Trad 101: Languages and Cultures of East Asia

Phonology
Phonology

- What is Phonology?
  - description of speech sound systems; how these sounds are organized within a language
  - These sounds are called phonemes
  - A phoneme can have more than one phonetic realization; these are called allophones
Phonemes & Allophones

- **Phoneme**
  - A minimal unit of sound that serves to distinguish meaning between words
  - May be composed of a set of sounds (“allophones”), even though native speakers may perceive them as the ‘same’ sound

- **Allophone**
  - the different phonetic realizations of a phoneme
Phonemes & Allophones

\[
\begin{align*}
top & \quad [th^h] \\
stop & \quad [stap] \\
\text{little} & \quad [lIr] \\
kitten & \quad [kIr\,n]
\end{align*}
\]

Phoneme $\rightarrow \quad /t/$

Allophones $\rightarrow \quad [th^h] \quad [t] \quad [r] \quad [?]
Phonemes & Allophones

- Note that symbols in brackets (e.g., [p], [t], [k]) are phonetic; symbols in slashes (e.g., /p/, /t/, /k/) are phonemic
- The symbol /t/ in English represents the following sounds: [tʰ], [t], [ɾ], and [ʔ]
- Therefore [tʰ], [t], [ɾ], and [ʔ] are all allophones of /t/
Phonemes & Allophones

- How do we know if we have one phoneme or two? That is, how do we know that $[t^h]$, $[t]$, $[ɾ]$, and $[ʔ]$ are all forms of /t/ and not unique sounds in the language?
  
  By looking for minimal pairs which will tell us if sounds are in contrastive distribution.

  If contrastive distribution then there are two different phonemes; if complimentary distribution then we have allophones of the same phoneme.
Phonemes & Allophones

- Um, what?
- **Minimal pairs** are words that have different meanings and only one sound is different:
  
  - mop : top  
  - tip : sip
  
  - cap : cab  
  - cap : cup

- The phonemes in blue are said to be in **contrastive distribution**; they can occur in the same phonetic environment.

- The sounds /m/, /t/, /s/, /p/, /b/, /a/, and /u/ are all phonemes in English.
Phonemes & Allophones

- Um, what?
- Complementary distribution are when two phonetically similar sounds do not occur in the same phonetic environments. Compare [p] and [pʰ] in the following examples:
  - [spay] ‘spay’ : [pʰay]‘pie’
  - [spul] ‘spool’ : [pʰul] ‘pool’
  - [spik] ‘speak’ : [pʰik] ‘peak’
  - [spæt] ‘spat’ : [pʰæt]‘pat’
Phonemes & Allophones

- Complementary distribution are when two phonetically similar sounds do not occur in the same phonetic environments.

- \([p]\) and \([p^h]\) do not occur in the same phonetic environments: \([p]\) cannot occur in word initial position \([p^h]\) does. \([p^h]\) cannot occur after \([s]\) but \([p]\) does.

Therefore \([p]\) and \([p^h]\) are allophones of a single phoneme /p/. 
Phonemes and Allophones

- Here we have the phoneme /p/ and its allophones [pʰ] and [p]

```
pat            spat
[pʰæt]         [spæt]
```

```
phoneme /p/
```

```
allophones [pʰ] [p]
```
Phonemes and Allophones

- The analogy
Phonemes and Allophones

The analogy
Clark Kent and Superman are the same person. But they are never seen in the same environments.
Phonemes and Allophones

- The analogy
  - Superman is found only in an emergency.
  - Clark Kent is found everywhere else.
Phonemes and Allophones

The analogy

[/CK/]

[Superman] [Clark Kent]
Phonemes and Allophones

The analogy

/CK/ is a phoneme that has the allophones [Superman] and [Clark Kent]

[Superman] occurs in the environment of an emergency

[Clark Kent] occurs elsewhere

[Superman] and [Clark Kent] occur in complementary distribution; they do not appear in the same environments
Phonemes and Allophones

- Any questions so far?
Let's do a phonology problem

When looking at problems, follow these steps:

Step 1: State their distribution

Step 2: Decide if they are phonemes or allophones. If they are phonemes, you can stop here. If they are allophones, go to step 3.

Step 3: Make generalizations about the environments where the sounds occur.

Step 4: Designate one as the phoneme.

Step 5: Rewrite the data phonemically.
Phonemes and Allophones

Let's look at an example from Mokilese

What are the high vowel phonemes?

