We saw in Chapter 4 that certain sounds are not free to occur in particular environments. Sometimes this leads to allophonic variation, as in the case of Aspiration; sometimes it causes neutralisation. We will now take a look at some more examples.

Let us start with a very simple case from Hungarian. If you observe sequences of two obstruents in this language, you’ll find that both obstruents must have the same value for voicing: they must be either both voiced or voiceless. So, for instance, piszkál, patkány, sport, futball (= db!), Mézga, lagzi, etc. are okay, but combinations like *zk, *dk, *sp, *gs, *dp, etc. would not be possible.1 Inside a morpheme, therefore, we do not find clusters of obstruents whose members disagree in voicing. Often, however, morphemes are combined. For instance, the suffix morpheme –től/-től can be added to nouns or adjectives, e.g., nőtől, szobától, lánytól, etc. The suffix begins with a voiceless obstruent; what happens if it is added to a word that ends in a voiced obstruent, as ház, bab, mag, MAV, etc.? The combination of these words with the suffix yields ill-formed sequences such as *kt, *bt, *gt, *vt. What does the phonology do to “repair” these ill-formed sequences?

Theoretically, there are several possibilities: the sequence could be broken up by inserting a vowel in between; one of the consonants could be deleted; or, one of the consonants could change its voicing value to adjust it to that of the other consonant. This option is taken in Hungarian: the first consonant of the cluster — the last consonant of the stem — loses its voicing, assimilating (= becoming more similar) to the second, suffix-initial consonant: háztól is pronounced hastól, for example, rather than *haztól. The same happens if the last consonant of the stem is a voiceless obstruent, and the suffix begins with a voiced obstruent: the first assimilates to the second, becoming voiced, e.g., in vasban, mészben, kútban, pronounced with 3b, zb, db, respectively. Voicing assimilation in Hungarian is regressive: it acts backwards, that is, the voicing value of the second obstruent spreads onto the first.

Voicing assimilation works across words, too, that is, when two words are juxtaposed. Suffice it to mention examples like a ház teteje, savanykás bor, mássz be, with st, 3b, zb, resp. Note please that voicing assimilation results in one phoneme being replaced by another phoneme: e.g., /z/ → /s/ in háztól: that these are different phonemes is shown by minimal pairs such as méz — mész. In other words, voicing assimilation has a neutralising effect: the contrast between [+voiced] and [-voiced] is neutralised before a following obstruent. So, for instance, while méz and mész is a minimal pair, méztől and mésztől are not: they are homonyms, both being mestől. (If I say A légy a mestől fulladt meg, only the context will tell you if the poor insect was drowned in lime or honey.)

In English, voicing assimilation is more restricted: firstly, voiceless obstruents never undergo assimilation when followed by a voiced consonant. This is difficult for Hungarians, who automatically impose the voicing rule of their native language on English, pronouncing nice boy and black dog as *naiz bɔi and *blæg dɔŋ, resp., which are naiz bɔi and blæk dɔŋ, resp., in English. Secondly, regressive de-voicing is limited to fricatives (and affricates: note that they end in a fricative!), but not to plosives. So, dad came and big town, for instance, are dæd kɛm and big tɔn, rather than *dæt kɛm and *bɪt tɔn, as often pronounced by Hungarian learners. Let us now take a look at English Fricative Devoicing.

First of all, let’s see if inside English words it is possible to find a voiced fricative before a voiceless sound: do we find English words which contain sequences such as vt, zp, 1 There’s one single obstruent which misbehaves: /vl/, which permits voiceless consonants before it, cf. hatvan, kőszvény, etc. On the other hand, it is itself not possible before voiceless obstruents, in which sense it’s regular.
etc.? The answer is a sound “no”: there aren’t such words. Instances of a voiceless fricative followed by a voiceless sound are, on the other hand, very common, cf. after, grasp, ask, lofty, etc. This suggests that in English, there is a restriction on fricative + obstruent combinations, which we can formulate as in (1):

(1) *[+cont, -son, +voice] / ___ [-voice]

In prose: A voiced nonsonorant continuant (= a fricative) before a voiceless segment yields an ill-formed sequence.

Such restrictions on sound sequences are called constraints in phonology — because they constrain (restrict) the number logically possible sound combinations. One result of the constraint in (1) is that inside a word, we do not find a sequence of a voiced fricative + voiceless sound.

Let me remind you that there is a similar constraint we saw earlier — a constraint on consonant combinations: the ban on voiced plosives after s. As a result, we do not find sequences like *sb, *sd, *sg inside English words. This can be formulated as in (2):

(2) *[+cont, -son, +voice] / s ___

Hopefully, this simple formula doesn’t require a “prose statement” by now!

Both constraints act as well-formedness conditions on the shape of signs: they set a limit on what counts as a well-formed word in English.

Let us now return to voicing assimilation. We have said that in English, there’s Fricative Devoicing: voiced fricatives are devoiced when followed by a voiceless sound. Here are some examples:

(3) have turned  hæf tənd
cause to die  kɔːs tə dæi
breathe slowly  briːθ ˈslaʊliː:
garage to let  ˈɡærɪdʒ tə lɛt

Compare these with the pronunciation of the italicised words in (3) when uttered in isolation, or when followed by a voiced sound: hæv, kɔːz, briːθ, ˈɡærɪdʒ.

