Li/Lt6
Phonology and Morphology

Lecture 1
Phonemes and abstract representations

Today’s topics

- Two theories of mind
- Evidence for abstract mental representations
  - Competence vs performance
  - Priming
  - Phonological alternations
- Evidence for phonemes
  - Neutralization
  - Language games
  - Speech errors
  - Loanword phonology and L2 transfer
  - Orthography
  - Perception
  - Discrimination tasks
Two theories of mind

<table>
<thead>
<tr>
<th>rationalist</th>
<th>reductionist</th>
</tr>
</thead>
<tbody>
<tr>
<td>learning that</td>
<td>learning to</td>
</tr>
<tr>
<td>whole &gt; sum of parts</td>
<td>WYSIWYG</td>
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<tr>
<td>abstract, multi-level</td>
<td>concrete, surface level only</td>
</tr>
<tr>
<td>symbol-manipulating rules and constraints</td>
<td>connectionist network + statistical knowledge</td>
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<tr>
<td>Turing machine</td>
<td>switch network</td>
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<tr>
<td>categorical, symbolic</td>
<td>gradient, numerical</td>
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The reductionist position

- Popular lay intuition that we store and manipulate surface forms
- Priming effects by individual voice
- “Once we introduce mechanisms for describing word-word correspondences into the grammar, it may be possible to dispense with underlying representations altogether (see proposals by Burzio 1998, Bybee 2001).” (Sumner 2003)
- connectionists
Evidence for abstract URs

Psychological reality:
Sapir 1933

- **Basic points:**
  1. Speech sounds are stored in the mind as abstract categories (phonemes)
  2. These are not always identical to their surface manifestations (allophones)
  3. Speakers think of language in terms of phonemes, not phones (i.e., phonemes have psychological reality)

- **Evidence:**
  1. **Spelling**:
     - Alex Thomas (Nootka)
       - Writes <hi, hu> for [hr, h3]
       - Writes <Cl> for 2 different things he was taught (T!, 'R)
  2. **Intuitions**
     - Southern Paiute
       - Tony says [p+cj]uh for 'at the water'
       - Asked to divide the word into syllables, he says [p:c:][puh]
       - /p t k/ → /β r y/ /V_;/ no /β r y/
     - Sarcee
       - John Whitney feels that dinih 'it makes a sound' has a final /i/, whereas dinih 'this one' does not (cf. dinif→l 'the one who...')

NB Sapir needs external evidence to decide if the two forms he hears as identical are actually different phonetically.
Preferential Looking paradigm (Hirsh-Pasek and Golinkoff 1993)

- 19-month old infants’ comprehension of sentence like “Big Bird is hugging Cookie Monster. Where is Big Bird hugging Cookie Monster?”
- Infants (who can’t speak yet) looked longer at correct video

"Did you say θŋk?

Did you say θŋk?

Competence vs. performance

- intoxicated speech of the captain of the Exxon Valdez (Johnson, Pisoni, and Bernacki 1990)
  - Observed effects:
    - misarticulation of /r/ and /l/
    - final devoicing
    - Deaffrication
  - Performance problem, not different grammar
- attempts at producing adult [pʰən] pen collected from a 15-month-old child in a 30-minute period (Ferguson 1986):
  - [mɑə], [v], [dɛdn], [hɪn], [mbo], [pʰɪn], [tʰnθntʰn], [bah], [dhaun], [buɑ]
**competence vs. performance**

- **Bedore, Leonard, and Gandour 1994**
  - 4 yr old girl substitutes dental click for \{s z ʃ ʒ tʃ dʒ\}
  - She can initially imitate the fricatives, but not produce them on her own
  - After a short training session, she starts to produce [s] correctly
  - She then immediately gets all the others right
  - “the rapid rate of change observed in the child’s phonological system seems consistent with a phonological learning model in which the child has adult-like underlying phonological representations” (283)

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**Priming**

- Colloquial Dutch optionally neutralizes obstruent voicing with the clitic -der 'her'
  - /ik koes der/ 'I kiss her' ~ [ik koestar]
  - /ik kiz der/ 'I kiss her' ~ [ik kistar]
- Do speakers respond faster to targets that match the voicing of a prime?
- Lexical decision task, with following sequence of events:
  1. **PRIME** (verb+clitic construction)
  2. **TARGET** (verbal infinitive or nonword)
  3. **DECISION** (is the target a legitimate word of Dutch?)
- **Results**
  - Responses were faster when voicing of prime corresponded to voicing of **UR**
- **Conclusion**
  - Both variants of a verb are not stored in the lexicon

Japanese  ~n and rendaku
(Ito and Mester 2003)

- Rendaku: C → [+voi] / [+ X]
  - kami-kaze vs. ori-gami
- Lyman’s Law: X does not contain [+voi, -son]
  - taba ‘bundle’ satsu+taba ‘wad of bills’ (*satsu-daba)
- g-weakening: non-initial /g/ → [ŋ]
  - [gai+ŋi] ‘foreigner’
  - [koku+ŋai] ‘abroad’

Rule interaction
- R feeds GW: /ori+kami/ → [orinami]
- R counterfeeds GW: /saka+tope/ ‘reverse thorn’ → [sakatoro]e

<table>
<thead>
<tr>
<th>a. feeding</th>
<th>b. counterfeeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘folding paper’</td>
<td>‘reverse thorn’</td>
</tr>
<tr>
<td>/ori + kami/</td>
<td>/saka+tope/</td>
</tr>
</tbody>
</table>

If GW preceded R it would change g to ŋ and thereby feed R, resulting in *sakadoro]

g-weakening: non-initial /g/ → [ŋ]
- [gai+ŋi] ‘foreigner’
- [koku+ŋai] ‘abroad’

Evidence for abstract phonemes
Phonemes are also abstractions

Ambiguity: German devoicing

God designs the great white shark

[κ] = voiced uvular fricative
cf. French, Hebrew

Perception
Categorical perception: VOT

Categorization functions for synthetic stimuli ranging from [b] to [p]. Open circles indicate the percent of times that each stimulus was perceived as [b], and the filled circles indicate the percent of times that each stimulus was perceived as [p]. (Lisker and Abramson 1970)

Hearing Cs that aren’t there I: The McGurk effect

- When hearing the sound BA, while seeing GA:
- most adults (98%) think they are hearing DA

Hearing Cs that aren’t there II:
V formants \( \Rightarrow \) C \( \Rightarrow \)

Identification of burstless stops with different vowels:
transitions are all you need!

