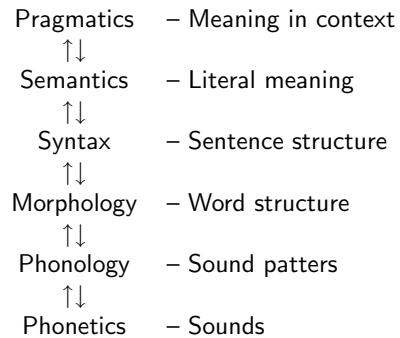


An overview of the language system



↑ – understanding language expressions; ↓ – producing language expressions

Subfields

Articulatory Phonetics - the study of the production of speech sounds
The oldest form of phonetics.

A typical articulatory observation: “The sound at the beginning of the word ‘foot’ is produced by bringing the lower lip into contact with the upper teeth and forcing air out of the mouth.”

Auditory Phonetics - the study of the perception
Related to neurology and cognitive science.

A typical auditory observation: “The sounds s, sh, z, zh are called ‘sibilants’ because they share the property of sounding ‘hissy’ ”

What is Phonetics?

Phonetics is the study of speech sounds

- how they are produced,
- how they are perceived, and
- what their physical properties are.

The technical word for a speech sound is a **phone** (hence, **phonetics**; cf. also *telephone*, *headphone*, *phonograph*, *homophone*).

Acoustic Phonetics - the study of the physical properties of speech sounds.

A relatively new subfield (only in last 50 years or so) due to sophisticated equipment (spectrograph, etc) needed for research. Closely related to acoustics, the subfield of physics dealing with sound waves.

A typical acoustic observation: “The strongest concentration of acoustic energy in the sound [s] is above 4000 Hz”

Why do we need a new alphabet for sounds?

- We want to be able to write down how things are pronounced and the traditional orthography is not good enough for it.
- Writing down how words are pronounced has a wide range of uses: dictionaries, foreign language instruction, to write about dialects, individual differences in pronunciation, etc.

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More on English spelling

The relation between English spelling and pronunciation is very complex:

- *same spelling – different sounds*
ough: ought, cough, tough, through, though, hiccough
- *silent letters*: knee, knight, knife, debt, psychology, mortgage
- *one letter – multiple sounds*: exit, ue
- *multiple letters – one sound*: the, revolution
- *alternate spellings*: jail vs gaol

Curious example: One could write *chef* as *seagh* (since sure, dead, laugh).

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On the relation of orthography and pronunciation

- Words are pronounced differently depending on region, speaker, mood, etc., but they are (usually) spelled the same way
root [rut] or [rʊt], *truck* [trʌk] or [tʁʌk], *strong* [strɔŋg] or [stɹɔŋg]
- Words or word forms sounding differently can be spelled the same way
read [rid] vs. [rɛd]
- One sound is spelled many different ways:
[k]: king, card, clique, nick, chasm, exit
reed vs. *read*
- There are many more sounds than there are letters in English alphabet
There are only 5 vowel letters, but English has at least 10 vowel sounds
thigh, thy

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Other languages also include such non-obvious correspondences:

French:

- (1) a. “*Versailles*” → [versai] (“*sailles*” = [sai])
b. “*ete, etais, etait, etaient*” → [ete]

Irish:

- (2) a. “*Baile A’tha Cliath*” (*Dublin*) → [bl’a: kli uh]
b. “*samhradh*” (*summer*) → [sauruh]
c. “*scri’obhaim*” (*I write*) → [shgrim]

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Special alphabets for representing sounds

Phonetic symbols are unambiguous:

- designed so that each speech sound gets its own symbol,
- eliminating the need for
 - multiple symbols used to represent simple sounds
 - one symbol being used for multiple sounds.

Several special alphabets for representing sounds have been developed:

- IPA (International Phonetic Alphabet) – de facto standard; very detailed
See: <http://www2.arts.gla.ac.uk/IPA/ipa.html>
- APA (American Phonetic Alphabet) – less detailed; recently modified to be similar to IPA. This alphabet is used by the Language Files.

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Articulatory descriptions of sounds

An articulatory phonetic description generally makes reference to six main factors:

- **Air stream:** The source and direction of air flow identifies the basic class of sound. The vast majority of speech sounds are produced using *pulmonic egressive air*. Non-pulmonic sounds include clicks, implosives, and ejectives.
- **Vocal folds:** The action of the vocal folds must be considered - in particular, the presence or absence of vibration. *Voiced* sounds are produced when the vocal folds vibrate; *voiceless* sounds are produced when there is no vibration, the folds remaining open.

