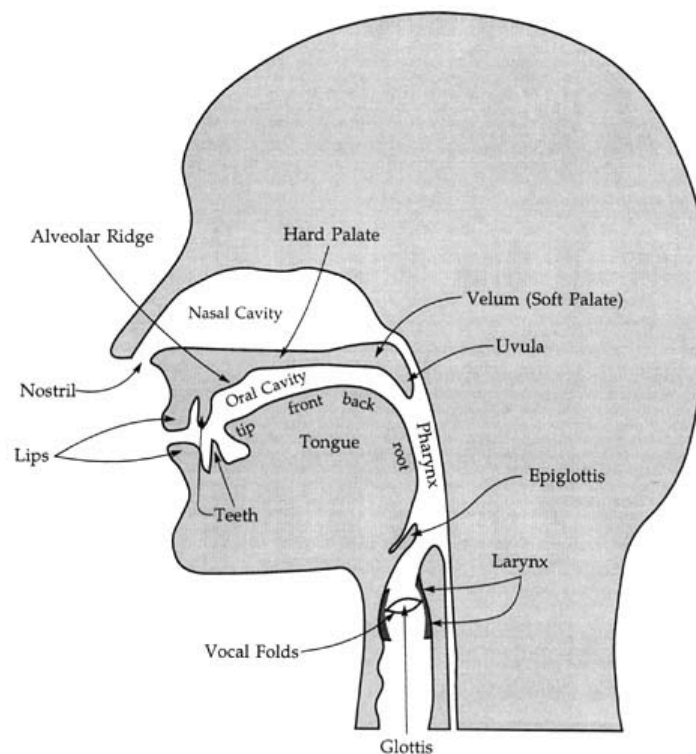


Lecture 5

Introduction to phonetics and phonology

Allomorphy often depends upon **phonetic properties** of morphemes;
and rules defining the possible sound structures the language permits.
To explain those fully, we have to know how to **describe speech sounds**.

Most speech sounds are produced by air from the lungs passing through the **vocal tract**; the **positions** of the organs in the vocal tract determines the sound the air makes.



The **vocal tract**.

It begins at the **larynx**, containing the **vocal folds** (AKA “vocal cords”):
a pair of muscular flaps that can be opened or closed,
allowing air from the lungs to flow freely or blocking it off.
(The space between the vocal folds is the **glottis**.)

If vocal folds are held **partially open**, they **vibrate** as air passes over them;
speech sounds produced with vocal cords vibrating are called **voiced** sounds.
Example: “v” and “z” are **voiced** speech sounds; “f” and “s” are **voiceless**:
if you pay attention to your vocal tract, you can feel that the only difference
between “f” and “v” is that your vocal cords vibrate for “v” but not for “f”.

If the airstream encounters **no significant obstacles** between larynx and lips—
i.e., the air **flows freely** through the vocal tract—
the sound produced is a **vowel**.

If there is some **blockage** in the vocal tract that air must go **through** or **around**,
the resulting sound is a **consonant**.

Consonants are described in terms of two main parameters:

Place of articulation: where in the vocal tract is the obstacle to airflow?

Manner of articulation: what type of obstacle is the airflow faced with?

These parameters plus **voicing** let us classify all the consonants used in English.

Manners of articulation are divided into **two main types**:

Obstruent: Some obstacle **blocks the whole vocal tract**; air must push
through the obstacle to escape, creating turbulent noise.

Sonorant: Only **part of the vocal tract** is blocked; air can escape by **flowing**
around the obstacle.

In English, basically all **sonorants are voiced**.
obstruents come in **paired voiced and voiceless** versions.

Major obstruent manners of articulation

Stop: vocal tract is **completely blocked** for a split second, then fully released;
the **release** creates a noise we hear as a consonant.

Fricative: vocal tract is **not fully blocked** but **narrowed** to a small passageway;
air **passes turbulently through** the passage and thus makes a sound.

Affricate: combination of stop + fricative—vocal tract is **blocked briefly** (stop),
and then **partially released** into a narrow channel (fricative).

