An S is an S is an S, or is it?
On the pronunciation of complex words

Ingo Plag
Variability in the pronunciation of complex words (book-s, un-true)

Variability in phonetic detail: acoustics and articulation

Variability in alternations: áanalyse ~ analýsable

Why is this important?

Organization and structure of the mental lexicon

How do we perceive, store, and produce complex words?
Background

- Complex words: words with more than one meaningful unit
  
  clue-less  dis-agree  fondness  cap-s

- Storage vs. computation, whole-word vs. segmentation

- Gradient morphological and phonological structure
  
  government  disappoint  business

- First problem:
  Does the variability in phonetic detail reflect morphological structure? If so, how?
Speech production: How to verbalize ideas

<table>
<thead>
<tr>
<th>Concept</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lemma</strong></td>
<td>‘cap’ Noun [+ concrete] [+count] ‘more than one’ [plural]</td>
</tr>
<tr>
<td><strong>Phonological representation</strong></td>
<td>/kæp/ /-z/</td>
</tr>
<tr>
<td><strong>Phonological rules</strong></td>
<td>[kʰæps]</td>
</tr>
<tr>
<td><strong>Syllabary</strong></td>
<td>[$ kæps $]</td>
</tr>
<tr>
<td><strong>Articulation</strong></td>
<td>&lt;movement of articulators&gt;</td>
</tr>
<tr>
<td><strong>Acoustic signal</strong></td>
<td></td>
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</tbody>
</table>

**Crucial point**
No morphological information available post-lexically
A case in point: English S


• An S is an S is an S

  \[\text{caps} /\text{kæps}/ \quad \text{keeps} /\text{kips}/ \quad \text{lapse} /\text{læps}/\]
  PLURAL 3sg non-morphemic

• Or is it?

• *time* and *thyme* are acoustically different (Gahl 2008)

• *like* (verb), *like* (particle) and *like* (quotative) are acoustically different (Drager 2010)

• Stems are acoustically different when part of a complex word (e.g. Kemps et al. 2005, Blazej & Cohen-Goldberg 2015)
Methodology

• /z/ and /s/ (henceforth ‘S’)

• Buckeye Speech Corpus, natural conversations, North American English

• plural, genitive, genitive singular, 3sg, clitics of has, is

• N = 447, up to 100 per category

• Acoustic analysis

• Statistical analysis: duration by type of S (LMER, beta regression)
The data
Many other potential influences (covariates)

- Multiple regression

**Covariates** (selection)

- voicing
- number of consonants in rhyme
- number of syllables in host
- context (in utterance: *middle* or *final*, following consonant, before a phrase-final boundary)
- frequency
- speech rate (local, non-local)
- N-gram frequencies, phonological neighbors, orthographic neighbors

...
Main results

• We find robust differences between different types of S

• Duration hierarchy reflects boundary strength

  Non-morphemic S  \(>>\) suffix S  \(>>\) clitic S

• We also find differences in other acoustic parameters (center of gravity)

• We find acoustic differences between different D’s (past tense D, adjectival D, clitics of \textit{would, had, did})

• Challenges current models of lexical phonology and models of speech production
The other problem: Alternations

Stress shift with *-ity, -arian, -ory*

(1)  
   a.  acceptável ✶ acceptabilité  
       impeccable ✶ impeccable  
   b.  authorité ✶ authoritárian  
       légalité ✶ legalitárian  
   c.  antécipate ✶ antécipatory ∼ antécipátory  
       circulate ✶ círculatory ∼ cìrculátory

No stress shift with *-able*

(2)  
   a.  adorable ✶ adóirable  
       understand ✶ understandable  
       answer ✶ answerable  
   b.  préférer ✶ préferable  
       compáre ✶ cómparable  
   c.  analyze ✶ análisezable ∼ análýzable  
       réconcile ✶ réconcilable ∼ rèconcílable

Website links:
- [dict.leo.org](http://dict.leo.org)
- [dict.cc](http://dict.cc)
Alternations

• ‘Rule vs. exception’ does not work (too many ‘exceptions’)

• Compatibility of variation with existing theories is unclear

• What determines the variation?

• Is the variation systematic and productive?
Experimental study

30 speakers
97 sentences from *Corpus of American Soap Operas* (Davies 2012)

Hey, listen. I'm in the mood for a celebratory drink...

celebrátor, célébratory, célebatory
First results

- only 121 items, 5 speakers
- A lot of variation, robust differences between speakers
- Rhythm of base word is preserved
- Base-final stress only if it is a heavy syllable
- Base-final stress is dependent on segmental structure: 
  \[\text{[aɪ]}\] favors, \[\text{[uː]}\] disfavors base-final stress
  certifiable    attributable
- Results challenge traditional rule-based approaches to stress shift
- Which theoretical model can account for these results?
- Analogy? Naive Discrimantive Learning? To be tested!
Summary

• There is much more variation in the pronunciation of complex words than is traditionally recognized.

• This variation challenges long-cherished concepts in many areas of linguistic research (e.g. phonology, morphology, psycholinguistics).

• An investigation of this variation can yield important insights into the nature of complex word, of the mental lexicon and of models of lexical processing.

• Stay tuned and watch out for more @ Research Unit FOR 2373!
Thank you very much for your attention!