6. Laryngeal features

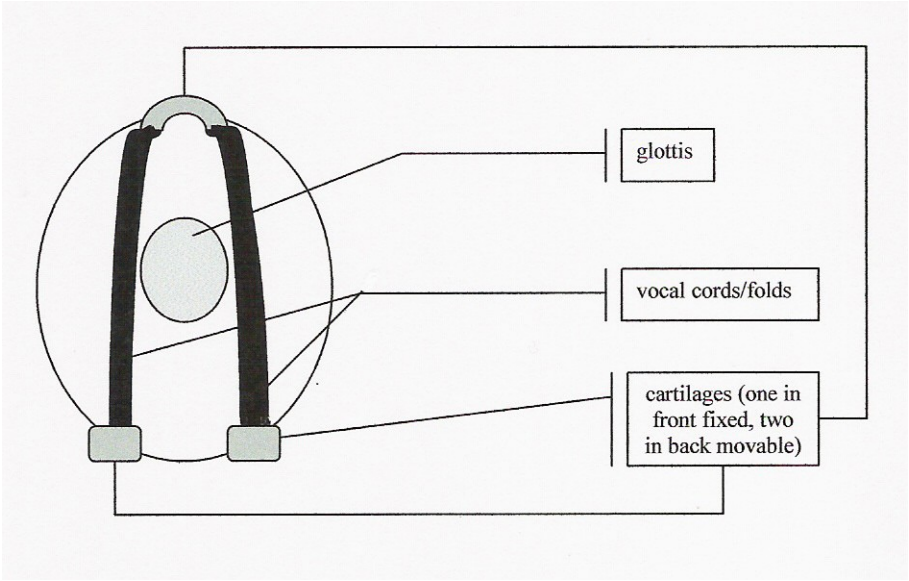
Before you study this chapter, check whether you are familiar with the following terms: allomorph, allophone, aspiration, devoicing, frequency, glottalization, glottal stop, glottis, hiatus, larynx, organs of speech, phoneme, pulmonic egressive airstream, root, sibilant, suffix, syllabic consonant, utterance, vocal cords/folds, voice assimilation, voiced, voiceless, voicing

In this chapter we take a look at the articulatory role of the glottis, the vocal cords/folds and all the different phenomena that are related to the operation of the larynx. This includes voicing and voicelessness, (a comparison of English and Hungarian) voice assimilation, devoicing, aspiration and glottalization, and the effect of voicelessness on preceding vowels, Pre-fortis Clipping.

Recall from Chapter 1 that the basic mechanism that is used to produce speech sounds in English and Hungarian is a pulmonic egressive airstream mechanism. Having left the lungs, the air continues upward in the windpipe up to the **larynx** – the front, shield-like part of which is called **Adam's apple** – then into the pharynx and the supraglottal cavities, the oral and nasal cavities. In the larynx it has to pass between the **vocal cords/folds**, two bundles of muscle, which may produce numerous different effects. Before discussing these, let us take a look at the structure and parts of the larynx and their different configurations.

As it can be seen in the diagram, the larynx consists of some **cartilages** – one fixed in the front and two movable ones in the back, plus one more on the top not shown in the diagram, the epiglottis, which can close the windpipe, and a circular one serving as the frame for the larynx –, the

vocal cords connecting the cartilages, and the opening between them, the **glottis**. Depending on how tense the muscles of the vocal cords are, the two cartilages in the back will move closer together or further apart. This way the vocal cords will close or open the glottis to different degrees.



When the vocal cords are wide apart then silent breathing is produced. When the vocal cords are slightly pulled together but still do not close the glottis and no vibration is produced, voiceless consonants are articulated. If the vocal cords are pulled a bit closer together than in the case of voiceless consonants, a voiceless glottal [h] sound is produced. In another configuration the elastic vocal cords are pulled together and the outflowing air pushes them apart and then, because of their elastic nature, they return into their original position. This is repeated periodically at a rate of about 120 times in average in males and about 220 times in average in females (that is, the basic frequency in males is about 120 Hz and about 220 Hz in females), this way producing **vibration**, that is, voiced sounds. This mechanism is very similar to when children put a blade of grass or a piece of a leaf between their two thumbs and then blow it producing a high pitch trumpet-like noise. In

both cases it is a flexible, elastic string – the vocal cords or the blade of grass – that is forced to move in a fast, periodic way.

