribution between ka vs. ga is less perfect than between ta vs. da or xe/i vs. ge/i, it still seems evident to me that it must have an underlying phonetic reason. It is instructive to first look at the spelling of these words in younger texts. Itnamely appears that the well-attested OS words (i.e. words with more than 5 attestations) that occur with the spelling ka only, are in younger texts virtually consistently spelled with ka as well: ka- ‘this one’,59 ninda-kaḫari, a kind of bread,60 kalulupa- ‘finger’,61 kâri ‘early’,62 kašša ‘just’,63

58 Broken forms that could not be accurately assigned to a specific word are left out of consideration: goł- – (KBo 20.8, iv 14), kârd– (KBo 25.110 rev. 2, 3), goš– (KBo 25.97), go-ar– (FHL 117, col. 4).
59 Cf. Puvel (HED 4, 3f) for attestations.
60 Cf. Puvel (HED 4, 16) and Hoffner (1974, 166–7) for attestations. Note that the clear cognate terms ninda-kaḫari- and ninda-gâš- do also show spellings with the sign ga, however. Yet, since these words are undoubtedly of a foreign origin (cf. Hoffner 1.c.), this should not concern us too much here.
61 Cf. Puvel (HED 4, 31) for attestations. This word is spelled 3x with ga as well, namely nom.sg. gâ-la-la-pu-aʃ (KUB 13.2 ii 6, MH/NS), nom.pl. gâ-la-la-pu-e-š (KBo 32.13 ii 30, 31, MH/MS, note the aberrant plane spelling of -e), and once with qa, namely acc.pl. qa-la-la-pu-aʃ (KBo 15.10 ii 6, OH/MS, which contains aberrant qa-a-a as well, cf. footnote 63).
62 Cf. Puvel (HED 4, 112f) for attestations. Also its derivatives karâtiḫ- ‘former’ and karegaru- ‘early in the morning’ are consistently spelled with ka.
63 Cf. Puvel (HED 4, 118) for attestations. This word is spelled qa-a-a in KBo 15.10 (i 30, 31 ii 8, 19, 32, 43, OH/MS), the same table where we find aberrant qa-la-la-p ‘fnger'.

Well-attested OS words that are spelled with ga only, occur in younger texts spelled with the sign ga as well as ka, however: gene/iṣṣ-20 ‘to recognize’ is in younger texts spelled gene/iṣṣ- as well.64 gûpin- ‘thread, yarn’ is in younger texts spelled gûpin- as well.65 This reminds us of the situation of ta vs. da, where we saw that in post-OH times da was spreading at the cost of ta, which was caused by the loss of the OH phonetic distinction between ta = /ta/ and da = /t’a/ admiration. For ka vs. ga, it now seems that in post-OH times ka is spreading at the cost of ga, indicating that if there originally was a phonetic difference between these two signs, it was lost in the post-OH period. Since ga is in this scenario the unproductive sign, spellings with ga are linguistically important, even if they are found in young texts. In the following, words that are always spelled with the sign ka are rendered with initial k- (e.g. kâ-, kâša, etc.), whereas words that are spelled with both ga and ka are rendered with g- (e.g. garaiti, despite its OS spellings with ka, garâp- /garip/, despite its OS spellings with ka, etc.).

In the case of xe/i vs. ge/i, we have seen that the distinction between these two signs represents the phonetic distinction between forts/ki/ and lenis/lj/. It is therefore a priori unlikely that this would be the case for ka vs. ga as well. And indeed, several of the words starting in ka-etymologically reflect a fortis */k/ki/-: ka- ‘this one’ < kâ-, kâša ‘just’ < kâša-, katti- ‘along with’ < *kettini- (Kloekhorst 2008a, 425–7, 460–1 and 463–4, respectivly). Conversely, several of the words starting in ga-etymologically reflect a lenis */g/ki/-: gomarti- ‘to defecate’ < *gōmātisnsn (‘gōmāronsnsn), gâš- ‘hunger’ < *gōsdsn (Kloekhorst 2008a, 432 and 461–3, respectively). So far, so good. In the case of words starting in gaR, the situation is different, however. Here we find a few words spelled with ga that etymologically should go back to fortis */k/ki/-: galtis- ‘to call’ < *kîh, gantaratt ‘horn’ < *kô-r-ur, gariteit/ – ‘to cover’ < *k-je/-o- (Kloekhorst 2008a, 430–1, 446–7 and 449–50, respectivly). Yet, it does not seem problematic to me to assume that before a resonant, */g/ki-/ and */g/ki-/ merged into Htt/ lg/-66. The fact that in the case of karini- ‘to silence’ < *kri-neu- (Kloekhorst 2008a, 450–1) is in OS texts spelled both with ka and with ga, could indicate that this development took place within the OH period.

64 Cf. Puvel (HED 4, 42f) for attestations.
65 Cf. Puvel (HED 4, 65) for attestations.
66 If indeed the phonetic distinction between word-initial fortis and lenis stops was one in voice (cf. footnote 57), then the development of */g/ki- to lg/- can be seen as due to voice assimilation.
If the difference between KA and GA indeed denotes an etymological difference between fortis /k/ and lenis /g/, and taking into account that a sequence *#/R/- seems to have developed into Hitt. /gR/-, the spelling of the following words can now be accounted for:

\[(kV)\]

\[gR\]

\[ka < *Ko-\]

\[galank < *gleng-\]

\[ganan < *gandar-s(?)/\]

\[kani < *Kani\]

\[galiss < *Klihs-\]

\[gast < *gand-\]

\[kast, kasta < *Kast\]

\[ganeus < *ganhs-\]

\[gaste < *ganeus\]

\[katt < *Kenti-\]

\[garaitt < *geoint-\]

\[garap < *geoint-\]

\[garä < *geoint-\]

\[garät < *girh-od\]

\[gårätar < *Kor-ÜR\]

\[garic/oc < *Kr-ic-o\]

\[gårucu < *Kr-ic-neu\]

\[garit < *geoint-\]

Unfortunately, there remain some words that do not immediately fit into this picture: their spelling with KA or with GA does not match the value of their initial consonant as is reconstructed on the basis of commonly accepted etymologies. This means that either our interpretation of the signs KA and GA has to be adjusted, or that the etymologies of these words are incorrect. Let us look at these words more closely.

11) **gaina-** ‘in-law, kinsman’ is spelled ga-i-na- (also ga-e-na- and ga-a-i-na-) as well as ka-i-na- (also ka-e-na-), which in our present understanding would point to an initial /g/. The etymology of this word is difficult. The fluctuation between spellings with -i- and -e- is highly remarkable and unexplained. When compared to a word like pa-i-mi = /pái-mi/ ‘I go’, which is never spelled *pa-e-mi, it seems that ga-i-na-/ga-e-na- cannot be simply interpreted as /gaina/. Therefore Hrozný’s proposal (1919, 100–1) to connect gaina-/gaena- to Lat. civis ‘citizen’, Skt. śivā ‘friendly’, which implies a reconstruction *koi-no- and nowadays seems to be quite generally accepted, cannot be correct.69 Puhvel’s connection (HED 4, 13–4) with Skt. jāmātara, Av. zāmātara ‘son-in-law’, Gr. ἵρπος ‘son-in-law; brother-in-law’ and subsequent reconstruction *grh₂-i-nō- is formally difficult as well (the laryngeal should have been retained in this position; moreover, it does not explain the spelling with -e-). Unfortunately, I am unable to offer a better proposal, so we must conclude that gaina-/gaena- cannot be used as an argument in this discussion.

**kaelhej/a** ‘to tie up, to truss’ is attested with the sign KA only, which would point to an initial /k/-. This does not match the fact that this verb is thought to reflect *kell₂-el-je-o- (Kloekhorst 2008a, 429–30), on the basis of which we would expect initial /g/- (since */kR/- > /gR/-). Yet, the number of attestations of this word is quite low (it is attested six times only, five of which are found in NS texts), and it therefore is quite possible that the absence of spellings with GA is coincidental. This makes this word non-probative.

