Phonetics and Phonology
Seminar *Introduction to Linguistics*, Andrew McIntyre

1 Phonetics vs. phonology

- **Phonetics** deals with three main areas:
  - Articulatory phonetics: speech organs & how they move to produce particular sounds.
  - Acoustic phonetics: what happens in the air between speaker & hearer; measurable using devices such as a sonograph, which analyses frequencies.
  - Auditory phonetics: how sounds are perceived by the ear, how the brain interprets the information coming from the ear.
- **Phonology**: study of how particular sounds are used (in particular languages, in languages generally) to distinguish between words. Study of how sounds form systems in (particular) languages. Examples of *phonological* observations:
  - The underlined sound sequence in German *Strumpf* can occur in the middle of words in English (*ashtray*) but not at the beginning or end.
  - In *pan* and *span* the *p*-sound is pronounced slightly differently. Some languages treat them as variants of the same sound (e.g. English), others do not (e.g. Hindi).
- Phonetics deals mainly with *physical* phenomena, and phonology more with *mental* ones.
- Often one cannot study phonetics and phonology in complete isolation from each other.

2 Transcription

- **Transcription**: Since spelling (especially in English) does not always reflect pronunciation, there are internationally accepted conventions for writing sounds in such a way that any trained phonetician can know how they are pronounced: the **International Phonectic Alphabet (IPA)**. E.g.
 (1) *cough* /kɒf/ *though* /ðoʊ/ *ghost* /goʊst/ *plough* /plaʊ/ *night* /naɪt/
- Notice that IPA better reflects the number of sounds in words. It has no silent letters (*knight, bomb*) or *digraphs* (=2 letters for one sound: *sing, ghost, enough*).
- IPA transcriptions are written between slashes or in square brackets: [ ]. We deal with the differences between these later.
- Forget spelling and concentrate on sounds when doing phonetics. Pronunciation in normal speech is NOT based on spelling (4-year-olds can speak but can't read).
- Simplest way to type IPA symbols on a computer: go to the website ipa.typeit.org

3 Preliminaries in discussing the articulation of sounds

- Differences between **vowels** and **consonants**:
  - Older definition: consonants, unlike vowels, cannot be pronounced on their own (hence the old German terms *Selbstlaut/Mitlaut*). Problem: exceptions like [s].
  - Phonetically vowels involve no closure or friction in vocal tract. Complication: this means that some consonants (*semivowels*, see below) are vowel-like.
  - Phonological definition: Vowels form the centre of syllable while consonants are at the edges of syllables.
- **Articulator**: speech organ (part of vocal tract) used to make a sound. With most sounds an **active articulator** moves to(wards) an immobile **passive articulator**.

4 Consonants
4.1 The three features for describing consonants

- **Manner of articulation**: what the articulators involved do. E.g. do articulators touch or merely form a narrow opening. Contrast *tea, sea*. (More details in next section.)
- **Place of articulation**: where the articulatory gesture happens, the point where the airflow in the vocal tract is constricted. Compare the first sounds in *bet*, *debt*, *get*.

- **Voicing**: In **voiced** sounds, the vocal cords (=vocal folds, *Stimmbände*) are pulled together and vibrate, unlike in **voiceless** sounds. Compare *zoo/sue, ban/pan*. Tests for voicing:
  - Put hand on larynx. You feel more vibrations with voiced consonants.
  - Say [fvfvfv] continuously with ears blocked. [v] echoes inside your head, unlike [f].

4.2 Description of English consonants (organised by manners of articulation)
- The accompanying handout gives indications of the positions of the speech organs referred to below, and the IPA description of all sounds in English and other languages.

4.2.1 Plosives

- **Plosive** (*Verschlusslaut*): complete closure somewhere in vocal tract, then air released.
 (2) **Bilabial** (both lips are the active articulators): [p,b] in *pie, bye*
 (3) **Alveolar** (passive articulator is the alveolar ridge (=gum ridge)): [t,d] in *to, do*
 (4) **Velar** (back of tongue approaches soft palate (velum)): [k,g] in *cat, go*
- Optional info: Another type of plosive, rare in English, is the **glottal stop** [ʔ] (a plosive formed by closing the vocal cords, as in coughing). It appears in the expression *ah-ah* [ʔaʔa] (used in telling a child not to do something). It is also used by some speakers as a variant of /t/ before other consonants *geʔ down*; *noʔ much, mountain* [maʊnʔn̩]), and between two vowels in some British dialects, e.g. Cockney: *water* [wɔːʔə]. It is used in German whenever a syllable does not begin with another consonant: *überall* [ybɐ.ʔal].

