

Phonetics and Phonology

FOCUS ON

- *Vowels*
- *Place of articulation*
- *Manner of articulation*
- *Consonants*
- *Minimal pairs*
- *The syllable*
- *Word and stress*
- *Weak forms*

Whereas syntax is about sentence formation, and semantics about sentence interpretation, phonetics and phonology cover the field of sentence utterance.

Phonetics is concerned with how sounds are produced, transmitted and perceived. Phonology is concerned with how sounds function in relation to each other in a language. In other words, phonetics is about sounds of language, phonology about sound systems of language. Phonetics is a descriptive tool necessary to the study of the phonological aspects of a language.

Phonetics and phonology are worth studying for several reasons. One is that as all study of language, the study of phonology gives us insight into how the human mind works. Two more reasons are that the study of the phonetics of a foreign language gives us a much better ability both to hear and to correct mistakes that we make, and also to teach pronunciation of the foreign language (in this case English) to others.

As phonetics and phonology both deal with sounds, and as English spelling and English pronunciation are two very different

things, it is important that you keep in mind that we are not interested in letters here, but in sounds. For instance, English has not 5 or 6 but 20 different vowels, even if these vowels are all written by different combinations of 5 different letters, "a, e, i, o, u". The orthographic spelling of a word will be given in italics, e.g. *please*, and the phonetic transcription between square brackets [pli:z]. Thus the word *please* consists of three consonants, [p,l,z], and one vowel, [i:]. And sounds considered from the phonological point of view are put between slashes. We will use the symbols in figure (1).

List of symbols

This is the standard set of phonemic symbols for English (RP and similar accents).

Consonants

- p pen, copy, happen
- b back, baby, job
- t tea, tight, button
- d day, ladder, odd
- k key, clock, school
- g get, giggle, ghost
- t̪ church, match, nature
- d̪ judge, age, soldier
- f fat, coffee, rough, photo
- v view, heavy, move
- θ thing, author, path
- ð this, other, smooth
- s soon, cease, sister
- z zero, music, roses, buzz
- ʃ ship, sure, national
- ʒ pleasure, vision
- h hot, whole, ahead
- m More, hammer, sum
- n nice, know, funny, sun

Vowels

- ɪ kit, bid, hymn, minute
- e dress, bed, head, many
- æ trap, bad
- ɒ lot, odd, wash
- ʊ strut, mud, love, blood
- ə foot, good, put
- iː fleece, sea, machine
- eː face, day, break
- aː price, high, try
- ɔː choice, boy
- uː goose, two, blue, group
- əʊ goat, show, no
- ɑː mouth, now
- ɔː near, here, weary
- ɛː square, fair, various
- ɑː start, father
- ɔː thought, law, north, war

- | | |
|--|--------------------------------------|
| ŋ ring, anger, thanks, sung | əʊ poor, jury, cure |
| l light, valley, feel | ɔː nurse, stir, learn, refer |
| r right, wrong, sorry, arrange | ə əbout, common, standard |
| j yet, use, beauty, few | i happy, radiate, glorious |
| w wet, one, when, queen | u thank you, influence,
situation |
| ə (glottal stop) department,
football | n ə suddenly, cotton |
| | ʌ ʌmiddle, metal |
| | ə̄ (stress mark) |

PHONETICS

The Speech Organs

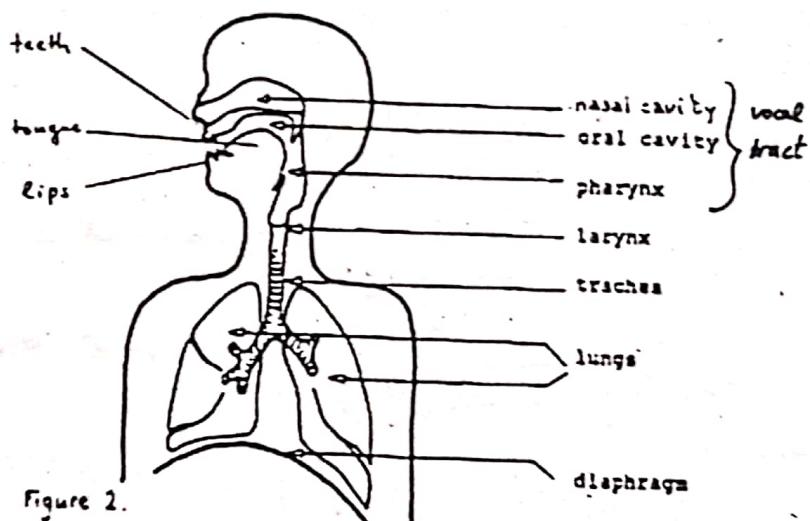


Figure: 2

All the organs shown on figure (2) contribute to the production of speech. All the sounds of English are made using air on its way out from the lungs. The lungs pull in and push out air, helped by the diaphragm. The air goes out via the trachea, where the first obstruction it meets is the larynx, which it has to pass through. Inside the larynx the air passes by the vocal folds, which, if they vibrate, make the sound voiced. Afterwards the air goes up through the pharynx and escapes via either the oral or the nasal cavity.

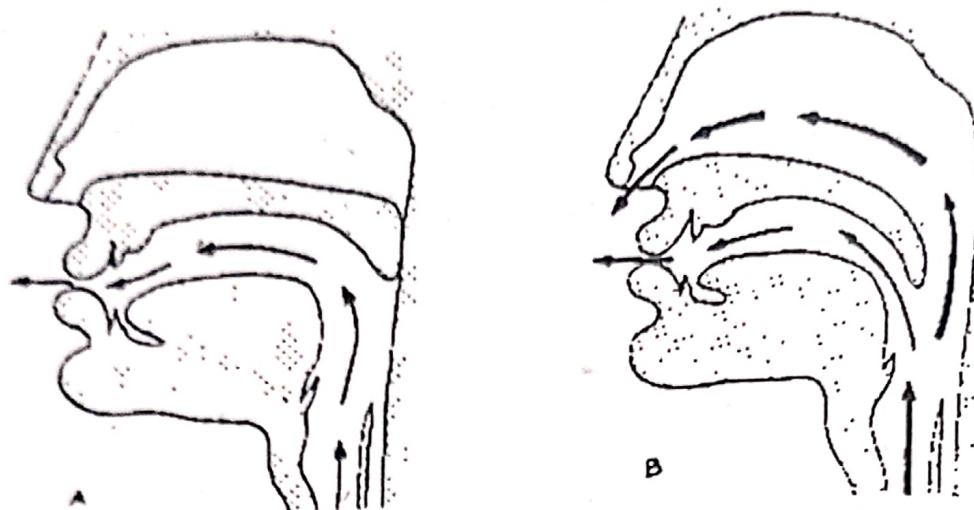


Figure: 3

Figure (3): production of oral and nasal sounds. (Thomas 1976: 32)

Almost all the organs involved in speech production also have other functions. The lungs and the diaphragm are obviously involved in breathing, as is the nasal cavity, which cleans, heats and humidifies the air that is breathed in. The teeth and the tongue play a part in digestion, and in a way, so do the vocal folds, as they have to be closed when swallowing, to keep the food from going down the wrong way.

There are 4 places in which a sound can be modified. You have to add to this the fact that the vocal folds can vibrate.

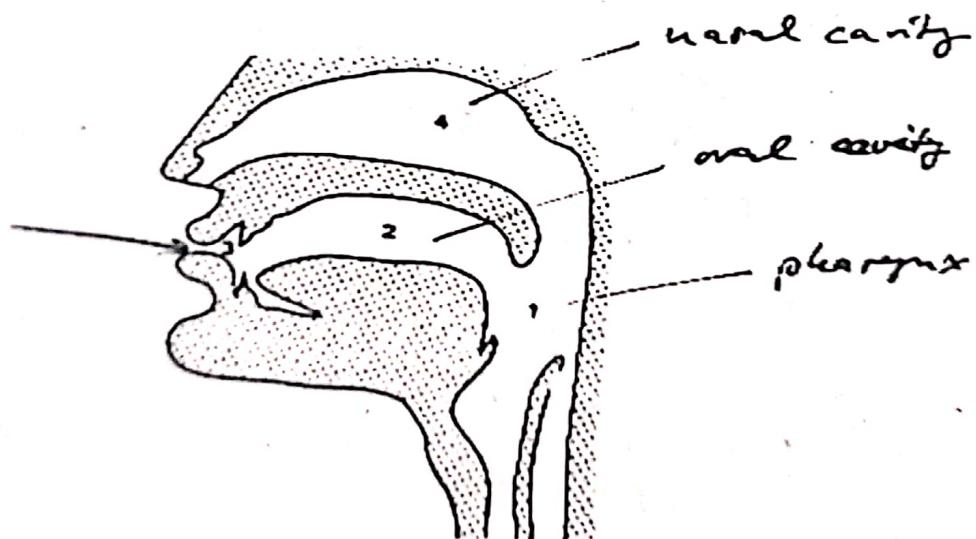


Figure: 4

Figure (4): sound modification places. (Thomas 1976:33)

Cross-section of the human head, labelling components of the vocal tract

Consonants

On the way out the air flow can be more or less obstructed, producing a consonant, or is simply modified, giving a vowel. If you pronounce the first sound of the word *paper* you close your mouth completely and that is the utmost obstruction, whereas if you pronounce the first sound of the word *after* the mouth is more open than normal, the air flows as freely as it possibly can.