**gänk/-gang-** ‘to hang (trans.)’ is already in OS texts spelled with KA as well as GA: 1sg.pres.act. ga-a-an-ga-ab-he (StBoT 25.4 iv 13), ga-a-an-ga-ab-he (StBoT 25.3 iv 17), 3sg.pres.act. ka-a-an-ki (KBo 17.2 i 3 [fr.], 7), 3pl.pres.act. ka-an-kän-zi (KBo 17.2 i 1, 11), part.nom.pl.c. ga-an-ga-an-te-el (KBo 17.6 iii 19, StBoT 25.3 iii 26, 27). Note, however, that all forms with KA are from one tablet. Etymologically, känk/-kank- clearly belongs with Goth. hahan ‘to hang’, Skt. śāṅkate ‘to wave’, Lat. cunctor ‘to hesitate’ and must reflect *konk/-kink- (Kloekhorst 2008a, 437–8). According to our findings above, we would now expect the strong stem *känk-to develop into Hitt. /känk-, spelled with KA, but the weak stem *konk-into Hitt. /gnk-, spelled with GA. Since Hitite did not tolerate consonant-alternation within one paradigm, it should be no surprise that the initial consonant of one of these stems was generalized throughout the paradigm. The two attestations of känkti spelled with KA may still reflect the original /k/-, but the spellings gängahhe and gängahhi clearly show that already in OH times the /g/- of the weak stem was spreading at the cost of /k/-.

**kariant-** ‘grass’ and its derivative kariantaja- ‘lawn’ are both hapaxes in a NS text, and their spelling with KA is therefore non-probative. Their reconstruction as *grh₂ente- (Kloekhorst 2008a, 448–9) would rather predict an initial /g-/.

**karija/a** ‘to be gracious towards’ and its derivatives karijaša- ‘graciousness’ and karijaša-a ‘to be gracious toward’ are attested with the sign KA only, which would point to an initial /k/-. This would not fit the etymology of these words, which are usually connected with Skt. ṣarya ‘to desire, to covet’ and Gr. γειού ‘to rejoice at, to take pleasure in’ and therefore reconstructed as *grh₂-je-o- and *grh₂-ir- (Kloekhorst 2008a, 449). Yet, the fact that the number of attestations of these words is very low (karija/a is attested twice, karijaša- once and karijaša-a about ten times)

---

67 All reconstructions taken from Kloekhorst (2008a, s.n.).
68 Taken over by Kimball (1994) and Kloekhorst (2008a: 427).
69 Moreover, the semantic connection between civis ‘citizen’ and śivā ‘friendly’, on the one hand, and ‘in-law, kinsman’, on the other, also leaves room for doubt.
and that these forms are all from NS texts, allows us to assume that the absence of spellings with GA is coincidental, which makes the attestations of these words with KA non-probative.

Karī 'already; early; up to now' is usually spelled ka-rū-ū. In principle, this spelling can be interpreted both as /karī/ and as /karū/. Since we now expect an initial cluster */k/ to develop into Hitt. /gr-/ the consistent spelling of this word and its derivatives kareyariqar 'early in the morning' and karī(i)lli 'former' with the sign KA would be problematic for the latter interpretation. It therefore seems preferable to assume that karī stands for /karī/. This interpretation might be supported by the attestations ka-a-rū-ū (KBo 31.108 iv 5) and ka-a-re-ya-ra-ya-ar (KUB 5.6.1.edge 5), which show plene spelling of the -ar. The etymology of karī is not easy to determine since the semantics of the word is quite broad. On the one hand, karī means 'in former times', but on the other it can also mean 'already'. Puvel (HED 4, 114) states that '[t]he source-meaning is probably 'early', perhaps literally 'at dawn' and therefore follows Köp (1961–2, 197–97, 206–9) in connecting karī with ON greyandi 'dawn' and Swed. dagen gryr 'it dawns', which together with ON grar and OHG grāo 'grey' point to a stem *grēh₂-ār. A reconstruction *grēh₂-ēu or *grēh₂-ū (thus Kloekhorst 2008a, 458) would not fit a phonological interpretation /karī/, however. Moreover, although it is understandable that an original meaning 'grey' would develop into a meaning 'dawn', as it did in Germanic, it is harder to envisage how an original meaning 'grey' would yield 'in former times' as well as 'already', as would be the case in Hittite. 79 Also Eichner (1978, 160) apparently assumed a basic meaning 'at dawn' since he compares Lat. crās 'tomorrow'. This latter word has nothing to do with 'dawn', however, since it rather reflects *krēh₂-s 'at the head, up front > tomorrow' (De Vaan 2008, 141), and therefore must be separated from karī. In my view, the semantics of karī should be interpreted as follows. When meaning ‘in former times’ it denotes the time span before the present (sometimes until just before the present), but when meaning ‘already’ it denotes the time span before the present including the present itself. So, the point of reference of karī is not a point of time that is situated in the past, but rather the present moment: its basic meaning is to be seen as ‘up to now, up to this point’, sometimes excluding and sometimes including the present. I therefore want to return to an etymological proposal suggested already by Hrozný (1917, 79), namely to connect karī with the de-

monstrative pronoun kā- 'this (one).” 71 The element -r was connected by Hrozný with the *r found in e.g. Skt. kār-ḥi 'when' and tār-ḥi 'then', which is comparable to e.g. Lat. cār 'why', Goth. hwar 'where' < *hur and Goth. her 'here' < *hur. This means that Hitt. kar- should reflect *kor- 'this point'. The element -u probably goes back to *e̞MU, 72 and therefore could be a locativial formant denoting the meaning 'up to'. If this is correct, ka-ra-ū = /karī/ would reflect *kor-ēu, and therewith fit our finding that KA spells initial /k/.

As we see, all the words that at first sight seem to contradict the interpretation of KA = /ka/- vs. GA = /ga/-, are either non-probative, or have received an alternative etymology with which they do fit this interpretation. We therefore can conclude that, just as in the case of KE1 vs. GE1, the words that begin with /k/ show that in OH the original distinction between fortis /k/- and lenis /g/- was still preserved, the former being spelled with KA, the latter with GA (except before a resonant, where both /k/ and /g/ seem to have merged in /r/). Unlike in the case of KE1 vs. GE1, however, the distinction between /ka/- and /ga/- seems to have been lost from the MH period onwards.

QA

The sign QA, which in Alalah Akkadian is used to spell the emphatic stop, /k'a/, is in Hittite hardly ever used word-initially. The only examples I know of are all from one tablet, qa-a-su (KBO 15.10 i 30, 31, ii 8, 19, 32, 43), qa-a-ru-ru-ru-aš (ibid. i 6), where the sign QA seems to be used as a mere variant of KA, and had better be read kā-su. 74 The fact that QA = /ka/ is not

---

70 The derivative kareyariqar 'early in the morning' is sometimes translated as 'at dawn' as well, but the proper expression for 'at dawn' is (máas) hukkattu (which can also refer to the dawn of the next day).

71 For a semantic parallel, cf. Lat. ālem 'formerly, once', which is derived from ole, ollus 'that; he, she, it'.

72 On the basis of kareyariqar, which must be a derivative in -yar of a verb kareyariqar, itself a derivative in -ariq-/ of the stem *karey-.

73 The interpretation of HLMW. ruan 'formerly' is less clear. This word is a hapax (KARATEPE 1 XXXII), spelled ri-wa-si-na, i.e. with the sign Ri = CERVUS₂, which is almost exclusively used to write the name of the deity Rünüya. Since the name Rünüya denotes the Stag-god (and CERVUS₂ =designation of the antlers of the stag), it is often thought that it must etymologically be connected with the PIE root *ker- 'horn'. It has therefore been suggested that the name Rünüya is derived from *ker- (through a stage *kern-). This would mean that ri-wa-si-na could possibly go back to *ker(i)-wa as well. This would invalidate the argument that since only lenis *i̇gi̇r̄ disappears in Luwian, ruan can only reflect *i̇gi̇r̄.