4.2.2 Fricatives

- **Fricative** (*Reibelaut*): articulators move quite close together, with audible friction in the air, hissing sound (cf. a slightly open window during strong wind).
 (5) **Labiodental** (lower lips, upper teeth as articulators): [f,v] in *find, vice*
 (6) **(Inter)dental** (tongue touching back of teeth or between teeth): [θ] in *thin*; [ð] in *the*
 (7) **Alveolar** (tongue near alveolar ridge): [s,z] *sue, zoo*
 (8) **Alveolo-palatal** (also *alveo-palatal, palato-alveolar, postalveolar*; passive articulator between alveolar ridge and hard palate) : [ʃ] in *fish*, [ʒ] in *measure, vision*
 (9) **Glottal**: [h] in *help*
   While /h/ is a voiceless glottal fricative, we can also describe /h/ as a voiceless variant of the following vowel (since the oral articulators move into the position of the following vowel).

4.2.3 Affricates

- **Affricate**: plosive+fricative combination, pronounced as a single sound in the time it takes to pronounce a single consonant; a plosive released as a fricative:
 (10) [dʒ] in *judge*, [tʃ] in *itch, church*
 (11) German [pf] in *Pfanne*, [ts] *zehn*
- To ensure that the plosive-fricative combination is interpreted as an affricate and not as to separate consonants, one can use a tie symbol ([d͡ʒ], [t͡ʃ]):
 (12) *that shop* [ðət͡ʃɔp] *the chop* [ðət͡ʃɔp]

4.2.4 Nasals

- **Nasal**: velum lowered so air exits via nose. Also complete closure somewhere in mouth (this place is the place of articulation). Nasals produce a resonant sound (like vowels), but are also like plosives in that there is a full closure in mouth. Nasals are generally voiced.
 (13) Bilabial nasal: [m] in *me*
 (14) Alveolar nasal: [n] in *no*
 (15) Velar nasal: [ŋ] in *sing, think*

4.2.5 Approximants

Approximant: articulators approach each other, but not close enough for friction. Hence a more resonant, vowel-like sound. (Some writers include vowels under approximants.) English has the following types of approximants:

4.2.5.1 Glides (semivowels)

(16) **Palatal** [j] in _yet_ (similar to the vowel [ɪ] in _it_)
(17) **Labio-velar** [w] in _wet_ (similar to the vowel [ʊ] in _put_)
Labiovelar= velar approximation (tongue moves toward velum, but the lips are rounded, as a secondary articulation.

Some writers treat this phoneme as a _labiodental_ approximant (approximation between lower lip and upper teeth, but the corresponding symbol [ʋ] is best avoided since it looks like the vowel [u].

- [j] and [w] are phonetically like vowels because:
  - being approximants, they lack the friction/closure normally associated with consonants
  - [j] and [w] are articulated similarly to [i] and [u] respectively; this becomes clear if one holds the first sounds in _yet, wet_ for a longer time than usual.
  - they are (normally) voiced
- Semivowels behave phonologically like consonants because, unlike other vowels, they
  - only occur directly before vowels
  - only occur at start/end of syllable; they must go with another vowel to form a syllable
  - select the _a_-form of the indefinite article

(18) _a good car; an old car; a yellow car, a white car; *an yellow car, *an white car_)

4.2.5.2 Laterals (_l_-sounds)

- **Laterals** (_l_-sounds): Lateral articulation involves a partial closure made with tongue at the alveolar ridge. One or both sides of the tongue are lowered, and air escapes through the resulting passageway. This can be demonstrated as follows:
  - Pronounce [dldldldl] and feel downward movement of tongue at side.
  - Whisper /l/ loudly and feel air move along the tongue. (Whispering makes this easier, as the airstream is stronger with unvoiced sounds, as vocal cords don't block airflow.)
- More is said on laterals below when we discuss the notion _allophone_.

4.2.5.3 Rhotics (_r_ sounds)

- There are various different rhotics. Using the wrong one makes one sound foreign, even if comprehensibility is not impeded. Here are the most important ones found in English:
  - **Alveolar approximant**: [ɹ]. The commonest type of _r_ in English. The tongue is in the position used in pronouncing the vowel in _bird_, i.e. approaches the alveolar ridge.
  - **Retroflex alveolar approximant**: [ɻ]. Like the alveolar approximant, but tongue curled back towards postalveolar area. Used by many American speakers.
- Optional point: other types of rhotics:
  - **Flap (=tap)**: [ɾ]. Tongue tip hits the aveolar ridge, creating a very brief plosive-like effect. Used by many English speakers after dental fricative (_throw, thread_), where the tongue strikes the alveolar ridge on the way from the dental position to the position of the vowel further back. In some American and Australian varieties [ɾ] is also used as a variant of /t/ between two vowels (_better, matter_). [ɾ] sounds like [d] here.
  - **Trill (=roll)** really a series of small, fast plosions caused by vibrating tongue against some passive articulator. Two types:
    - [r]: the alveolar ridge is the passive articulator (Scottish, classical singers). The exclamation _brrrr_ (used in English by a person who is freezing cold) uses this _r_.

- [ʀ] passive articulator = uvula (heard in German, French, Scottish accents)
- **Uvular fricative:** [ʁ]. Used by some German, French speakers.
- Some books use [r] for any rhotic when the differences between rhotics are not crucial.
- **Non-rhotic** varieties (dialects) do not pronounce /r/ at the end of a syllable: _far_ /fa/. Most British varieties of English are non-rhotic, most American varieties are rhotic.

