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Phonology at the Interface: Late Insertion & Spell Out in L2 Morphophonology

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SLA & Interfaces

- “All grammars leak.”

--Edward Sapir (1921)

- White (2011), Montrul (2011), Sorace & Serratrice (2009), etc. all show the importance of the interfaces in grammatical design
 - Focus on morphology/syntax; pragmatics
 - Emphasis on variability

SLA & Interfaces

- Phonological interfaces are also key:
 - Phonetics (laboratory phonology (Pierrehumbert, et al. (2000)); exemplar theory (Pierrehumbert, 2001); intake frequency (Archibald, 2013))
 - Syntax (relative clause ambiguity (Fodor, 1998); contiguity theory (Archibald, 2016))
 - Morphology (Prosodic Transfer Hypothesis (Goad & White, 2006))

Distributed Morphology

- Single engine for word and sentence construction (Halle & Marantz, 1993)
- Seminal work for me was Embick (2010) in triggering the idea of the how the phonology/morphology interface could work in SLA
- A “local, serial” model of the interface
- This has implications for phonetics and syntax, as well

Arguments & Implications

- Parsimony
- Epistemology
- Language Mixing
- Psycholinguistics
- SLA

(1) Parsimony



**“Pluralitas non
est ponenda
sine
necessitate”**

**William of
Ockham**

(2) Epistemology

- Externalism (Pierrehumbert, 2001; Bresnan & Ford, 2010)
- Emergentism (MacWhinney & O'Grady, 2015; Goldberg, 1995)
- Essentialism (Chomsky, 1992, 1995; Hale & Reiss, 2000)

Essentialism *All-the-Way Down*

- Externalism: poverty-of-the stimulus (Berwick et al., 2011); lack of *property* theory; critiques of Bayesian epistemology (Pollock, forthcoming)
- Emergentism: domain-specificity (Abutelabi & Green, 2013; Blanco-Elorrieta & Pylkkänen, 2016)
- As a thought experiment, and consistent with Ockham, let's explore the Essentialist Department Store.
 - Aka: Representational Realism (Fodor; Pylyshyn)

Inconsistent Epistemologies

- In my abstract, I used the department store metaphor highlighting some incompatible assumptions of models like:
 - Stratal OT
 - Distributed Morphology
 - Harmonic Serialism
 - Selective lexicon access
 - Exemplar Theory
 - Lexicalist models

Properties of Distributed Morphology (DM)

- Functional morphemes are bundles of features (e.g., [past]) in the syntax which, via Vocabulary Insertion (VI), are spelled out phonologically.
- There is competition for allomorph selection but, crucially, no competition between complex objects (as in OT).

Properties of Distributed Morphology (DM)

- A syntactic derivation is sent to Spell Out which is then sent to both PF and LF
- There is a matrix of features on the syntactic terminal node and various Vocabulary Items would compete for insertion by seeing which affix matched the most features.

Properties of Distributed Morphology (DM)

Roots

- The store (of category-neutral roots) contains no phonological information (reminiscent of *lemmas* which have conceptual structure but no phonological structure)
- \sqrt{dog} and \sqrt{chien} and \sqrt{hund}
- Grammatical categories are established in the syntax via functional heads such as *v* or *n*.

(3) DM & Language Mixing

- Alexiadou et al. (2015) look at heritage Norwegian speakers in the U.S. who mark English roots with Norwegian affixes

- Så play-de dom game-r

then play-PAST they game-INDEF.PL

Then, they played games.

- Så close-a di åpp kjist-å

so close-PAST they up casket-DEF.SG.

Then they closed up the casket.

DM & Language Mixing

- The affixes come from the terminal nodes on a Norwegian syntactic structure (note V2)
- Note, though, that an L2 root can get inserted into an L1 syntactic skeleton
- DM provides an elegant account of intra-word (root +affix) language mixing
- Parsimony suggests that we explore whether roots (as well as affixes) could be subject to competition in bilinguals.

(4) Competition for Root Insertion

- Haugen (2008) and Haugen & Siddiqi (2013) argue that there is competition for roots and therefore the root is part of the Vocabulary list.
- We also see evidence for this in the psycholinguistics of bilingual root insertion.

Bilingual Competition

- Studies on the non-selective bilingual lexicon (e.g. Dijkstra et al, 1999)

Interlingual Homophones	Interlingual Homographs
e.g. English/Dutch [lif] 'leaf' / 'dear'	e.g. English/Dutch "glad" [glæd] / [xlat] 'slippery'
-slower (inhibited) activation	-faster activation
-don't share a root -same spell out	-don't share a root -different spell out (matched by letters, predictability, etc.)