74 The form "QA-su=ga-at-šišt" (KUB 18.2 ii 9) as cited by Riemschneider (1973, 2749), is rather to be read "Za-su=ga-at-šišt" (cf. van den Hout 1998, 136f, on the Ziyātli-deity). Only rarely do we find a word-initial QA in the spelling of geographical names: e.g. QA-aš-ga-at
used word-initially coincides with the fact that I know of no Hittite word starting in ka- where we would have to reconstruct *k₁H- or *g₁H-.⁷⁵

**KU vs. GU**

As said above, the sign GU is practically never used in writing phonetically spelled Hittite words, and in word-initial position we therefore only find the sign KU. Hittite words starting with ku- can on the one hand go back to words starting in labiovelars and, on the other, to words starting in (palato)velars + -ur- or -Vur-. In the case of words with an initial labiovelar, we must assume on the basis of words like kuer-²⁶ ‘to cut’ < *kuer-, kuelu-yan- ‘washbasin(?); < *gelh₁(u)-ono- (?) and kuen-²⁷ ‘to kill’ < *gewen-, which are spelled with initial KU, that the three labiovelars *k₁, *g₁ and *g₂ seem to have merged in word-initial position in Hittite, probably into /k₁u-. In the case of words starting in (palato)velar + -(V)ur, the same seems to apply: kuyan- ‘dog’ < *kuom-, kukuṣ-²⁸ ‘to taste’ < *g(e)us⁻⁰ and kuit- ‘wall’ < *g(e)u(ẹ)tet-, which are all spelled with initial KU, indicate that the three (palato)velars *k₁, *g₁ and *g₂ have merged in word-initial position before an u, probably into /k₁u-.⁷⁴

/ku-u/?

In Alalah Akkadian, the syllable ku, i.e. /k₁u/, is consistently spelled with the sign KU, which can then be read as qū. This means that even if in Hittite words would exist that would start with /k₁u-/ (but note that as far as I am aware no Hittite words exist that go back to a preform containing *k₁H- or *k₁H-), they would in spelling probably not be differentiated from words starting in /ku-/.⁷⁶

---

⁷⁵ Except kattu- ‘strike’ if this really reflects *k₁t₂r-ur- (< OIr. cath- ‘strike’, MHG hader ‘fight’, Skt. śātr- ‘enemy’(?), cf. Kloekhorst 2008a, 466), which is always spelled with the sign KAT. Note that this sign can in Akkadian be read QAT, i.e. /k₁/at/, as well.

⁷⁶ Cf. footnote 2 for exceptions.

---

Initial stops in Hittite

PA VS. BA

The last group of signs I am treating are those representing labial stops, starting with the pair PA vs. BA. The sign BA is hardly ever used in word-initial position in genuine Hittite words. The only good examples I know are the following: ba-iti-š ‘he gave’ (KBo 18.151 obv. 7, 13, MS),⁷⁷ ba-iti-t ‘he went’ (ibid. rev. 19, MS),⁷⁸ ba-tal-ha-as ‘sole of the foot’ (KUB 17.1 i 10, NH)⁷⁹ and ba-as-li-uš ‘pedestal’ (KUB 42.46, 3, NH).⁸⁰ Note that the first two forms are from KBo 18.151, a tablet that is notorious for its many spelling aberrancies (cf. footnote 29) and are therefore to be taken as a peculiarity of that tablet that do not shed light on normal spelling practices. The words in which we find initial PA on a wider scale are all likely to be of foreign origin: GISP bānin- ‘tamarisk’⁸¹ is probably a loanword connected with Hurrian pain- and Akkadian bina (Tischler HEG P. 384); NAM barbaras, a semi-precious stone,⁸² may be derived through Hurrian from Akkadian maraššitu-glass, itself derived from the place name Marhashi, Barasha, Paraši (Tischler HEG P. 444–5); ba-ra-ti-il[š]’? (KBo 18.170a rev. 11) is preceded by a gloss wedge and therefore probably of non-Hittite origin; bastā-‘embroidery’⁸³ is probably of Luwian origin as can be seen by the Luwian formation bastaini- ‘embroidered’;¹³ bātinš, a priest with purificatory functions,⁸⁵ is likely to be a term of Hurrian origin (CHD P. 246). So, although it cannot be excluded that BA in these foreign words denoted

---

⁷⁷ The verb paili- ‘to give’ is in all other attestations consistently spelled with the sign PA.

⁷⁸ The verb paili- to go is in all other attestations consistently spelled with the sign PA.

⁷⁹ The noun pailašša ‘sole of the foot’ is in all other attestations consistently spelled with the sign PA.

⁸⁰ The noun pailašša is in all other attestations consistently spelled with the sign PA. Note that Kollar (1982, 182) suggests that ba-as-li-uš might perhaps rather be read ba-asi-li-uš, with which he seems to imply an interpretation as acc.pl. of bastaa- ‘embroidery’.

⁸¹ GISP bānin is in all other attestations consistently spelled with the sign PA.

⁸² Note that the noun pailašša is in all other attestations consistently spelled with the sign PA. Note that Kollar (1982, 182) suggests that ba-as-li-uš might perhaps rather be read ba-asi-li-uš, with which he seems to imply an interpretation as acc.pl. of bastaa- ‘embroidery’.

⁸³ Note that the noun pailašša is in all other attestations consistently spelled with the sign PA. Note that Kollar (1982, 182) suggests that ba-as-li-uš might perhaps rather be read ba-asi-li-uš, with which he seems to imply an interpretation as acc.pl. of bastaa- ‘embroidery’.

⁸⁴ Except kattu- ‘strike’ if this really reflects *k₁t₂r-ur- (< OIr. cath- ‘strike’, MHG hader ‘fight’, Skt. śātr- ‘enemy’(?), cf. Kloekhorst 2008a, 466), which is always spelled with the sign KAT. Note that this sign can in Akkadian be read QAT, i.e. /k₁/at/, as well.

⁸⁵ Except kattu- ‘strike’ if this really reflects *k₁t₂r-ur- (< OIr. cath- ‘strike’, MHG hader ‘fight’, Skt. śātr- ‘enemy’(?), cf. Kloekhorst 2008a, 466), which is always spelled with the sign KAT. Note that this sign can in Akkadian be read QAT, i.e. /k₁/at/, as well.

⁷⁶ Cf. footnote 2 for exceptions.

⁷⁷ Cf. Watkins (2003) and Kloekhorst (2008a, 491–2) for this verb, its semantics and etymology.

---

⁷⁸ The verb paili- ‘to give’ is in all other attestations consistently spelled with the sign PA.

⁷⁹ The verb paili- ‘to go’ is in all other attestations consistently spelled with the sign PA.

⁸⁰ The noun pailašša ‘sole of the foot’ is in all other attestations consistently spelled with the sign PA.

⁸¹ The noun pailašša is in all other attestations consistently spelled with the sign PA. Note that Kollar (1982, 182) suggests that ba-as-li-uš might perhaps rather be read ba-asi-li-uš, with which he seems to imply an interpretation as acc.pl. of bastaa- ‘embroidery’.

⁸² GISP bānin is in all other attestations consistently spelled with the sign PA.

⁸³ Note that the noun pailašša is in all other attestations consistently spelled with the sign PA. Note that Kollar (1982, 182) suggests that ba-as-li-uš might perhaps rather be read ba-asi-li-uš, with which he seems to imply an interpretation as acc.pl. of bastaa- ‘embroidery’.

⁸⁴ Except kattu- ‘strike’ if this really reflects *k₁t₂r-ur- (< OIr. cath- ‘strike’, MHG hader ‘fight’, Skt. śātr- ‘enemy’(?), cf. Kloekhorst 2008a, 466), which is always spelled with the sign KAT. Note that this sign can in Akkadian be read QAT, i.e. /k₁/at/, as well.