4.2.6 More general terms for manners of articulation (optional)

The terms below cover more than one manner of articulation.

- **Stop**: sound with complete closure in mouth, i.e. plosives, affricates, nasals. Some books call plosives **oral stops** and nasals **nasal stops**.
- **Obstruent**: some kind of obstruction (blockage) of airstream (plosives, fricatives, affricates; nasals are sometimes included because of closure in the mouth).
- **Sonorant**: air flows freely through mouth or nose, i.e. nasals, laterals, approximants, vowels, but not plosives, fricatives, affricates. In English, sonorants are basically voiced. Acoustically, sonorants are resonant, i.e. closer to singing than hissing or dull sounds.
- **Continuants** can continue as long as the speaker has breath, i.e. all sounds but plosives.

4.3 List of places of articulaion

Below are given the places of articulation needed for English and German consonants. Compare these with a diagram of the vocal tract like that given to you with this handout.

- **Bilabial**: both lips are active articulators: [p,b,m]
- **Labiodental**: upper lip, lower teeth: [f,v]
- **(Inter)dental**: Dental = tongue touches back of teeth. Interdental: tongue between teeth. English uses either of these articulations in [θ] in _thing, teeth_ and [ð] in _the, then, loathe_.
- **Alveolar**: passive articulator is the alveolar ridge (=gum ridge): [t,d,s,z]
- **Alveolo-palatal** (=**alveo-palatal, palato-alveolar, postalveolar**): passive articulator between alveolar ridge and hard palate: [ʃ] in _fish_, [ʒ] in _measure, vision_.
- **Palatal**: hard palate is passive articulator: [j] in _yes_. (Also [ç] in German _ich_.)
- **Velar**: back of tongue approaches soft palate (velum): [k,g,ŋ]. [x] in German/Scots _Loch_
- **Glottal**: the glottis is the opening between the vocal cords & the larynx (=voice box). Relevant for [h] and glottal stop [ʔ].

4.4 Summary: Classifying consonants

In the exam you might be asked to **classify** some consonants, which means that you have to describe them in terms of the (usually two or three) relevant features. Examples:

(19) [f] is a voiceless labiodental fricative
(20) [g] is a voiced velar plosive
(21) [l] is a (voiced) lateral approximant
(22) [m] is a (voiced) bilabial nasal

(Here 'voiced' is optional as approximants and nasals are typically voiced anyway.)

> **1.** The sounds underlined in the words below represent all English consonants. Transcribe and classify each consonant.
> a. pu_b_, de_bt_, lea_g_ue, _c_at
> b. _ph_ilosophy, hi_v_e, _then_, _thing_, _s_outh, plea_s_e, _sh_oe, plea_s_ure, _h_at
> c. bri_dge_, i_tch_
> d. _y_ellow, wor_l_d, _r_ea_l_
> **2.** Transcribe all the consonants pronounced in the following words.
> a. knight b. fifths c. ethical d. university e. world
> f. efficient g. loathe h. seizure i. judgmental

5   Vowels
5.1   Parameters for describing vowels
- **Pure vowels** (**monophthongs**) don't change while being pronounced, while **diphthongs** do change (they consist of two vowels pronounced in the time it takes to pronounce one).
  - Compare the pure vowels in *far, ant, caught* with the diphthongs in *right, toy, now*.
- **Tongue height** describes the highest point of the tongue in pronouncing the vowel. Distinguish **high** > **high-mid** > **low-mid** > **low**.
  - High vowels are also called **close** vowels as the tongue is close to the roof of the mouth. Low vowels are **open** vowels as the mouth is wide open.
  - Feel your tongue move lower (and your mouth open) as you say the vowels in *be, bet, bat, barn*.
- **Backness**: which part of the tongue is highest (or how far back is the passive articulator)? Possibilities: **front** / **central** / **back**.
  - Say repeatedly the vowels in *be* and *you* (or *got/get*); feel tongue move back and forth.
  - N.B. Do not confuse *central* (backness) with *mid* (height).
- **Tenseness**: **tense** (=**long**) vowels are articulated with more muscular effort, higher air pressure than **lax** (**short**) vowels. Tense vowels are also longer (they take about twice the amount of time to pronounce). Compare *beat* and *bit* or *suit* and *soot*.
- **Roundedness**: **rounded** vowels: lips rounded & pushed forward; **unrounded** vowels: lips are spread. Compare German *Biene/Bühne* or *helle/Hölle*.
- (Optional:) **Nasality**: in nasal vowels the velum is lowered to let air into the nose.

5.2   English pure vowels
Compare the remarks below with the IPA vowel chart.

5.2.1   High vowels
(23) [iː] (*tree, me*): high front unrounded tense
(24) [ɪ] (*it*): high front unrounded lax
(25) [uː] (*root, use*): high back rounded tense
(26) [ʊ] (*look, put*): high back rounded lax
- Many linguists omit the length symbol ':' with /i, u/ in broad transcriptions since these vowels are always long in English.
- The high tense vowels [i, u] are realised as diphthongs (e.g. [ɪi, ʊu]) in many varieties, but the symbols [i, u] are typically used in broad transcriptions.
- Notice how the lax vowels are slightly more central than the tense ones on the IPA chart. A central articulation involves less muscular exertion.