Monolingual Competition

- Studies on polysemy (e.g. Pylkkänen et al. 2006) show that different senses of a polyseme have shorter M350 latencies. Berretta, Fiorentino & Poeppel, 2005) show that polysemy is facilitative and homonymy is inhibitive in a LDT.

Polysemes	Homophones
e.g. The <i>paper</i> is A4. The <i>paper</i> is owned by Rupert Murdoch. The <i>paper</i> was written by Ocke.	e.g. He fell off the <i>bank</i> of the river. She opened a savings account at the <i>bank</i> .
-faster activation	-slower activation
-share root	-don't share root
-same spell out	-same spell out

Interlingual Allomorphs

- What are traditionally called *translation equivalents*.

Interlingual Allomorphs

e.g. √*dog* and √*chien* and √*hund*

-share root (bilingual root competition)

-different spell-out

-polysemy in bilingual speech context

The Role of Phonology

- Cognate (i.e. phonologically close) translation equivalents are easier to recognize than non-cognates in Lexical Decision Tasks (Lemhofer, Digkstra & Michel, 2004)
- cognate translation equivalents are translated more quickly than non-cognates (de Groot, 1992)
- Voga & Grainger (2007) demonstrate that cognate translation equivalents show facilitative priming relative to “matched phonologically related primes.” The primes were Greek (L1) and the targets were French (L2)

The Role of Phonology

- “Translation equivalent primes (both cognate and non-cognates) [aka *interlingual allomorphs*] produce facilitation via their shared meaning representation.”
 - -like polysemy – they share a root
- *Cognate* translation equivalents produce stronger priming effects than do *non-cognate* translation equivalents (Vogel & Grainger, 2007; Nakayama et al. 2013).

The Role of Phonology

- Consider the phonological comparisons of cognate versus non-cognate translation equivalents between Japanese/English:
 - Cognate: /remoN/ 'lemon'
 - Non-cognate: /josei/ 'woman'
- When activating the same root, the phonological overlap facilitates recognition

DM Redux

- We see competition for root insertion across languages. Consistent with Libben's (2000) Homogeneity Hypothesis, the DM vocabulary list is non-selective
- Evidence for language tags as grammatical not conceptual
 - In MOGUL terms: tags are in the *language core*
- DM provides an elegant account of the role of phonology in the spell out of roots and affixes in bilinguals

(5) SLA Data

- Abrahamsson (2003) presents some classic data on the acquisition of coda consonants in L2 Swedish by L1 Mandarin speakers
- The following is a reanalysis of these data invoking, not a functional principle of *recoverability* but rather a DM feature-bundle style analysis

Swedish 'r's

- From Abrahamsson:

if [r] is part of a lexical stem it will be pronounced more accurately than [r] that is part of present tense or plural affixes.

- Retention of an 'r' in lexical forms helps *recoverability* more than the retention of 'r' in inflected forms because there are *redundant cues* to things like tense and plural. (Italics mine)

Present Tense	Plural	Monomorphemic
kasta-r 'throw[s]'	sko-r 'shoes'	dyr 'expensive'
gå-r 'walk[s]'	bil-ar 'cars'	klar 'ready'
sitt-er 'sit[s]'	röst-er 'voices'	hår 'hair'
	blomm-or 'flowers'	doctor 'doctor'
		mer 'more'
		när 'when'
		ner 'down'
		ungefär 'approximately'

All the subjects had significantly more errors for multimorphemic words than for monomorphemic words; it's not *just* phonology.

- The difference in error patterns between inflected versus uninflected forms implicates syntactic features in the explanation.
- But what of the differences between performance on [past] versus [plural]?
- Remember Abrahamsson invokes a functional explanation: unique markers are retained more than redundant markers.
- But, as he admits, it is not easy to tell whether Tense or Plural is more redundant in Swedish.

Hypothesis A

- Present should be more accurate than Plural (in order to avoid ambiguity between the infinitive and the present tense).

tala/tala-r	talk/talks	häst-ar	horse/horses
gå/gå-r	walk/walks	röst-er	voice/voices
se/se-r	see/sees	flicka/flick-or	girl/girls

Hypothesis A: Present >> Plural

Hypothesis B

- present tense forms could be argued to be more redundant (hence more predicatable) than plurals because the Tense of a sentence can often be inferred from the conversation.
- Number, on the other hand, cannot be predicted from the conversational turn and must be specified for each noun.
- plural would be the marked form (contrasted with singular) making it more important to preserve a surface plural [r] than a surface present [r].

