ASC 232 • Descriptive Phonetics

Distinctive Features

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Phonological Analysis

- A Phonological Analysis consists of the following elements:
  - List of the phonemes of a language
  - Classification system for categorizing the phonemes
  - Phonotactics - positional and sequential occurrences of phonemes within a language
  - List of the allophonic variations for each of the phonemes
Alternative Classification Systems For Describing and Categorizing Phonemes

• Classical phonetic features of place and manner, and voicing
• Distinctive Features
 Classical Phonetic Features

/p/ specified using articulatory descriptors:

/ p / =
voiceless bilabial stop
## Distinctive Features

/p/ described as a bundle of features

| [-Vocalic] | [- Low] | [- Continuant] |
| [+Consonantal] | [- Back] | [+Tense] |
| [-Sonorant] | [- Rounded] | [- Voiced] |
| [-Coronal] | [- Distributed] | [-Strident] |
| [+Anterior] | [- Nasal] | |
| [-High] | [- Lateral] | |
Distinctive Feature Theory

• Roman Jakobson
  – Prague School of Linguistics (Pre-WWII)
  – Massachusetts Institute of Technology (MIT)
    and Harvard University

• Gunnar Fant
  – KTH - Royal Technical Institute, Stockholm, Sweden

• Morris Halle
  – Massachusetts Institute of Technology
Uses for Distinctive Features

• To specify a phoneme
• To specify a class of phonemes
• To describe the set of speech sounds used in a particular language or dialect
• To write concise rules of phonetic change
• To characterize a speech disorder
  – e.g. substitution, often involving a change of feature)
Distinctive Features

• Features are binary (+ or - values)
• Each speech sound may be described as a “bundle” of features
• Each member of every pair of phones is distinguished from the other member by at least one feature value
• Features are universal, but a given language may use a subset of features as distinctive
Features
(*=Original Jakobson, Fant & Halle features)

• *Vocalic/Nonvocalic
• *Consonantal/Nonconsonantal
• Sonorant/Obstruent
• Rhotic/Nonrhotic (vowels)
• Advanced/Nonadvanced (vowels and diphthongs)
• Front/Nonfront (vowels)
• Coronal/Noncoronal [=*Acute/Grave]
• Anterior/Nonanterior [=*Compact/Diffuse] (consonants)
Features, continued (*=Original Jakobson, Fant & Halle features)

• High/Nonhigh
• Low/Nonlow
• Back/Nonback
Features, continued (*=Original Jakobson, Fant & Halle features)

• Rounded/Nonrounded (*Flat/Plain)
• Distributed/Nondistributed
• *Nasal/nonnasal
• Lateral/Nonlateral
Features, concluded
(*=Original Jakobson, Fant & Halle features)

- *Continuant/Stop
- *Tense/lax (vowels)
- *Voiced/voiceless
- *Strident/Nonstrident (consonants)
Redundancy Rules

• All vowels in English are [+ Voiced]
• All [-Voiced] sounds are [+Consonantal], [-Nasal], [-Sonorant] and [-Vocalic]
• [+Anterior] sounds are [-Distributed]
• Sounds that are both [-Continuant] and [+Anterior] are [-Strident]
• [-Coronal] sounds are [-Lateral]
With Redundancy eliminated

/p/= [-Voiced]
  [-Continuant]
  [+Anterior]
  [-Coronal]
Features Used to Define A Class

• Class of “Stop Consonants”
• /p,b,t,d,k,g/: [+Consonantal]
  [-Vocalic]
  [-Continuant]
  [-Nasal]
  [-Distributed]
Concept of “Complement”

A is the complement of B
B is the complement of A

A “complements” B.
A + B = whole
Complementary Distribution

• aspirated /p/ in syllable initial position “pot”
  \[ p^{h_a} t \]

• non-aspirated after /s/ “spot”
  \[ s p^{=a} t \]
Free Variation

• “cigarette” - stress on first or last syllable
• “economics” - first vowel sound /ɪ/ or /ɛ/
• aspiration of final /p/ in “pop”
Phonotactic Rules

- Some languages permit only CV syllables
- English has consonant clusters “sixths”
- Some languages permit engma [ŋ] as first sound in a word
- If a word starts with three consonants, the first must be /s/
Levels of Structure

- Phone
- Phoneme
- Morpheme
- Word
- Phrase
- Sentence
- Paragraph
Example of a Substitution Rule

\[
/ʃ/ \Rightarrow /s/
\]

A common substitution made by children

“shoe” pronounced as “Sue”
Feature Representation of Rule

\[ \begin{array}{c}
\text{-Anterior} \\
\text{+High}
\end{array} \quad \Rightarrow \quad \begin{array}{c}
\text{+ Anterior} \\
\text{-High}
\end{array} / \begin{array}{c}
\text{+ Consonantal} \\
\text{+ Coronal} \\
\text{- Nasal} \\
\text{- Low} \\
\text{- Strident} \\
\text{- Voiced}
\end{array} \]