Finally, it is possible to produce a total closure, a complete obstruction to stop the air in the larynx. This way a glottal stop is produced, the sound often heard in the pronunciation of words like *bottle* [ˈbɒʔɬ] or [ˈbɒˀtɬ] in British dialects (mentioned in Chapter 2 and discussed in more detail below), and in Hungarian as an extralinguistic device to express surprise in [oʔˈoː] or to optionally break up a hiatus – the sequence of two vowels – in words like *kiiktat* [ˈkiʔiktɒt].

Let us now take a look at how English makes use of the qualities ***voiced*** and ***voiceless*** in the different classes of speech sounds. To start with the easy part, consider vowels first: as all vowels are always produced as voiced, we can say that voicing is not a distinctive quality in vowels, i.e., it does not distinguish vowels from each other. Voiceless vowels are only used when whispering, partially devoiced vowels – vowels which have lost part of their voicing, the very beginning, the first few milliseconds of the vowel being voiceless – occur after aspirated stops, a topic already discussed in Chapter 2 and to be discussed later in this chapter. Sonorant consonants behave in a very similar way to vowels: they are always voiced by default and they only become partially devoiced after aspirated stops.

This leaves us with obstruents: stops, fricatives and affricates. If one takes a look at the table of manners and places of articulation in Chapter 2, then it is easy to see that obstruents occur in voiced-voiceless pairs or to put it very simply: in the obstruent part of the table there are always voiced-voiceless pairs of stops, fricatives and affricates at each place of articulation. The only exceptions seem to be the glottal stop and /h/. The glottal fricative does not have a voiced counterpart in English – as opposed to Hungarian,

where the phoneme /h/ does have a voiced allophone [ɦ] occurring between sonorants, e.g., *konyha* ['koɲɦɒ], but not a separate voiced glottal /ɦ/ phoneme.

The most interesting aspect of the voicing of obstruents is the stability of voicelessness and the relative instability of voicedness in English. The so-called voiced obstruents of English are very often realized by a partially or fully devoiced allophone – this **devoicing** is represented in transcription by a small circle below the symbol of the sound, e.g., [z̥]. As English voiced obstruents seem to be voiced only phonologically (i.e., they only *behave* as if they were voiced) in many cases, two other terms have been introduced instead of voiced and voiceless: **lenis** (Latin for 'weak') and **fortis** (Latin for 'strong'). Lenis obstruents are weak and often lose their underlying voiced quality; they are phonologically voiced and may be realized by voiced or voiceless speech sounds in actual pronunciation depending on the environment. Fortis obstruents, on the other hand, are strong, and are thus always realized by voiceless speech sounds.

The devoicing process affecting lenis consonants typically applies in utterance-initial, utterance-final positions and next to fortis obstruents.

Utterance-initial	Utterance-final	Next to a fortis sound	
(a)	(b)	(c)	(d)
Bravo! [ˈb̥rɑːvəʊ]	*Mad!* [ˈmæd̥]	*obtain* [əb̥ˈtʰeɪn]	*matchbox* [ˈmætʃb̥ɒks]
Good! [ˈg̊ʊd̥]	*Go ahead!* [əˈhed̥]	*cheesecake* [ˈtʃiːz̥kʰeɪk]	*baseball* [ˈb̥eɪsb̥ɔːɬ]
Zany! [ˈz̥eɪnɪ]	*Think big!* [ˈb̥ɪg̊]	*bigfoot* [ˈb̥ɪg̊fʊt]	*cookbook* [ˈkʰʊkb̥ʊk]
Damn! [ˈd̥æm]	*Bob!* [ˈb̥ɒb̥]	*eggghead* [ˈeg̊hed̥]	*life gear* [ˈlaɪfg̊ɪə(r)]
Very much! [ˈv̥erɪ]	*Leave!* [ˈliːv̥]	*roadster* [ˈrəʊd̥stə(r)]	*Shoot back!* [ˈʃuːt ˈb̥æk]