Hypothesis B: Plural >> Present

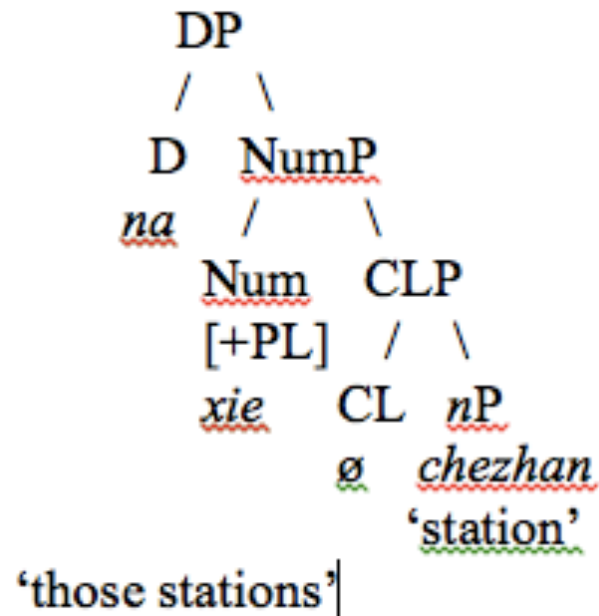
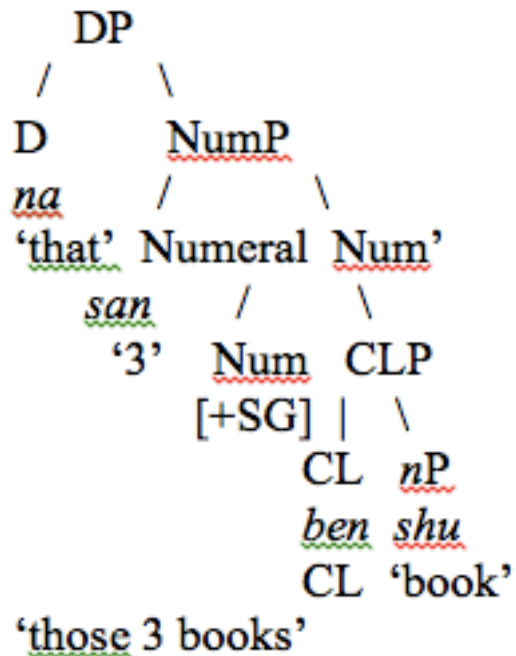
And the (empirical) winner
is....

○ Hypothesis B:

○ Plural >> Present

A DM Transfer Analysis

- Singular Num Head is null but [PL] must be marked morphologically. Yang (2005), Hsieh (2008)



The underlying plural feature is available for L2 spell out.

A DM Transfer Analysis

- Mandarin doesn't have Tense but rather Aspect, so (as is well discussed in the literature) there is clearly a learning task here; it does have [finiteness], though
- Mandarin learners have difficulty with surface marking of Tense (Hawkins & Liszka, 2003)

Lardiere's *Patty*

- **Past tense *production*** in obligatory contexts:
 - Spoken: 35%
 - Written: 78%
- **Plural** marking in quantified expressions:
 - Spoken: 58%
 - Written: 84%
- **Plural** in unquantified expressions:
 - Spoken: 55%
 - Written: 70%

- Would be nice to see Swedish *written* data
- Lardiere adopts Prosodic Transfer Hypothesis to account for lack of lack of spoken morphemes in English (where affixes adjoin to a Prosodic Word) unlike Mandarin where they adjoin to the Root
- This could *not* explain the Swedish production data (all with single, word-final [r])
- DM's model of morphological features in a syntactic tree accounts for the L2 data via a local, serial architecture of the phonology/morphosyntactic interface

Conclusion

- The study of interfaces reveals, not just a potential locus of optionality, but the necessary design conditions for an internally-consistent architecture for a comprehensive model of second language speech
- Guided by parsimony, and grounded in epistemological consistency, a probe of the utility of a post-syntactic vocabulary insertion (DM) approach to the phonological interface, is supported by data from
 - Language mixing
 - The mental lexicon
 - L2 phonology

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Thank you.

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