English obstruents:

voiceless stops:	[p] <i>pep</i>	[t] <i>taught</i>	[k] <i>cork</i>	
voiced stops:	[b] <i>bib</i>	[d] <i>dead</i>	[g] <i>gag</i>	
voiceless fricatives:	[f] <i>fife</i>	[θ] <i>think</i>	[s] <i>cease</i>	[ʃ] <i>shush</i>
voiced fricatives:	[v] <i>verve</i>	[ð] <i>this</i>	[z] <i>zoos</i>	[ʒ] <i>pleasure</i>
voiceless affricate:				[tʃ] <i>church</i>
voiced affricate:				[dʒ] <i>judge</i>

[h] as in *heart* is also more like a voiceless fricative than anything else.

Recall we represent speech sounds using the **International Phonetic Alphabet**,
which doesn't have the **ambiguities** that ordinary spelling does.

Most consonants have IPA symbols that are the **same** as ordinary spelling;
but **take note** of those that aren't!: [θ] [ð] [ʃ] [ʒ] [tʃ] [dʒ]

Tricky bits:

Note [θ] and [ð] are **different sounds**, though they're always spelled the same!

Note words like *zoos* end with [z] even though it's spelled with "s"!

Major sonorant manners of articulation

Nasal: **mouth** is completely blocked (as in a stop), but air escapes **via the nose**.

Lateral: **middle** of the mouth is blocked, but air flows **around the sides**.

Approximant: constriction in vocal tract is **very weak**; almost a vowel
(also called **glide** or **semivowel**)

English sonorants:

nasals:	[m] <u>mum</u>	[n] <u>noon</u>	[ŋ] <u>singing</u>
lateral:		[l] <u>lull</u>	
approximants:	[w] <u>way</u>	[r] <u>row</u>	[j] <u>yes</u>

Tricky bits:

[j] represents the consonant sound of “y”: [y] represents a **different sound** in the IPA!

[ŋ] is actually a **single sound**, even though it’s **spelled** as if it were [n]+[g]!

[r] is a symbol with a **variety** of uses; sometimes it stands for other *r*-type sounds instead.

Places of articulation used in English

Bilabial: the two lips come together: [p], [b], [m]

Labiodental: the lower lip on the upper teeth: [f], [v]

(Inter)dental: the tip of the tongue on or between the front teeth: [θ], [ð]

Alveolar: the tip of the tongue on the **alveolar ridge**, the bony ridge above the upper gums: [t], [d], [s], [z], [n], [l], [r]

Postalveolar: the front of the tongue just behind the alveolar ridge, near the hard palate: [ʃ], [ʒ], [tʃ], [dʒ]

Palatal: the middle of the tongue on the roof of the mouth: [j]

Velar: the back of the tongue on the soft palate: [k], [g], [ŋ]

We describe [h] as a **glottal** fricative—its point of articulation is the **glottis**, the space between the vocal folds. [w] is **simultaneously bilabial and velar**.

There’s also a **glottal stop** [ʔ], which can be heard between the syllables of *uh-oh*: it’s a **momentary complete closure** of the glottis.

Some additional terms:

Coronal: a collective category for articulations using the tip or front of the tongue —dental, alveolar, postalveolar, et al.

Sibilant: a **coronal fricative** / affricate constricted **behind the teeth**: [s z ʃ ʒ dʒ tʃ]
—the air coming from the constriction **hisses** loudly through the teeth.

The set of sounds that has some particular feature or features in common is referred to as a **natural class**—

e.g., the natural class of all fricatives,

the natural class of all voiced bilabial sounds, etc.

Sounds in a natural class often show **common patterns of behavior**.

Vowels have features that define natural classes as well:

Vowels

Unlike consonants, vowels are produced with **no constriction** in the vocal tract; the sound of vowels is determined by the overall **position of tongue and lips**. Classify vowels in terms of features describing **overall shape of the vocal tract**:

Vowel height—

essentially corresponds to **distance from tongue to roof of the mouth**.

High vowels have tongue **close to roof of mouth**; **low** vowels farther away.

(High/low vowels are also sometimes called **close/open**, based on the position of the **jaw**.)

