Phonetics

Study of speech sounds

Linguistics Module

Phonetics - overview
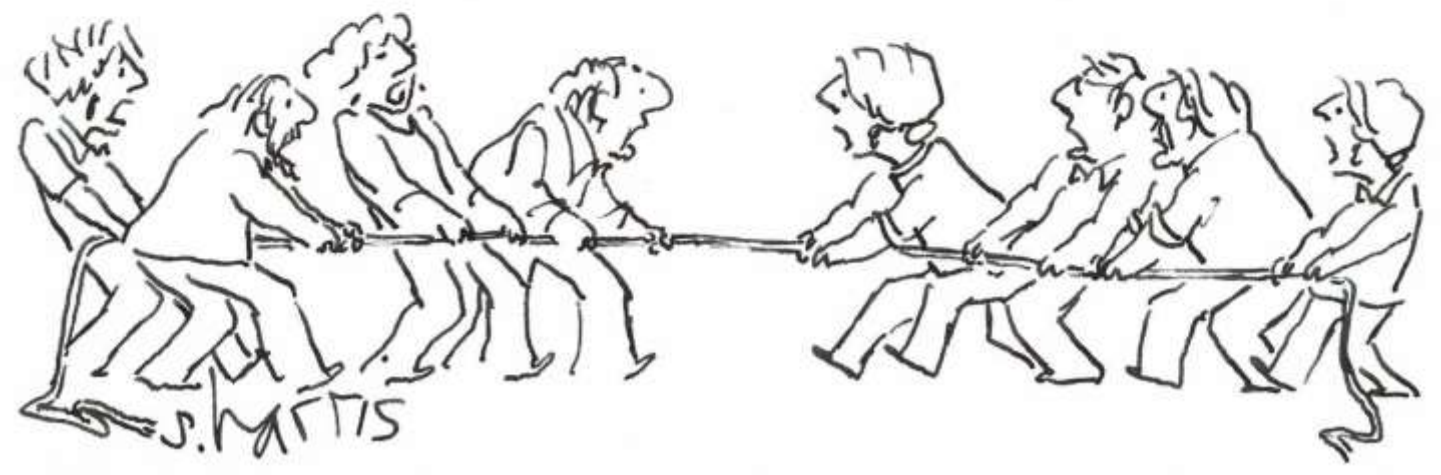
- Phonetics is about the sounds that languages use to make words

- Languages differ in the inventory of speech sounds they use, though there are quite a few sounds that are found in lots of languages

- In this topic we will focus on the sounds of English but make brief mention of sounds found in other languages

- Speech sounds are divided between consonants and vowels, though there is some overlap between these two categories

- We will look first at the range of speech sounds found in general and then concentrate on the English sound system

Speech and non-speech sounds

- Speech sounds are determined by the position of (mainly) the tongue, and other "organs of speech"

- Some sounds that you can make are not used in any languages (e.g. 'blowing a raspberry' sound)

- There are some (notably "clicks", eg tut-tut, gee-up) that in some languages have a meaning of their own (English eg), but in other languages are used just like other sounds

Writing vs speech: the International Phonetic Alphabet (IPA)

- Note the difference between writing and speech:
- Writing developed as a way of representing spoken language, not vice versa
  - so if there is a discrepancy, you should question the spelling, not the pronunciation!
- Most writing systems (even alphabetic ones) are not fully "phonetic"
  - Letters can have different values
  - The same sound can be written differently
- The International Phonetic Alphabet was developed to allow phoneticians to write down speech sounds unambiguously
  - Most letter symbols are have their expected values, but not all
  - There are some new symbols to "learn"
  - Principle is: one sound per symbol and one symbol per sound

How is speech formed?

- Almost all sounds are formed on a stream of air from the lungs which is modified in some way as it passes through the "speech tract"
- The glottis (vocal chords) located in the larynx affects "voicing"
- The velum controls whether air passes through the nasal cavity as well as the oral cavity ("nasalisation")
- The main factor is the position of the tongue relative to the other parts of the mouth

- **Curious fact: all the organs that we use for speech have been adapted, and have other primary uses →**

Can you name them?