- [pʰisan]
- [dʊpʊkda]
- [pʊko]
- [kɪsa]
- [sʊpwo]
- [kamwɔkɪti]

- [uduk]
- [kaskas]
- [poki]
- [pil]
- [apid]
- [iju]
Phonemes and Allophones

Step 1: State their distribution

[p̥isan]  [uduk]
[dup̥mkda]  [kaskas]
[p̥ko]  [poki]
[k̩sa]  [pil]
[s̪wpwo]  [apid]
[kamwɔk̃iti]  [iju]
## Phonemes and Allophones

### Step 1: State their distribution

<table>
<thead>
<tr>
<th>Phonetic Form</th>
<th>Transcription</th>
</tr>
</thead>
<tbody>
<tr>
<td>[pısan]</td>
<td>[uduk]</td>
</tr>
<tr>
<td>[dupųkda]</td>
<td>[kaskas]</td>
</tr>
<tr>
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<td>[kamwųkįti]</td>
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<table>
<thead>
<tr>
<th>Diacritical Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
</tr>
<tr>
<td>p_s</td>
</tr>
<tr>
<td>k_s</td>
</tr>
<tr>
<td>k_t</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

`#` = word boundary
Phonemes and Allophones

**Step 2:** Decide if they are phonemes or allophones. If they are phonemes, you can stop here. If they are allophones, go to step 3.
Step 3: Make generalizations about the environments where the sounds occur.

“Natural classes” are an easy way to describe sounds, by grouping phonemes into categories, e.g., between vowels, at the end of words, between nasals, etc.

Can you simplify the description of the environments by looking for natural classes?
Phonemes and Allophones

Where do these sounds occur?

\[
\begin{array}{c|c}
\text{[pɔsan]} & \text{[uduk]} \\
\text{[dupɔkda]} & \text{[kaskas]} \\
\text{[pɔko]} & \text{[poki]} \\
\text{[kɔsa]} & \text{[pil]} \\
\text{[sʊpwo]} & \text{[apid]} \\
\text{[kamwɔkiti]} & \text{[iju]} \\
\end{array}
\]

\[
\begin{array}{c|c|c|c|c}
\text{i} & \text{u} & \text{i} & \text{u} \\
p_s & p_k & ___# & d_p \\
k_s & s_p & p_l & ___ \\
k_t & & p_d & d_k \\
 & & #_ & ___# \\
\end{array}
\]

‘#’ = word boundary
Phonemes and Allophones

Where do these sounds occur?

[i] occurs...
– btw. voiceless consonants

[u] occurs...
– btw. voiceless cons.

No natural class can be used to define where [i], [u] occur
Phonemes and Allophones

Where do these sounds occur?

- \([i]\) does not occur where \([\text{o}]\) does, and vice versa

- \([u]\) does not occur where \([\text{o}]\) does, and vice versa

**THUS...**

- \([i]\) and \([\text{o}]\) are in complementary distribution
- \([u]\) and \([\text{o}]\) are too
Phonemes and Allophones

Where do these sounds occur?

General statement: the high vowels are voiceless between voiceless consonants
Phonemes and Allophones

Step 4: Designate one as the phoneme.

To determine which is the phoneme and which are the allophones choose the sound that occurs in more environments
Phonemes and Allophones

Step 4: Designate one as the phoneme.
To determine which is the phoneme and which are the allophones choose the sound that occurs in more environments:

[i] and [ᵻ] occur between voiceless consonants
[i] and [u] occur elsewhere
Phonemes and Allophones

Where do these sounds occur?

General statement: the high vowels are voiceless between voiceless consonants.

To determine which is the phoneme and which are the allophones choose the sound that occurs in more environments:

[i] and [ᵢ] occur between voiceless consonants
[i] and [u] occur elsewhere

Thus:
Phonemes and Allophones

Where do these sounds occur?

Thus:

[i] between voiceless consonants

[u] between voiceless consonants

[i] elsewhere

[u] elsewhere
Phonemes and Allophones

Step 5: Rewrite the data phonemically.

[pisan]  [uduk]  /pisan/
[dupũkda] [kaskas] /dupukda/
[pũko]  [poki]
[kĩsa]  [pil]
[sũpwo] [apid]
[kamwɔ̃k̚i] [iju]
Step 5: Rewrite the data phonemically.

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<td>/kisa/</td>
<td>/pɪl/</td>
</tr>
<tr>
<td>[sʊpwo]</td>
<td>[apɪd]</td>
<td>/supwo/</td>
<td>/apɪd/</td>
</tr>
<tr>
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