## **Phonetics 2**

JADDA bebi bAgi bAmpaız ða sıksθ sık ſiks sıksθ ſips sık alɛvan banɛvalant ɛlafants ajııſ JIStwatſ Jɛd lɛðaJ, jɛlo lɛðaJ θJi ſoJt soJd ſiθs sızaJz sızal, θIsalz sızal wıliz Jili wiJi Jil wiJd JIJ wilz Jajp wajt wit JipaJz Jip Jajp wajt wit Jajt

| one more pair of vowels: |                     |                                    |                      |             |                      |
|--------------------------|---------------------|------------------------------------|----------------------|-------------|----------------------|
|                          | Front               |                                    | <u>Central</u>       | <b>Back</b> | <u>rounded</u>       |
| High                     | [i]                 | h <u>e</u> 'd,                     |                      | [u]         | wh <u>o</u> 'd,      |
| C                        | [1]                 | h <u>i</u> d                       |                      | [ʊ]         | h <u>oo</u> d        |
| Mid                      | [e]                 | h <u>a</u> te,                     | [ə] m <u>a</u> chine | [0]         | h <mark>oe</mark> d, |
|                          |                     | h <u>ea</u> d                      |                      | [၁]         | h <u>aw</u> ed       |
| Low                      | [æ]<br><u>tense</u> | h <u>a</u> d<br>, <mark>lax</mark> |                      | [a]         | h <u>o</u> t         |

Not all speakers distinguish between [ə] and [Λ]. "above"= əbʌv English has (about) 14 vowels, and 5 letters to spell them with...

| High            | <u>Front</u><br>[i] h <u>e</u> 'd,<br>[1] h <u>i</u> d | <u>Central</u>                            | <u>Back</u><br>[u]<br>[ʊ] | <u>rounded</u><br>wh <u>o</u> 'd,<br>h <u>oo</u> d |
|-----------------|--|---|---------------------------|--|
| Mid             | [e] h <u>a</u> te,<br>[ε] h <u>ea</u> d                | [ə] m <u>a</u> chine<br>[ʌ] d <u>o</u> ve | [0]<br>[၁]                | h <u>oe</u> d,<br>h <u>aw</u> ed                   |
| Low<br>plus dip | [æ] h <u>a</u> d<br>hthongs:                           |   | [a]                       | h <u>o</u> t                                       |

[aj] mice [aw] mouse [ɔj] joy (and several English tense vowels are sort of diphthongal: [e]=[ej], [o]=[ow])

Again, this categorization has (at least) two benefits:

- leads us to look for gaps
- helps with theories of sound change

| <u>Front</u> |                          | <u>Central</u>  | Back   | <u>rounded</u>   |
|--------------|--------------------------|---|--|--|
| [i]          | h <u>e</u> 'd,           |   | [u]  | wh <u>o</u> 'd,  |
| [I]          | h <u>i</u> d             |   | [ʊ]  | h <u>oo</u> d  |
| [e]          | h <u>a</u> te,           | [ə] m <u>a</u> chine  | [0]  | h <u>oe</u> d,   |
|              | h <mark>ea</mark> d      | $[\Lambda] d\mathbf{\underline{o}}ve$                       | [၁]  | h <u>aw</u> ed   |
| [æ]          | h <u>a</u> d             |   | [a]  | h <u>o</u> t   |
|              | [i]<br>[Ι]<br>[e]<br>[ε] | [I] h <b>i</b> d<br>[e] h <u>a</u> te,<br>[ε] h <u>ea</u> d | [i]h <u>e</u> 'd,[1]h <u>i</u> d[e]h <u>a</u> te,[ə]h <u>a</u> te,[ə]h <u>ea</u> d[a]h <u>ea</u> d | [i] $h\underline{e}'d,$ [u][I] $h\underline{i}d$ [v][e] $h\underline{a}te,$ [ə][e] $h\underline{a}te,$ [ə][ɛ] $h\underline{ea}d$ [A][ɛ] $h\underline{ea}d$ [A] |

In English, all and only nonlow back vowels are rounded.

But is that necessary?

| High | <u>Front</u><br>[i] h <u>e</u> 'd,<br>[1] h <u>i</u> d | <u>Central</u>                            | <u>Back</u><br>[u]<br>[ʊ] | <u>rounded</u><br>wh <u>o</u> 'd,<br>h <u>oo</u> d |
|------|--|---|---------------------------|--|
| Mid  | [e] h <u>a</u> te,<br>[ε] h <u>ea</u> d                | [ə] m <u>a</u> chine<br>[ʌ] d <u>o</u> ve | [0]<br>[၁]                | h <u>oe</u> d,<br>h <u>aw</u> ed                   |
| Low  | [æ] h <u>a</u> d                                       |   | [a]                       | h <u>o</u> t                                       |

[y], German Gef<u>üh</u>l 'feeling' (high front rounded vowel)
[u], Korean [k<u>un</u>ɛ] 'swing' (high back unrounded vowel)

| High | <u>Fron</u><br>[i]<br>[1] | <u>t</u><br>h <u>e</u> 'd,<br>h <u>i</u> d | <u>Central</u>                               | <u>Back</u><br>[u]<br>[ʊ] | <u>rounded</u><br>wh <u>o</u> 'd,<br>h <u>oo</u> d |
|------|---------------------------|--|--|---------------------------|--|
| Mid  | [e]<br>[ɛ]                | h <u>a</u> te,<br>h <u>ea</u> d            | [ə] m <u>a</u> chine<br>[ʌ] d <u>o</u> ve    | [0]<br>[၁]                | h <u>oe</u> d,<br>h <u>aw</u> ed                   |
| Low  | [æ]                       | h <u>a</u> d                               |  | [a]                       | h <u>o</u> t                                       |
|      | [y],                      |  | Gef <u>üh</u> l 'feeling'<br>front rounded v | vowel)                    |  |

[y], German Gef<u>uh</u>l 'feeling' (high front rounded vowel)
[u], Korean [k<u>un</u>ɛ] 'swing' (high back unrounded vowel)
[ɛ̃], French [mɛ̃], 'hand' (vs. [mɛ̃] 'dish') (front mid lax <u>nasalized</u> vowel) Classification of vowels also helps us in developing theories of phonologically natural sound changes.

Turkish nouns: aslan 'lion' kol 'arm' kul 'slave' kuız 'daughter' yel 'wind' di∫ 'tooth' gyl 'rose' Classification of vowels also helps us in developing theories of phonologically natural sound changes.

Turkish noun plurals:

| <b>▲</b>       |                    |
|----------------|--------------------|
| aslan 'lion'   | aslanlar 'lions'   |
| kol 'arm'      | kollar 'arms'      |
| kul 'slave'    | kullar 'slaves'    |
| kuz 'daughter' | kuzlar 'daughters' |
| yel 'wind'     | yeller 'winds'     |
| di∫ 'tooth'    | di∫ler 'teeth'     |
| gyl 'rose'     | gyller 'roses'     |
|                |                    |

other ways to manipulate airflow (see the UCLA sound files)

- ejectives
- clicks
- implosives
- trills

(...and others)

fooling around with spectrograms:

- vowels
- fricatives
- how do we tell stops apart?

## ...and other sources of information? McGurk effect

let's think more carefully about voicing....

**Voice Onset Time**: vocal cords start vibrating some time after the stop closure is released....

VOT 0-25 ms-->voiced VOT 25 ms +-->voiceless

**categorical perception**: we have an arbitrary dividing line in the continuum of VOT

...categorical perception detected in 1-month-old infants.

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