⁸⁵ Except kattu- ‘strike’ if this really reflects *k₁t₂r-ur- (< OIr. cath- ‘strike’, MHG hader ‘fight’, Skt. śātr- ‘enemy’(?), cf. Kloekhorst 2008a, 466), which is always spelled with the sign KAT. Note that this sign can in Akkadian be read QAT, i.e. /k₁/at/, as well.

---

⁷⁵ Except kattu- ‘strike’ if this really reflects *k₁t₂r-ur- (< OIr. cath- ‘strike’, MHG hader ‘fight’, Skt. śātr- ‘enemy’(?), cf. Kloekhorst 2008a, 466), which is always spelled with the sign KAT. Note that this sign can in Akkadian be read QAT, i.e. /k₁/at/, as well.

⁷⁶ Cf. footnote 2 for exceptions.

⁷⁷ Cf. Watkins (2003) and Kloekhorst (2008a, 491–2) for this verb, its semantics and etymology.
another sound than PA, that sound was not a part of the normal Hittite phonemic system.\textsuperscript{36} We can therefore conclude that Hittite knew only one labial stop in word-initial position, which must have been the result of the merger of PANat. */p/- and */b/-, and which was spelled with the sign PA.

\[ \text{PE/PI and PU} \]

This conclusion is supported by the situation regarding the spelling of labial stops + e/i and u. The sign PI, which in 'normal' Old Babylonian can have the values pi, pe as well as wa, we, wi and wu, is in Alalakh Akkadian used with the values wa, we, wi and wu only (Giacumakis 1970, 23). For writing the syllable pi or pe, the sign NI is used, which is then read PI and PE.\textsuperscript{87} This practice is taken over in Hittite; the sign PI is only used in its value \textit{wa}, whereas the sign NI is used to spell \textit{pi} and \textit{pe}.\textsuperscript{88} In the case of labial stop + u, the cuneiform script only knows one sign to spell PU as well as NU, which in Hittite is therefore only transliterated with its \textit{p}-value, PU. These facts support the hypothesis that in word-initial position only one phonemic labial stop existed.

\[ /p\text{\textsuperscript{2}}/ \]

In Akkadian, the sound /\textit{p}/ did not exist, and therefore the cuneiform script does not possess signs to indicate this sound. In Hittite, I know of no good examples of words that etymologically should be reconstructed with word-initial \textit{PHV}.,\textsuperscript{89} and I know of no spelling pecularity either that could be interpreted as pointing to the presence of an initial sound /\textit{p}/.

---

\textsuperscript{36} Compare e.g. the situation in Finnish. Originally, the Finnish phonemic system only knew voiceless word-initial stops, and loanwords with voiced word-initial stops were taken over with the corresponding voiceless one. Only since recently, the voiced stops of such loanwords are being retained, which now have gotten a marginal phonemic status in Finnish. Cf. Suomi/Toivanen/Yllitalo (2008, 55).

\textsuperscript{87} The sign NI is also used to write the syllable bi, whereas the syllable be is written by the sign BE, cf. the excursus on Alalakh Akkadian.

\textsuperscript{88} In Hittite, the sign BE is only used in its alternative value pats/pe\textit{t}/piu.

\textsuperscript{89} The only possible examples are \textit{pitsuwa} `to pound, to grind', if this is cognate with Lat. \textit{pivire} `to beat' and Gr. \textit{piros} `to strike' < */pe\textit{h}i\textit{w}/, and \textit{pite} `to be eclipsed'\textsuperscript{7} if this is cognate with Lat. \textit{panicus}, Gr. \textit{pik\textit{os}} `small, little' < */pe\textit{hi}\textit{w}/ (Kloekhorst 2008a, s.v.).

---

\textbf{Conclusion}

On the basis of the results presented above, we can draw the following conclusions regarding the initial stops in Hittite. In the case of dentals, labials and labiovelars, there is no evidence that the original distinction between fortis and lenis stops has been retained. We may therefore assume that original */t/- and */d/- merged into Hittite /t/-, original */p/- and */b/- merged into Hitt. /p/-, and original /*/k/- and */g/- merged into Hitt. /k/-). The case of the (palato)velars is more complicated, however. Here it seems probable that before e and i the original distinction between fortis */k/- and lenis */\textit{g}i/- has been retained up to NH times. Before e, this distinction was retained up to OH times, but was lost after the MH period, when the two stops seem to merge, probably into /k/-/ Before u, however, the original distinction between */\textit{k}i/- and */\textit{gi}i/- was already lost in pre-Hittite times, since here we find evidence for one stop only, probably /k/-/. Before /s/, */\textit{k}i/- and */\textit{gi}i/- merge to /k/-, whereas before resonants, */\textit{k}i/- and */\textit{gi}i/- merge to /gi/-/ Moreover, we have found evidence that initial clusters of stop + laryngeal yielded glottalized stops which in the OH period were still phonemic (/tu/\textit{w}/ being spelled with TA = \textit{ta}, /gi/\textit{w}/ being spelled with \textit{ki} = \textit{qi}), but only at the end of the OH period started merging with their non-glottalized counterparts.

At first sight, it may seem odd that within the dental, labial and labiovelar series the original fortis and lenis stops merged unconditionally in word-initial position, whereas within the (palato)velar series the moment of merger is dependent on the following vowel: before -\textit{u} the merger apparently took place in pre-Hittite times; before -\textit{a} the merger took place in the MH period; but before -\textit{e} and -\textit{i} the merger never took place (at least not within the period of attested Hittite). Why would there be a difference between the dental, labial and labiovelar stops on the one hand, and the (palato)velar stops on the other? And why would within the (palato)velar series the moment of merger be dependent on the following vowel? In order to answer these questions, we must compare the situation as found in the Luwic branch.
The Luwic branch

Although Cuneiform Luwian, due to the ambiguities of the cuneiform script, exhibits the same problems regarding the interpretation of its initial stops as Hitite, its cognates Hieroglyphic Luwian (written in its own hieroglyphic script) and especially Lycian (written in an alphabetic script) provide us with more information regarding the development of initial stops in the Luwic branch. If we look at the development of the dental stops, we can conclude on the basis of the fact that in Lycian only word-initial /t/ occurs, and not word-initial /d/,90 that fortiis */t/- and lenis */d/- merged into /t/- in word-initial position. This coincides with the fact that in HLLuwian, for which Rieken (2008) recently established that the sign <ta> denotes the fortiis stop /t/ and the sign <ta> the lenis stop /d/, only the sign <ta> occurs word-initially, indicating that here, too, fortiis */t/- and lenis */d/- merged into fortiis /t/- (Rieken 2008, 646). This makes it likely that this was a Proto-Luwic development. In the case of the labial stops, the same is true: in Lycian, only word-initial /p/- occurs, and no word-initial /b/,91 which indicates that fortiis */p/- and lenis */b/- merged into /p/- as well. Unfortunately, the HLLuwian script does not allow us to distinguish between fortiis /p/ and lenis /b/ at all, so this language cannot provide additional evidence for the merger of */p/- and */b/-. The cases of the palatovelar and velar stops are quite different, however. It is well known that the fortiis palatovelar stop */k/- assimilated into Luvian /z/- and Lycian ʃ. The development of the corresponding fortiis palatal stop */k/- is less clear, since good Lycian examples are lacking. The CLuwian verb kars- to cut < *kers- seems to show that it was retained as a fortiis stop, although it cannot be strictly proven that it was proven as a fortiis stop, /k/- . The development of the lenis stops */g/- and */g/- is quite different: their outcome depended on the following vowel (note that although not always good examples exist for both */g/- and */g/-, they seem to behave similarly). Before a front vowel, */g/- disappeared in Luvian and Lycian, probably through a stage */g/- ( /*gésr/- > Luv. isș̄ara/-, Lyc. izre/- hand)), whereas before a back vowel */g/- was retained as a fortiis stop.

