Today

- Phonological rules
- How to solve a phonology problem
  - Work a problem

Readings: 4.3-4.5
Phonological rules are responsible for the mapping between the phonemic and phonetic (AKA allophonic) levels.
Phonological rules

- Account for *predictable* properties of pronunciation
- Have 3 parts:
  - A) sound(s) that undergo the rule
  - B) result of the rule
  - C) environment where the rule applies

\[
A \rightarrow B \text{ / } C
\]

“A becomes B in the environment C”
Natural classes

- A group of sounds, which have a particular feature (or combination of features) in common, that are treated as a group by the phonology.

  - e.g.,
    - labial consonants: \([p, b, m, w, \phi, f, v]\)
    - low vowels: \([a, \emptyset]\)

Or

- [+labial]
- [+low]

Distinctive feature
Natural Classes

*May be broad…*

- all glides, liquids, nasals, and vowels = [+sonorant]
- all stops and fricatives = [-sonorant]
- all consonants = [+ consonantal]
- all vowels = [-consonantal]
Natural Classes

or narrow…

all high vowels = [+ high, - consonantal]

all voiceless consonants = [- voiced, +consonantal]

voiceless labial stops = [-voi, +labial]

A distinctive feature is that property of sound that is the least common denominator describing the set. It must apply to all and only the members of the set.
Problems in phonology

- What are the phonemes of a given language? How are they distributed?
How to solve a phonology problem

- Some diagnostic tests…

1. *Minimal pairs* are our test for *contrastive distribution* (allophones of different phonemes)

2. *Predictability* is our test for *complementary distribution* (allophones of the same phoneme)
What are the high vowel phonemes?

<table>
<thead>
<tr>
<th>Phoemes</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[pisan]</td>
<td>[uduk]</td>
</tr>
<tr>
<td>[dupuko]</td>
<td>[kaskas]</td>
</tr>
<tr>
<td>[poko]</td>
<td>[poki]</td>
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<tr>
<td>[kisa]</td>
<td>[pil]</td>
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<tr>
<td>[supwo]</td>
<td>[apid]</td>
</tr>
<tr>
<td>[kamw koti]</td>
<td>[iju]</td>
</tr>
</tbody>
</table>
## Distribution of Sounds

<table>
<thead>
<tr>
<th>[pišan]</th>
<th>[uduk]</th>
<th>p_s</th>
<th>p_k</th>
<th>___#</th>
<th>d_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>[dupukda]</td>
<td>[kaskas]</td>
<td>k_s</td>
<td>s_p</td>
<td>p_l</td>
<td>___#</td>
</tr>
<tr>
<td>[puko]</td>
<td>[poki]</td>
<td>k_t</td>
<td></td>
<td>p_d</td>
<td>d_k</td>
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</tbody>
</table>

‘#’ = word boundary
1. Look at environments to find natural classes

[i] occurs…
- btw. voiceless consonants

[u] occurs…
- btw. voiceless cons.

No natural class can be used to define where [i], [u] occur
2. Look for gaps in environments

- [i] does not occur where [i] does, and vice versa
- [u] does not occur where [u] does, and vice versa

**THUS**...

- [i] and [i] are in complementary distribution
- [u] and [u] are too
3. State generalizations

“[i] and [u] are voiceless…
...when they occur between voiceless consonants.”

“[i] and [u] are voiced…
...elsewhere.”

Question: Is the Mokilese rule a voicing rule or a devoicing rule?
4. Determine identity of the phonemes and their allophones

- Which is the basic and which is the restricted allophone(s)?
  - Restricted (‘Derived’): occurs in simplest set of environments
  - Basic: occurs in wider, more complex set of environments

- Basic allophone is assumed to be the phoneme, restricted allophone is predicted by the rule.
  - Phonemes: voiced high vowels /i/ /u/
  - Restricted allophones: voiceless high vowels [i] [u]
Mokilese rule

“/i/ and /u/ become [ᵻ] and [ᵻ] between voiceless consonants”

or...

“High vowels become voiceless between voiceless consonants”
Summary

1) List the phonetic environments
2) State the environments in terms of natural classes
3) Are the environments the same or non-overlapping?
   - **Same**: Contrastive distribution (allophones of different phonemes) e.g., [i] vs. [u]
   - **Non-overlapping**: Complementary distribution (allophones of the same phoneme) e.g., [i] vs. [i]
4) Identify the basic vs. restricted allophone(s)