ISSN: 2998-7482

Continua (2025), **2:1**, 11–64

RESEARCH ARTICLE

Codeswitching in words and phrases: The prosodic domain of phonological uniformity

John Archibald

University of Victoria

(Received Jul. 19, 2024; revised Feb. 3, 2025; accepted Jun. 19, 2025; published Aug. 21, 2025)

Abstract

While the properties of bilingual codeswitching are well-documented, and switching morphology within words is often addressed, the properties of intraword phonology are less-understood. Morphemes from more than one language occur within a single word (e.g., a root from one language and affixes from the other). Furthermore, the affixes come only from the language which generates the syntactic tree while the root can be taken from either language. The data also strongly suggest that within such a morphologically mixed word, the phonology does not switch, a property I refer to as *phonological uniformity*. The key question explored in this paper is: why is phonological mixing in a morphologically mixed word not allowed? I first present evidence that there is phonological activation of both languages even in a monolingual task such as a Lexical Decision Task which is consistent with an integrated I-phonological grammar. I provide an analysis of some fascinating data from Delgado, Cabrelli, and López (2022) in arguing against both the Matrix Language Framework, and a phase-based account of phonological uniformity. The mechanism which ensures that the *phonology* of the X^0 matches the language of the affixes is Match Theory (Selkirk 2011). The preferential mapping is between (a) syntactic phrases (XPs) and phonological phrases (ϕ), and (b) syntactic heads (X^0s) and prosodic words (ω). Match Theory's (monolingual)assumption that syntactic and phonological structure are isomorphic can easily be extended to bilinguals through language tags (Green and Abutalebi 2013). I recast the Match Theory machinery within the framework of Co-phonologies (Sande, Jenks, and Inkelas 2020). In order to account for the differential behaviour of determiners in codeswitched simple DPs (e.g., *the mesa*) versus codeswitched complex DPs (e.g., *the brown mesa*) I show how a combination of the notion of the *head* of the phonological phrase, the free (as opposed to affixal) clitic status of the English determiner, and the parsing of an English vocabulary item via the Spanish contrastive hierarchy(triggered by a Spanish functional head) explains the phonological properties observed. A Null Theory phonological account of phonological uniformity is argued to be preferred over a phase-based account.

Keywords: L2 phonology, codeswitching, intraword codeswitching, phonological uniformity, language tags, Distributed Morphology, co-phonologies

How to cite:
Archibald, John. 2025. Codeswitching in words and phrases: The prosodic domain of phonological uniformity. *Continua* 2:1. 11–64. doi: https://doi.org/10.59236/Continua2.1/Archibald

1. Introduction

It is clear that multilingual speakers are capable of switching from language A to language B within an utterance (see Parafita Couto, Bellamy, and Ameka 2023 for a recent overview). The linguistic properties of bilingual codeswitching are well-documented (Green and Li 2016; MacSwan 1999; López 2020). It has been shown that codeswitching can occur within conversations, within sentences, and within phrases. In this paper, I will explore some of the phonological properties of what have often been described as intraword codeswitches. It has been noted that within a phonological word we see phonological uniformity (i.e., all from language A or all from language B) but that across phonological words we can see a change in phonology. I will argue that phonological uniformity is not determined by a particular syntactic domain, or by a phase domain but rather by a phonological domain, and by phonological processes.

1.1 Codeswitching

Paradis, Nicoladis, and Genesee (2000) provide examples which show lexical and phonological switching between language A (English) and B (French) within a sentence as shown in (1) and (2).

(1) *Where's the <u>mitaine</u> go?*
'Where's the mitten go?'

(2) *Comme <u>dark</u> bleu.*
'Like dark blue.'

In these examples the French word (*mitaine*) in an English sentence has French phonology, while the English word (*dark*) in a French sentence has English phonology; phonological switches are licensed within a sentence.

1.2 Intraword codeswitching

It has recently been substantively demonstrated that codeswitching can occur within a word. Stefanich (2019) and Stefanich et al. (2019) provide a descriptive and explanatory account of the morphophonology of intraword codeswitching

(ICS) in which morphemes from more than one language occur within a single word. For example, a Spanish/English bilingual might produce the sentence shown in (3):

(3) *Voy a hangear con mis amigos.*
'I'm going to hang with my friends.'

This sentence contains a word which combines the English verb 'to hang' with Spanish verbal infinitival inflection to create a mixed or codeswitched word. ICS words can include a root from one language and affixes from the other. Examples drawn from Stefanich's (2019) useful database include the examples shown in Table 1.