In (a) and (b), in utterance-initial and -final position, i.e., before or after a pause, lenis obstruents often devoice at least partially: in initial position it is typically the beginning of the obstruent that is voiceless while in final position it is the end. This is probably the consequence of the fact that there is a timing difference between the beginning or end of vocal cord vibration (voicing) and the beginning or end of the closure. In initial position closure is produced first and voicing starts only a few milliseconds later, while in final position voicing stops first and only after that is the stop released. Note that Hungarian is different in this respect as there is no such devoicing in initial or final position. The voicing of obstruents normally starts before the closure is produced and voicing only ends after the closure ceases – Hungarian is said to have **pre- and postvoicing** in obstruents.

In column (c) all the sample words contain a lenis obstruent followed by a fortis one. As a result of the influence of the fortis (voiceless) sounds, the preceding obstruents become devoiced, partially or fully voiceless. It is similar to what happens in identical Hungarian clusters.

English		Hungarian	
(c)	(d)	(e)	(f)
ob̲tain [əbˌˈtʰeɪn]	*matchb̲ox* [ˈmætʃbˌɒks]	*rab̲tól* [ˈrɒptoːl]	*match̲box* [ˈmɛdʒboks]
chees̲ecake [ˈtʃiːz̬kʰeɪk]	*base̲ball* [ˈbˌeɪsbˌɔːɬ]	*réz̲karc* [ˈreːskɒrts]	*bas̲eball* [ˈbeːzboːl]
bigfoot [ˈbˌɪgfʊt]	*cookb̲ook* [ˈkʰʊkbˌʊk]	*hangfal* [ˈhɒŋkfɒl]	*tök̲ből* [ˈtøgbøːl]
eggghead [ˈeg̬hedˌ]	*life gear* [ˈlaɪfg̬ɪə(r)]	*éghez* [ˈeːkhɛz]	*afgán* [ˈɒvgaːn]
road̲ster [ˈrəʊdˌstə(r)]	*Shoot b̲ack!* [ˈʃuːt ˈbˌæk]	*road̲ster* [ˈroːtstɛr]	*kert̲ből* [ˈkɛrdbøːl]

As it can be seen, whenever a fortis and a lenis obstruent of English occur adjacently, one of them changes its voice quality. Similarly, whenever a Hungarian voiced and voiceless obstruent occur adjacently, one of them has to change its voice value. We may call this a case of **voice assimilation** by which the voicing of one sound becomes identical to that of a neigbouring one. It is called **regressive** if the sound that changes precedes the sound that influences it, and it is called **progressive** in the opposite case.

The difference between the lenis+fortis case in the English and Hungarian examples – columns (c) and (e) – is manyfold: devoicing is not necessarily complete in English, but it is in Hungarian as indicated by the difference in the symbols; devoicing is not obligatory in English but it is in Hungarian – but assimilation is regressive in both languages. As for the difference between the fortis+lenis cases – columns (d) and (f) – the difference is even bigger. It is not just a matter of degree – partial or complete – and nature – optional or obligatory – but also a matter of value: in English the lenis obstruent assimilates to the fortis one – devoicing applies –, in Hungarian it is the fortis obstruent that assimilates to the lenis one – voicing applies. Consequently, in English we see progressive devoicing while in Hungarian we see regressive voicing. That is, it seems that in English it is the result of assimilation that is fixed – it is always voicelessness –, while in

Hungarian it is the direction – it is always regressive. The following table sums up the differences between voice assimilation and devoicing in English and Hungarian.

English	**Hungarian**
► optional	► obligatory
► partial or complete	► complete
► its result is always devoicing	► its result may be devoicing or voicing
► may be regressive or progressive	► always regressive
► initial or final devoicing may apply	► no initial or final devoicing

There is one more special area of English voice assimilation that we have to mention here: the assimilation of the suffixes *-s* 'plural', '3rdSg' or 'possessive' and *-ed* 'past tense' or 'past participle'. Normally it is assumed that the basic forms of these suffixes are /z/ and /d/, respectively, as these are the ones that appear after vowel-final roots. These forms then assimilate to the root-final consonants.