5.2.2   Mid vowels
(27) [ɛ] or [e] (*get, bread*): front mid unrounded lax
  - This vowel is between [ɛ] (low-mid) and [e] (high-mid) on the IPA chart. Though closer to [ɛ], it is often transcribed as [e] by English linguists for convenience. The nearly identical vowel in German *Bett* is transcribed with [ɛ] by German linguists.
(28) [ɔː] (*taught, thought, sort, thaw*): back low-mid rounded tense
  - (This vowel is replaced by low back vowels, [ɒ] or [ɑː], in some US varieties.)
(29) [ə] (called **schwa**) (*butter, away*, German *bitte*): mid central lax unrounded
  - [ə] requires little effort to pronounce, as the tongue is in a relaxed position.
  - Most English unstressed syllables have [ə] (though in many words weak syllables are alternatively pronounced [ɪ]: *women, hatless, behave, buses, illegal*).
(30) [ɜː] (*first, nerd, blur, word, nurse, fir, worse, her*) low-mid central tense unrounded
  - Some linguists transcribe this with a long schwa: [əː].

- This vowel is always followed by <r> in spelling. It arose historically from the influence of /r/ on the original vowel. It was thus an *r-coloured* vowel.

5.2.3   Low vowels
(31) [æ] (*cat*): front low-mid unrounded lax
(32) [ɑː] (*far*): back low unrounded tense
  - Alternative used by some linguists: [a]: low front unrounded tense
(33) [ɒ] (*dog*): back low rounded lax
  - Alternative: back low-mid rounded lax [ɔ] (=Ger. *Gott*).
  - [ɒ] is unrounded to [ɑ] in many US varieties, so it sounds like the vowel in *far*.
(34) [ʌ] (*cup, love, country, blood, does*): low central unrounded lax

> **3.** Why do parents wanting to clean their children's teeth tell them to say [aaaaaaa]?
> **4.** Linguists who transcribe the vowel in *first, nerd* as [əː] and not [ɜː] never omit the length symbol ':' in [əː]. Why?
> **5.** The rounded vowels in English are [u, ʊ, ɔ, ɒ]. What do they have in common?

5.3   Diphthongs
- **Diphthong**: a vowel in which the tongue glides from the position of one vowel to the position of another. This takes about the same time to pronounce as a single (long) vowel.
- In the following *closing diphthongs*, the tongue moves to a higher position:
(35) [aɪ] (*try, die, I*)
(36) [au] (*thou, now*)
(37) [eɪ] (also written [ɛɪ]) (*tray, bait, late*)
(38) [ɔɪ] (*void, ploy*)
(39) [oʊ] or [əʊ] (*boat, vote*) ([əʊ] is mainly confined to British, RP)
  - Some US writers transcribe the second part of these diphthongs with [j,w], e.g. [aj, aw]. This is acceptable, but do not copy dictionaries that transcribe the second element with [y] (e.g. [ay, ɔy]), as this is not real IPA script.
- In the following *centring diphthongs* the tongue moves towards a central vowel position.
(40) [ɪə] (*ear, pier*)
(41) [eə]/[ɛə] (*pear, bare, there, air*)
  - Rhotic dialects lack these (since they derive historically from weakening of /r/ to schwa). To transcribe American English, write /r/ instead of schwa in these words.
  - Older RP speakers have more centring diphthongs: *pour* [pɔə], *poor* [puə]. Young RP and many other speakers realise these as [ɔː], so that *paw, pour, poor* are all [pɔː].
- In English diphthongs, the first element is usually more forceful and longer.
- **Triphthongs** are vowels consisting of three vowels, not just two as in diphthongs. They involve gliding from one vowel to another, then change direction:
(42) [aɪə] (*fire, iron*); [eɪə] (*layer*); [ɔɪə] (*boyant*); [auə] (*hour*); [əʊə]/[oʊə] (*lower, Noah*)
- Like centring diphthongs, these are the non-rhotic equivalents of vowel+/r/ in rhotic dialects, but this time the part before [ə] (</r/) is a diphthong rather than a pure vowel.
- Triphthongs can usually be replaced by bisyllabic pronunciation diphthong+[ə], but there are speakers who differentiate *flower, power* (2 syllables) vs. *flour, hour* (triphthong).

> **6.** Transcribe the following words.
> | a. careful | b. meeting | c. acquaintance | d. letter | e. battering |
> | f. united | g. notation | h. fought | i. royal | j. bottle |
> | k. suppose | l. undersign | m. loudness | | |

7. Transcribe *Why choose white shoes*? What is the difference between the pronunciation of the first two and the second two words?

