11-823: Conlanging

Human Phonetics and Phonology
The vocal tract

- hard palate
- soft palate
- uvula
- pharynx
- tongue root
- epiglottis
- alveolar ridge
- tongue tip
- tongue blade
- tongue body
- larynx
From meat to voice

- **Blow air through lungs**
  - **Vibrate larynx**
  - **Vocal tract shape defines resonance**
  - **Obstructions modify sound**
    - *Tongue, teeth, lips, velum (nasal passage)*
The ear

Diagram showing the anatomy of the ear, including the outer ear, middle ear, and inner ear. Key components labeled include the ear canal, ear drum, stapes, cochlea, malleus, incus, facial nerve, and auditory nerve.
From sound to brain waves

- **Sound waves**
  - *Vibrate ear drum*
  - *Cause fluid in cochlear to vibrate*
  - *Spiral cochlear*
    - *Vibrate hairs inside cochlear*
    - *Different frequencies vibrate different hairs*
    - *Converts time domain to frequency domain*
From grunts to meaning

- **Grunts and vocalization**
  - Lots of variation available
    - *(continuous systems – not discrete)*
  - Noises become distinct, recognizable

- **Grow into languages, dialects and idiolects**

- **What are the fundamental units?**
Articulatory Movements
Electromagnetic Articulograph
Phonemes

- Defined as fundamental units of speech
  - If you change it, it (can) change the meaning

  “pat” to “bat”
  “pat” to “pam”
• One or two banded frequencies (formants)
<table>
<thead>
<tr>
<th>Vowel</th>
<th>Example Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>wAshington</td>
</tr>
<tr>
<td>AH</td>
<td>bUt, hUsh</td>
</tr>
<tr>
<td>AW</td>
<td>hOW, sOUth</td>
</tr>
<tr>
<td>AY</td>
<td>hIde, bUY</td>
</tr>
<tr>
<td>ER</td>
<td>makER, sEARch</td>
</tr>
<tr>
<td>IH</td>
<td>bIt, shIp</td>
</tr>
<tr>
<td>OW</td>
<td>lOne, nOse</td>
</tr>
<tr>
<td>UH</td>
<td>fUll</td>
</tr>
<tr>
<td>AE</td>
<td>fAt, bAd</td>
</tr>
<tr>
<td>AO</td>
<td>lAWn, mAll</td>
</tr>
<tr>
<td>AX</td>
<td>About, cAnoe</td>
</tr>
<tr>
<td>EH</td>
<td>gEt, fEAther</td>
</tr>
<tr>
<td>EY</td>
<td>gAte, EIght</td>
</tr>
<tr>
<td>IY</td>
<td>bEAt, shEEp</td>
</tr>
<tr>
<td>OY</td>
<td>tOY, OYster</td>
</tr>
<tr>
<td>UW</td>
<td>fOOl</td>
</tr>
</tbody>
</table>
English Consonants

- **Stops:** P, B, T, D, K, G
- **Fricatives:** F, V, HH, S, Z, SH, ZH
- **Affricatives:** CH, JH
- **Nasals:** N, M, NG
- **Glides:** L, R, Y, W

**Note:** voiced vs unvoiced:
- P vs B, F vs V
Number of Phonemes in Language

- **US English:** 43
- **UK English:** 44
- **Japanese:** 25
- **Hindi:** 81

- Numbers aren’t definite though
  - Depends on who you ask,
  - And what you want it for
Not all variation is Phonetic

Phonology: linguistically discrete units
- May be a number of different ways to say them
- /r/ trill (Scottish or Spanish) vs US way

Phonetics vs Phonemics
- Phonetics: discrete units
- Phonemics: all sounds

/t/ in US English: becomes “flap”
- “water” /w ao t er/
- “water” /w ao dx er/
Dialect and Idiolect

- **Variation within language (and speakers)**
- **Phonetic**
  - “Don” vs “Dawn”, “Cot” vs “Caught”
  - R deletion (Haavaad vs Harvard)
- **Word choice:**
  - Y’all, Yins
  - Politeness levels
Not all languages use the same set

- **Asperated stops (Korean, Hindi)**
  - P vs PH
  - English uses both, but doesn’t care
  - Pot vs sPot (place hand over mouth)
- **L-R in Japanese not phonological**
- **US English dialects:**
  - Mary, Merry, Marry
- **Scottish English vs US English**
  - No distinction between “pull” and “pool”
  - Distinction between: “for” and “four”
Different language dimensions

- **Vowel length**
  - *Bit vs beat*
  - *Japanese: shujin (husband) vs shuujin (prisoner)*

- **Tones**
  - *F0 (tune) used phonetically*
  - *Chinese, Thai, Burmese*

- **Clicks**
  - *Xhosa*
Other dimensions

- **Power**
  - Loud and soft versions
  - Trajectories
- **Excitation**
  - Creak voice
- **Gestures**
  - Face, hand, body gestures
IPA

- Vowel Chart
- Consonant Lists
(Festival) IPA Features

- Voicing +/-
- Vowel Length: schwa, short, long, diphthong
- Vowel Height: high, mid, low
- Vowel Frontness: front, mid, back
- (Vowel) rounding: +/-
- Consonant Type: stop, fricative, affricative, nasal, lateral, approximant
- Consonant Place: labial, alveolar, palatal, labio-dental, dental, velar, glottal
Syllable structure:
- UV → V → vowel → V → UV

Syllable structure
- Stop (Af)Fricative, Stop, Nasal, Liquid, Vowel
- Vowel, Liquid, Nasal, Stop (Af)Fricative) Stop
- /S T R EH NG TH S/
- /T S K L EH R N SH T/ (?)

Different languages have strong restrictions
- Borrowing may break this (id's origin)
- /SH L …/, /ZH …/, /T S …/,
Co-articulation

- Voicing actually doesn’t always stop
  - “have honey”, “impossible”

- Nasalized voices, lip rounding
  - “min” vs “bit”, “sow” vs “see”

- Lexical stress:
  - EMphasis, emPHAsis
  - PROject, proJECT

- Reduction, contraction
  - “A boy is riding a bike”
  - “I want to go to Disneyland.”
  - “I will go tomorrow”
Assignment 2

Phonetic/syllabic inventory

Design a list of vowels and consonants
   Give their names, IPA, an example word

Design syllable structure
   Consonant clusters, allaphonic variants
   Other syllabic restrictions

Stress, tone, pitch accent, other

Must be “interesting” somehow (in at least 2-3 ways)