Heat contains a high vowel; *hot* contains a low vowel—

if you say them both, you'll feel your tongue and jaw moving up and down.

Vowel frontness—

roughly corresponds to **how far forward or back** the center of the tongue is.

Kate contains a front vowel; *court* contains a back vowel—

if you say them both, you'll feel your tongue moving forward and back.

We **categorize** vowel sounds as **high, mid, or low** and as **front, central, or back**;

but unlike consonants, vowel production takes place in a **continuous** space.

It's possible for one high vowel to be **slightly higher or lower** than another one;

but not for an alveolar consonant to be "more alveolar" than another one.

Thus **dividing them up** into e.g. high/mid/low classes is a (useful!) **abstraction**.

Vowel roundness—

corresponds to whether or not the **lips are rounded** to produce the vowel.

In **English**, **most back vowels are rounded**.

Beet contains an unrounded vowel; *boot* contains a rounded vowel—

if you say them both, you'll feel your lips spreading and rounding.

Vowel tenseness—

corresponds **roughly** to the amount of **tension** or **energy** in the vocal tract.

Tense vowels are **more extreme** in their articulation:

tense rounded vowels have **more tightly rounded** lips than lax ones;

tense front vowels are **fronter** than lax front vowels; etc.

(It's often hard to figure out the tenseness or laxness of **low** vowels.)

Beet contains a tense vowel; *bit* contains a lax vowel—

if you say them both, you'll feel your vocal tract tensing and relaxing.

Tenseness is a major feature in English; less important in many other languages.

The **laxest possible vowel sound** is called **schwa**, symbolized [ə]:

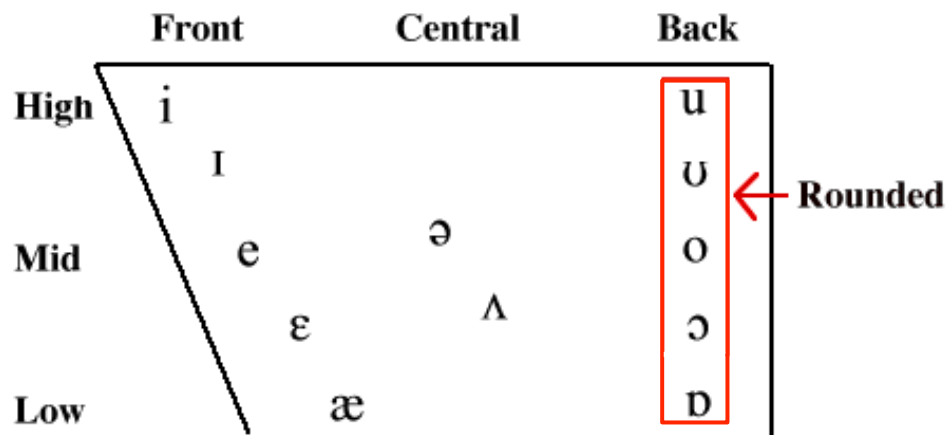
it's mid, central, unrounded—lacking in energy or distinctive features.

English uses schwa in words like *comma* or *about*.

English vowels

Caveat:

There are large differences among dialects of English in vowel pronunciation. What we'll describe here is a **basic default vowel system** for **Canadian English**; you may speak a dialect with a **slightly different** vowel system.



Note that the symbols differ substantially from ordinary spelling!

High front tense [i]	as in <i>fleece</i>
High back tense [u]	as in <i>goose</i>
High front lax [ɪ]	as in <i>kit</i>
High back lax [ʊ]	as in <i>foot</i>
Mid front tense [e]	as in <i>face</i>
Mid back tense [o]	as in <i>goat</i>
Mid front lax [ɛ]	as in <i>dress</i>
Mid central/back lax [ə, ʌ]	as in <i>strut</i>
Mid back lax [ɔ]	as in <i>north</i>
Low front [æ]	as in <i>trap</i>
Low back [ɒ]	as in <i>thought</i>

English also has an unusual vowel [ɜ] as in *nurse*: mid, central, tense, and **rhotic**: this is produced with the tongue in the same position as the approximant [r].