8. Transcribe the words in (a), (b) and (c) below. What phenomenon is present in all words in (a) but absent in (b), and is distinctive in the minimal pairs in (c)? (This phenomenon is also heard when non-German-speakers try to pronounce German *Duden, Dürer, Universität*.) Describe the phenomenon as precisely as possible.
  a. *unite, utility, U.C.L.A., abuse, few, spew*
  b. *ooh!, zoom, sluice, clue, boo, doom, dude*
  c. *to use* vs. *to ooze*; *do* vs. *due/dew*; *coo* vs. *cue*

9. Vowels are more likely to vary between dialects and over time than are consonants. Can you think of reasons for this?

10. From your knowledge of English, German and any other languages/dialects you know, complete the following typological generalisations by replacing *x* and *y* with either *rounded* or *unrounded* as appropriate.

Back vowels are more likely to be *x* and front vowels are more likely to be *y*.

Implicational universal: Languages that have *x* front vowels also have *y* front vowels.

6 Phonology: Phonemes, phones and allophones

6.1 Introduction to the concepts: the example of aspiration

- Two types of 'p' sound:

(43) [p] = *plain* /p/, e.g. *spun*: vowel begins immediately after 'p'

(44) [pʰ] = *aspirated* /p/, e.g. *pun*: there is a short period after the release of /p/ where a voiceless puff of air is heard. Aspiration is like pronouncing an /h/ after a consonant. Test: hold your finger or a candle in front of your mouth; with aspirated sounds you feel air on your finger or see the flame move

- These facts are purely phonetic. The rest of this section deals with phonological facts about the use of these sounds in particular languages.

- In Hindi, aspiration is **distinctive (contrastive)**: the difference between [pʰ] and [p] yields **minimal pairs**, words which are otherwise pronounced identically:

(45) [pʰal] 'edge of a knife' vs. [pal] 'take care of'

- This isn't true of English. [pʰ] and [p] are in **complementary distribution**, i.e. do not occur in the same *environment* (position). In English voiceless plosives (/p,t,k/) are aspirated at the start of a stressed syllable, but not elsewhere, e.g.

(46) a. *Stan* [stæn] *tan* [tʰæn] *Dan* [dæn]
 b. *territory* [ˈtʰerɪtrɪ] *territorial* [ˌtʰerɪˈtʰɔrɪəl]

- Thus, in English, [pʰ] and [p] are thus variants of the same sound which appear in different environments. In Hindi, they are completely different sounds.

- To describe these facts clearly, we need terms for different notions of 'sound':
  - In any language which has them, [pʰ] and [p] are different **phones** (i.e. different 'sounds' in a narrow sense of 'sound': they aren't pronounced identically).
  - In English [pʰ] and [p] are instances of the same **phoneme** (i.e. 'sound' in a broad, abstract sense). We say that they **realise** (i.e. pronounce, are variants, representatives of, belong to) the same phoneme. [pʰ] and [p] realise distinct phonemes in Hindi.
  - [pʰ] and [p] are **allophones** of the same phoneme in English. An allophone is a phone which is one of the set of phones which can realise a particular phoneme.
  - We don't hear phonemes. We hear the (allo)phones that realise them.

- When transcribing sounds, a **broad (=phonemic) transcription** (in slashes, / /, see (47) below) focusses on phonemes rather than phones and a **narrow (=phonetic) transcription** (in square brackets, [ ]) indicates specific (allo)phones. The phoneme is usually transcribed with the symbol for one of the allophones.

(47) Broad transcription   Narrow transcription
  a. *pun* /pʊn/ [pʰʊn]
  b. *spun* /spʊn/ [spʊn]

- Understanding spoken language involves working out sequences of *phonemes*, since phonemes determine meaning differences. Native speakers often cannot consciously hear the difference between allophones of the same phoneme, though they can always hear distinctive differences between sounds. Thus Hindi but not English or German speakers easily hear the difference between [pʰ] and [p].

- Allophones of a phoneme always share some phonetic characteristics with other allophones of the same phoneme. Thus, complementary distribution between two sounds is not enough to prove that they are allophones of the same phoneme. (More on this later.)

- A small percentage of phonemes in the world's languages have allophones which are in **free variation** rather than complementary distribution. Thus, some German speakers may pronounce *rot* using different types of /r/.

- Most phonemes in the world's languages display **allophony** (i.e. have allophones).

6.2 Case study 2: Clear and dark /l/

- Two allophones of /l/ in English:

(48) Dark *l* [ɫ] back of the tongue is raised towards the velum (to about the position where the tongue is in pronouncing [u]). This is an instance of *velarisation* or a *velar secondary articulation*. (~ in IPA stands for velarisation.)

(49) Clear *l* [l] back of tongue is in its normal low position. (This is the only type of /l/ in Standard German.)

- These are allophones of the same phoneme in English because they are in complementary distribution: [l] is used directly before vowels and [ɫ] in all other cases:

(50) *lull* [lʊɫ]

11. What types of *l*-sounds are used in *call* and *calling*? What does this tell us about syllable boundaries in English?