Based on these data, we can now say that a sequence of a voiced fricative + a voiceless sound is not found across a word boundary, either: if a word ends in a voiced fricative, and the next one begins with a voiceless sound, the voiced fricative loses its voicing. As a result, many English words have two pronounced forms: one with a final voiced fricative, and another with a final voiceless ones, e.g., hæv — hæf, kɔːz — kɔːs, etc. Nonetheless, it is reasonable to assume that such words are stored in a single form in memory: speakers do not learn both forms. Instead, these words are memorised as ending in a voiced fricative, and the replacement of the voiced fricative with a voiceless one is the result of an automatic phonological process:

(4) [+cont, -son, +voice] → [-voice] / ___ # [-voice]

In prose: A word-final voiced fricative loses its voice before a voiceless sound at the beginning of the following word. Note that the process changes the voicing value only: everything else remains unchanged. As a result, the voiced fricative is replaced by the voiceless one which is identical to it in all other respects. For instance, v becomes f, which is a labiodental fricative, too.
To sum up, the speaker stores these words in a single form in his/her mental lexicon. This form is called the lexical or underlying form. But due to the application of phonological processes, words are not always pronounced in their lexical form: their actual surface form may differ. Lexical forms are indicated in linguistics by double slants. For example, we can say that the lexical form of *cause* is //kɔ:z//, and the surface forms are [kʰɔz] and [kʰɔs]. The difference between the final consonants is due to the process formulated in (4). Note also that the surface forms are pronounced with an aspirated plosive, which is not indicated in the lexical form. This is because the lexical — mental — form, logically, consists of phonemes, as allophonic differences are rule-governed, and the speaker doesn’t store allophonic variants in his/her memory (in fact, the speaker isn’t even aware that they exist)!

Now, note please that Fricative Devoicing, just like Hungarian Voice Assimilation, is a neutralising process: it eliminates the possibility of contrast. In other words — as all neutralising processes — it turns a phoneme into another phoneme. (If a process doesn’t turn a phoneme into another one, it’s an allophonic rule, such as Aspiration.) If we now want to give a broad — phonemic — transcription, or representation, of, say, *cause a problem* and *cause to die*, we can give the following: /kɔz ə prəbləm/, /kɔs ə dɛi/. This is logical: since /s/ and /z/ are different phonemes, a change from one to the other must be reflected in a transcription that denotes phonemes. All in all, the morpheme *cause* has the following representations:

(5)

Lexical (underlying) representation:

//kɔ:z//

Phonemic representations:

/kɔ:z/ /kɔ:s/

Surface (phonetic) representations:

[kʰɔz] [kʰɔs]

The lexical form is, then, the form the word is stored in memory. It isn’t necessarily pronounced in that form, though: phonological processes can apply to it. In this example, Fricative Devoicing may apply (of course, only if the next word begins with a voiceless consonant!!!); if it does, it alters the word’s final *z* into a *s*. This a change at the phonemic level, reflected in the phonemic representation. If the next word doesn’t begin with a voiceless consonant, the *z* remains unchanged. Aspiration applies in both cases, so the word always surfaces with an aspirated plosive. This, however, is but an allophonic rule, it’s not a change at the phonemic level.

We have, then, assumed the existence of a Fricative Devoicing process (4). Note, however, that voiced fricatives before a voiceless consonant are not possible in English inside a word: this is what we formulated in (1). The net result of (1) and (4) is that we never encounter a sequence of a voiced fricative + a voiceless consonant in English! In other words, we can say that the constraint in (1) applies not only inside words, but also across word boundaries. It is not a constraint on the shape of words: it is a constraint on sound sequences, irrespective of whether or not the members of the sequence are inside one word or not. To understand the relevance of this, let us examine the constraint in (2). Does it apply across word boundaries? To put it differently, do we encounter the sequences *sb, sd, sg* when the *s* and the following plosive are in different words?

As we have already mentioned, the answer is “yes”: a word ending in *s* can be happily followed by another one which begins with a voiced plosive, e.g., *this boy, face death, nice*.
The constraint in (2), therefore, is different from (1): it doesn’t ban the sequences $sb$, $sd$, $sg$ across the board, only inside a morpheme. It is a constraint on the well-formedness of words. As opposed to this, (1) is a constraint on the well-formedness of sound strings. In other words, both constraints restrict the lexical form of words, but (1) goes further and applies across words, too. Constraints which apply to lexical items (words) only are called lexical, such as (2); constraints that apply to sound strings (and, therefore, apply across words, too) are called post-lexical. Phonologists say that the domain of the application of lexical constraints is the word; the domain of post-lexical constraints is the utterance, that is, a sound string without an internal pause.