Table 1. Examples of intraword codeswitching

Language pairs	**Example**
Telugu/English (Bandi-Rao and den Dikken 2014)	my sister kalp-ified the curry 'my sister stirred the curry'
German/Spanish (González-Vilbazo and López 2011)	utilis-ier-en 'we use' use-v-3.PL.
Nahuatl/Spanish (MacSwan 2000)	nik-amar-oa 'I love her' 1S.3Os-love-transitive

In this paper, I assume that codeswitching at the word level and borrowing are handled by the same basic mechanisms (López 2020), and, while we cannot pursue this complex issue in depth, the data in Table 1 are not borrowings: English has not borrowed *kalp*; German has not borrowed *utiliz*; Nahuatl has not borrowed *amar*. By this I mean that in a monolingual environment an English speaker will not use the word *kalp*. Of course there are situations where a word gets borrowed from another language. Japanese has borrowed the English word *idol* and it has become in fact a vocabulary item in Japanese with fully adapted Japanese phonology [ajdoɾu]; in a monolingual environment a Japanese speaker will use the word /ajdoɾu/ because it is, for all intents and purposes, a Japanese word. Some researchers (e.g., Poplack 1980; MacSwan and Colina 2014) argue that codeswitching and borrowing are guided by separate principles. However, we assume that for a Japanese/English bilingual codeswitching would involve the insertion of a root from English, while borrowing would involve the insertion of a root from Japanese. The behaviour results from competition for vocabulary insertion and general phonological principles.

Furthermore, in probing the phonological patterning, we note that the affixes come only from the language which generates the syntactic tree while the root can be taken from either language (Myers-Scotton 2002; Alexiadou and Lohndal 2018) when generating utterances. To illustrate, Alexiadou et al. (2015) present data from heritage Norwegian speakers in the United States who produce English roots with Norwegian affixes, as shown in (4).

(4) a. *Så play-de dom game-r*
then play-PST they game-INDEF.PL
'Then, they played games.'
b. *Så close-a di åpp kjist-å*
then close-PST they up casket-DEF.SG
'Then they closed up the casket.'

Consistent with what we have said so far, the affixes come from the terminal nodes on a Norwegian syntactic structure. We note that the verb-second (V2) word order of the sentence provides strong evidence that it is Norwegian sentential syntax not English (as English lacks V2). Once again, note that a root from one language (English) can be inserted into a syntactic skeleton of another language (Norwegian).

1.3 Intraword phonology

The published data also strongly suggest that within such a morphologically mixed word, the phonology does not switch; the language of the affix determines the phonology of the root. I refer to this property as *phonological uniformity*. Let us consider some of the key examples we have presented so far in (5).

(5) a. *Voy a hang-ear con mis amigos.*
b. *My sister kalp-ifi-ed the curry.*
c. *Wir utilis-ier-en spanische Wörter.*

In each of the above examples, the syntactic structure is generated by the language written in regular font while the underlined root comes from the other language. Furthermore, González-Vilbazo and López (2011) also demonstrate that there are no examples of morphological switching between a derivational and inflectional affix found in extant corpora. This has implications for looking at the phonological patterns in ICS in that the only possible location for a phonological switch would be between the root and the first affix. While it is true that many papers discussing codeswitching do not explicitly mention the phonology or phonetics of the roots and affixes, Stefanich (2019) found no robust counter-examples to the claim that the phonology is uniform and dictated by the language of the affixes. Thus (5-a) *hangear* would have all Spanish phonology ([xangear]), (5-b), *kalpified* would have all English phonology, and (5-c) *utilisieren* would have all

German phonology ([ʔʊtʰɪliziʁn̩]). To be explicit, (5-c) is not produced with mixed phonology (*[ut̪ilisiːʁn̩]), nor all Spanish phonology (*[ut̪ilis̯eren]).

These production patterns are further supported by an acceptability judgement task in Stefanich and Cabrelli Amaro (2018). Balanced bilinguals were asked to judge single words with ICS in three conditions: (1) uniform phonology throughout the word in the language of the affixes, (2) uniform phonology throughout the word in the language of the root, or (3) mixed phonology with the root pronounced in its source phonology, and the affix pronounced in its source phonology. Their acceptability results for these conditions are shown in Figure 1.