90 Word-initial /d/- is only found in reduplicated formations standing in /dd/, of which it is quite possible that they reflect original *ød/, in which *t/- was assimilated to *d/- (cf. Kloekhorst 2008b, 147). Compare also footnote 6.
91 Cf. footnote 8.
92 The best examples are before /a/-, Melchert (1994, 252) also gives CLuw. kaimarsı/(a)/- to defeate < */pdomməsia/- as an example of fortition before /a/-, but cf. Kloekhorst (2008a, 432) for doubts regarding this etymology.

(*gut-esr/- > CLuw. kutaššara/-, HLuw. ku-ta-sar-ra-i- 'orthostat'). This velar stop possibly was fortiis, if Lyc. ḫupa- 'tomb' /kupa/-, which Melchert (1994, 303) connected with Gr. γυνή 'hole, lair', can be used as evidence for this assumption. The development of */g/- before consonants is unknown since good examples are lacking. The labiovelars develop in more or less the same way. The fortiis labiovelar stop */k/- was retained as a labiovelar stop in Luvian (e.g. */k̚i/- > CLuw. kun-ii, HLuw. kwi- 'who'), which, since in Lycian */k̚i/- yielded the fortiis stop /t/- when palatalized (e.g. */k̚i/- > Lyc. ti- 'who'), probably was fortiis as well, /k/- . Unfortunately, we have no good examples of the outcome of */k̚/- in non-palatalizing position in Lycian. The lenis labiovelar stop */g̚/-, however, gives /v/- in both Luwian and Lycian in the following examples, where it stands before a vowel: */g̚ona/- > CLuw. ʔaŋna- 'woman', */g̚u/- > HLuw. wawa/- 'cow', Lyc. wawa/- 'cow'. If Lyc. q̚a- = */k̚a-/ to 'destroy' derives from the stem */g̚e/ to kill, to slay', then we may assume that */g̚/- was retained as */k̚/- before consonants.93

Comparing Hitite and Luwic

If we summarize, we see that in the Luwic branch the dental fortiis and lenis stops and the labial fortiis and lenis stops in word-initial position have merged into their fortiis variant, i.e. that the lenis stops have undergone fortition. This corresponds to the merger of */t/- and */d/- and of */p/- and */b/- as seen in Hitite. It should be noted, however, that these developments are not to be projected back to Proto-Anatolian times, as is clear from the fact that in Hitite the assimilation products of */ti/- and */di/- were different, namely /z/- and /ʃ/-, respectively, which shows that the distinct-

93 With the interpretation of the Lycian sign q as the labiovelar stop /k/- (Rasmussen 1974; Schürr 1997, 129–30; Gubiani 1997, 152–6; Kloekhorst 2006b, 97–101), the connection between Lyc. q̚a- 'to destroy, to ruin' and Hit. kwen- kwen- 'to kill, to slay, to ruin' < Kewen-Hajnal 1995, 161100, followed by Schürr 1997, and independently Gubiani 1997, 156) becomes more attractive. Deriving q̚a- = */k̚a-/ directly from */g̚e/n/- is impossible, however, since */men/- should have yielded *e-. Yet, since */CnC/- yields Lyc. ġāC, we may assume that the zero-grade stem was generalized. This could then also explain the retention of the stop, which should have yielded /v/- before the vowel /e/-; if we assume that before consonants */g̚/- was retained and eventually underwent fortition to /q̚/-, the original paradigm *g̚e/n/-, *g̚i/n/-, *g̚e/-, *g̚e/-, *g̚i/- would have regularly yielded Lyc. *q̚e/-, *q̚e/-, *q̚e/-, q̚a/-, q̚a/-, q̚i/-, *q̚e/-, q̚a/-, q̚i/-, in which the stem q̚a- was generalized, yielding 3sg.pres.act. q̚i/-, 3pl.pres.act. q̚i/-, and imperf. q̚a/-;
tion between initial */r/- and */d/- must still have been present after the disintegration of Proto-Anatolian (the assimilation is specifically Hittite and did not occur in the Luwic branch, cf. e.g. */diwot- > CLuw. tijaq-). The Hittite and Luwic fortiﬁcation of initial dental and labial lenis stops must therefore be parallel developments. In the case of the (palatovelars), we also observe some cases in Luwic where original lenis stops underwent fortiﬁcation, namely in the words where */gü̞-/ preceded a back-vowel: e.g. */gə̈t-xar- > CLuw. kütasaxa- and */gupə̈- > Lyc. ḫupa- /kupa-. It is remarkable that, although initial */g̊̂̄-/ in these words became a fortiﬁed stop, it did not merge with the outcome of fortis */k/-, which was assimilated in Luwic to Luv. /ɾ-/ and Lyc. /ɾ̚-/./. This shows that the fortiﬁcation of */g̊̂̄Vbobk- to /kB̂obk-/ must have taken place after the assimilation of */k-./.

When preceding a front vowel, */g̊̂̄-/ did not undergo fortiﬁcation, but yielded */j̊̂̄/-, which was subsequently lost. This means that the fortiﬁcation of initial lenis (palato)velar stops took place later than the fortiﬁcation of initial lenis dental and labial stops, and that the moment of fortiﬁcation was dependent on the color of the following vowels: before back vowels the fortiﬁcation took place earlier than before front vowels (where it never took place because it was bled by the development */g̊̂̄- > */j̊̂̄- > /O-/-). We have seen that in Hittite the merger of the fortiﬁed and lenis velar stops before -u- has taken place in pre-Hittite times, before -a- in MH times, whereas before -e- and -i- it never happened (at least, not before the end of the Hittite Empire). So here too, the merger of the two velar stops, i.e. the fortiﬁcation of */g̊̂̄u-/, took place later than the fortiﬁcation of */d-/- and */b-/-, and was dependent on the color of the following vowel: before back vowels it took place earlier than before front vowels. The case of labiovelars is different in the two branches: in Hittite, */kä̂w-/- and */g̊̂̄w-/- seem to have merged in pre-Hittite times already, whereas in the Luwic branch they were kept distinct before vowels (with */kä̂w-/- remaining and */g̊̂̄w-/- yielding ɣ-), and only merged before consonants (Lyc. qa- = /kwä̂w- / < */g̊̂̄w-/-). This could indicate that the fortiﬁcation of */g̊̂̄w-/- took place in time between the fortiﬁcation of, on the one hand, */d-/- and */b-/- and, on the other, */g̊̂̄u-/-.

In order to accommodate all these facts, we could set up the following relative chronologies of sound laws for the two branches. The fortiﬁcation of word-initial lenis stops was an independent but parallel development in Hittite and in Luwic. The fortiﬁcations of these stops did not happen at one

<table>
<thead>
<tr>
<th>Stage</th>
<th>Hittite</th>
<th>Luwic</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>*/b̃-/&gt; /p̃- /</td>
<td>*/b̃-/&gt; /p̃- /</td>
</tr>
<tr>
<td></td>
<td>*/d̃-/&gt; /t̃- /</td>
<td>*/d̃-/&gt; /t̃- /</td>
</tr>
<tr>
<td></td>
<td>*/k̃-/&gt; */t̃- /</td>
<td>*/k̃-/&gt; */t̃- /</td>
</tr>
<tr>
<td></td>
<td>*/g̊̂̄-/&gt; */g̊̂̄- /</td>
<td>*/g̊̂̄-/&gt; */g̊̂̄- /</td>
</tr>
<tr>
<td></td>
<td>must precede</td>
<td>must precede</td>
</tr>
<tr>
<td>(2)</td>
<td>*/g̊̂̄w-/&gt; */kʷ-/-</td>
<td>*/g̊̂̄w-/&gt; */kʷ-/-</td>
</tr>
<tr>
<td></td>
<td>must precede</td>
<td>must precede</td>
</tr>
<tr>
<td>(3)</td>
<td>*/g̊̂̄u-/&gt; */kʷ-/-</td>
<td>*/g̊̂̄u-/&gt; */kʷ-/-</td>
</tr>
<tr>
<td></td>
<td>must precede</td>
<td>must precede</td>
</tr>
<tr>
<td>(4)</td>
<td>*/g̊̂̄w-/&gt; */kä̂- /</td>
<td>*/g̊̂̄w-/&gt; */kä̂- /</td>
</tr>
<tr>
<td></td>
<td>must precede</td>
<td>must precede</td>
</tr>
</tbody>
</table>

Development (4) can be dated to around 1400 BC. The expected development (5), namely */g̊̂̄ï̂-/> */kʷ-/-, is attested in neither of the branches. In Hittite, it may have taken place after the collapse of the Empire, and therewith after our historical records, whereas in the Luwic branch it was completely bled by the development */g̊̂̄-/> */ï̂-/.