nasal cavity

oral cavity

larynx

lungs
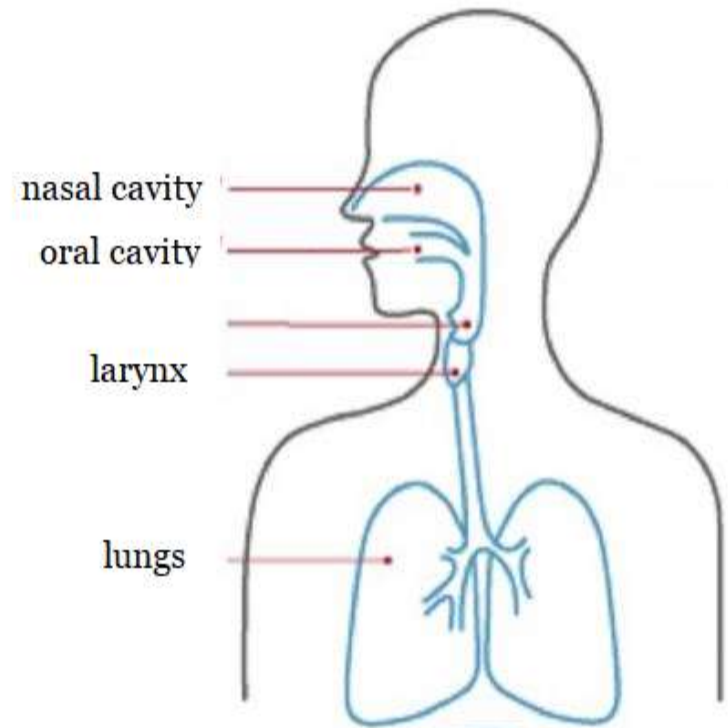
Consonant sounds

- Consonants are sounds which involve a blockage in the vocal tract
- Either complete (momentary) closure, or a partial blockage
- Consonants are defined by three features:

  1. Place of articulation
  2. Manner of articulation
  3. Voicing

Place of articulation

- lips (labial)
- lips+teeth (labio-dental)
- tongue tip + teeth (dental)
  - between teeth
  - behind teeth
- tongue tip and tooth ridge (alveolar)
- blade of tongue and hard palate (palatal)
- back of tongue and soft palate (velar)
- root of tongue and back of throat (uvular) (not in English)
- vocal folds only (glottal)
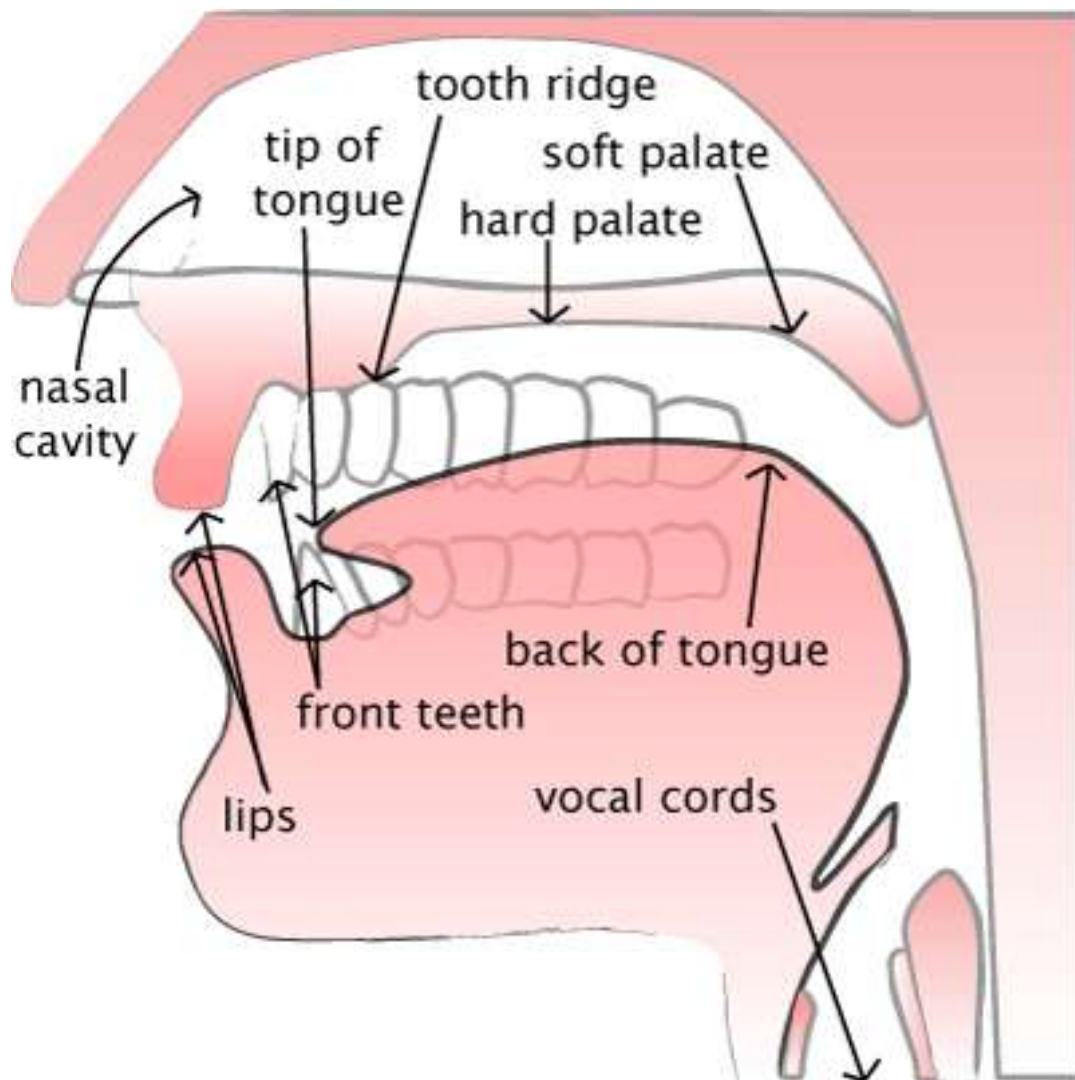
Manner of articulation