12. /æp(ə)l/ is /æpʊ/ in some dialects. Why do we find [ʊ] and not another vowel here?

6.3 Other illustrations of allophony

(51) [ʔ] is used as an allophone of /t/ before other consonants (*ge?ʔ down*; *no?ʔ much*). In these cases [ʔ] and [t] are in free variation, since [t] is also possible here.

(52) German [ç] (*ich*) and [x] (*ach*) are allophones of the same phoneme. Simplifying somewhat, [x] is used after back vowels and [ç] elsewhere:
  kriechen/kroch, Loch/Löcher, Dach/Dächer, Tuch/Tücher, Molch

- Sometimes allophones of a phoneme differ only subtly:

(53) /i/ is slightly longer before voiced consonants than before voiceless ones: *beat/bead*

(54) /n/ is normally alveolar, but has a dental allophone before dental sounds: *tenth* [tenθ].

(55) /k/ is normally velar, but is palatal before /i/, cf. *cool* [kuɫ] vs. *keel* [ciɫ].

- If very subtle differences are taken into account, it might be correct to say that all phonemes in every language have allophones.

13. Prove that the following pairs of sounds are or are not allophones of the same phoneme: English [i] and [ɪ], English [eɪ] and [æ], German [z] and [s].

14. Show that /ʒ/ and /ʃ/ are distinct phonemes. Hint: the word *Confucian* 'follower of Confucius', pronounced [kənfjuʃən] will help.

15. In English, [h] and [ŋ] are in complementary distribution ([h] at start and [ŋ] at end of syllable). Are they therefore allophones of the same phoneme?

16. Is vowel roundedness distinctive in English? In German? Give evidence.

17. What is the phonetic difference between English *Hell* and German *hell*?

7 Processes: What happens to sounds in connected speech

- **Assimilation** occurs when a sound becomes more similar to a sound near it.
- **Regressive assimilation**: a sound influences another sound *before* it (this is called *anticipatory assimilation* as the speech organs anticipate (prepare for) a later sound):

(56) In fast speech, speakers may pronounce the underlined fricatives below as voiceless, assimilating them to the following voiceless consonants (fricative devoicing):
fi<u>v</u>e past,   b. lo<u>v</u>e to go,   c. ha<u>s</u> to go,   d. loa<u>the</u> to go

(57) In fast speech, alveolar consonants may have their place of articulation assimilated to that of a following consonant:
a. *that bad*   [ðæp bæd]   b. *Great Britain*   [greɪp brɪtən]
c. *ten boats*:   [tem boʊts]   d. *his shop*   [hɪʃ ʃɒp]

- In **progressive assimilation**: a sound influences a sound *after* it (this is also called *perseverative assimilation* because articulatory characteristics of an earlier sound 'persevere' (continue to exist) during the next sound):

(58) a. plural affix pronounced [z]: *dogs, trees*
b. plural affix pronounced [s]: *bits, tops, cliffs*

- Assimilation is often a cause of allophony. Examples:

(59) Approximants are normally voiced, but have voiceless allophones that occur immediately after voiceless consonants:
please [pl̥iz]   *tree* [tɹ̥i]   *twelfth* [tw̥elfθ]

(60) /n/ is normally alveolar, but has a dental allophone before dental sounds: *tenth* [ten̪θ].

(61) German velar fricative and palatal fricatives (allophones of same phoneme, cf. (52)) occur respectively after back and front vowels (cf. *Dach/Dächer, Tuch/Tücher* and others in (52)) because of assimilation: palatal is closer to tongue position in pronouncing a front vowel, velar position is closer to back vowel.

(62) /k/ is normally velar, but is palatal before /i/, cf. *cool* [kuɫ] vs. *keel* [ciɫ].

- **Deletion**: the non-pronunciation of a sound in fast speech.

(63) a. /raspbərɪ/   >   /razbrɪ/(schwa deletion is common, cf. *victory, memory*)
b. /ɪgzæktlɪ/   >   /ɪgzæklɪ/   (consonant cluster simplification
c. /sɔftdrɪŋks/ >   /sɔfdrɪŋks/

- **Epenthesis/insertion**: Adding a sound to facilitate pronunciation of neighbouring sounds.

(64) a. /wɔːmθ/ > /wɔːmpθ/   (Similar examples: *some*[p]*thing, chan*[t]*ce*)
b. *quizzes* /kwɪzəz/   (Obligatory epenthetic schwa, since it is hard to pronounce two adjacent instances of /z/)
c. *kenntlich* (<*kenn+lich;* /t/ originally epenthetic; cf. *vesehentlich, wöchentlich…*)

- **Vowel reduction**: the pronunciation of a vowel as a lax vowel (most often a the mid central lax vowel, i.e. schwa) in unstressed syllables. An extreme case of vowel reduction occurs when the vowel is deleted entirely (see the schwa deletion examples above).

