The study of speech segments

Speech is divided into recognizable **segments** or speech sounds (or gestures in the case of signed languages).

Sheep

three sounds

[sip]

사과

five sounds

[sagwa]
The study of speech segments

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Phonetics is the study of speech sounds and gestures (often called just ‘gestures’).
The study of speech segments

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- **Articulatory phonetics** – The study of how speech sounds are produced
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Phonetics is the study of speech sounds and gestures (often called just ‘gestures’)

- **Articulatory phonetics** – The study of how speech sounds are produced
- **Perceptual or auditory phonetics** – The study of how speech sounds are perceived
- **Acoustic phonetics** – The study of the acoustic/physical properties of speech sounds
Phonetics ≠ Orthography

- Be careful not to confuse orthography with speech segments.
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‘shoe’ – two segments but four letters
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- ‘shoe’ – two segments but four letters
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Phonetics ≠ Orthography

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- ‘shoe’ – two segments but four letters
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- 없다, 엇다, 엇다 – all pronounced the same, but spelled differently
- 할인/할 일 - the final consonant (받침) of the first syllable is ₩, but is pronounced differently
Be careful not to confuse orthography with speech segments.

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‘of’ – has a [v], but no [f]

없다, 엎다, 엎다 – all pronounced the same, but spelled differently

할인/할 일 - the final consonant (받침) of the first syllable is ㄹ, but is pronounced differently

The speech segments of the world’s languages are written using the International Phonetic Alphabet – IPA.
Vocal Apparatus

lips
teeth
Vocal Apparatus

alveolar ridge
Vocal Apparatus

hard palate
Vocal Apparatus

soft palate/velum
Vocal Apparatus

uvula
Vocal Apparatus

tongue
Vocal Apparatus

pharynx
Vocal Apparatus

vocal folds
Vocal Apparatus

epiglottis
Vocal Apparatus

nasal cavity
Airflow Mechanisms

- **Pulmonic** – airflow is supplied by lungs – most common
Airflow Mechanisms

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- **Egressive** – air flows outwards
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## Airflow Mechanisms

<table>
<thead>
<tr>
<th></th>
<th>Pulmonic</th>
<th>Glottalic</th>
<th>Velaric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Egressive</strong></td>
<td>most speech sounds</td>
<td>Ejective</td>
<td>–</td>
</tr>
<tr>
<td><strong>Ingressive</strong></td>
<td>gasping (meta-linguistic)</td>
<td>Implosive</td>
<td>Click</td>
</tr>
</tbody>
</table>

**Table**: Airflow Types
Airflow Mechanisms

- Ejectives – [t’], [p’], etc. – must be voiceless. . . .why?

[Map showing percentage of speakers by county]
Airflow Mechanisms

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Airflow Mechanisms

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- Navajo (nav) – Dené–Yeniseian language spoken in the southwest of the United States
Airflow Mechanisms

- **Implosives** – [ɓ], [ɗ], etc – involve some pulmonic airflow, too

SINDH
Airflow Mechanisms

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**Airflow Mechanisms**

- **Implosives** – [ɓ], [ɗ], etc – involve some pulmonic airflow, too
- [Link to website](http://www.phonetics.ucla.edu/course/chapter6/sindhi/sinhi.html)
- Sindhi (snd) is an Indo-Aryan language (of the Indo-European family) spoken on the border between India and Pakistan.
Airflow Mechanisms

- Clicks – [ʘ], [,!], etc – found almost exclusively in Africa
Airflow Mechanisms

- Clicks – [ʘ], [ǃ], etc – found almost exclusively in Africa
- [http://www.phonetics.ucla.edu/course/chapter11/zulu/zulu.html](http://www.phonetics.ucla.edu/course/chapter11/zulu/zulu.html)
Airflow Mechanisms

- Clicks – [ʘ], [ǃ], etc – found almost exclusively in Africa
- Zulu is a Bantu language in the Niger-Congo family spoken in southern Africa.
Voicing

- 4 types of voicing

- Voiceless – vocal folds are spread (no vibration felt on Adam's apple).
- Voiced – vocal folds vibrate rapidly (vibration felt on Adam's apple).
- Breathy voice and creaky voice are two others. We'll deal with these when they come up.

Average frequency:
- Children's voices: 265 Hz
- Women's voices: 225 Hz
- Men's voices: 120 Hz

조미, Sumi Jo: high F6 in Magic flute: 1397 Hz
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Manner of Articulation

- **Stop** (also called ‘plosive’ or ‘oral stop’) – airflow is completely stopped along the oral tract.