Phonemes vs. allophones

- \( t : t^{h} \) in English (allophonic) vs. Thai (phonemic)
  - Speakers produce consistent and finely controlled distinctions between allophones
  - When measured experimentally, subjects typically distinguish allophones at above chance levels, but much less easily and well than phoneme pairs
Phoneme vs. allophone

- Phonemes can distinguish meaning (flight : fright)
- Allophones don’t
In semantic disambiguation tasks, the phonology of a word interfered with the disambiguation process even when the reader had access to its semantic representations (Van Orden 1987).

- reader was presented with IS THIS A FLOWER?
- followed by the presentation of ROWS
- Correct response accuracy for such sentence-target pair was significantly lower when the targets shared a phonological representation with a word neighbor that semantically fit the question (i.e., ROSE).
- when the subject had the ability to resolve the task with the correct answer (NO) phonological information intervened.
Letter priming

Lee and Turvey 2003

- forms with deleted silent letters (SALM, COLUM) prime better than forms with deleted pronounced letters (COUSI)
- Conclusion: phonological representations are activated during visual word recognition.

Speech errors
## Types of speech errors

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
<th>Unit involved</th>
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<tbody>
<tr>
<td><strong>Sound errors</strong></td>
<td></td>
<td></td>
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<tr>
<td>Misordering</td>
<td></td>
<td></td>
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<tr>
<td>Substitution</td>
<td>York library — verk libary</td>
<td>Phoneme</td>
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<tr>
<td></td>
<td>Small bear — speer bell</td>
<td>Rime-constant</td>
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<td></td>
<td>Snow flurries — flow-sarrries</td>
<td>Consonant cluster</td>
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<td></td>
<td>Clear bluc — pleer bluc</td>
<td>Feature</td>
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<tr>
<td>Anticipation</td>
<td>Reading list — reading list</td>
<td>Phoneme</td>
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<tr>
<td></td>
<td>Coach is comfortable — cond is</td>
<td>Syllable or time</td>
</tr>
<tr>
<td>Perseveration</td>
<td>Beef needle — beef needle</td>
<td>Phoneme</td>
</tr>
<tr>
<td>Addition</td>
<td>effectively — efcetivly</td>
<td>Consonant cluster</td>
</tr>
<tr>
<td>Preparatory addition</td>
<td>Friendly stump — speckle stump</td>
<td></td>
</tr>
<tr>
<td>Preservatory addition</td>
<td>Blue bug — blue blog</td>
<td>Phoneme</td>
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<tr>
<td>Shift</td>
<td>Black boots — back booset</td>
<td>Phoneme</td>
</tr>
<tr>
<td>Deletion¹</td>
<td>Same tale — same outer</td>
<td>Phoneme</td>
</tr>
<tr>
<td>Noncontextual errors</td>
<td>Department — ipment</td>
<td>Phoneme</td>
</tr>
<tr>
<td>(substitution, deletion)</td>
<td>Winning — wending</td>
<td>Phoneme</td>
</tr>
<tr>
<td></td>
<td>Tremendously — tremenously</td>
<td>Syllable</td>
</tr>
</tbody>
</table>

## Language games
**Backwards English**

- *Cowan & Leavitt 1992 study of one woman*
  - Example: garage [graż] reversed as [žarg]
  - Evidence that she reverses phonemes (rather than letters):
    - 1. no silent letters pronounced in reverse forms
    - 2. homographs were always pronounced differently (two <g>'s in garage)
  - Not functioning as reversed tape recorders:
    - Compound units (diphthongs and affricates) were consistently preserved as units rather than being reversed.
    - choice [tšojs] was reversed as [sojtš] (rather than *[sjošt]*)

**Verlan**

- *Procedure*
  - Invert syllables (in polysyllabic words)
    - L’envers ‘the reverse’ → [verlan], femme ‘woman’ → meuf
    - Cf. Spanish Vesre, which inverts syllable order, e.g. muchacho → chochamu
  - Drop final vowel
- *What to do with monosyllables?*
  - Include final optional schwa, if there is one
  - moi [mwa] ‘me’ → ouam [wam]
  - fou [fu] ‘crazy’ → ouf
- Viens chez ouam soir-ce y’a une teuf de ouf, je suis avec l’autre nasbo, j’ai du sky et la race de beuh
  - ‘Come to my place tonight there is a huge party, I’m with this hot chick, I’ve got some whiskey and a lot of weed’
  - teuf - fête ‘party’, nasbo = bonasse ‘hot chick’, sky = whiskey, beuh = herbe ‘weed’
- *Key for us: monosyllables ⇒ inversion of phonemes*
Conclusions

- Words are not acoustic signals, but rather abstract mental representations of language.
- Words in turn are composed of abstract phonemes, which are again abstract mental symbols rather than elements of the physical world.

References

Kroll et al. 2003: phonological features shared between [phonological correspondents of] graphemes increase priming effects