**Excursus: The spelling of stops in Alalakh Akkadian**

As we have seen, it is commonly held that the typical Hittite ductus best resembles the ductus as found in Old Babylonian texts from Alalakh (Tell Aşšana), level VII (18–17th century BC), cf. e.g. Rüster/Neu (1989, 15). In an investigation dealing with the spelling of initial stops in Hittite, it is therefore instructive to also discuss the spelling of stops in the variety of Akkadian as attested on these Alalakh tablets.

---

89 The place of the development */g̊̂̄-/> */ï̂-/ within the relative chronology of sound laws of the Luwic branch depends on the interpretation of CLuw. kaitärk-. If really from "godmer", this would show that the development */g̊̂̄-/> */ï̂-/ must have taken place after stage (4). If, however, the stages (1), (2), (3) and (4) are not only parallel developments in these two branches, then the same time at the same time and therewith are areal features spreading over the boundaries of linguistic communities, it must be dated before stage (4), since stage (4) is attested in historical records (namely in MH texts, around 1400 BC), by which time the development */g̊̂̄-/> */ï̂-/ had already taken place (as it can be found in the oldest attested CLuwic texts already, which date to the 15th century BC).
In his book in which a large part of the corpus of tablets found in Alalāḫ is for the first time published, Wiseman remarks that in Alalāḫ Akkadian “there is constant graphic confusion between voiced and voiceless stops” and that “emphatic sounds (q, t, s) are not separately indicated” (1953, 19). In his grammatical sketch of Alalāḫ Akkadian, Giacumakis puts it more mildly. He states about the dental stops /d/t that they “are distinguished phonetically” but “are not always distinguished in the script” (1970, 26). This seems to indicate that he assumes that the dental stops /d/ and /t/ were phonologically distinct, but that they were not always spelled accordingly. Yet, he does not indicate how often this lack of distinction in the script occurs. The velar stops /k/g/q are, according to Giacumakis, “frequently not distinguished in the script”, whereas the labial stops /p/b/ “are often confused in the script” (l.c.). He does not indicate to what extent he thinks that /k/g/q and /p/b/ are separate phonemes in Alalāḫ Akkadian. Moreover, both authors do not, in this respect, distinguish between the scribal practices as found on the Old Babylonian tablets from Alalāḫ VII and the Middle Babylonian tablets that were found in level IV (15–14th century BC).

Because of the unclear situation regarding the spelling of stops in Alalāḫ Akkadian, I have looked closely at these consonants in the Alalāḫ texts, trying to determine whether or not the voiced, voiceless and emphatic stops of each series were phonemically distinct, and if so, how exactly they are spelled and to what extent this coincides with the Hittite spelling practices. Since only the script as used on the tablets from Alalāḫ VII can be regarded as the precursors of the Old Hittite script (Alalāḫ IV postdates the introduction of the cuneiform script in Ḫattuša), I will limit myself to these.

I will first treat the dental series, starting with the question whether voiceless /t/ and voiced /d/ are phonemically distinct. Wiseman (l.c.) states that “/d/ and /t/ freely interchange” on the basis of the observations that in some words an expected /t/ is spelled with a sign of the D-series and that in others an expected /d/ is spelled with a sign of the T-series. He gives as examples the forms /i-mi-id-da-šu/ for imitta-šu ‘his right hand’, /a-ti/ for adī ‘until’, as far as /ta-am-gu/ for damqu ‘good’, to which Giacumakis (l.c.)

96 I have investigated the corpus of Alalāḫ VII texts as published by Zeeb (2001) and Dietrich/Loretz (2004a, 2004b, 2005, 2006). The numbers given here follow the numbering of these editions. Numbers starting in “ATT” refer to Alalāḫ IV texts published by Wiseman (1953). I have excluded from this research personal and geographical names as well as words of unknown meaning.

97 In this text we find the aberrant spelling /p-a-la-a-ka-tu/ (23.05, 12) for ḫbabakakatu ‘acts against an agreement’ as well, cf. below.

98 The reading “/t/ /Hu-di-is/” of 41.83, 4 as given by Zeeb (2001, 609), which would form another aberrant spelling of /Hu-dizi/, is very uncertain.

99 G.pers.3sg. /i-na-ad-di-in/ (10.02, 61, 62, 22.19, 12 fr.), 22.21, 6 fr.), 23.03, 9, 11, 19, 21, 24), /i-na-ad-di-na-ad-ka-kum/ (10.03, 27, i-na-ad-di-na-dum (22.05, 23), i-na-ad-di-na-nu (10.02, 59, lsg. /a-na-ad-di-in/ (10.02, 32), G.pers.3sg. /i-id-di-in/ (20.01, 31, 20.01A, 33, 20.07, 32, 20.08, 7, 20.10, 6 fr.), 21.02, 6, 22.23, 6, 23.01, 11, 23.02, 11, 23.03, 6, 23.04, 7, 23.05, 11, 30.11, 3, 7, 13, 31.01A, 6 fr.), 44.01, 26, 51.04, 6, 60.02, 7 fr.), /i-id-di-na-a-nu/ (51.03, 3), /i-id-di-na-a-nu/ (10.01, 6), /i-id-di-na-a-nu/ (10.01, 8), /i-id-di-in-a-ni-ma/ (20.02, 27), /i-id-di-na-ak-ki/ (20.05, 11), /i-id-di-in/ (11.01, 7, 31.12, 2 fr.), /i-id-di-na-ma/ (20.02, 25), lsg. /i-ad-di-na-ka-mi/ (10.02, 42), 3pl. /i-ad-di-na/ (40.05, 15, 40.01, 3, 50.07, 3 fr.), /i-ad-di-na/ (43.07, 9, 43.07, 9, 43.07, 9, 21.03, 5, 20.09, 4 fr.), /i-ad-di-na/ (20.04, 8), /i-ad-di-na/ (10.01, 13), /i-ad-di-na/ (22.05, 27), C.ing. /i-ad-di-na/ (20.02, 8, 24), G.statue /a-di-ni/ (30.14, 4, 41.50, 8, 41.54, 15, 43.09, 2, 17, 28, 44.04, 39, 50.07, 6, 51.08, 12 fr.), G.statue /i-ad-di-na/ (20.02, 24), G.pers.3sg. /i-ad-di-na/ (23.05, 34).

100 G.pers.3sg. /i-ad-di-a/ (23.02, 16), G.statue /a-di-na/ (23.02, 11, 20.08, 27), /a-di-a/ (43.08, 9, ma-di-ru/ (20.08, 20), lsg. /i-di-di/ (21.04, 6) (erroneously transliterates as /i-di-di/, by Dietrich/Loretz 2004, 94).

101 On the same tablet we find aberrant /i-ri-di/ for /irtu ‘breast’ as well, cf. below.

102 G.pers.3pl. /i-mu-tu/ (20.08, 11, 13).
as’, *dimiu* ‘legal decision, lawsuit’, and *qadim(u)* ‘together with, including’.