Consonants are often classified by being given a so-called VPM-label. VPM stands for Voicing, Place and Manner:

- voicing means that the vocal folds/cords are used; if they are not, the sound is voiceless (note that vowels always imply the use of vocal folds).
- place of articulation is the place where the air flow will be more or less obstructed.
- manner is concerned with the nature of the obstruction.

Voicing

The larynx is in the neck, at a point commonly called Adam's apple. It is like a box, inside which are the vocal folds, two thick flaps of muscle. In a normal position, the vocal folds are apart and we say that the glottis is open (figure a). When the edges of the vocal folds touch each other, air passing through the glottis will usually cause vibration (figure b). This opening and closing is repeated regularly and gives what is called voicing.

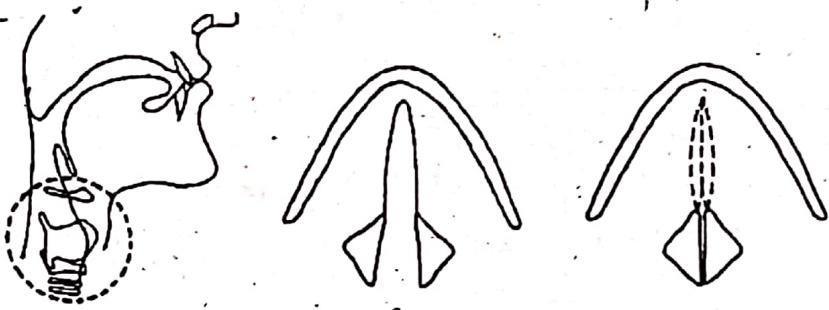


Figure: 5

Figure (5): voicing. (Roach 1983:23,25)

The only distinction between the first sounds of *sue* and *zoo* for example is that [s] is voiceless, [z] is voiced. The same goes for *few* and *view*, [f] is voiceless, [v] is voiced. If you now say [sssssszzzzzzssss] or [fffffvvvvvfffff] you can either hear the vibrations

of the [zzzzz] or [vvvvv] by sticking your fingers into your ears, or you can feel them by touching the front of your larynx (the Adam's Apple).

This distinction is quite important in English, as there are many pairs of sounds that differ only in voicing. In the examples below the first sound is voiceless, the other is voiced: *pie/buy*, *try/dry*, *clue/glue*, *chew/Jew*, *thigh/thy*. This distinction can also be made in between two vowels: *rapid/rabid*, *metal/medal*, or at the end of a word: *pick/pig*, *leaf/leave*, *rich/ridge*.

In English the following consonants are voiced: b d g v ð z l r j
w
m n ŋ

The following ones are unvoiced: p t k f θ s ʃ h χ

Places of Articulation

As we saw above [p, t, k] are all voiceless, so there must be another way to distinguish between them, otherwise we would not be able to tell *try* apart from *try* or *cry*, or *pick* from *kick*. Apart from the behaviour of the vocal folds, sounds can also be distinguished as to where in the oral cavity they are articulated (i.e. where in the mouth there is most obstruction when they are pronounced).

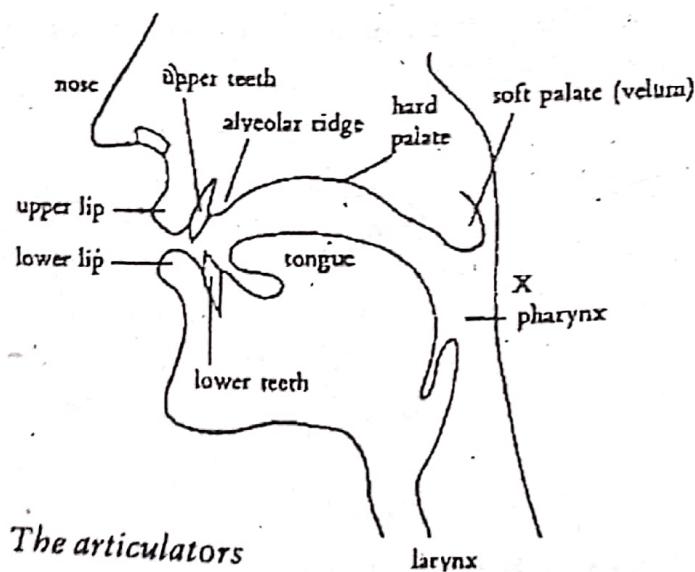


Figure: 6

Figure (6): places of articulation. (Roach 1983:8)

Bilabial sounds are produced when the lips are brought together. Examples are [p], which is voiceless, as in *pay* or [b] and [m] which are voiced, as in *bay*, *may*.



[p, b] ([m])

Figure: 7

Labiodental sounds are made when the lower lip is raised towards the upper front teeth. Examples are [f] *safe* (voiceless) and [v] *save* (voiced).



[f, v]

Figure: 8

Dental sounds are produced by touching the upper front teeth with the tip of the tongue. Examples are [θ] *oath* (voiceless) and [ð] *clothe* (voiced).



b Dental fricative

Figure: 9 (θ ð)

Alveolar sounds are made by raising the tip of the tongue towards the ridge that is right behind the upper front teeth, called the alveolar ridge. Examples are [t,s] *too, sue*, both voiceless, and [d,z,n,l,r] *do, zoo, nook, look, rook*, all voiced.

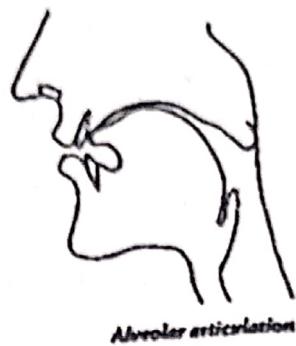


Figure: 10

Palatoalveolar sounds are made by raising the blade of the tongue towards the part of the palate just behind the alveolar ridge. Examples [p t] pressure, batch (voiceless) and [p d t] pleasure, badge (voiced).



Palato-alveolar fricative

Figure: 11

Palatal sounds are very similar to palatoalveolar ones, they are just produced further back towards the velum. The only palatal sound in English is [j] as in *yes, yellow, beauty, new* and it is voiced.

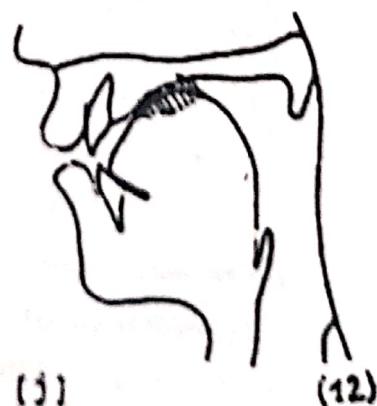


Figure: 12

Velar sounds are made by raising the back of the tongue towards the soft palate, called the velum. Examples [k] back, voiceless, and [g, ŋ] both voiced *bag, bang*. [w] is a velar which is accompanied with lip rounding.



Velar articulation

Figure: 13

Glottal sounds are produced when the air passes through the glottis as it is narrowed: [h] as in *high*. (Figure (13): Roach 1983:25)

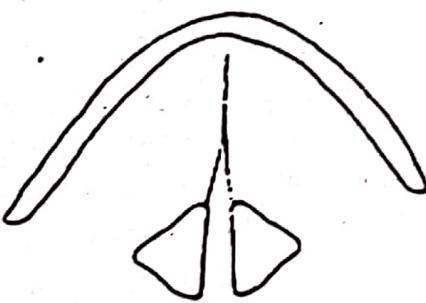


Figure: 14

Manners of Articulation

We can now distinguish between English consonants from two points of view, that of voicing, and that of place. We can see that [b] and [t] are different in both respects, [b] is voiced and bilabial, and [t] is voiceless and alveolar. [p] differs from [b] only in being voiceless, as both are bilabial, and [p] differs from [t] only in being bilabial, as both are voiceless.

There are still pairs of sounds where we cannot yet describe the difference of one from the other, e.g. [b,m] *bend, mend* as both are voiced and bilabial, and [t,s] *ton, son* which both are voiceless and alveolar. As the examples show, we can however tell the words apart, and this is because the sounds are different in a way we have not yet discussed, and that is with respect to their manner of articulation.