/z/	**/s/**	**/ɪz/**
legs /ˈlegz/	*kicks* /ˈkɪks/	*churches* /ˈtʃɜːtʃɪz/
tabs /ˈtæbz/	*blokes* /ˈbləʊks/	*judges* /ˈdʒʌdʒɪz/
heads /ˈhedz/	*taps* /ˈtæps/	*bushes* /ˈbʊʃɪz/
means /ˈmiːnz/	*turnips* /ˈtɜːnɪps/	*garages* /gəˈrɑːʒɪz/
girls /ˈgɜːlz/	*hats* /ˈhæts/	*kisses* /ˈkɪsɪz/
ways /ˈweɪz/	*laughs* /ˈlɑːfs/	*buzzes* /ˈbʌzɪz/
shows /ˈʃəʊz/	*baths* /ˈbɑːθs/	*stretches* /ˈstretʃɪz/

As can be seen in the last column of the table, /ɪz/ is used after the sounds /tʃ/, /dʒ/, /ʃ/, /ʒ/, /s/, and /z/, that is, after sibilant consonants, as it would be difficult to pronounce the sibilant /z/ of the suffix after the root-final sibilants. The first column of the table shows that the basic form /z/ is used after all non-sibilant voiced sounds – both consonants and vowels – while the second column demonstrates that /s/ occurs after voiceless non-sibilants. All in all, we can say that the suffix consonant progressively assimilates to the root-final consonant. We have to remember, though, that this voice assimilation is different from the devoicing cases in that it is always complete, progressive and obligatory.

The suffix *-ed* behaves in a very similar way to *-s* presented above.

/d/	/t/	/ɪd/
begged /ˈbegd/	*clicked* /ˈklɪkt/	*wanted* /ˈwɒntɪd/
robbed /ˈrɒbd/	*ripped* /ˈrɪpt/	*mended* /ˈmendɪd/
advised /ədˈvaɪzd/	*laughed* /ˈlɑːft/	*protected* /prəˈtektɪd/
depraved /dɪˈpreɪvd/	*passed* /ˈpɑːst/	*beheaded* /bɪˈhedɪd/
damaged /ˈdæmɪdʒd/	*kissed* /ˈkɪst/	*located* /ləˈkeɪtɪd/
contained /kənˈteɪnd/	*hushed* /ˈhʌʃt/	*paraded* /pəˈreɪdɪd/
filled /ˈfɪld/	*stretched* /ˈstretʃt/	*navigated* /ˈnævɪgeɪtɪd/
followed /ˈfɒləʊd/	*attached* /əˈtætʃt/	*vaccinated* /ˈvæksɪneɪtɪd/

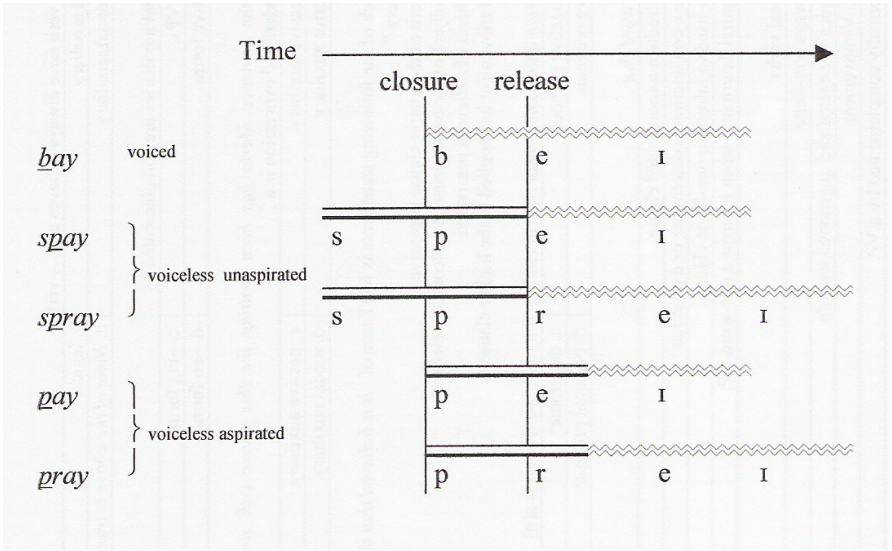
In the last column, after root-final alveolar stops /t/ and /d/, the /ɪd/ allomorph is used, as an /ɪ/ is inserted between the two alveolar stops. After all other voiced root-final phonemes the basic variant /d/ is used while after all other