It is clear that although a small number of forms indeed exist that are spelled with the incorrect stop, the overwhelming majority of words containing *t* or *d* are spelled with the correct stop. There can be no doubt, therefore, that in Alalakh Akkadian the voiceless dental stop *t* and the voiced dental stop *d* were separate phonemes.

The question whether the emphatic dental stop *t* must be regarded a relevant phoneme as well is more difficult to answer since the number of relevant forms is considerably lower than with *r* and *d*. Nevertheless, if we look at all forms where we would expect to find *t*, we find the following interesting facts.

The syllable *ta* is in the Alalakh texts primarily spelled with the sign *DA*, which we therefore can read as *TA* (ten times: *pa-ta-su* (22.01, 2, 22.00, 2, 23.03, 3) ‘its district’, *pa-ta-su-nu* (22.04, 3) ‘their district’, *ta-ab* (22.13, 15, 22.15, 7, 23.03, 14), *ta-ab* (22.02, 13, 22.09, 14) ‘is satisfied’, and *ta-uis* (22.03, 18) ‘slaughtered’). Three times, we find forms spelled with the sign *tu*, which then must be read as *TA*: *pa-tu-su* (22.03, 2, 22.06, 2) ‘its district’, and *ta-ab* (22.06, 10) ‘is satisfied’. In three forms, the syllable *ta* seems to be spelled by the sign *TA*; however, namely *ta-ab-num* (41.38, 4, 8) = *taptum* and *ta-ab-it* (41.92, 6) = *tapti* ‘salt’. Since the two attestations of *ta-ab-num* are found on the same tablet where we find incorrectly spelled *ga-tu-su-nu-ma* (5) and *ga-tu-su-ma* (9) for *qattu-su-ma* and *qattu-su-ma* ‘their/his hand’, respectively. I would regard them as erratic.

---

104 On the same tablet we find the aberrant spellings *i-qa-sí-a-tu-su* (14) for *ikšé-kadu* ‘they will conquer it’, *ib-ba-qa-du* (23) for *ippagaddu* ‘they will put someone in charge’ and *ba-qa-du* (23) for *paqu* ‘person in charge’ as well, cf. below.


106 Three of these are: *ba-ál-ig-di* (20.01, 8) for ballat ‘you’ (fs.3sg) are entitled to a share’ (cf. the spelling *ba-ál-a-ti* in 20.01, 3); *i-ta-ti-nu* (51.01, 14) for *iadatâ ‘our wages’ (on the same tablet we find aberrant *i-pí-tu-su-nu-ti-nu* ‘they imprisoned them’ as well, cf. below); *i-tu-su* (40.05, 14) for *iri ‘cheat’ (on the same tablet we find aberrant *im-tu-it* ‘he has died’ as well); *tu-ti-tu* (40.06, 21) for *napuštu ‘person’; and *qa-tu* (31.03, 8, 31.04, 10) for *qatáti ‘guarantees’.

The forms *ta-tu-ar* (30.10, 7, 31.16, 5 [*fr*], 32.02, 11, 32.04, 9) and *it-tu-tu-ar* (32.03, 9) are since Tsevat (1958, 115) interpreted as *ittdarur* and *ittdaur* shall become an object of litigation’ on the basis of an etymological connection with Talmidic *dtv*n ‘drr’ ‘money of disputed ownership’. Since the semantics of *ii-tu-tu-ar* and *it-tu-tu-ar* cannot be independently determined, and since Tsevat’s formal root is based on his presumption that in Alalakh texts the signs *ta* and *tu* can be read as *dé* and *dí*, respectively (1958, 115), his interpretation is circular, and these forms cannot therefore be used as arguments in our discussion.

The form ‘*sá-tu-pí-lí*’ read thus by Dietrich/Loretz (2004, 63) in 20.02, 6, is in fact *úsá-tu-pí-lí* ‘he sent’.

107 Always spelled with *tu*: *i-tu* (11.01, 21, 20.01, 32, 20.02, 29, 20.08, 21, 38).

108 Always spelled with *tu*: *i-tu-ti* (10.01, 18, 10.03, 27, 21.07, 12, 30.12, 5, 30.18, 2, 41.07, 5, 42.01, 17, 42.03, 8, 42.05, 8, 42.06, 11, 42.08, 5, 42.09, 8, 42.10, 7, 42.11, 7, 42.16, 4, 43.01, 5, 43.05, 3, 43.07, 11, 43.08, 5, 43.09, 27, 43.13, 9, 44.01, 14), *qi-tu-fí* (10.01, 16), *qi-tu-su-ma* (41.38, 9), *qi-tu-su-ma* (51.03, 10), *qi-tu-su-nu-ma* (41.38, 5), *qa-tu-ka* (10.03, 38).


110 Always spelled with *ta* or *te*: *ne-qa-ag-qí* (10.03, 23) (G.pers. *3sg. of naqú ‘to sacrifice’), *tē-tē-qā* (20.01, 10, 20.01A, 11) (G.pret. *3sg. of lēqī ‘to take’), *ti-ti-pu-á* (10.03, 24, 28, 34) (G.pers. *3sg. of epē-tu ‘to do, to make’), *ta-ub-á* (10.03, 39) (G.pret. *3sg. of erē-bi ‘to enter’).


112 Always spelled with: *du*: *qa-du* (22.06, 8, 22.01, 13, 22.03, 13, 30.10, 14, 32.03, 2, 40.08, 26 [*fr*], 40.09, 26, 61.05, 4), *qa-du-num* (10.02, 1, 22.02, 2, 22.05, 4, 22.08, 1, 32.01, 2, 31.13, 7, 31.09, 4).

113 Cf. below for a treatment of these forms.

114 Although personal names were excluded from this research, it is illuminating to look for instance at the spelling of the names that bear the stem *talb* as their second element. This stem is spelled 22 times with *DA* = *TA*, namely *A-bi-ta-ba* (30.04, 12, 30.04A, 10, 30.08, 3, 8, 41.22, 16, 41.35, 4, 45, 41.36, 13, 41.57, 10, 41.63, 3, 41.69, 18, 42.05, 10), *Am-mi-ta-ba* (21.07, 1 [*fr*], *A-gar-ta-ba* (22.03, 23), *I-ta-ba* (20.24, 26), *I-di-ta-bi* (20.12, 11), *I-a-hi-bi-ta-a-bi* (20.12, 10), *Su-mi-ta-ba* (20.01, 44, 20.01A, 47, 20.01A, h), *Su-mi-ta-ba* (21.03, 43), and only once with *TA* = *TA*, namely *Am-mi-ta-ba* (21.07, 12). Moreover, the one aberrantly spelled form is found on a tablet where we find other aberrant forms as well (*we-te-fí* (21.07, 5) ‘has appointed’, *i-te-gí-* *te*-*sí-a-du* (14) ‘they will conquer it’, *i-pá-gá-di* (ibid., 23) ‘they will put someone in charge’, *pi-ag-di* (ibid., 23) ‘person in charge’, cf. below).
The syllable $te$ is spelled by the sign $\text{TE}$, which we therefore could read $\text{TE}_4$ (five times: $\text{i-it-\text{TE}_4}$-$\text{ru}$ (31.07, 13) 'they will pay', $\text{i-it-\text{TE}_4}$-$\text{eb-bi}$ (10.02, 20) 'may impress'),\textsuperscript{115} $\text{MUNIS.MES}$-$\text{TE}_4$-$\text{mi}$-$\text{tum}$ (41.44, 13) 'wise women', $\text{TE}_4$-$\text{e}$-$\text{nim}$ (41.01, 26, 27) 'milking'. It is interesting to note that in Alalah the sign $\text{DI}$ is not used in its value $\text{TE}$.