The manner of articulation has to do with the kind of obstruction the air meets on its way out, after it has passed the vocal folds. It may meet a complete closure (plosives), an almost complete closure (fricatives), or a smaller degree of closure (approximants), or the air might escape in more exceptional ways, around the sides of the tongue (laterals), or through the nasal cavity (nasals).

Plosives are sounds in which there is a complete closure in the mouth, so that the air is blocked for a fraction of a second and then released with a small burst of sound, called a plosion (it sounds like a very small explosion). Plosives may be bilabial [p,b] park, bark, alveolar [t,d] tar, dark or velar [k,g] car, guard. There is a fourth kind of plosive, the glottal stop. The word football can be pronounced without interruption in the middle as in [f \square tb \square ll] or with a complete closure of the glottis instead of [t]: [f \square bb \square ll].

In English a voiceless plosive that occurs at the beginning of a word and is followed by a vowel, is rather special in the sense that at the release of a plosion one can hear a slight puff of air (called aspiration) before the vowel is articulated. Hence in 'pen' we hear [phen].

These aspirated voiceless plosives are not considered to be different sounds from unaspirated voiceless plosives from the point of view of how they function in the sound system. This difference, which can be clearly heard, is said to be phonetic.

Fricatives have a closure which is not quite complete. This means that the air is not blocked at any point, and therefore there is no plosion. On the other hand the obstruction is big enough for the air to make a noise when it passes through it, because of the friction. This effect is similar to the wind whistling around the corner of a house. Fricatives may be labiodental [f,v] wife, wives, dental [θ,ð] breath, breathe, alveolar [s,z] sink, zinc, palato-alveolar [ʃ,ʒ] nation, evasion, or glottal [h] help. [h] is a glottal fricative. As it has no closure anywhere else, and as all air passes between the vocal folds, this means that [h] is like aspiration unaccompanied by any obstruction.

A distinction may be made between sibilant and non-sibilant fricatives. Sibilant sounds are the fricatives with a clear 'hissing' noise, [s,z,ʃ,ʒ] and the two affricates [t \square ,d \square] choke, joke.

Affricates are a combination of a plosive and a fricative (sometimes they are called 'affricated plosives'). They begin like a plosive, with a complete closure, but instead of a plosion, they have a very slow release, moving backwards to a place where a friction can be heard (palatoalveolar). The two English affricates are both

palatoalveolar, [t^ʃ] which is voiceless, *chin*, *rich*, and [d^ʒ] which is voiced, *gin*, *ridge*. The way an affricate resembles a plosive followed by a fricative is mirrored in the symbols. Both consist of a plosive symbol followed by a fricative one: [t+^ʃ], [d+^ʒ].

Nasals resemble plosives, except that there is a complete closure in the mouth, but as the velum is lowered the air can escape through the nasal cavity. Though most sounds are produced with the velum raised, the normal position for the velum is lowered, as this is the position for breathing (your velum is probably lowered right now when you are reading this). The three English nasals are all voiced, and [m] is bilabial, *ram*, [n] is alveolar, *ran*, and [ŋ] velar, *rang*. In the section on places, the dotted line on the pictures of bilabial, alveolar and velar articulations illustrate the three nasals.

Laterals are sounds where the air escapes around the sides of the tongue. There is only one lateral in English, [l], a voiced alveolar lateral. It occurs in two versions, the so called 'clear l' before vowels, *light*, *long*, and the 'dark l' in other cases, *milk*, *ball*. Words like *little*, *lateral* have one of each type. 'Dark l' may be written with the symbol [ɫ]. 'Clear l' is pronounced with the top of the tongue raised, whereas for 'dark l' it is the back of the tongue which is raised. Here again, as with aspirated and unaspirated voiceless plosives, even though 'clear l' and 'dark l' are phonetically different, they cannot be said to be different sounds from the point of view of how they function in the sound system. If you produce a 'dark l' where usually you have a 'clear l', for example at the beginning of the word *long*, your pronunciation will sound odd but nobody will understand a different word.

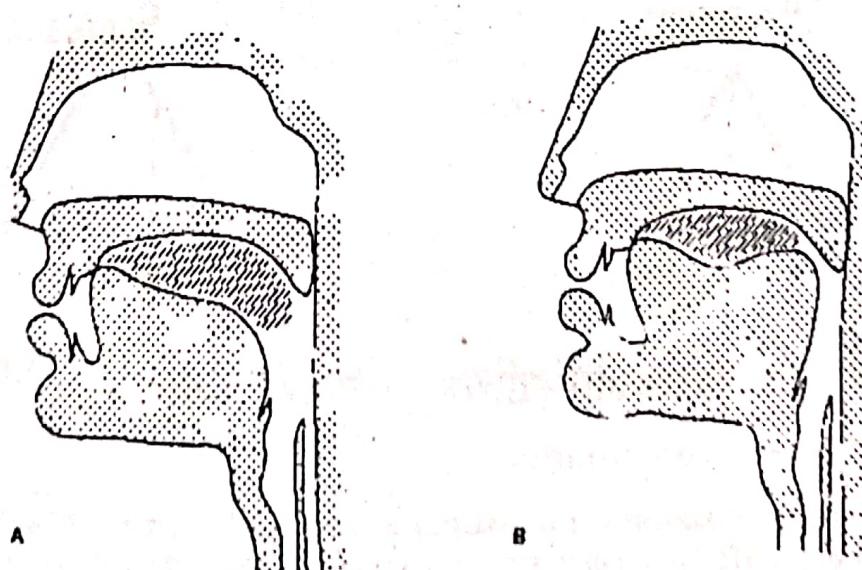


Figure 15: clear and dark "l". (Thomas 1976:44)

Approximants are sounds where the tongue only approaches the roof of the mouth, so that there is not enough obstruction to create any friction. English has three approximants, which are all voiced. [r] is alveolar, right, brown, sometimes called post-alveolar, because it is slightly further back than the other alveolar sounds [t,d,s,l]. [j] is a palatal approximant, use, youth, and [w] is a velar approximant, why, twin, square. [w] always has lip-rounding as well, and therefore it is sometimes called labio-velar.

[r] only occurs before vowels in southern British English, whereas other accents, e.g. Scottish, Irish, and most American ones, also can have it after vowels. Therefore those accents can make a distinction between e.g. saw and sore, which are pronounced exactly alike in southern British English.

The manners of articulation can be put into two major groups, obtrudents and sonorants. The obtrudents are plosives, fricatives and affricates, all sounds with a high degree of obstruction. Obtrudents usually come in pairs, one voiceless, one voiced, e.g. [p/b, t/d]. Sonorants have much less obstruction and are all voiced and therefore more sonorous. They include nasals, the lateral, and approximants. The manners can be illustrated as in the following diagram:

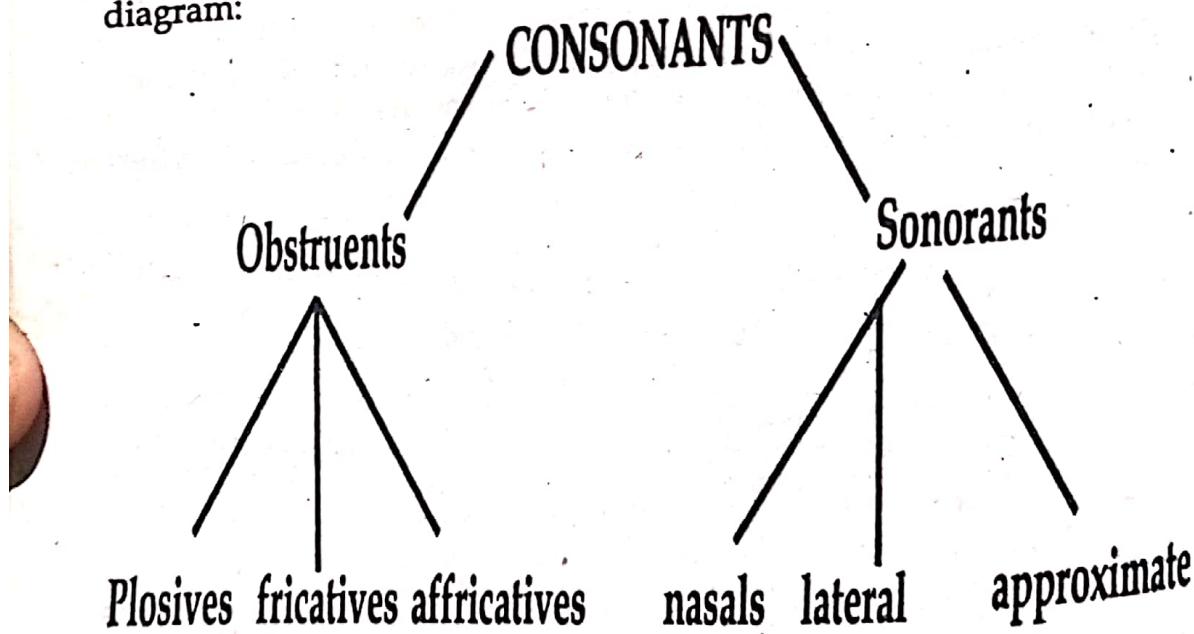


Table of the Consonants

The discussion on consonants above can be summarized in the table below (Roach 1983:52). A sound on the left side of a column is voiceless; one on the right side is voiced.