- Complete closure "plosive" or "stop"
  - very brief
  - you can't tell what the sound was until the closure is released
- Gap is narrowed but not completely closed, allowing air to hiss through "fricative"
- Combination of both: "affricate"
- Complete closure but velum is lowered allowing air to pass through nasal cavity: "nasal"
- Closure with tip of tongue, but air passes around the sides of the tongue: "lateral"
- Tip of tongue curled back, closure is made with back of tongue tip: "retroflex"
- Narrowing but no closure, like a vowel "frictionless continuant" or "semi-vowel"

Voicing - let's try it together

- Larynx or glottis consists of two folds of cartilage
- They can be held tight
    - to prevent food passing into the windpipe
    - to compress air in the lungs eg when straining
    - to utter a "glottal stop" as in "uh-oh" [ʔ]
- Or, as the air passes through they can be allowed to vibrate to produce a "voiced" sound
- Rate of vibration determines pitch
- Loose vibration results in whisper
- No vibration gives "voiceless" sound

Let's try it! Tests for voicing:

Hold your fingers to your throat or put your hands over your ears, then pronounce a long SSSS then a long ZZZZ. If you can feel or hear buzzing then it's voiced.

Consonants of English

	Bilabial	Labio-dental	Dental	Alveolar	Palatal	Velar	Glottal
Stop	p b			t d		k g	
Fricative		f v	θ ð	s z	ʃ ʒ		h
Affricate					ʧ ʤ		
Nasal	m			n		ŋ	
Lateral				l			
Retroflex				r			
Semi-vowel	w			r	j		

Unfamiliar symbols: θ (<u>th</u>in) ð (<u>th</u>is) ʃ (sh) ʒ (mea<u>s</u>ure) ʧ (ch) ʤ (j) ŋ (ng)
NB [j] is 'y' (<u>y</u>oung) NOT 'j' !

Vowel sounds

- Sounds formed by shape of tongue, but with no contact
- Harder therefore to classify exactly
- Defined by three main features

1. Which part of the tongue is raised
2. Relative height of tongue
3. Lip rounding

- Vowels are usually voiced but can be voiceless (though not in English)
- Can be nasalised (again, not in English)
- Length is often distinctive
- Glides ("diphthongs") are possible, and quite common in English
- Vowels differ greatly in different accents of English (much more than consonants) both per location and over time
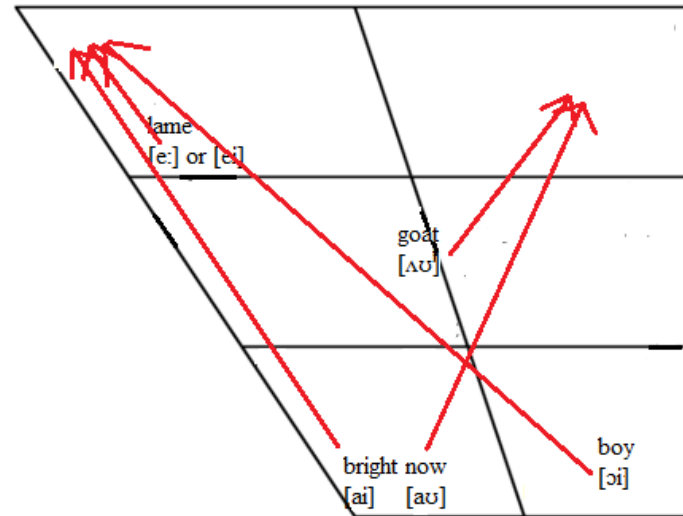
Vowel sounds