(65) a. *Finnland*   /fɪnlænd/   >   /fɪnlənd/
b. /aɪ wɒd hæv gɒn/ >   / aɪ wɒd **(ə)**v gɒn/

- Sometimes current pronunciations of a word are the result of phonological processes that no longer occur in that word. E.g. *handkerchief* is pronounced /hæŋkət͡ʃif/ since assimilation, vowel reduction and deletion affected the original (now impossible) pronunciation /hændkɜːt͡ʃif/. Few people know the word comes from *hand+kerchief*. Here we can only speak of 'processes' if we are talking about the history of the word (*diachronic approach*) but not if we are discussing the word as it is used now (*synchronic approach*).

> **18.** Which phonological processes are at work in the following examples?
> a. /traɪʌmf/   >   / traɪʌmpf/   b. /ɪgzæktlɪ/   >   /ɪgzæklɪ/
> c. /ɪnkəmplit/   >   /ɪŋkəmplit/   d. /hjud͡ʒ/   >   /çjud͡ʒ/
> e. /æktjuəlɪ/   >   /ækt͡ʃəlɪ/   >   /ækʃlɪ/

> f. /aɪ æm səpəʊzd tu hæv saɪnd ðem/>   /aɪm spəʊst(ə)f saɪndəm/
> g. (broad Australian accent): /əstrʌɪlɪ.ən/   > /əstrʌɪjən/ > /strʌɪn/
> h. /aɪgəntlɪç habən vir ʔɛs nɪçt/   >   /aɪŋklɪç hamɐs nɪç/

8 Suprasegmentals (a very brief treatment)

- **Segment**: a sound in the intuitive sense. Distinct from:
  - **Suprasegmentals** like stress, intonation (phenomena based on more than one segment)
  - **Features**: elements smaller than segments (e.g. voicing, tongue height).
- **Suprasegmental/prosodic** features are features that cannot be defined with reference to a single segment (sound). These include
  - **Pitch**: how high or low a segment is in relation to others. In some languages, pronouncing the same word with different pitch accents gives a difference in meaning. (Here pitch is called **tone**.) In other languages, e.g. English, pitch does not affect word meaning, but it can affect the interpretation of a sentence (e.g. statement vs. question). Here we speak of **intonation**.
  - **Stress**: the relative loudness of a syllable compared to its neighbouring syllables.

> **19.** Can you think of cases where the way a word is stressed affects its meaning?

9 Syllables

- The organisation of the syllable (abbreviated **σ**): **nucleus** (also called **peak**) contains the vowel. **Onset** and **coda** contain respectively the consonants before and after the nucleus. The nucleus and coda form a unit called the **rhyme**.

(66) a. *drink*: [σ [onset dr] [[rhyme [nucleus ɪ] [coda ŋk]]]
b. *open*: [σ [rhyme [nucleus oʊ]]]   [σ [onset p] [rhyme [nucleus n]]]

- Some consonants (**syllabic consonants**) can be a syllable nucleus. In fast speech we find syllabic [n̩ m̩ l̩ r̩] when schwa is deleted in front of /n, m, l, r/ in unstressed syllables.

(67) *button* [bʌtn̩], *subtle* [sʌtl̩], *atom* [ætm̩], *butter* [bʌtr̩] (in rhotic accent)

9.1 Heavy and light syllables

- **Light syllables** have a short vowel and no coda. Other syllables are **heavy**: they have either a coda, or no coda but a long vowel (be it pure or diphthongal) in the nucleus.
- Put otherwise: light syllables have one **timing unit** in the rhyme (where short vowels and consonants each count as one timing unit, and long vowels count as two timing unity). Heavy syllables have more than one timing unit.
- *Heavy* and *light* do not mean *stressed* and *unstressed*! But syllable weight is important for determining whether a syllable can carry stress or not: Only heavy syllables can be stressed. Examples of this:

(68) a. *the* can be pronounced [ðə] or [ði:]:
b. *she's THE* [ði:] *expert on this subject!* ([ðə] not possible here)

(69) *er sagte nicht 'ich habe mich b*[e:]*wundert', sondern 'ich habe mich g*[e:]*wundert'*!

(70) More functional (grammatical) items with heavy/light syllable pronunciations:
a. *The indefinite article is '*<u>A</u>*', not 'THE'.*
b. *There are good reasons NOT to go there, and no reasons <u>TO</u> go there.*

- Other than grammatical words, no English words consist solely of a light syllable, since all lexical (i.e. not purely grammatical) words must be able to be stressed. *[bæ, dʊ] are not possible lexical words.

9.2 Syllable structure and sonority

- Syllables tend to be organised according to the following principles:

(71) **Sonority Sequencing Generalisation**:
The nucleus of the syllable is the most sonorous (≈ vowel-like) element. The onset and coda are organised such that the most sonorous elements are closer to the nucleus.