Table of English Consonants

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Vocal	Glottal
Plosive	p b		t d		tʃ dʒ		k g	
Affricate					fʒ θʒ			
Fricative		f v	θ ð	s z	ʃ ʒ		(x)	h
Nasal	m			n			ŋ	
Lateral					l			
Approximant	w				r		j	

Vowels

We shall first have a closer look at the way in which vowels differ from consonants. Then we shall analyse vowels phonetically, i.e. according to:

- tongue position: how high in the mouth is the tongue, and which part of the tongue is the highest?
- length: are the vowels long or short?
- rounding: are the lips rounded or not?
- nasality: is there free passage of air through the nose?

- diphthongs: are they steady, or do they somehow change in character?

The last section is a table of the vowels. (There are other points of view which we shall not deal with here, since they are irrelevant for our study).

Difference from Consonants

Even though all the languages of the world contain both vowels and consonants, and although almost everybody has some idea of whether a given sound is a vowel or a consonant in his language, there is actually more than one way to distinguish between the two classes of sounds. From a phonetic point of view one way of distinguishing is by considering which sounds have the highest degree of obstruction. Although vowels have almost no obstruction, and some consonants (obstruents, nasals and the lateral) have a high degree of obstruction, there is a group of consonants (the approximants) which would be classified as vowels if this criterion was used: approximants have no more obstruction than vowels. This can be seen by comparing the approximant [j] in *yeast* [ji:st] with the vowel [i:] in *east* [i:st].

From a phonological point of view, it is possible to distinguish between vowels and consonants by testing which sounds may be the nucleus of a syllable, i.e. the part of a syllable that cannot be left out. If you consider a syllable such as [kɒt] *cart*, the initial [k] may be left out and we still have a syllable, [ɒt] *art*, the final [t] may be left out and we still have a syllable, [kɒ] *car*. In fact [k] and [t] may both be left out, and the remainder is still a syllable, [ɒ] *are*. If however you try to leave out the vowel, then there is no syllable anymore: * [kt]. [ɒ] is then the sound that cannot be left out. Compare with *yeast* whereas [j] can be left out, giving [i:st], [i:] can't: *[jst]. Syllability seems to be the criterion to determine whether a sound is a vowel or a consonant.

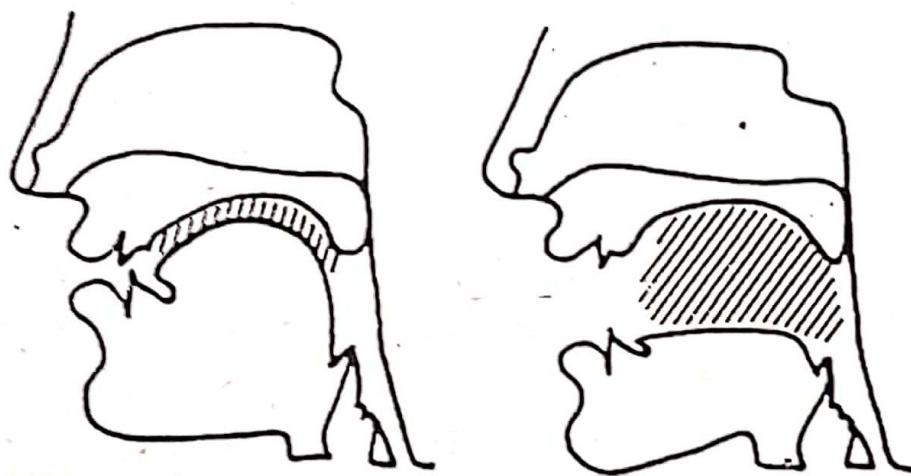
The above discussion would not be complete if we didn't mention the problem of so called syllabic consonants. This is the case when sounds like / r, l, n / may function as a separate syllable consisting of an only sound, as in /kɒt+n/ *cotton* or / æp+l/ *apple*, where English speakers clearly hear two separate syllables. In these words, the /n/ and /l/ seem to function as the nucleus of the second

syllable of these words. However they cannot be classified as vowels, as they can never occur alone as a word.

Tongue Position

Tongue position is described using two criteria: the height (how high is the tongue) and the part of the tongue involved in the production of the sound.

In English the tongue may either be high, i.e. when the speaker produces e.g. [i:, u:] in [bi:t, bu:t] *beat, boot*, intermediate, e.g. [e, ə] in [bet, bɔ:t] *bet, bought*, or low, e.g. [æ, ɒ] in [bæt, bɔ:t] *bat, Bart*.



a) tongue is at the highest b) tongue is at the lowest

Figure 16: tongue height. (Thomas 1976:56)

Depending on the language we can have several intermediate tongue heights. English has three heights: high, mid and low, whereas French has two intermediate tongue heights with a total of four tongue heights: high, mid high, mid low and low.

The part of the tongue involved in the production of a vowel can also be illustrated with the examples above. If you say [i:] and then [u:] just after it, you almost have the feeling that you are moving your tongue backwards. This is because [i:] is a front vowel, and [u:] is a back vowel, or in other words, the highest point in the pronunciation of [i:] is the front of the tongue, whereas the highest point in [u:] is the back of the tongue. Figure (17) gives you two examples of tongue position:

- a. is an example of the front of the tongue being at the highest
- b. it is the back of the tongue which is nearest to the palate.

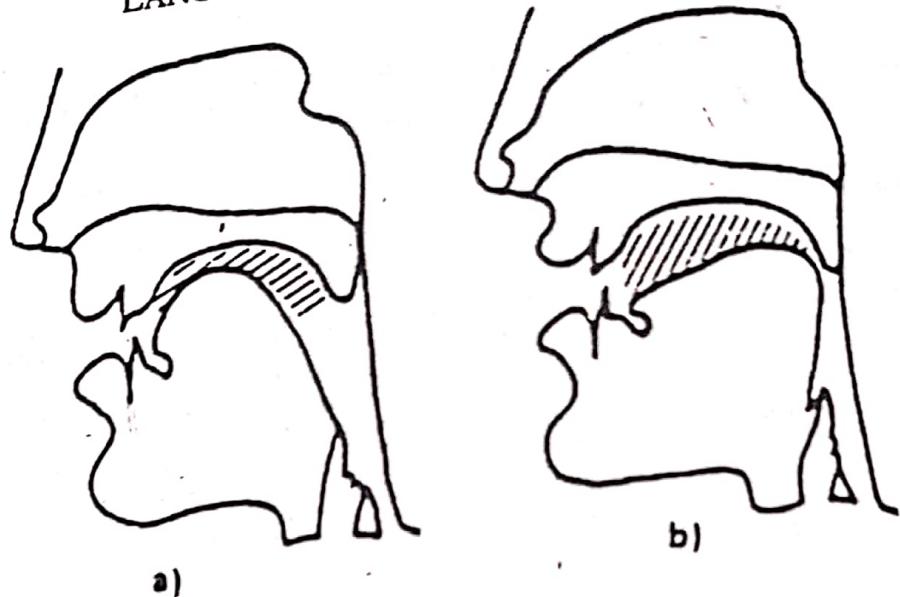
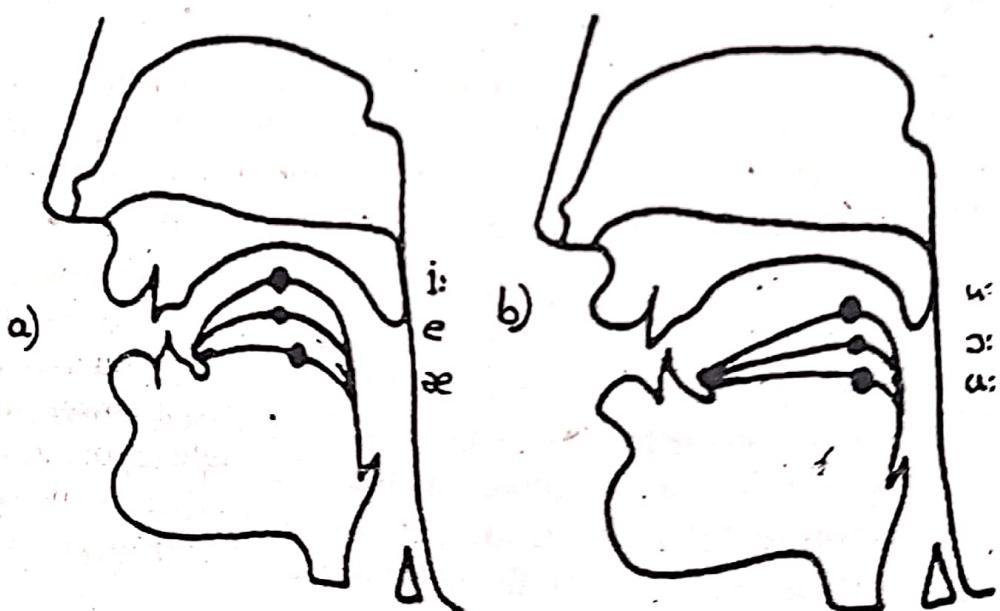


