Basic phonological analysis

- Establish sound inventory (phonetic level)
  - Transcribe words using narrow phonetic transcription

- Establish phoneme inventory
  - Analyze sound distribution, using the technique of minimal pairs
  - Establish allophonic patterns – looking for complementary distributions, and free variations

Korean [l] and [r]

[l] and [r] are in complementary distribution in Korean

English consonantal phonemes

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[p]</td>
<td>stop</td>
</tr>
<tr>
<td>[b]</td>
<td>stop</td>
</tr>
<tr>
<td>[t]</td>
<td>affricate</td>
</tr>
<tr>
<td>[d]</td>
<td>affricate</td>
</tr>
<tr>
<td>[k]</td>
<td>postalveolar stop</td>
</tr>
<tr>
<td>[g]</td>
<td>postalveolar stop</td>
</tr>
</tbody>
</table>

English vocalic phonemes

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[a]</td>
<td>high central front vowel</td>
</tr>
<tr>
<td>[i]</td>
<td>high front unrounded vowel</td>
</tr>
<tr>
<td>[e]</td>
<td>high front rounded vowel</td>
</tr>
<tr>
<td>[o]</td>
<td>high back unrounded vowel</td>
</tr>
<tr>
<td>[u]</td>
<td>high back rounded vowel</td>
</tr>
</tbody>
</table>

Near-minimal pairs

- If no minimal pairs are found in the language, we often resort to the next best, which is near-minimal pairs:
  - Paired words that have segments in nearly identical environments

- E.g.: assure [asur] vs. azure [əzər]
Types of sound distributions

- **Contrastive**: two sounds occur in the same phonetic environment and they contrast with one another (produce meaning differences)

- **Non-contrastive**:
  - **Complementary**: if two sounds never occur in the same phonetic environment, then they are in complementary distribution.
  - English aspirated and non-aspirated stops
  - Korean [?] and [r]
  - **Free variation**: if two sounds occur in the same phonetic environment and they do not produce meaning differences, then they are in free variation.
    - E.g., English [t] and [t]; or [d] and [d]

Valid inferences from distributional properties of segments

- If two segments contrast with one another
  - they are allophones of two different phonemes
- If two segments are
  - In complementary distribution or
  - In free variation
  - they are allophones of the same phoneme

Problematic inferences

[\text{h}] \quad \{h\} \quad \{N\}
\{hoU\} \quad \text{hope} \quad \ast \quad \{NoU\} \quad \text{word initial}
\{heI\} \quad \text{hate} \quad \ast \quad \{NeI\}
\ast \{lah\} \quad \{laN\} \quad \text{long} \quad \text{word final}
\ast \{sih\} \quad \{siN\} \quad \text{sing}

Why is this an unwanted inference?

Criterion for establishing phonemes: Phonetic similarity

For two sounds to be considered allophones of the same phoneme they must be phonetically similar.

Types of phonological rules

- Assimilation – segments becoming more alike (voicing/devoicing, vowel harmony)
- Dissimilation – segments becoming less alike
- Strengthening (fortition): English aspiration
- Weakening (lenition): English flapping
- Deletion (syncope)
- Insertion (epenthesis)
- Metathesis

Property of Phonological Rules

- Phonological rules refer to natural classes
  - **Vowels** are nasalized before a **nasal consonant**
  - **Voiceless stops** are aspirated before a stressed **vowel** (if the onset of a stressed syllable)
  - [r] occurs after **vowels** (Korean)
Natural Class

- A natural class is a set of **all** sounds and **only** those sounds in a language with a certain property (e.g. labial).
- An example of a natural class in English:
  - Stops   [p,t,k,b,d,g]
  - Voiced stops   [b,d,g]
  - Voiceless stops [p,t,k]
  - Rounded vowels  [u, o, ə]
  - …

What is not a natural class

- For English:
  - [p,t,k,l]
  - [m,n]
  - [o,i]
  - [b,d,g,t]
  - [s,z,h]

Phonology-morphology interaction

- Allophonic alternations result in allomorphy (i.e., two or more different phonetic forms for the same morpheme).
- Phonetic neutralizations often result in homophony in the lexicon or syncretism in inflectional paradigms (i.e., one phonetic form for two or more morphemes).

Alternations

<table>
<thead>
<tr>
<th>Affix alternations</th>
<th>Stem alternations</th>
</tr>
</thead>
<tbody>
<tr>
<td>[dagː]</td>
<td>[kœt]</td>
</tr>
<tr>
<td>-z</td>
<td>-s</td>
</tr>
</tbody>
</table>

How many plural morphemes are there?

How many stems for “knife” are there?

Hypothesis 1

- Plural = [-s]
- Hypothesis 1
  - Input: [kœt] - s
  - Voicing Rule: dna
  - Vowel Insertion rule: dna
  - Output: [kœts]

Hypothesis 2

- Plural = [-z]
- Hypothesis 2
  - Input: [dag] - s
  - Voicing rule: [dag]
  - Vowel Insertion rule: dna
  - Output: [dagz]

Rules

- Voicing rule 1 (voicing)
  - C \rightarrow [+voice] / [+voice]___
- Voicing rule 2 (devoicing)
  - C \rightarrow [-voice] / [-voice]___
- Vowel Insertion
  - e \rightarrow [s] / C ___ C
difractive
difractive
Rule ordering

- [kœt] - z input
  - Voicing rule
  - Vowel Insertion rule
  
  [kœts] output

- [dag] - z input
  - Voicing rule
  - Vowel Insertion rule
  
  [dagz] output

- [tS´rtS] - z input
  - Voicing Rule
  - Vowel Insertion rule
  
  *[tS´rtS´s]* output

By reordering the rules we have changed the input to the voicing rule and blocked the application of the voicing rule

Neutralization

Flapping rule in English:

- [l] → [r] / V ___ V
  - [alveolar stop] → [r] / V ___ V

  - [l] → [r] / V ___ V

write [rait] → [raɪt]
writer [raitə] → [raɪtə]

ride [raid] → [raid]
rider [raidə] → [raidə]

By reordering the rules we have changed the input to the voicing rule and blocked the application of the voicing rule