We can now say that the process of Fricative Devoicing (as in (4)) is simply an automatic consequence of the fact that (1) is a post-lexical constraint: if two words are joined, and the first one ends in a voiced fricative and the second begins with a voiceless sound, the combination yields a sequence which is ill-formed according to (1). The process in (4) steps in, therefore, to “repair” the ill-formed sequence by devoicing the fricative, making the sequence conform to (1). A process which applies across words, not surprisingly, is a post-lexical process. Hungarian Voicing Assimilation is a post-lexical process, too. Now, an important note: please pay attention not to confuse processes and constraints: the former turn something into something else, while the latter are bans prohibiting certain combinations.

Let us now see our old friends, the allophonic rules of L-Darkening and Aspiration. Are they lexical or post-lexical? Specifically, do they apply across words, or only inside them?

The answer for L-Darkening is, hopefully, easy to give. You will remember that L-Darkening takes the first sound of the following word into consideration, so that a mi-lee to-go is pronounced with a dark [v], since to begins with a consonant; a mile away, however, is pronounced with a clear [l], because away begins with a vowel. L-Darkening is, then, a post-lexical rule.

What about Aspiration? Recall that Aspiration doesn’t take place if the voiceless plosive is preceded by s within the same word, as in sky, restore, spin. If Aspiration is post-lexical, a word-final s should prevent it from applying to the initial voiceless plosive in the following word. So, for example, face Tony should be pronounced with an unaspirated [t]: *[feis ˈtaunɪ:] As indicated by the asterisk, this isn’t what we find: the actual pronunciation is [feis ˈθaunɪ:]. Similarly, face Kate and face Pete contain a [kʰ] and a [tʰ], respectively. This means that Aspiration only applies within words: a word-initial voiceless plosive is always aspirated, even if the preceding word begins with a s. That is, Aspiration is a lexical process.

Sometimes a process can apply within words as well as across words, but differently. A good example is English Palatalisation. The term palatalisation means a process whereby non-palatal sounds become palatal or palato-alveolar. Hungarian has a palatalisation process, applying when certain suffixes beginning with j are added to the stem. Such a suffix is the 3rd person singular suffix –ja, as in fogja, kapja, várja, bánja, látja, adja, etc. If the stem ends in a coronal stop (= t, d, n), the Yod (itself palatal) of the suffix turns the coronal stop into a corresponding palatal one\(^2\); the Yod itself disappears, but the stop is lengthened (unless preceded by a consonant). So, bán, lát, ad end in a coronal stop underlyingly, but bánja, látja, adja are pronounced with long palatal stops, viz. [bː], [lː], [aː], resp., rather than with [nj], [tj], [dj]. (As if written bánnya, láttya, aggya, but note that the spelling reflects the underlying forms here.) This is a lexical process in Hungarian, as it only applies inside words: if the Yod is in the following word, nothing happens: lát jól as in Józsi bácsi nem lát jól is not pronounced *[laxcoːl], but latʃʃoːl. (Not as if it was written láttyol.)

\(^2\) Corresponding, of course, means that the two stops differ in place only, e.g., t and c, both being voiceless plosives but the former is coronal, the latter palatal.
English palatalisation is different. First, it applies to alveolar obstruents, i.e., t, d, s, z. Second, it is also applied in a different way. Consider what happens inside words. Several English suffixes begin with a Yod. One of them is -ju, spelled <-u>, as in annual ‘ænju. If it is added to a stem which ends in an alveolar obstruent, the obstruent becomes palato-alveolar, and the Yod is dropped. The alveolar stops become the affricates tf, dz; the fricatives yield f, z, i.e., they only change their place of articulation. Examples:

(6) 

sensual  sens + ju → 'sensju  Cf. sense
sexual  seks + ju → 'seksju  Cf. sex
gradual  græd + ju → 'grædu  Cf. grade
ritual  rit + ju → 'ritju  Cf. rite

Palatalisation often happens across words, too. Consider the following:

(7) 

hit you  hit ju:  Or:  htsu:
lead you  lidd ju:  Or:  lizu:
this year  dis jia  Or:  disia
praise you  prez ju:  Or:  prezzi:

As suggested by the alternatives — one with, another without palatalisation —, palatalisation across words is optional. Whether or not it occurs is dependent on the speaker, as well as speech tempo, etc.; in fast speech, it is more likely to happen, for example. A process which is not obligatorily applied is, then, optional. Compare this to obligatory processes such as L-Darkening: such processes always apply. Now, it is important to emphasise that obligatory and optional are not used in the prescriptive sense, i.e., they are not applied according to teachers’ instructions at school or the requirements of rhetorics: instead, obligatory simply means that speakers follow it consistently, without actually being aware of it.

We can then say that Palatalisation in English is optional as a post-lexical process, but obligatory as a lexical one. In this sense, there are two palatalisations in English: a lexical and a post-lexical one. Finally, it must be noted that the obligatoriness of lexical palatalisation applies to AdvRP; in ConsRP, it is variable. The word sexual, for instance, is — according to the LPD — always pronounced with palatalisation (= no one says *seksju), while gradual is pronounced both ways (‘grædu as well as ‘grædu), but the unpalatalised variant is rare; on the other hand, LPD gives ‘sensju as the more frequent pronunciation of sensual.

This concludes our discussion of phonological processes for the time being, but we’ll have the opportunity to return to them later on.