Figure 17: tongue position

(a) front and (b) back. (Thomas 1976:56)

For example [e] is front and [ə] is back, and [æ] front, [ɒ] back. There are also vowels in between front and back, called central, namely [ʌ, ɔ, ɒ] as in [wʌd, fʌwəd, mɒd] word, forward, mud. [ʌ] for instance is between [e] and [ə], as can be seen from [bed, bʌd, bɒd], bed, bird, board.

To give an accurate account of tongue position one has to combine height of the tongue and part of the tongue involved.



a) height position for front vowels b) height position for back vowels
Figure 18: tongue position (Thomas 1976:57)

If you put 18a and 18b together and isolate tongue position, you get the following diagram:

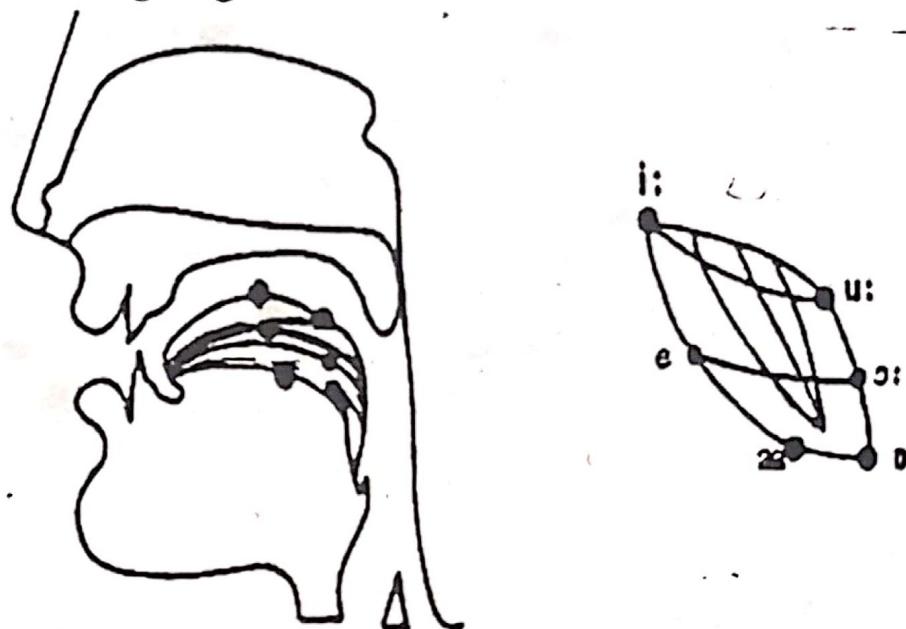
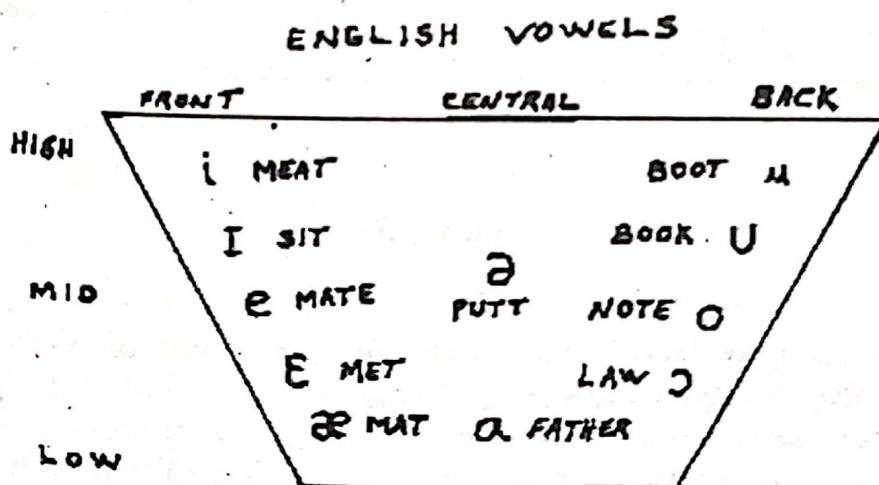


Figure 19: vowel diagram (Thomas 1976:57)

The complete diagrams of English vowels are: (19, 20, 21)



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Figure (19)

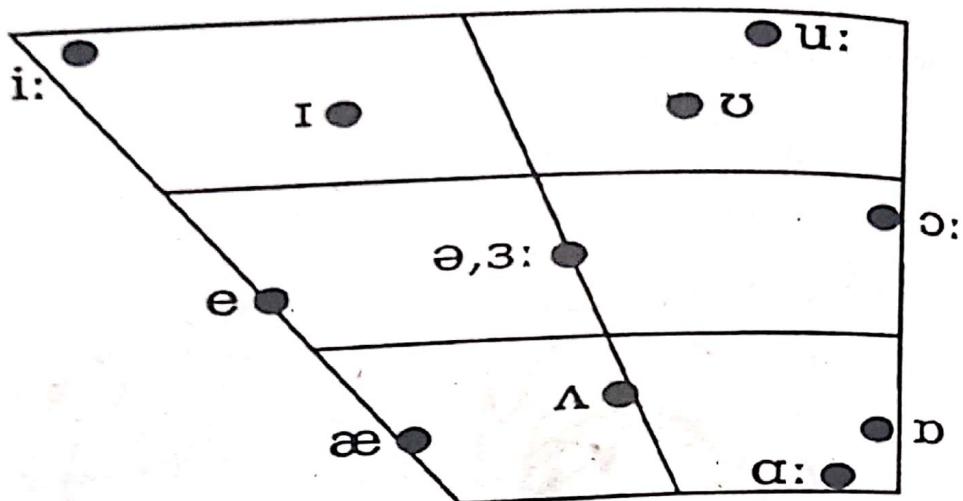


Figure (20)

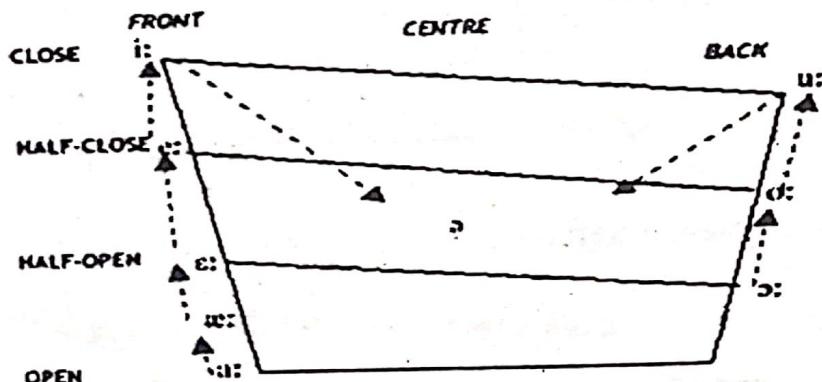


Figure (21)

Length

As you may have seen, there are two types of [i] sound in English placed in two different positions. However for the purpose of description, what is relevant is not the difference of position but that of the perceived length of the vowel. Thus it is said that [i:] is a long vowel and [ɪ] is a short one. The same is valid for [u:] / [ʊ], [əʊ] / [ə], [əʊ] / [ə]. Symbols for long vowels all have a colon.

Phonologically, one can establish the rule such as only long vowels may be the last sound of a syllable, whereas short vowels are always followed by at least a consonant. If we take away the final [t] from court, [kɔ:t] is a possible syllable (core) whereas [kɔ:] could not possibly occur. (Exceptions from this are the three short vowels that occur in completely unstressed syllables, [sɪtlɪ, intɪ, swetə] city, into, sweater).

Rounding

Vowels may also be different from each other with respect to rounding. If you compare [i:] in [t̬i:z] *cheese* with [u:] in [t̬u:z] *choose*, you will see that not only is [i:] a front vowel and [u:] a back vowel, but [i:] is also unrounded where [u:] is rounded. When pronouncing [u:] your lips are rounded, but when pronouncing [i:] the corners of the mouth are much further apart.