- Plotted on a chart which represents the oral cavity
- Which part of tongue is raised towards the roof of the mouth?
  - Front, Central, Back
- How high (relatively) is it raised?
  - Close, Half-close, Half-open, Open
- Are the lips rounded or spread?
  - Front vowels typical spread, back vowels rounded
  - But this can be reverse (though not in English) - e.g.
    - French 'u', German 'ü' (close front rounded)
    - French 'eu' German 'ö' (half-close front rounded)
    - Turkish 'ı', Japanese 'u' (close back spread) like 'ugh'
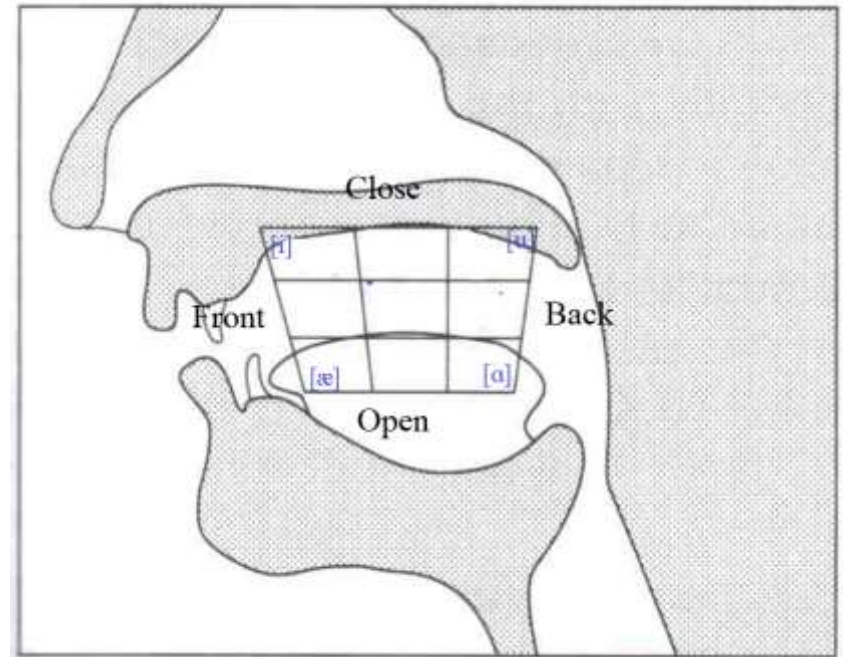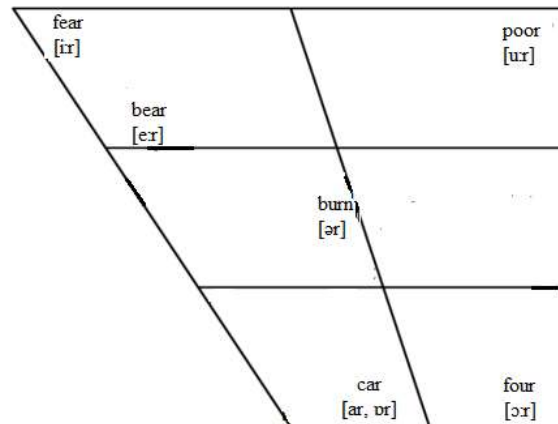
Vowels of (Hiberno-)English
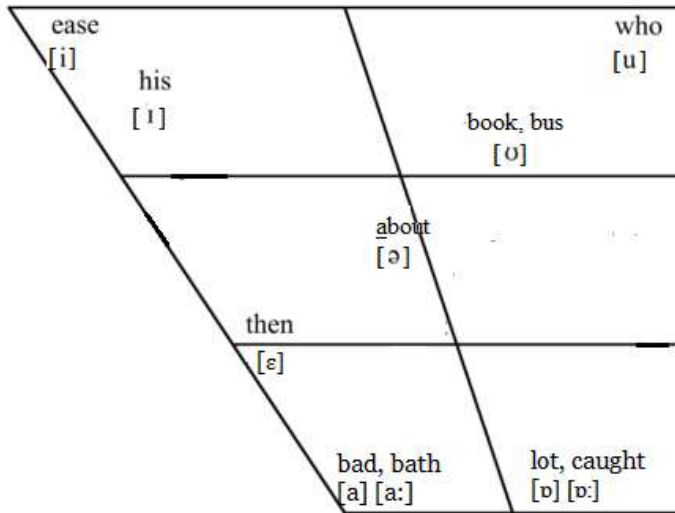
Pure vowels

Glides (diphtongs)

R-coloured ("rhotic")

Phonology

- Some sounds are slightly different depending on context

- Most obvious (in English) is "clear L" vs "dark L"
    - compare L sound in 'slip' and 'bull'
    - but we think of them as the same sound or "phoneme"

- [n] can be dental 'tenth', labio-dental 'inform', retroflex 'unruly', palatal 'onion', velar 'incur' … ie assimilated to the following sound

- Velar nasal only occurs before velar plosives [k] and [g] as in 'sink' and 'sing'
    - For some speakers, the final [g] is also pronounced

Vowel or consonant?