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Components of the human speech system

larynx (glottis, vocal folds), lips, teeth, alveolar ridge, hard palate, soft palate (velum), uvula, pharynx, tongue (tip, front, back, root)

(cf. picture in Language Files)

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- **Soft palate or Velum:** The position of the soft palate must be noted. When it is lowered, air passes through the nose, and the sound is described as *nasal* or *nasalized*; when it is raised, air passes through the mouth, and the sound is *oral*.
- **Place of articulation:** This refers to the point in the vocal tract at which the main closure or narrowing is made, such as at the lips, teeth, or hard palate.
- **Manner of articulation:** This refers to the type of constriction or movement that occurs at any place of articulation, such as a marked degree of narrowing, a closure with sudden release, or a closure with slow release.
- **Lips:** The position of the lips is an important feature of the description of certain sounds (especially vowels), such as whether they are rounded or spread, closed or open.

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Consonants vs Vowels

The difference between consonants and vowels is that consonants involve some narrowing at some point in the vocal tract, while vowels do not. So vowels can always be held indefinitely, while consonants in general cannot. (e.g. [p], [t], but note [n], [l])

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- **Tongue advancement:** tongue further forward or back in mouth

3 distinctions:

- **Front:** [i, ɪ, e, ε, æ] "seek, sick, sake, sec, sack"
- **Back:** [u, ʊ, o, ɔ, ɒ] "ooze, look, road, paw, dot"
- **Central:** [ə, ʌ] "sofa, but"

- **Lip rounding:** rounded [u, ʊ, o, ɔ] "food, put, road, caught"

→ only four rounded sounds, all in upper left corner of the chart.

- **Tenseness:** vowels which are farther from the center are *tense*, others are *lax*. Muscles in *tense* vowels feel a bit more strained than in *lax* vowels. *tense* vowels tend to have more extreme lip rounding.

- (3) a. [i] vs [ɪ] "peat, pit"
b. [u] vs [ʊ] "boot, put"

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Describing Vowels

- Vowels are the most sonorant sounds in speech
- They are produced with a mostly open oral tract, so place/manner of articulation a la consonants is not useful in describing them.
- All vowels are *voiced* (in English).
- **Tongue height:** higher height = smaller distance from roof of mouth
Opening of mouth coincides more or less with tongue height.
3 distinctions for English:
 - **High:** [i, ɪ, u, ʊ] "leak, lick, luke, look"
 - **Mid:** [e, ε, ə, ʌ, ɔ, ɒ] "bait, bet, sofa, but, bought, boat"
 - **Low:** [æ, ʌ] "cat, cot"

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Describing Consonants

Air Stream: for English always **pulmonic egressive** (pulmonic = lungs; egressive = going out).

Three-part description of consonants:

- **Voicing:** Those consonants produced while the folds are vibrating are *voiced* sounds, all others are *unvoiced*.
- **Place of Articulation**
- **Manner of Articulation**

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Place of Articulation

- **Bilabial** (bi = 2, labial = lips): bringing the lips close together or touching. [p], [b], [m], [w], [ɸ]
- **Labiodental** (labial = lips, dental = teeth): bringing the lower lip up against the upper front teeth. [f], [v]
- **Interdental** (inter = between, dental = teeth): placing the tip of the tongue between the front teeth [θ], [ð]
- **Alveolar**: the ridge just behind your front teeth. You can feel it as a little "cliff" or "hill" while dragging your tongue backwards along the roof of your mouth. [t, d, s, z, n, l, r]

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Manner of Articulation

- **Stops**: made by completely obstructing ("stopping") the flow of air [p, b, t, d, k, g]
- **Fricatives**: (*Friction*) made by forming a very narrow constriction and forcing air through, producing a hissing turbulent sound because of the friction between the air and the sides of the constriction. [f, v, θ, ð, s, š, z, ž]
- **Affricates**: (have a *fricative* after a stop): a combination of a stop and a fricative. As soon as the stop is released the fricative begins. [č, ĵ]
- **Nasals**: velum acts as a "door" to nasal passages. If open, then nasal cavities become part of the resonating chamber. [m, n, ŋ]

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- **Palatal**: the tongue is near the hard part of the roof of the mouth. (dragging tongue backwards also helps distinguish hard palate from velum). [š, ž, č, ĵ, y]
- **Velar**: The tongue approaches the soft part of the roof of the mouth (velum) to form a constriction. [k, g, ŋ]
- **Glottal**: The glottis is the point of constriction. [h], [ʔ] (ex: ʔuh-ʔoh)

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- **Liquids**: narrow passage, but not narrow enough to cause friction (a la fricatives). [l] [r] (*lateral* = sides; *retroflex*: retro = back, flex = bent – "bent backwards")
Since nasals and liquids are relatively sonorant, they can be *syllabic*.
(4) *button, reason, girl, bottle, girdle*
- **Glides**: almost a vowel, but slightly more constricted. The least constricted type of consonant. [y, w, ɹ]

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