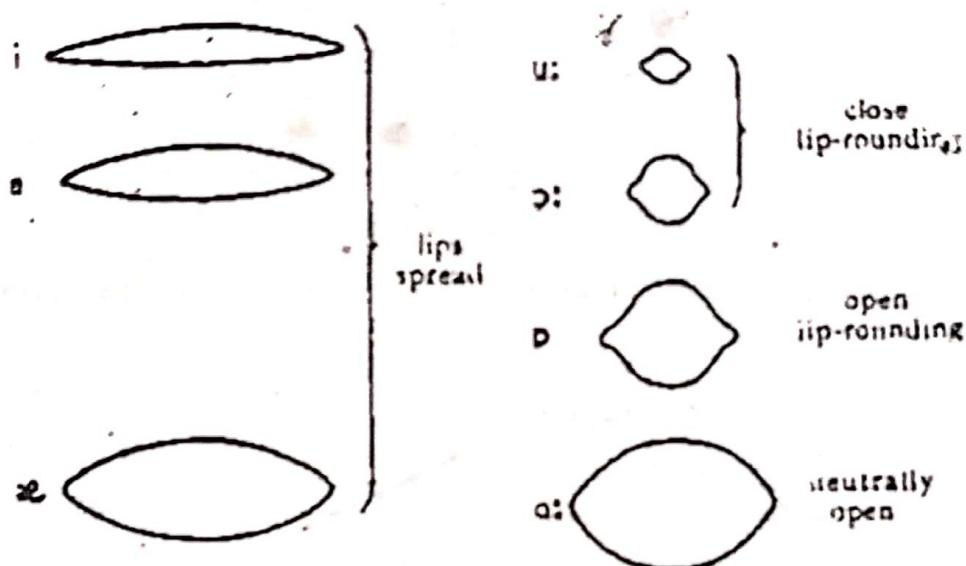


Figure 22: rounding. (McCarthy 1967:31)

Nasality

There are no nasal vowels in British English, i.e. no vowels in which the air also escapes through the nose.

Diphthongs

So far we have only been considering vowels that were constant, i.e. vowels that were pronounced at one and the same place. Such vowels are called monophthongs, and English has 12 of them.

English also has 8 diphthongs, which are vowels that change character during their pronunciation, that is, they begin at one place and move towards another place. Compare for example the monophthong in *car* with the diphthong in *cow*, or the monophthong in *girl* with the diphthong in *goal*. The vowels of *cow* and *goal* both begin at a given place and glide towards another one. In *goal* the vowel begins as if it was [ə], but then it moves towards [ə]. Therefore it is written [əə], as in [gəəl] *goal*, with two symbols, one for how it starts and one for how it ends.

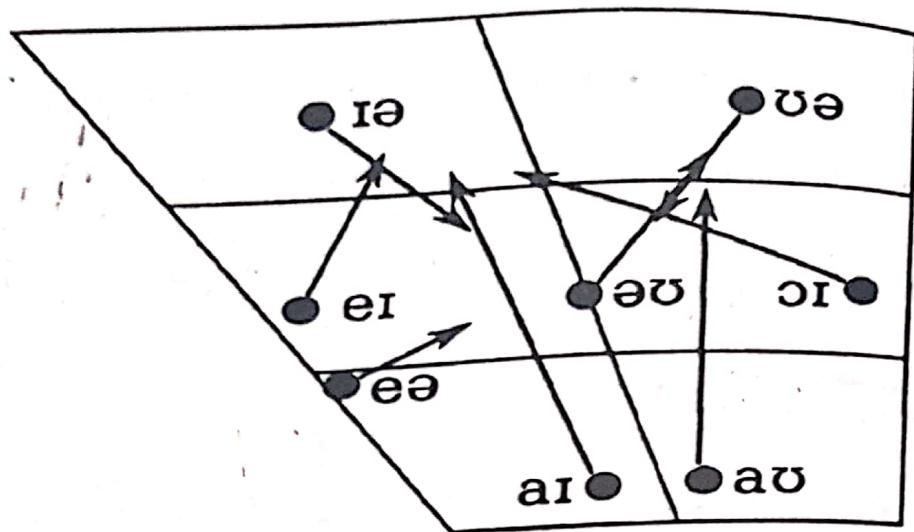
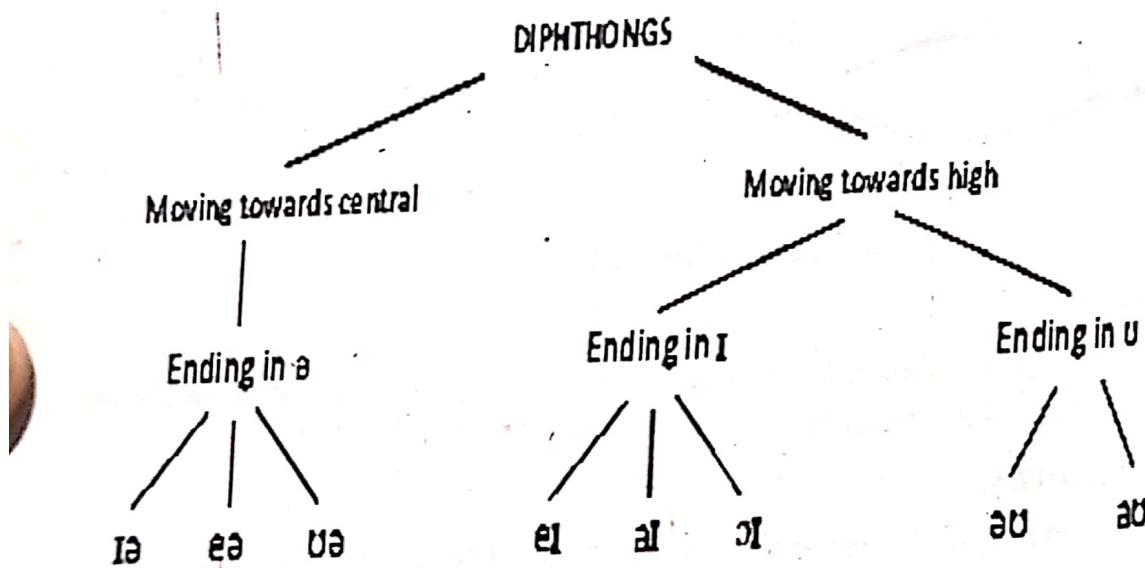


Figure 23: table of diphthongs.

The easiest way to remember them is in term of three groups composed as follow:



Note that some people speak of triphthongs for groups of diphthongs + schwa (ə) Example: [məʊə] mower.

Phonemes

Mark and Mary Brown are both doctors in the same hospital. One of them is a physician, the other is a biologist. When an invitation addressed to Dr M. Brown arrives, the secretary of the hospital wants to know which Dr Brown is invited. She asks a colleague: "Who's the physician?" The answer is: "She is". Hence it is Mary who's invited. Had the answer been "He is", it would have been Mark. This important information is conveyed by a single

segment of the utterance. If we transcribe the two possible answers in phonetic symbols, we get:

(1) a. [ɔi:əz]

b. [hi:əz]

These two answers refer respectively to Mary and Mark

(2) a. [ɔi:əz] she is = Mary

b. [hi:əz] he is = Mark

If we permute [ə] and [h] we change the meaning of the sentence and hence we aren't speaking about the same person.

Consider the following sentence:

(3) [ðə kæt əz ən ðə mæt]
the cat | is on the mat

If we change the first consonant of the noun *cat* and insert [h] instead we get the sentence

(4) [ðə hæt əz ən ðə mæt]
the hat is on the mat

which does not have the same meaning.

Again, if in (3) we substitute [b] for [k], we get

(5) [ðə bæt əz ən ðə mæt]
the bat is on the mat

The three strings of sound [kæt], [hæt] and [bæt] differ only because of their initial sound and thus are potentially three different words.

As in the case of Mark and Mary the substitution of one sound for another one changes the meaning completely.

Now if we say:

(6) a. the cat is on the mat

b. the mat is on the cat

What is the difference in sounds?

What is the difference in meaning?

Obviously the set of sounds uttered in (6a) and (6b) is identical. So the difference lies in the order in which these sounds appear:

[k] and [m] permute in (6b). We see that the order of appearance can alter meaning. In (6a) and (6b) the relationship between the cat and the mat is inverted.

In our examples we produce a change in meaning through a substitution of segments in a string of sounds. These segments are called **phonemes**. A precise definition will be given later on.