- **Fricative** – airflow is tightly restricted along the oral tract. There is constant airflow, but a high degree of turbulence: contrast [t] and [s], *tea*, *see*; *다* 과 *사* 과

- **Affricate** – airflow is completely stopped along the oral tract and released slowly. contrast [t] and [ʦ], *too* and *chew*; *단*, *잔* 

- **Nasal** (also called ‘nasal stop’) – airflow is completely stopped along the oral tract, but the uvula is lowered allowing for free airflow through the nasal cavity: contrast [b] and [m]
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Manner of Articulation

- **Lateral Fricative** - turbulent airflow passes out the side(s) of the tongue.

- Toda (Dravidian)

- [http://www.phonetics.ucla.edu/appendix/languages/toda/toda.html](http://www.phonetics.ucla.edu/appendix/languages/toda/toda.html)
Manner of Articulation

- **Trill** – airflow causes an articulator to pass repeatedly and quickly past a surface.
- Italian/Spanish [r]

Korean 로마 'Rome'

English 'butter' [b2Rô] (only in some varieties of English)

Spanish contrasts [r] and [R] perro [r] 'dog'
pero [R] 'but'
Manner of Articulation

- **Trill** – airflow causes an articulator to pass repeatedly and quickly past a surface.
- **Italian/Spanish** [r]
- **Flap/Tap** – airflow causes an articulator to pass once quickly past a surface.
- **Korean** [ɾ] 로마 ‘Rome’ 얼음 ‘ice’
- **English ‘butter’** [bʌrə] (only in some varieties of English)
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- English ‘butter’ [ɾ] (only in some varieties of English)
- Spanish contrasts [ɾ] and [ɾ]
- perro [ɾ] ‘dog’
- pero [ɾ] ‘but’
Manner of Articulation

- **Liquid** – airflow is only slightly constricted along the oral tract. Either no or very little audible turbulence: contrast [z] and [l] “zip” and “lip”
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  contrast [i] and [j] east and yeast; ear and year

- Korean 의 – [ɯi]
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- Korean 의 – [ɯi]
- The term **approximant** is used to refer to the set of liquids and glides together.
Korean Consonants

- English has a two-way *laryngeal* contrast: voiced and voiceless (state of larynx)
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- Korean has a three-way laryngeal distinction for consonants:
  - 다 ta [ta] lenis
  - 따 tta [t*a] fortis
  - 타 tha [tʰa] aspirated

Note – the plain consonant is aspirated in utterance-initial position, but is not aspirated as long – much dialect variation.
Korean Consonants

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Korean Consonants

달 [tal] ‘moon’

탈, [tʰal] ‘mask’
Place of Articulation

- **Bilabial** – made with both lips: [p], [b], [m]
- Japanese: voiceless bilabial fricative [ɸ]
- bilabial trill [ʋ]
Place of Articulation

- **Bilabial** – made with both lips: [p], [b], [m]
- Japanese: voiceless bilabial fricative [φ]
- bilabial trill [ɓ]
- **Labiodental** – made with the lower lip and the upper teeth: [f] and [v]
Place of Articulation

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- Japanese: voiceless bilabial fricative [φ]
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- **Labiodental** – made with the lower lip and the upper teeth: [f] and [v]
- Ewe (ewe): both [φ] and [f]
- Niger-Congo language of Ghana, Togo, and Benin
- [éφá] – ‘he polished’ [éfá] – ‘he was cold’
- [F] bilabial trill
- [´ eF´ a] – ‘he polished’ [´ efá] – ‘he was cold’
- [F] bilabial fricative
- [´ eF´ a] – ‘he polished’ [´ efá] – ‘he was cold’

http://phonetics.ucla.edu/course/chapter11/ewe/ewe.html
Place of Articulation

- **Dental** – made with the tip of the tongue at or between the teeth: [θ], [ð] (These are sometimes called ‘interdental’ in English because the blade of the tongue is well between the teeth)
  - think: [θɪŋk], voiceless dental fricative
  - they: [ðeɪ], voiced dental fricative
  - 대대로 [tɛɗro], lenis dental stop

- **Alveolar** – made with the tongue against the alveolar ridge (upper gums): [t], [d], [s], [z], [l], [ɹ]

- **Postalveolar** – made with the tip of the tongue behind the alveolar ridge. [s], [z], [ʃ], [ʒ]: sue, zoo, shoe, [ʒ] is somewhat rare in English: beige, azure, pleasure, allusion, fusion