- Vowels and consonants can be defined by HOW they are produced, as we have done here
- Or by their FUNCTION
  - Semivowels [j] an [w] are essentially the same as the vowels [i] and [u], but they function as consonants in words like 'yellow', 'weather', 'awake' …
  - Consonant that are "continuants" (ie not stops) can function as vowels, forming a syllable
  - In English, syllabic L in 'bottle' (for some speakers), syllabic N in 'sudden'
  - R in some (rhotic) accents could be described as syllabic as in 'bird'
  - Also in paralinguistic forms such as 'hmmm', 'shhhh'

Some non-English consonant sounds

- Voiceless is shown first, then voiced

- Bilabial fricatives ɸ (Japanese f) and β (Spanish, Greek v)

- Palatal fricatives ç (German i<u>ch</u>, Irish slender ch, h as in '<u>H</u>ughes') and ʝ (Irish slender dh)

- Velar fricative x (Irish broad ch, 'lo<u>ch</u>', German 'Ba<u>ch</u>') and ɣ (Irish broad dh, Spanish, Greek g)

- Lateral fricative ɬ (Welsh ll, Zulu hl) and ɮ (Zulu dl)

- Uvular stops q and ɢ (Arabic)

Some non-English consonant sounds (cont.)

- Uvular fricative ʁ (French, most varieties) voicing depends on context, eg voiceless in 'lett<u>r</u>e', voiced in '<u>r</u>ouge'

- Retroflex stops typical of Indian languages

- Voiceless bilabial semi-vowel ʍ (wh in some varieties of English, written 'wh' but actually one sound, or else [hw]

- Labio-dental semi-vowel ɥ (French 'l<u>u</u>i')

- Clicks (tut, gee up, clip clop) in Xhosa, Zulu and other African languages

Some general facts about languages' sound systems

- All languages have consonants and vowels, but the ratio differs hugely

- Number of consonants varies from 117 (in !Xũ, spoken by 5000 people in Angola/Namibia) to 6 (Rotokas, Melanesia); English has 24

- All known languages (except one, an almost extinct Native american language) have bilabial sounds

- Number of vowels ranges from (arguably) 2 (Karbadian, a Caucasian language with 650k speakers) to 28 (Kashmiri); English has ~20 depending on accent, quite a high number

- Latin had 5 long vowels and 5 short vowels, hence the 5 vowel symbols in our alphabet - that's (part of) why English spelling is so hard

- Most languages (97%) have more consonants than vowels

- Source: Mikael Parkvall, *Limits of Language*, Battlebridge Pubs, 2008

Some general facts about languages' sound systems (cont.)

- Languages also differ in the way words are constructed from the sounds ("phonology")

- Some languages allow only simple syllable structures V, CV (eg Japanese, Polynesian languages), and don't allow "consonant clusters"

- Others allow more or less complex consonant clusters initially or finally
  - English allows initially CC or CCC as long as the first C is [s]
  - not all combinations of Cs are allowed ("phonotactics")
  - Finally up to 4 or 5 Cs are possible (eg 'twelfths')

Exercise 3.1 Places of Articulation

- Worksheet 3.1 Places of Articulation (includes diagram, worksheet and solution)

- Extra helpful resource to complete above task: Youtube video by IPA Basics : Place of Articulation

- Break the students into pairs to explore the places of articulation of consonants. Referring to the diagram, students must pronounce a list of words out loud, and fill in the worksheet.

Exercise 3.2 Phonetic symbols / IPA

- Worksheet 3.2 Phonetic Symbols

- Break students into pairs to use the phonetic symbols guide to fill in the worksheet.

- Extra resource to help: A more comprehensive list of IPA symbols

Exercise 3.3 Articulation Test AILO Puzzle

- Adapted All Ireland Linguistics Olympiad (AILO) Articulation Test Puzzle and Solution

- Students read the Speech Therapy articulation test data and predict pronunciations. The solution is provided.

Thank you