voiceless root-final phonemes a /t/ allomorph occurs. This assimilation process is also always complete, obligatory and progressive.

Now we turn to laryngeal processes other than voicing. In Chapter 2, **aspiration** is mentioned as one of the processes affecting the voiceless plosives /p t k/, but it is left unexplained what exactly aspiration is phonetically. We know that it has two forms. One is the short [^{h}]-like sound following the plosive, which is in fact not a separate sound segment but merely the acoustic impression that we get due to the first half of the following vowel being devoiced. As you know, all vowels are normally voiced, i.e., their articulation involves vocal cord vibration. In words like *pay* [p^{h}eɪ], the /p/ is voiceless, and its voicelessness spreads onto the vowel, as a result of which the vocal cord vibration characteristic of all vowels starts much later than the release of the plosive and the onset of the vowel. Therefore, what is heard right after the burst of the plosive is a short period with a voiceless vowel (= open vocal cords plus no considerable obstruction to the airflow in the oral cavity), which is, phonetically, identical with /h/ (= open vocal cords plus no considerable obstruction to the airflow in the oral cavity).

The other manifestation of aspiration is the devoicing of a following sonorant consonant in words like *play* [p̥leɪ], *true* [t̥ruː], *quick* [kw̥ɪk]. Of course, the two forms of aspiration are not unrelated, on the contrary, they are the same: the voicelessness of the plosive spreads onto the following segment. Whether it is a vowel or a consonant, its vocal cord vibration lags well behind the release of the plosive. This is schematically represented in the diagram below. The two parallel lines symbolize the vocal cords; when they are straight, there is no vibration, when they zigzag, there is. In *b̲ay*, we have a voiced plosive; in *sp̲ay* and *sp̲ray*, a voiceless unaspirated one owing to the

preceding /s/; in *pay* and *pray*, a voiceless aspirated /p/, which devoices the following vowel and sonorant, respectively.[1]



Another process caused by laryngeal activity is **glottalization**. As it is explained in Chapter 2, the voiceless plosives /p t k/ (and also /tʃ/) are in certain positions accompanied by a short closure of the vocal cords, i.e., by the so-called glottal stop ([ʔ]), e.g., *bat* [b̥æʔt], *actor* [ˈæʔktə(r)], *teacher* [ˈtʰiʔtʃə(r)]. This is called **glottal reinforcement**. Sometimes, especially before a syllabic /n/, a /t/ can be completely replaced by it, that is, **glottal replacement** can take place, e.g., *button* [ˈb̥ʌʔn̩]; in several non-standard varieties of English, especially London English, this can even happen in words like *let* [leʔ], *butter* [ˈb̥ʌʔə] (or [ˈb̥ʊʔə]) or *city* [ˈsɪʔɪ]. What connects these examples to the previous discussion is the fact that the production of the glottal stop involves the movement of the vocal cords only, and no gesture above the larynx.

[1] We ignore the slight devoicing of /b/ at the beginning of *bay*.