Now imagine you're in London and you want to go to Bond Street. You ask a couple: "Excuse me, could you tell me where Bond Street is?". They both answer in chorus: "Second left and then right", which can be transcribed as

(7) a [sekənd left ən ðen rəʊt]

b [sekənd left ən ðen Raʊt]

Both have given you the same information although you perceive a difference in the sounds used, that is, the woman has used [r], the regular English /r/ sound, whereas the man used the rolled lingual [R] instead. They are transcribed phonetically respectively as

[raʊt] and [Raʊt]

This difference in the pronunciation, which allows you to deduce that the wife is English and the husband Scottish, doesn't entail a change in meaning.

The two segments [r] and [R] can be used indifferently since there is no change of meaning: the difference between the two is said to be **phonetic**. This was not the case for the substitution of [h] for [θ] in [θi:θz] - [hi:θz], which brings about a change in meaning and is said to be **phonological** (or **phonemic**).

Minimal Pairs

Let's come back to the concept of phoneme. Since the substitution of [h] for [θ] changes *she* into *he*, [h] and [θ] belong necessarily to two different phonemes. Whereas [r] and [R], which under no circumstances change the information given, are said to belong to the same phoneme /r/. In the discussion of phonological versus phonetic differences, what matters is whether the substitution of one sound for another brings about a change in meaning or not; the description of this change does not enter the field of phonology.

Generally, when we wish to decide whether two segments belong to the same phoneme or, on the contrary, are realizations of two different phonemes, we put them in an identical context, that is the same string of sounds. When there is a difference between two

otherwise identical strings of sound and this difference results in a change of meaning, these two strings are said to constitute a minimal pair. Examples of minimal pairs were given in (1a) and (1b), and in (3), (4) and (5) above.

If we substitute one segment for another and this results in a change in meaning the two segments belong to two different phonemes. Thus [k] and [m] are realizations of two different phonemes /k/ and /m/ because substituting one for the other as first element of the string [-æ t] gives two different words: /kæt/ (cat) and /mæt/ (mat).

One can safely say that the phonemes of a given language form a system in which they are all opposed to one another. Take English /p/:

/p/ is opposed to /b/ as in	/pɒg/ : /bɒg/ pig : big
/p/ is opposed to /t/ as in	/pi:/ : /ti:/ pea : tea
/p/ is opposed to /d/ as in	/pɒg/ : /dɒg/ pig : dig
/p/ is opposed to /k/ as in	/pæt/ : /kæt/ pat : cat
/p/ is opposed to /g/ as in	/pɒt/ : /gɒt/ pot : got
/p/ is opposed to /m/ as in	/pæt/ : /mæt/ pat : mat
/p/ is opposed to /n/ as in	/pɒt/ : /nɒt/ pit : knit
/p/ is opposed to /M/ as in	/rɒp/ : /rɒŋ/ rip : ring
/p/ is opposed to /f/ as in	/pi:t/ : /fi:t/ peat : feet
/p/ is opposed to /v/ as in	/pet/ : /vet/ pet : vet
/p/ is opposed to /S/ as in	/pɒt/ : /θɒt/ port : thought
/p/ is opposed to /ð/ as in	/pæt/ : /ðæt/ pat : that
/p/ is opposed to /s/ as in	/pæt/ : /sæt/ pat : sat
/p/ is opposed to /z/ as in	/pɒp/ : /zɒp/ pip : zip
/p/ is opposed to /ɹ/ as in	/pi:/ : /ɹi:/ pea : she
/p/ is opposed to /ɾ/ as in	/lepa/ : /leɾə/ leper : leisure
/p/ is opposed to /tɹ/ as in	/pi:p/ : /tɹi:p/ peep : cheap
/p/ is opposed to /dɹ/ as in	/pi:p/ : /dɹi:p/ peep : jeep
/p/ is opposed to /l/ as in	/pɒt/ : /lɒt/ pit : lit

/p/ is opposed to /r/ as in	/pət/ : /rət/ pot : rot
/p/ is opposed to /w/ as in	/pi:/ : /wi:/ pea : we
/p/ is opposed to /j/ as in	/pək/ : /jək/ poke : yoke
/p/ is opposed to /h/ as in	/pi:/ : /hi:/ pea : he

Table 1: /p/ as opposed to the other consonant phonemes of English

This procedure can theoretically be applied to each phoneme of the language. Note, though, that in the chart above, /p/ is opposed to other consonants only. This is because even though all phonemes of a given language form a system, oppositions in that language are organised in such a way that consonants can only be opposed to consonants and vowels to vowels. We shall see in the next sections how oppositions are organised according to the rules of syllable structure, word formation and other contingencies.

Features

A phoneme is opposed to all other phonemes of its subsystem (respectively, consonants and vowels) in several ways. /p/ has to be defined as an unvoiced bilabial plosive to account for all the oppositions found with the other consonants in English. These three features are all necessary because if /p/ was described as an unvoiced consonant it could be opposed to /b/, /d/, /g/, /v/, /ð/, /z/, /θ/, /dθ/, but would not appear as distinct from all other unvoiced sounds. If /p/ was described as a bilabial only it could be opposed to all non-bilabials but would not appear as distinct from /b/ and /m/. If /p/ was described only as a plosive it would be opposed to all non-plosives but would not appear distinct from /t/, /d/, /g/, /b/, /k/.

Hence we can say that

- 1) voiceless
- 2) bilabial
- 3) plosive

are the *distinctive features* of /p/.

Consider the phoneme /m/. Phonetically it is described as a voiced bilabial nasal. However if bilabiality is necessary to account for its opposition to /n/ for example and nasality is necessary to

account for its opposition to /b/ voicing is not a phonological feature since there are no voiceless nasals. As voicing is not a distinctive feature of /m/, we say it is a redundant feature from a phonological point of view.

Let's have a look at /l/. It is described phonetically as a voiced alveolar lateral. However since there are no other lateral sounds in English, voicing and alveolarity are redundant *phonological features*. Voicing is also a redundant feature for vowels since there are no voiceless vowels.

Each language has its own set of phonemes; oppositions among those phonemes differ necessarily from language to language: they have been based on different sets of features for each language. For example nasalit y exists both in French and in English. However in French nasalit y is a distinctive feature of both consonants and vowels. The French /m/ is opposed to /p/, /b/ because it is nasal, as in English. But whereas there are no nasal vowels in English (at least in Received Pronunciation of British English) in French there are nasal and oral (non-nasal) vowels: /bo/ *beau* ("beautiful") is opposed to /bõ/ *bon* ("good") because of its nasalit y. So is /pla/ *plat* ("flat") when it is opposed to /plã/ *plan* ("map").

Another example of the relevancy of sets of features would be the role of lip rounding in French and in English. Lip rounding exists in both languages. In English, only back vowels are rounded and rounding alone will never account for the opposition between two vowels. So rounding is a redundant feature of English vowels. In French, both /i/ and /y/ are high front vowels, but /y/ is distinct from /i/ because of its rounding only: /vy/ *vii* ("seen") is opposed to /vi/ *vit* ("saw"). Rounding is a distinctive feature of French vowels.

Segmentation of the string of sounds can also differ from one language to the other. For example, phonetic [t^o] is considered as one phoneme in Spanish (/t^o/), as two in French (/t/+/^o/) and as one or two in English depending on the analysis of the set of consonants.

Allophones

Each phoneme can be described as a maximal set of distinctive features. We have seen that /p/ must be described as 'voiceless bilabial plosive' to account for all the oppositions it can be found in. Every sound which is a realization of a given phoneme must show the same set of distinctive features. The realizations of phonemes —

or phones – are called *allophones*. All allophones of a phoneme share the same set of distinctive features but each one can also show additional features. For example the phoneme /p/ is realized as [ph] in [phɔt], as it would be every time it occurs in a word as initial consonant before a vowel, and as [p] in all other cases. [ph] and [p] are said to be allophones because

1. they can both be described as voiceless bilabial plosives and
2. if we substitute one for the other we do not get any change in meaning but rather an odd pronunciation.

The feature 'aspirated', which we find in [phɔt], is context-bound. Its relevance is not a change of meaning but its position in a string of sounds or context. [ph] and [p] are realizations of the same phoneme, i.e. allophones that are in *complementary distribution*: [p] can never occur instead of [ph] and vice-versa. Note that these non-phonological variations are not always perceived.

Allophones can also be in free variation. That is, there are no restrictions as to their appearance. Probably no one ever utters the same phoneme twice in the very same way: with an appropriate acoustic instrument, one could always find a small difference between two allophones, a difference which can be attributed to a physiological state, the sort of conversation held, the climate, etc. More systematic instances of allophones may be due to regional "accent": we have already mentioned the case of the two /r/: [r] and [R], which can occur in exactly the same context without change of meaning, hence with an identical set of distinctive features but accompanied by non-distinctive features indicating that the speaker is, for example, a Scotsman.