- **Korean**:
  - 조 [ʈʂʰo] ‘trillion’,
  - 초 [ʈʂʰo] ‘second’
Place of Articulation

- **Dental** – made with the tip of the tongue at or between the teeth: \[\theta\], \[\delta\] (These are sometimes called ‘interdental’ in English because the blade of the tongue is well between the teeth)
  - think: \[\thetaɪŋk\], voiceless dental fricative
  - they: \[\deltaɛi\], voiced dental fricative
  - 대대로 [\tɛ̃dro], lenis dental stop

- **Alveolar** – made with the tongue against the alveolar ridge (upper gums): \[t\], \[d\], \[s\], \[z\], \[l\], \[r\]

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Alveopalatal – made with the blade (flat part behind tip) of the tongue behind the alveolar ridge: [ɕ], [ɻ]

Mandarin has voiceless alveopalatal:
- xī west 西 [ɕi], voiceless alveopalatal fricative
- qī seven 七 [tɕi], voiceless alveopalatal affricate

Retroflex – made with the tip of the tongue against the hard palate:
- [ù], [ã]

Mandarin has a voiceless retroflex fricative:
- shù book /書 [ùu]

Sindhi has several retroflex consonants:
- [ãorU] [or] 'you run'
- [http://phonetics.ucla.edu/course/chapter6/sindhi/sinhi.html]
Place of Articulation

- **Alveolopalatal** – made with the blade (flat part behind tip) of the tongue behind the alveolar ridge: [ʂ], [ʐ]
- Mandarin has voiceless alveolopalatals
  - xī west 西 [ɕi], voiceless alveolopalatal fricative
  - qī seven 七 [tɕi], voiceless alveolopalatal affricate
- **Retroflex** – made with the tip of the tongue against the hard palate: [ʂ], [ʐ]
- Mandarin has a voiceless retroflex fricative
  - shū book /書 [ʂu]
- Sindhi has several retroflex consonants
  - [qorv][or] ‘you run’
- **Palatal** – made with the body of the tongue against the hard palate: [j]
  - yet: [jɛt], palatal glide
  - German: ich ‘I’ [ɪç], voiceless palatal fricative
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- **Velar** – made with the tongue against the velum (soft palate): [k], [ɡ], [ŋ]
  - Korean 의 – [ɯi] – velar glide
- **Palatal** – made with the body of the tongue against the hard palate: \([j]\)
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  - Korean 의 – \([œi]\) – velar glide

- **Glottal** – made with the vocal folds: \([h]\), \([ʔ]\)
  - \([ʔ]\) – glottal stop: uh-uh-uh
  - \([h]\) – voiceless glottal fricative: hot, 하다
- **Palatal** – made with the body of the tongue against the hard palate: \[ j \]
  - yet: \[ jet \], palatal glide
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  - Korean \( \text{의} \) – \[ ui \] – velar glide

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  - \[ ñ \] – glottal stop: uh-uh-uh
  - \[ h \] – voiceless glottal fricative: hot, 하다

- **Uvular** – made with the uvula: \[ q \], \[ R \]
  - French: uvular trill \[ ru3 \] *rouge* ‘red’ \( \rightarrow \) typically realized as a voiced uvular fricative \[ ru3 \]
  - voiceless uvular fricative, *huitre* \[ ùitx \] ‘oyster’
  - Quechua (qwe): (official language in Peru and Bolivia)
  - http://www.phonetics.ucla.edu/vowels/chapter12/quechua.html
Pharyngeal – made with constricted wall of the pharynx: [ʰ], [ɣ]
  • Hebrew (heb) (Afro-Asiatic)
  • http://www.phonetics.ucla.edu/appendix/languages/hebrew/hebrew.html
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- More than one place of articulation:
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- More than one place of articulation:

  - Labio-velar
    - witch [wiʃ]; which [wiʃ] or [wiʃ]
    - 왔어 [was*ʌ]
Place of Articulation

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  - **Labio-velar**
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    - 왔어 [was*ʌ]
  - **Labio-palatal**
    - French oui ‘yes’ [ɥi]
    - 귀 ‘ear’ [kɥi]
Sounds are described in the following order:

1. Source of air (usually not stated if pulmonic egressive)
2. Direction of airflow (again, usually not stated if pulmonic egressive)
3. Laryngeal Features (usually only stated for segments that usually contrast)
4. Place
5. Manner

[p] (pulmonic egressive) voiceless bilabial stop (or plosive)
[z] (pulmonic egressive) voiced alveolar fricative
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5. manner

[p]
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  5. Manner

- \[p\]
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