The syllable $\text{DI}$ is four times spelled by the sign $\text{DI}$, which can therefore be read as $\text{TI}$ ($\text{BA-AL}$-$\text{TI}$-$\text{da}$) (31.13, 12) 'his life', $\text{BU-AL}$-$\text{TI}$-$\text{su}$-$\text{ma}$ (21.01, 3) 'his lifetime', $\text{TI}$-$\text{DI}$-$\text{TI}$ (31.12, 5) 'pledge', $\text{PA}$-$\text{AT}$-$\text{TI}$-$\text{su}$ (22.02, 2) 'its district'. Twice, it is spelled with the sign $\text{DI} = \text{TI}$ ($\text{BU-AL}$-$\text{TI}$-$\text{da}$ (21.06, 8) 'her lifetime', $\text{PA}$-$\text{AT}$-$\text{TI}$-$\text{su}$ (22.05, 4) 'their district'). Although the low number of forms precludes making significant statements, the sign $\text{DI}$ seems to be the normal way of spelling $\text{TI}$.

The syllable $\text{TU}$ is always spelled with the sign $\text{TU}$, which then could be read as $\text{TU}$ (eleven times: $\text{BA-AL}$-$\text{TU}$ (22.05, 21, 20, 30, 10, 9) 'alive', $\text{IP}$-$\text{TU}$-$\text{ar}$ (32.01, 12, 32.02, 8, 32.03, 7, 32.04, 7) 'he released', $\text{IT}$-$\text{TU}$-$\text{ru}$ (21.03, 16, 43.12, 5 [fr.]) 'they wrote', $\text{TU}$-$\text{UH}$-$\text{su}$ (22.06, 17)\textsuperscript{116} 'added', $\text{U}$-$\text{TA}$-$\text{TU}$-$\text{U}$ (10.02, 44, 52) 'they are damaging').\textsuperscript{117} Once, we find the sign $\text{TUM}$ = $\text{TU}$, in $\text{BA-AL}$-$\text{TU}$-$\text{tu}$-$\text{ma}$ (31.02, 11) 'alive', but this is due to the fact that we are here dealing with the syllable $\text{tum}$: we could also transliterate $\text{BA-AL}$-$\text{TU}$-$\text{tu}$-$\text{ma}$.

It should be noted that the sign $\text{TU}$ does not occur in Alalah.

Our conclusions should be the following. The forms that contain the syllable $\text{fa}$ show a preference for being spelled with the sign $\text{DA}$ = $\text{TA}$ (10 out of 16, three others being spelled with $\text{HI}$ = $\text{TA}$, and the remaining three being spelled with $\text{TA}$ = $\text{TA}$).\textsuperscript{118} This seems to indicate that the emphatic stop $\text{f}$ was phonologically distinct from the voiceless stop $\text{f}$. The syllable $\text{fu}$ is always spelled with the sign $\text{FU}$ = $\text{TU}$ (9 times), and not with $\text{DU}$, which shows that the emphatic stop $\text{f}$ was distinct from the voiceless stop $\text{f}$ as well. The combination of these two insights leads to the conclusion that Alalah Akkadian must have had three distinct dental phonemes, namely voiceless $\text{f}$, voiced $\text{d}$ and emphatic $\text{f}$.

\begin{footnotes}
\textsuperscript{115} Cf. Giacumakis (1970, 109), who derives this form from $\text{ebu}$ 'to sink, impress' (pace CAD B, 257, which rather reads $\text{lit}ebi$ 'may remove' as if belonging to the verb $\text{ebu}$).
\textsuperscript{116} Falsey cited by Giacumakis (1970, 109) as "$\text{tu-uh-su}".
\textsuperscript{117} The interpretation of the form $\text{ma-ad}$-$\text{su}$ in 41.32, 1, which is transliterated by Zeek (2001, 533) as "$\text{mu-ur}$-$\text{ti}$" (correctly "$\text{mu-ur}$-$\text{ti}$"), is far from clear, cf. the discussion by Zeek (2001, 452-3).
\textsuperscript{118} Cf. the spelling $\text{ba}$-$\text{al}$-$\text{tu}$-$\text{ma}$ in 31.01 A, 16.
\textsuperscript{119} If we include the personal names containing $\text{-tab}$ (cf. footnote 114) in these numbers, we see a much clearer distribution: 32 times $\text{DA}$, 3 times $\text{HI}$, and 4 times $\text{TA}$.
\end{footnotes}
with the sign PA = ḫa.126 Again, we see that the vast majority of forms (97.6 % and 97.7 %, respectively) are spelled with the correct stop, which indicates that p and b must have been distinct phonemes.

All in all, we must conclude that in Alalāḫ Akkadian there was a phonemic distinction between all members of the dental series (t, d, ð), the velar series (k, g, q) and the labial series (p, b). In the following table I have indicated for each syllable which sign is most commonly used in writing it.

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>e</th>
<th>i</th>
<th>u</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dентals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>TA</td>
<td>TE</td>
<td>TI</td>
<td>TU</td>
</tr>
<tr>
<td>d</td>
<td>DA</td>
<td>--127</td>
<td>DI</td>
<td>DU</td>
</tr>
<tr>
<td>ð</td>
<td>DA = TA</td>
<td>TE = TEq</td>
<td>DI = TI</td>
<td>TU = ḫu</td>
</tr>
<tr>
<td><strong>velars</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k</td>
<td>KA</td>
<td>KI = KE</td>
<td>KI</td>
<td>KU</td>
</tr>
<tr>
<td>g</td>
<td>GA</td>
<td>GI = GE</td>
<td>GI</td>
<td>GU</td>
</tr>
<tr>
<td>q</td>
<td>QA</td>
<td>KI = QE</td>
<td>KI = QI</td>
<td>KU = QU</td>
</tr>
<tr>
<td><strong>labials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>PA</td>
<td>BI = PĒ</td>
<td>BI = PĒ</td>
<td>PU</td>
</tr>
<tr>
<td>b</td>
<td>BA</td>
<td>BE</td>
<td>BI</td>
<td>BU = PU</td>
</tr>
</tbody>
</table>

For the sake of convenience, I also give here a corresponding table for the Hittite spelling practices as unravelled above.

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>e</th>
<th>i</th>
<th>u</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dентals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ð/t/</td>
<td>TA</td>
<td>TE</td>
<td>TI128</td>
<td>TU</td>
</tr>
<tr>
<td>ð²/t/</td>
<td>DA = TA</td>
<td>TE = TEq</td>
<td>TI = TU</td>
<td></td>
</tr>
<tr>
<td><strong>velars</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ð/k/</td>
<td>KA</td>
<td>KI = KE</td>
<td>KI</td>
<td>KU129</td>
</tr>
<tr>
<td>ð/g/</td>
<td>GA</td>
<td>GI = GE</td>
<td>GI</td>
<td>--</td>
</tr>
<tr>
<td>ð/q/</td>
<td>QA</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>labials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ð/p/</td>
<td>PA</td>
<td>BI = PĒ</td>
<td>BI = PĒ</td>
<td>PU</td>
</tr>
</tbody>
</table>

As we see, there is a perfect match between the two tables.

---

126 ḫa-lat-ak-ka-tu (23.05, 12) ‘they act against an agreement’ (on the same tablet we find aberrant i-mi-ti-tē-tu (14) ‘his right hand’ as well), ḫa-ap-pi-ti (41.13, 16) ‘malt’.

127 The syllable de is unattested in texts from Alalāḫ VII. In texts from Alalāḫ IV, it is spelled with the sign TE = DEq (I-deq (AIT 297, 17) ‘he knows’ and ti-deq (AIT 297, 21) ‘you know’).

128 Before /t/ there is no opposition between /t/-t/ and /ð²/-t/.

129 Before /u/ there is no opposition between /k/-k/ and /g/-g/.

---

Bibliography


– (1999): Hittite Historical Phonology. Innsbruck


- (1994): Anatolian Historical Phonology. Amsterdat/Atlanta
Sturtevant, E. H. (1932): The development of stops in Hittite, JAOS 52, 1–12