Week 1 – Speech Sounds and Phonemes

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1 Phonemes

1. Phonemes are *abstract* categories of speech sounds which are hypothesized to be psychologically real.

2. A strong claim is that two languages could have *identical* surface sounds, but *different* phonemic organization (Sapir, 1925).

3. Another important question is how abstract can phonemic categories be?

1.1 Contrast

The key notion when discussing phonemes is *contrast*. When speech sounds are *distinct* from other sounds of the language it makes a spoken vocabulary possible.

★ What would a vocabulary look like if there were only one speech sound [a]? If there were two [a,t]? If there were 100 million?

1.2 Discovering Contrast

1. When two words only differ by a single speech sound in a single location then a contrast has been discovered. For example, when making pairwise comparisons among the words [fæn, væn, tæn, pæn] we realize that the sounds [f,v,t,p] are realizations of different phonemes.

2. Such pairs are called **minimal pairs** and finding them is the surest way to discover contrast.

3. Sometimes there can be no minimal pair between sounds. Consider the English diphthongs [eɪ]. In the words on the right, its pronunciation is quite a bit shorter than its pronunciation in the words on the left. This is indicated with the IPA diacritic [◡] on the [e] of the diphthong.

save	[seɪv]	*safe*	[sĕɪf]
Abe	[eɪb]	*ape*	[ĕɪp]
made	[meɪd]	*mate*	[mĕɪt]
age	[eɪdʒ]	*H*	[ĕɪtʃ]
Haig	[heɪg]	*ache*	[ĕɪk]

★ Can you predict where the longer and shorter versions of this diphthong occur?

★ Is it possible therefore to find a minimal pair for these two sounds?

★ Let's draw a diagram summarizing this situation.

4. The **allophones** of a phoneme are its surface variants.

5. Sometimes there are no minimal pairs, but there are **near-minimal pairs**. These are pairs that would be minimal except for some irrelevant difference. For example, *plaque* [plæk] and *sag* [sæg] are near-minimal pairs for [k,g].

1.3 Complementary Distribution

Sounds are in **complementary distribution** if one of the sounds never occurs in the environments where the other sounds occur.

Examples.

1. English. [n] is an alveolar nasal and [n̪] is a dental nasal.

know	[ˈnoʊ]	*tenth*	[ˈtɛn̪θ]
annoy	[əˈnɔɪ]	*month*	[ˈmʌn̪θ]
onion	[ˈʌnjən]	*panther*	[ˈpæn̪θɚ]
nun	[ˈnʌn]	*chrysanthemum*	[krɪəˈsæn̪θəməm]

2. English. [l] is an alveolar lateral approximant; [ɬ] is a velarized [l]; [ɬ̪] is a dental, velarized lateral approximant; and [l͡l̥] is an [l] which begins voiceless but ends voiced.

file	[ˈfaɪɬ]	*slight*	[ˈs͡l̥laɪt]	*wealth*	[ˈwɛɬ̪θ]	*listen*	[ˈlɪsən]
fool	[ˈfuɬ]	*flight*	[ˈf͡l̥laɪt]	*health*	[ˈhɛɬ̪θ]	*lose*	[ˈluz]
all	[ˈɔɬ]	*plow*	[ˈp͡l̥laʊ]	*filth*	[ˈfɪɬ̪θ]	*allow*	[əˈlaʊ]
ball	[ˈbɔɬ]	*cling*	[ˈk͡l̥lɪŋ]	*tilth*	[ˈtɪɬ̪θ]	*aglow*	[əˈgloʊ]
fell	[ˈfɛɬ]	*discipline*	[ˈdɪsəp͡l̥lən]	*stealth*	[ˈstɛɬ̪θ]	*blend*	[ˈblɛnd]
feel	[ˈfiɬ]						

★ What are the environments where each sound occurs?

★ Let's draw a diagram summarizing this situation.

3. Sounds in complementary distribution may be allophones of the same phoneme.

1.4 Similarity Criterion

1. Another criterion for identifying sounds as allophones of the same phoneme is *phonetic similarity*.

2. The sounds [h] and [ŋ] are in complementary distribution in English: [h] only occurs at the beginning of words (or syllables) and [ŋ] only occurs at the ends of words (or syllables). However, phonologists do not posit that these are allophones of the same phoneme because they are not similar phonetically.

