Intro to Linguistics

Segmental phonology

Recall:

- **phonetics**: the physical manifestation of language in sound waves; how these sounds are articulated and perceived
- **phonology**: the mental representation of sounds as part of a symbolic cognitive system; how abstract sound categories are manipulated in the processing of language

So phonetics deals with the physiological and acoustic parts of the path between speaker and listener, while phonology resides in the brain.

**Phonemes**

phonological elements of a language = basic, distinctive sounds, also called phonemes.

Phonemes for a dialect of Standard American English:

- consonants: p, t, k, b, d, g, f, θ, s, h, v, ŋ, z, m, n, l, r, w, j, ĺ, ñ, Š, Ž

- vowels: i, u, ɪ, ʊ, ɛ, æ, a, ə, ʌ, o, a, U

"distinctive" = can be used to make contrasts between different words. For the stops, using minimal pairs (words that differ in exactly one sound):

pill  till  kill  bill  dill  gill

For the vowels (for each individual pair of vowels we could come up with a minimal pair):

bead  bood  bid  bade  bowed  bed  bud  bad  bod  bide  Boyd
heed  who'd  hid  hood  head  hawed  had  hide  how'd
jean  June  jin  Jane  Jen  John  join  lead
lew  lid  laid  load  lead  lad  lod  loud  Lloyd

And for the nasals:  rum  run  rung

**Allophones.**

There are often differences in the way a phoneme is pronounced in a specific context. The variant pronunciations are called allophones ("other sounds").
When it's important to make this difference:

- we'll use [square brackets] to indicate sounds from a phonetic point of view, i.e. focusing on their physical properties and the details of actual pronunciation;
- and we'll use /slashes/ to indicate sounds from a phonological point of view, i.e. as part of an abstract representation independent of potential differences in the way the sound is pronounced in specific contexts.
- I.e., [ ] = allophone, / / = phoneme.

A classic example of sound alternation in English relates to the [s] found at the beginning of a syllable before a voiceless stop.

**spin** is basically **pin** with [s] added, but the /p/ in each case is pronounced differently.

- **pin** contains an **aspirated** version of /p/, with a puff of air after the stop is released; [pʰ]
- **spin** contains a **plain** /p/, without a puff of air after the stop; this is written just [p]

The same is true for pairs like pit~spit, pot~spot, pair~spare, etc.

A simple statement of this alternation is as follows:

<table>
<thead>
<tr>
<th>the phoneme /p/ becomes:</th>
<th>allophone [p]</th>
<th>immediately following [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>allophone [pʰ]</td>
<td>at the beginning of the word</td>
</tr>
</tbody>
</table>

But the same generalization holds not just for /p/ but for the other voiceless stops, /t/ and /k/. Compare these word pairs:

- top~stop, take~stake, tie~sty, etc.
- kin~skin, cope~scope, can~scan, etc.

So more accurately, there's a single general statement that covers all these cases, stated in terms of natural classes.

<table>
<thead>
<tr>
<th>voiceless stops are:</th>
<th>unaspirated</th>
<th>immediately following [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aspired</td>
<td>at the beginning of the word</td>
</tr>
</tbody>
</table>

**Distribution of sounds: identifying phonemes and allophones**

How do we know that aspirated and unaspirated voiceless stops are not different phonemes? Same way Lois Lane knew Clark Kent was the Superman: they never appear at the same place in the same time. = **complementary distribution**.
- **complementary distribution**: never at the same place in the same time, predictable
- **contrastive distribution**: overlapping environments, minimal pairs
- **free variation**: overlapping environments, no change in meaning = not contrastive

Expanding: voiceless stops are aspirated when they occur syllable-initially and are followed by a stressed vowel (rápid, rapí*dy*); & word-initially regardless of stress (pótháto). At the beginning of a word, a preceding /s/ prevents the stop from being syllable- or word-initial.