Notes:

For some reason the Denning et al. textbook uses [ə] for the sound in *strut*.

This is confusing; [ʌ] is a more usual symbol for that vowel; for most people it's not the same sound as schwa.

The book distinguishes between **low front** [a] in *lot* and a **low back** [ɒ] in *thought*.

This is correct for **some American dialects**, but **not** for **Canadian English**—Canadians use the **same vowel sound** for *lot* and *thought*, and it's low back.

Diphthong:

a complex vowel sound produced with the vocal tract **changing position**.
E.g., the vowel in *boy* **starts** mid-back-rounded and **ends** high-front-unrounded.

Diphthongs are transcribed as a **sequence of vowels** (or as vowel+approximant):
thus *boy* is [boɪ].

English has **three major diphthongs**:

Diphthong	origin	target
[ɔɪ] as in <i>boy</i>	mid back rounded	high front unrounded
[aɪ] as in <i>prize</i>	low central unrounded	high front unrounded
[aʊ] as in <i>mouth</i>	low central unrounded	high back rounded

The **mid tense** vowels [e] (*face*) and [o] (*goat*) are often diphthongized as well;
each glides to the nearest high vowel, so we find [eɪ] and [oʊ].

A vowel that is not a diphthong is called a **monophthong**.

Stress

Stress is a phonetic feature that applies to an entire **syllable** at once.

Stressed syllables are usually a bit **louder, tenser, and longer in duration**.

Stress is the feature that distinguishes between the noun and verb *permit*:

I have a PERmit vs. I perMIT you to do that.

In the IPA, **primary** stress is a **raised tick mark before** the syllable: [pə' mɪt].

Long words often have a **secondary stress**, like the first syllable of *Manitoba*;
secondary stress is a **low tick mark**: [ˌ mænə' toʊbə].

How does phonetics affect **allomorphy**?

Many cases of allomorphy **depend on phonetic features** of the morphemes.

A very common phonological process is **assimilation**:

one sound **copies** some (or all) of the **phonetic features** of an **adjacent sound**.

Voicing assimilation:

a voiced sound **next to** a voiceless sound may become voiceless itself (or vice versa).

E.g., *reg-* 'rule' becomes *rec-* before a **suffix beginning with t**:

reg-ular, inter-reg-num but *di-rec-t, di-rec-tion*.

This is because the sounds [g] and [k] differ **only in voicing**;

so *reg-* becomes *rec-*, [g] becomes [k], to **match the voicelessness** of the *t*.

Similarly, *scrib-* 'write' becomes *scrip-* before *t*: *pre-scribe* but *pre-scrip-tion*.

Place (of articulation) assimilation:

a sound **copies the place of articulation** of an adjacent sound.

This is particularly common with **nasal** consonants:

e.g., [n] becomes (bilabial) [m] **before a bilabial** consonant.

We see this with the allomorphy of the prefixes *in-*, *con-*, *syn-*:

in-duce, in-scribe

con-tend, con-serve

syn-thetic, syn-drome

im-pel, im-bibe

com-pel, com-bine

sym-pathy, sym-bol

Though it doesn't change the **spelling**, [n] **often** becomes [ŋ] before **velars**:

i[ŋ]-cubate, co[ŋ]-gregate, sy[ŋ]-copate.

In both cases, the consonant remains a **nasal**, but **assimilates** to match the **place of articulation** of the following consonant.

Sometimes total assimilation takes place:

a consonant just becomes an **exact copy** of whatever consonant is next to it.

E.g., [n] in *in-* and *con-* **totally assimilates** to a following [l] or [r]:

il-lusion, ir-radiate, col-lect, cor-rect.

The prefix *ad-* **totally assimilates** to a **whole bunch** of different consonants:

it stays *ad-* before [v], [m], and [h] (*ad-vise, ad-mit, ad-here*), but:

ap-proach, af-fect, as-sume, ar-rogant, al-leviate, an-nex, ac-claim, ag-gravate.

(However, note that in general in English double consonants **aren't pronounced double**: the **spelling** is where we can see this assimilation taking place.)