(72) **Sonority scale** or **sonority hierarchy** (< = 'is less sonorous than'). Two versions:
a. obstruents   < sonorant consonants   < vowels
b. plosives < fricatives/affricates < nasals < liquids < glides < vowels

- Examples (the higher the line is at a given point, the more sonorous the sound is below it):

(73)   a. [k   l   æ   m   p]   b. [k   w   ɪ   l   t]
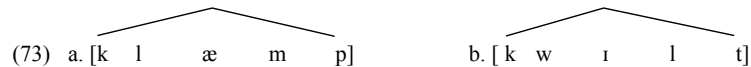
9.3   Principles of syllabification

- Most important principle helping us to find where the syllable boundaries are:
- (74) **Maximal Onset Principle** (**Onset Maximisation Principle**): If a segment is not a nucleus, assume that it is an onset rather than a coda *unless the resulting syllabification produces an unpronounceable syllable*. In other words, try to make onsets as big as possible.
- Examples (by convention, a full stop ('.') marks syllable boundaries):

(75)   a. *feisty*:   faɪ.stɪ
       b. *repair*   rə.pʰeə   (assuming pronunciation of <air> as diphthong)
       c. *despair*   də.speə
       d. *this pair*   ðəs. pʰeə
       e. *acknowledgement*   ək.nɔ.lədʒ.ment

- In (a)-(c), onset maximisation gives the right result because in English aspiration happens at the beginning of a syllable. In (e), we cannot adhere to onset maximisation fully because [kn] and [d͡ʒm] cannot be pronounced as onsets in English. No (modern) English words begin with these sounds.
- Syllable boundaries don't always correspond to morpheme boundaries (cf. (a), (c)).
- In English word boundaries are (nearly) always syllable boundaries (cf. (c,d)).
- Onset maximisation is independently supported by evidence from various languages:
  - There are languages with no codas (e.g. Hawaiian), but no languages without onsets.
  - Some languages have obligatory onsets (Arabic), but none have obligatory codas.
  - Children go through a phase where they only pronounce syllables with onsets.

9.4   Why the syllable and its parts are important

Why is it important to talk about syllables and their parts (e.g. coda, rhyme etc.)? Answer: many facts about the distribution of sounds and processes cannot be described without reference to the (parts of) the syllable and are not accurately described with generalisations like 'x occurs at the end of a word'. E.g.:

- Non-rhotic dialects of English have /r/ only in an onset. (Not just at start of word: *barrel*.)
- Aspiration of plosives happens when they are syllable-initial, not just word-initial: *repair, apalled, Attila* have aspirated [pʰ, tʰ].
- English clear /l/ is in onsets and dark /l/ in rhymes. Examples like *unclarity* and *subtlty* (pronounced with a syllabic /l/) show that the distinction isn't about start/end of a word.
- German obstruent devoicing is often said to apply at end of a word or a morpheme, but the following examples show that devoicing happens whenever the obstruent is in a coda:

(76) *Liebling* [lip.lɪŋ]   (/b/ is in a coda, but not end of a word)
(77) *Liebesbrief* [li.bəs.brif]   (/b/ is in an onset, but at end of a morpheme)
(78) Other examples to check this out on: *Radweg, des Rades; biegen, biegbar*

- Importance of onsets: Some sequences like [kn] can't be pronounced in English onsets (cf. English learners of German pronouncing *Knie* as [kə.ni]). If [kn] isn't in an onset, it can be pronounced, e.g. if a syllable boundary intervenes (*acknowledge*) or if /n/ is used as a nucleus (*blacken* [blæ.kn̩]).

9.5   Phonotactic constraints

Phonotactic constraints are constraints on what types of sounds can be pronounced next to what other sounds. Each part of the syllable has its own phonotactic constraints. Here are some examples from English. It is assumed that monosyllabic words are the best clue to what possible syllables could be like. (You needn't memorise these, they are just for illustration.)

- Onsets
  - [ŋ] can't be pronounced in onsets.
  - Sonority sequencing generalisation is respected (thus: *play, pray, dry, dwell, twin, trip,* but no syllables starting with [lp, rp, wd, rd]), but:
    - There are onsets which respect the SSG, but still aren't possible: **tlip, *tnip, *srip, *pnip, *knip* (some of these are possible in other languages like Czech)
    - /s/ disobeys SSG since it can appear before less sonorous sounds (*spy, sky*)
  - Onsets may have more than two members only if they begin with /s/: *strength, spring, square*. English allows no other onsets with 3 or more consonants: **[ftr, vpl]*.
- Codas
  - [h] cannot be pronounced in codas.
  - Codas have no more than two members and obey sonority sequencing. Exceptions are always syllables with more than one morpheme: *depth, watched, whinged, texts, sixths, midst*, and the outer sounds are always **coronals** (=dental, alveolar).
- Rhymes
  - English rhymes cannot have more than three timing units, unless the fourth one is a coronal: **[waɪmp, baːnk; hɔːnp]* vs. *wimp, bank, aunt, found, taint*.
  - [aʊ] can't be followed by a consonant other than a coronal:

(79)   a. *down, tout, proud, south, nous, rouse*
       b. Impossible syllables: **[daʊn, taʊb, naʊv, praʊg]*

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20. Transcribe and syllabify (divide into syllables) the following words:
a. preparatory   b. divulged   c. purportedly
d. syllabification   e. astringency   f. recompartmentalisation

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