   ★ Why not? How abstract is phonology?

3. It is difficult to define the similarity criterion rigorously.

1.5 Determining the phoneme

1. In the above example, we found that [l,ɬ,ɬ̪,l̥͡l̥] are allophones of the same phoneme. What is the phoneme?

2. Here is a useful principle for determining the phoneme.

   - The allophone which belongs to the "elsewhere" environment is the phoneme.

★ Let's work out the phonemes for the earlier examples.

3. However, sometimes, this doesn't seem to help. For example, consider our earliest example with [eɪ]. Another useful principle for determining phonemes is given here:

   - The rules or constraints required to derive the surface variants are phonetically motivated.

   We'll have to discuss rules and constraints a bit to see how this works.

1.6 An introduction to rules and constraints

1. How can the generalizations regarding the allophones of /l/ and /n/ be formalized?
2. There are two kinds of generalizations we are interested in: the *phonotactic* one and the *process-oriented* (or *derivational*) one.
3. Phonotactic generalizations:

   "Long diphthongs [eɪ] are not allowed before voiceless labiodental fricatives."

   *eɪf

   "Alveolar nasals are not allowed before voiceless dental fricatives."

   *nθ

   "Dental nasals are not allowed before low unround back vowels."

   *n̪a

   "Alveolar lateral approximants are not allowed at the ends of words."

   *l]$_{\text{wd}}$

   etc.

4. Notation

   - The asterisk [*] means the structure is ill-formed.
   - Nowadays structural boundaries are often given with square brackets. For example: "$_{\text{wd}}$[" is the beginning of a word, "$_{\sigma}$[" is the beginning of a syllable, and "]$_{\sigma}$" is the end of a syllable.

   ★ How might we generalize the above phonotactic generalizations to refer to classes of sounds?

5. Derivational generalizations:

"Alveolar nasals become dental before voiceless dental fricatives."

$$/\text{n}/ \longrightarrow [\underline{\text{n}}] \; / \; \_\_\_\_ \; \theta$$

"Alveolar lateral approximants velarize at the ends of words."

$$/\text{l}/ \longrightarrow [\text{ɫ}] \; / \; \_\_\_\_ \;]_{\text{wd}}$$

etc.

6. Notation:
   - The slash "/" means "in the environment of"
   - The long underline "____ " means this is where the change takes place

   ★ How might we generalize the environments in the rules above?

7. More generally $\text{A} \longrightarrow \text{B} \; / \; \text{X} \_\_\_\_ \; \text{Y}$ is the same as $\text{XAY} \longrightarrow \text{XBY}$.
   - XAY is called the **structural description** of the rule.
   - A is the **target** of the rule.
   - $\text{A} \longrightarrow \text{B}$ is called the **structural change** of the rule.

   ★ How can we simplify the structural change of the above rules?

8. Later we will examine these ideas more carefully when we discuss phonological features.

   ★ Consider again the allophones [eɪ] and [ĕɪ]. What are the two rules we could write?

1.7 Contextually Limited Contrasts

1. Two sounds may contrast in some, but not all positions.
2. English.

bedding	[ˈbɛɾɪŋ]	*bedding*	[ˈbɛɾɪŋ]

In V́____ V environments, both /t,d/ are realized as the flap [ɾ].

3. Toba Batak (Austronesian). There are near-minimal pairs indicating a voicing contrast.

[pinoppar]	'descendent'	[biaŋ]	'dog'
[dukkar]	'let out'	[tuak]	'palm wine'
[korea]	'Korea'	[garut]	'name of town in Indonesia'

But word finally all stops are voiceless.

[sukkup]	'adequate'	[surat]	'letter'
[hotop]	'fast'	[rappok]	'steal'
[dohot]	'with'	[halak]	'man'

★ What kind of constraint and rule could we write to describe this situation?

4. In short, a full description of a phonology of a language not only describes which sounds are contrastive, but also in which environments they contrast, and in which environments they do not.

1.8 For discussion

It can also be difficult to decide whether a sound is a phoneme or whether it is a sequence of two successive phonemes.

★ Consider the English sound [ŋ]. Is this derived from /ng/ or /ŋ/?

References

Hayes, Bruce. 2009. *Introductory Phonology*. Wiley-Blackwell.

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Sapir, Edward. 1925. Sound patterns in language. *Language* 1:37–51.