A final rule that belongs to laryngeal processes – although not a strictly laryngeal one – is the way fortis consonants influence the phonetic length of the preceding vowel. If a long vowel – monophthong, diphthong or triphthong – is immediately followed by a fortis consonant or a nasal and a fortis consonant within the word, then the vowel will be shortened or clipped, hence the name of the process, **Pre-fortis Clipping**. Long vowels become approximately as short as real, phonologically short vowels but it is important to remember that there is no change in the quality of the vowels at all. Remember (from Chapter 3) that the phonologically short but phonetically long vowel /æ/ behaves identically in this respect, i.e., it patterns exactly like phonologically long vowels do. The change in vowel length is indicated in narrow, phonetic transcription with the symbol [ˑ] instead of [ː] after the vowel.

long monophthong	shortened long monophthong	long diphthong	shortened diphthong
balloon [b̥əˈluːn]	*boot* [ˈb̥uˑt]	*obey* [əˈbeɪ]	*mistake* [mɪˈsteɪk]
believe [b̥ɪˈliːv̥]	*speak* [ˈspiˑk]	*decide* [d̥ɪˈsaɪd̥]	*tonight* [tʰəˈnaɪt]
store [ˈstɔː(r)]	*sports* [ˈspɔˑts]	*allowing* [əˈlaʊɪŋ]	*bounce* [ˈb̥aʊns]
star [ˈstɑː(r)]	*start* [ˈstɑˑt]	*towed* [ˈtʰəʊd̥]	*boat* [ˈb̥əʊt]
stir [ˈstɜː(r)]	*shirt* [ˈʃɜˑt]	*cleared* [ˈkl̥ɪəd̥]	*fierce* [ˈfɪəs]
span [ˈspæn]	*attacked* [əˈtʰækt]	*destroy* [d̥ɪˈstrɔɪ]	*catering* [ˈkʰeɪtərɪŋ]
carnival [ˈkʰɑːnɪvɨ]	*dance* [ˈd̥ɑˑns]	*staring* [ˈsteərɪŋ]	*spouse* [ˈspaʊs]
spawn [ˈspɔːn]	*daunting* [ˈd̥ɔˑntɪŋ]	*curious* [ˈkj̊ʊərɪəs]	*biting* [ˈb̥aɪtɪŋ]

Note that in the case of the vowel /æ/ we cannot indicate shortening as the vowel is classified as a phonologically short vowel and, as a result, the phonetic length of the vowel is not indicated with the colon originally. The case of diphthongs is similar: their length is encoded in the combination of

two symbols rather than a length mark – since neither of the two elements is lost through clipping, we are again unable to show this phonetic shortening in our transcriptions.

What is intriguing about Pre-fortis Clipping is that it is clearly conditioned by the fortis character of the following consonant, rather than its voicelessness. Recall that lenis obstruents systematically become devoiced/voiceless in, for instance, utterance-final position, e.g., *said* [sɛd̥]. Still, a preceding long vowel remains long, e.g., *seed* [siːd̥], as opposed to words like *seat* [siˑ̥t], where the consonant following the vowel is not only voiceless but also fortis. Similarly, the /aɪ/ is much shorter in *write* [raɪt] than in *ride* [raɪd̥], and the /æ/ is much shorter in *atom* [ˈætəm] than in *Adam* [ˈædəm]. In the so-called tapping dialects of English, mentioned in Chapter 2, the distinction between /t/ and /d/ may be lost in certain positions, both being replaced by a tap, but the length of the vowel is still there to show the fortis/lenis character of the original consonant: short in *atom* [ˈærəm] but long in *Adam* [ˈærəm]; short in *writing* [ˈraɪɾɪŋ] but long in *riding* [ˈraɪɾɪŋ]; short in *seater* [ˈsiɾə(r)] but long in *seeder* [ˈsiːɾə(r)]. The duration of the vowel ultimately becomes the indirect indicator of the nature of the following consonant.

To sum up the discussion of laryngeal processes, we can state that the vocal cords play a crucial role in the articulatory process not only in determining the voicedness of speech sounds, but also in producing individual segments like /h/ or the glottal stop. In addition, they are responsible for certain phenomena, e.g., devoicing, aspiration and glottalization, which constitute some of the most significant allophonic rules that English consonants undergo. We have also seen that although both Hungarian and English obstruents take part in voicing assimilation, there is a

huge difference between the two languages: in Hungarian, the direction of the assimilation is fixed (namely, it always proceeds from right to left), whereas in English the output of the process is fixed (namely, it always results in voicelessness). Finally, it has been demonstrated how complex an interaction exists between the vocal cord activity characterising a consonant and the phonetic length of the preceding vowels.