Different stresses cause alternations: underlying sound /t/ is pronounced as [t] etc. or [ṭ] etc.

```plaintext
rápid [p]       rapí*dy* [pʰ]
authéntic [t]   authentí*cy* [tʰ]
ré*cord [k]    recórd [kʰ]
```

This process is completely unconscious for most speakers, and often quite hard to unlearn.

English speakers who learn a language like French or Spanish impose aspiration according to this rule; but that's wrong for these languages, and sounds foreign.

Similarly, a French or Spanish speaker learning English will typically fail to produce aspiration in the right places; this is part of what it means to have a foreign accent.

Aspiration in English is a small example of what phonological knowledge consists of:

- it's learned unconsciously by children imitating (quite accurately!) the details of the language around them
- it's systematic, applying to all words with voiceless stops, not just some random selection
- it's defined in terms of a natural class (here "voiceless stops") rather than some arbitrary set of three consonants

The study of phonology is largely the investigation of alternations like this -- what changes occur, what sounds undergo them, and in what contexts.

**Example: flapping**

A prominent feature of American English affects /t/ and /d/, and is called flapping.

A flap is a quick motion with the tongue against the alveolar ridge.

All these English words have flaps where "t" or "d" is written in the spelling (relevant dialects).

<table>
<thead>
<tr>
<th>butter</th>
<th>caddy</th>
</tr>
</thead>
</table>
The proper phonetic symbol for a flap is \( r \) - it's an "r" missing the top left serif.

For most speakers, in the right context a phonological /t/ will end up sounding phonetically just like a phonological /d/, since both become a flap \([r]\) (voiced), as these homophones show:

<table>
<thead>
<tr>
<th>latter</th>
<th>ladder</th>
</tr>
</thead>
<tbody>
<tr>
<td>matter</td>
<td>madder</td>
</tr>
<tr>
<td>mettle</td>
<td>meddle</td>
</tr>
<tr>
<td>betting</td>
<td>bedding</td>
</tr>
<tr>
<td>outty (belly button)</td>
<td>Audi (car)</td>
</tr>
</tbody>
</table>

And the answer in this exchange is therefore ambiguous:

-- Do you want the ladder or the chair? -- Give me the \([\text{læ}\r]\).

Of course, /t/ and /d/ don't always end up as flaps: minimal pairs illustrate.

<table>
<thead>
<tr>
<th>hit</th>
<th>hid</th>
</tr>
</thead>
<tbody>
<tr>
<td>tin</td>
<td>din</td>
</tr>
<tr>
<td>tear</td>
<td>dare</td>
</tr>
<tr>
<td>melting</td>
<td>melding</td>
</tr>
<tr>
<td>attain</td>
<td>A Dane</td>
</tr>
</tbody>
</table>

What context causes flapping to occur? There are two conditions:

1. The /t/ or /d/ has to be between vowels (this includes a syllabic [r] or [l])
   - so not in hit, melting
2. The following vowel has to be unstressed.
   - so not in tin, attain

If you compare the list of homophones (with flapping) vs. minimal pairs (without flapping), you'll see that only the homophones satisfy both these conditions.

The same basic word (or word root, or morpheme) can change. This includes adding a vowel:

| sit [t] | sitting, sitter [r] |
As well as moving the stress (primary ` or secondary `):

<table>
<thead>
<tr>
<th>word</th>
<th>pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>spot</td>
<td>[t]</td>
</tr>
<tr>
<td>spotty</td>
<td>[ɾ]</td>
</tr>
<tr>
<td>mad</td>
<td>[d]</td>
</tr>
<tr>
<td>madder, maddest</td>
<td>[ɾ]</td>
</tr>
<tr>
<td>bird</td>
<td>[d]</td>
</tr>
<tr>
<td>birdy</td>
<td>[ɾ]</td>
</tr>
</tbody>
</table>

Borrowed new words are subject to these patterns too:

<table>
<thead>
<tr>
<th>word</th>
<th>pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>atomic</td>
<td>[tʰ]</td>
</tr>
<tr>
<td>átom</td>
<td>[ɾ]</td>
</tr>
<tr>
<td>cómputation</td>
<td>[tʰ]</td>
</tr>
<tr>
<td>computer</td>
<td>[ɾ]</td>
</tr>
<tr>
<td>prágramatism</td>
<td>[tʰ]</td>
</tr>
<tr>
<td>pragmático</td>
<td>[ɾ]</td>
</tr>
<tr>
<td>addictive</td>
<td>[d]</td>
</tr>
<tr>
<td>áddict</td>
<td>[ɾ]</td>
</tr>
<tr>
<td>edition</td>
<td>[d]</td>
</tr>
<tr>
<td>édit</td>
<td>[ɾ]</td>
</tr>
</tbody>
</table>

So aspiration and flapping are not learned in individual words (such as flapped latter), but are part of what we know about the language.

There are other allophones of the phoneme /t/: 
[t] [ʔ] [ɾ] [tʰ]

When these sounds occur in other languages, they may be distinct phonemes:

Korean [tʰal] arm [tal] foot (contrastive distribution)

Also: sounds that are distinct phonemes in English, might be allophones in another language

Korean /tʰ/: [tal] arm [mandu] dumpling (complementary distribution)

**Phonological processes**

Phonemic form => phonological processes => phonetic form.

These processes generally operate with natural classes of sounds.
For instance, the different pronunciations of the plural suffix "s" (phonetics lectures) involve:

- **Insertion of vowel** after sibilants: churches, judges, kisses, guises
- **Assimilation** in voicing after all other sounds: picks, pigs

**Assimilation**
e.g. alveolar stops assimilate in place of articulation to the following consonant
  I can see, I can bake, I can go

**Dissimilation**
e.g. Middle English *purpre* --> Modern English *purple*

**Insertion**
e.g. a voiceless stop between a nasal and a voiceless fricative: hamster, dance;
also /j/ insertion after initial alveolar consonants and before high vowels: few, puny, news

**Deletion**
e.g. /h/ may be deleted from unstressed syllables: He handed her his hat;
also /r/ is deleted after a vowel in some dialects: /ka/, /yad/

**Exchange = Metathesis**
e.g. Old English *thridda* --> Modern English *third*; acsian vs ascian (Old English)

**Strengthening = Fortition**
e.g. aspiration rule above

**Weakening = Lenition**
e.g. flapping rule above

**Fronting**
e.g. velar to alveolar nasal ("g"-dropping): running

**Other**
e.g. prenasal [i] lowering in the South, parts of Midwest, nad parts of the West of the US

**Multiple processes**

- Raising diphthong /ai/: followed by a voiceless consonant, it is "raised" so the first part is more like the first vowel of mother than that of father.

  **regular diphthong** at the end of a word, or before a voiced consonant

  Ø, b, d, v, z,ð, m, n, l, r, j, ŋ
  tie, jibe, hide, live, rise, tithe, time, line, tile, tire, oblige,

  **raised diphthong** before a voiceless consonant

  p, t, k, f, s ...
  hype, white, bike, life, ice ...

- This distinction between [ai] and raised [əi] is there even when the voicing distinction is eliminated by flapping. So if a speaker has raising in write, this is maintained in writer, while rider will have [ai] just like ride.

So: while flapping eliminates the distinction in consonants, the words still do not rhyme.
Most speakers think the difference lies in the consonants. In the pronunciation, it’s in the vowels.

- The reason why speakers "hear" the difference in the consonants is because
  - on an abstract level in their minds, the words are represented as /rætər/ and /rætər/, with the difference localized in the consonant.
  - raising of /aʊ/ in the former, & flapping in both are subsequent & unconscious.

How does raising keep working when the conditioning factor on raising - voicing on the following consonant - has been obliterated?

Raising the /aʊ/ in writer on analogy to write, where the conditioning factor is still intact?? NO

Speakers apply **phonological rules to these representations in some order**, so that the output of one rule can be the input to another:

- **writer**
  
  /rætər/ --> raising --> /rætər/ --> flapping --> /rætəɾ/

- **rider**
  
  /rætər/ --> raising /rætər/ --> flapping --> /rætəɾ/