The Syllable

We have seen that the sounds of a language form a system or a system of sub-systems in which the various elements are opposed to one another. However this is not enough to explain the organization of the sound pattern of language, whose units are used to convey meaning. The various elements of the system or sub-systems combine in certain ways which reveal the various levels of structure of the sound system. On the first level we find the structure called *syllable*.

In English a syllable consists of a phoneme or a sequence of phonemes. If the syllable receives word stress it can be associated with meaning and form what is usually called a word. No word in

English can consist of anything less than a syllable and no syllable can consist of anything less than a vowel. There aren't many examples of monosyllabic words consisting of only a vowel in English. However, we have /a:/ are, /ə/ or, awe, /a/ eye, I or ay(e), /ə/ owe, etc.

It would be nice to show that given the appropriate intonation, these words could form a sentence. However, there is no such example in English. Latin offers a good example of a sentence formed of a single word formed itself of a single syllable which consists of a vowel only: / i /, i which means "Go!".

Each vowel has the possibility of constituting a syllable (hence a monosyllabic word) by itself whereas this is never possible for a consonant. This is the great *phonological distinction* between vowels and consonants. Examples of monosyllabic words consisting of a vowel are given above. But not all English vowels can form a word by themselves. /ə/, for instance, is not an existing English word. However, what matters is that it could be a word. If we were to invent a name for a new product, we could well use the single-vowel syllable [ə]. We would then have made use of what is called an accidental gap. Accidental gaps are formed of possible combinations of phonemes at any level of the structure of the sound system of a language, which have not yet been assigned meaning.

Word and Stress

To avoid interference with meaning we have chosen to examine an accidental gap consisting of a whole sentence:

(1) 'dəi:kəzə 'nju:s 'həspet

This sentence can be divided into six syllables, the limits of which are not always obvious. Let's examine the first and the last syllables.

We know that /də/ is the beginning of the first syllable and that /i:/ is the nucleus. However, this syllable could either stop directly after the nucleus and we would have a syllable /dəi:/; or it could have a termination /k/, producing the syllable /dəi:k/. The next syllable could then have either a zero onset /ə../ or the onset /k:/ /kə../.

The last syllable finishes with /t/ and has /e/ as a nucleus. However it could:

- have no onset and yield a syllable /et/
- have an onset consisting of /p/ and yield a syllable /pet/
- have an onset consisting of the cluster /sp/ and yield a syllable /spet/.

All this is possible because the previous syllable can be either /h \square sp/ or /h \square s/ or /h \square /.

Usually the notion of stress is related to the notion of word and there is one stressed syllable per word. In our example, if this were true, we would have three words. Where would the word boundaries be, bearing in mind that there is no meaning to help us?

Here are some of the possible words:

(2)	a 'd \square i:k \square zə I	'nju:s	I 'h \square spet
	b 'd \square i: I	k \square zə 'nju:s	I 'h \square spet
	c 'd \square i:k \square z I	ə 'nju:s	I 'h \square spet

Effects of Stress on Words

In actual fact, our accidental gap sentence is English sentence in disguise:

(3)	/'d \square ɒn	əz	ə	'na \square s
	'h \square zbənd/			
	John	is	a	nice

husband

Now that we know what the sentence means, we realize that there are more words than stresses. So the notion of word as it is usually understood is not always absolutely compatible with the notion of stress. We have five words and yet two of them, i.e. /əz/ and /ə/ do not bear any stress even though they are well formed syllables. Each word has a potential word stress, even "little" words like articles, prepositions etc. For instance into /ən't \square / has a stressed syllable and an unstressed one even though most of the time the stress is not realized. Why then *are*, *is* and *a* not stressed in our example?

In the realization (utterance) of a sentence, functional words (i.e. our former "little words": articles, prepositions, auxiliaries, conjunctions etc.) do not receive stress as lexical words do.

In polysyllabic lexical words, there is one and only one prominent syllable, where the primary stress is realized. There can also be a so-called secondary stress in long words (ex: photographic /fəʊtə'grɪfɪk/) but this stress is not a phonological sign since its placement never results in an opposition between two words; it may indicate word structure. Primary word stress is signalled with an apostrophe (') which precedes the stressed syllable, and secondary stress with a comma before the stressed syllable.

As we have said, prominence is also achieved through quality, which affects mainly the vowel. As an example, let's examine the triplet:

(4) a. phone	'fəʊn
b. phonology	fəʊ'nɒlədʒi
c. phonological	fəʊ'næ'lɒdʒɪkəl

Notice first that the three words in (4) all bear a primary stress and the word *phonological* bears an extra, secondary stress. Even though these words are derived from the same root, the stress is placed on different syllables.

The nucleus [əʊ] of the first syllable remains unchanged even though in (4a) it appears in a stressed syllable, in (4b) it appears in a weak syllable and in (4c) in a syllable with a secondary stress. But not all nuclei remain constant. Let's examine the nuclei of the second and third syllables in *phonology* and *phonological* (example (4b) and (4c)).

The nucleus of the second syllable in *phonology* is stressed and is realised as /əʊ/ whereas the same nucleus in *phonological* is unstressed and is realized as /ə/; the vowel of the third syllable of *phonology*, being unstressed, is realized as /ə/ whereas its counterpart in *phonological* is stressed and realised as /əʊ/.

We see that the vowel /ə/ is never found in a stressed syllable. Recall our example of a foreign word such as banana. As the spelling indicates, it was pronounced /banana/ (the /ə/ sound is like the French one in /lək/ lac) when it was borrowed from the Spanish and Portuguese who themselves imported it from a Guinean word. The placement of the stress in English required that the only "full" vowel /əʊ/ to be kept as such was the one in the stressed syllable. The others, being unstressed, came to be pronounced in a very neutral way: /ba'na:nə/.

Stress and Oppositions

Stress placement is linked to vocalic quality. There are many pairs of words which are spelled the same way but are pronounced differently due to the placement of stress:

(5) a. 'k [□] nd [□] kt (N)	— kən'd [□] kt (V)	conduct
b. 'dezət (N)	— d [□] 'z [□] t (V)	desert
c. 'preznt (N, A)	— pr [□] 'zent (V)	present

In such cases we can verify our theory that placement of stress affects the quality of the nucleus of the syllable. Stressed /C [□] C/ in 'k[□]nd[□]kt / becomes unstressed /C ə C/ in /kən'd[□]kt/; stressed /C e / in /'dezət/ becomes unstressed /C I / in /d[□]'z[□]t/ and unstressed /C ə C/ becomes stressed /C □ C/.

Even more interesting is our third example (5 c) where in the unstressed second syllable of /'preznt/ we find a syllabic consonant, i.e. no vowel at all, which appears as vowel + consonant /en/ in an unstressed syllable.

It has been argued that in English one can find a certain number of minimal pairs in which it is the placement of stress which determines the opposition, the string of phonemes being rigorously the same. For example /'æbstræk^t/ *abstract* (A) differs from /æb'strækt/ *abstract* (V) because the adjective bears the stress on the first syllable and the verb on the second one. The same is true for *import*, *increase*, *insult*. One can discuss whether it is really worthwhile creating a category of opposition due to placement of stress only from such a small corpus of evidence. The fact that these vowels do not change (whether they appear in a strong or in a weak syllable) is perhaps due to some of their intrinsic characteristics such as length, position or quality. There could also be a morphological explanation linked to the presence of a prefix.

Weak Forms

As we have seen, each word, in the most common use of the term, has a potential word stress. In our example (2) /'d[□]i:k[□]zə'nju:s - h[□]spet/ we knew that phonologically there were three "words" (units equal to or higher than a syllable but smaller than a sentence) but we couldn't tell how many lexical and function words the sentence contained. When we translated our sentence into a meaningful one (/d[□]□n □z ə na□s h[□]zbənd/) we saw that two of

the words (is and a) had no stress. They were realized in their weak form, that is either with a schwa such as in /ə/ *the*, /ə/ *a*, /ən/ *and*, /əv/ *of*, /bət/ *but*, /ðən/ *than*, /əs/ *us*, /həv/ *have*, /əz/ *as*, /məst/ *must*, /ðə/ *there*, or with their long vowel being shortened such as in /ɔi/ *she*, /bi/ *be*, /ju/ *you*; weak forms can also drop their initial /h/ such as in /ɔz/ *his*, /i/ *he*, /ə/ *her*.

Function words often have both a weak and a strong form. They usually appear in their weak form when unstressed. They can appear in their strong form without a stress, but if they are stressed, they necessarily appear in the strong form.

Important University Questions

1. What are vowels in English? Describe their place and manner of articulation in detail.
2. What are consonants in English? Discuss them in detail.
3. Define the following terms and give examples
 - Minimal pairs
 - Syllable
 - Word and stress
 - Weak forms