(2) ⟶ (3) ⟶ (1)

Least preferred ··········► Most preferred

Figure 1. Acceptability scale of mixed phonologies.

González-Vilbazo and López (2011) also report that German-Spanish bilinguals reject phonologically mixed forms of words like (5-c) as in *[ut̪ilisiːʁn̩]. The most preferred structure was uniform phonology in the language of the affix, the least preferred was uniform phonology in the language of the root, and in the middle was the mixture of the root in its source phonology and the affix with its source phonology.

1.4 The Prosodic Hierarchy

In order to be explicit as to the nature of the phonological structures involved in these forms, we need to introduce the prosodic hierarchy (Nespor and Vogel 1986). There are many levels which have been proposed, as shown in (6).

(6)

Intonational Phrase
|
Phonological Phrase
|
Phonological Word
|
Foot
|
Syllable
|
Mora
|
Segment

It is commonly assumed that this hierarchy is universal (though see Özçelik 2017 for counter arguments). In this paper, for reasons that shall become clear, we will focus primarily on two levels: the phonological phrase ( ) and the phonological word (ω). These prosodic constituents will be key in explaining the phenomena in question.

This seeming ban on phonological switching in morphologically-switched words has also been explored by MacSwan (2000, 2005), MacSwan and Colina (2014), and Bandi-Rao and den Dikken (2014). The challenge we face is to come up with a linguistic explanation of these facts. Let us begin by outlining the nature of the puzzle.

1.5 The nature of the puzzle

I assume, following López (2020), that the bilingual lexicon (and indeed grammar) is integrated not separated. By this I mean that there are not separate cognitive or neural stores but it does not follow that the two languages are not somehow representationally distinct. Psycholinguistic evidence demonstrates that bilingual lexical access is non-selective (Duyck et al. 2007) and thus that both phonologies are activated simultaneously during a lexical search. Experimental evidence from interlingual homophones (Dijkstra, Grainger, and Heuven 1999) shows that the activation of a Dutch word [lif] (*lief*) inhibits the activation of English [lif] (*leaf*). With such simultaneous activation of both phonologies, the question arises as to what blocks phonological switching in a multimorphemic word? Looking at the example in (5-b) if *kalp* and *stir* are competing for insertion both vocabulary items are active and both phonologies are active. Why do we not find *kalp* with Telugu phonology and *-ify* with English phonology?

López, Alexiadou, and Veenstra (2017) showed that the phonology of the root (and indeed the phonological word) is determined by the phonology of the functional head, and this follows from their Block Transfer Hypothesis which is, more generally, the result of derivation by phase. Now, this could be a solution if we adopt the Phase Impenetrability Condition (Chomsky 2000) – which says that once a phase has been sent to spell out that it's internal structure is no longer accessible – but Newell (2017) shows that phonology doesn't respect this condition, so we need another account. I propose the solution lies in the articulation of the phonology/syntax interface, and that this will provide a single account for the phonological properties observed in single phonological words (including those with an affixal clitic), and phonological words which have free clitics adjoined to them at the phonological phrase level. Delgado, Cabrelli, and López (2022), for example present data such as *the mesa* (with all Spanish phonology) and *the brown mesa* (with mixed phonology). As we will see in Section 3.5, the English determiner *the* is a free clitic while Spanish determiners are affixal clitics (Goad and White 2006). My assumption is that a Spanish *n* will project an affixal clitic while an English *n* will project a free clitic.

1.6 The nature of the solution

The solution I propose lies in the machinery of the the phonology/syntax interface. To begin with, we need to look at the assignment of phrasal stress (including contrastive focus) and the fact that the most prominent phonological word in the phrase becomes the head of its phonological phrase. We also initially adopt Selkirk's (2011) Match Theory. Match Theory maintains a preferential mapping between (a) syntactic phrases (XPs) and phonological phrases (ϕ) and (b) syntactic heads (X^0s) and phonological words (ω). Then by introducing language tags (Amaral and Roeper 2014; Blanco-Elorrieta and Caramazza 2021; Green 2018; López, forthcoming; Sharwood Smith and Truscott 2014; Truscott and Sharwood Smith 2016) we can account for the fact that an English functional head preferentially maps onto an English phonological word while a Spanish functional head maps onto a Spanish phonological word. I recast the Match Theory notions into Cophonologies (see Sande, Jenks, and Inkelas 2020 for advantages of this model). We can now note that a free clitic (such as English *the*) inherits the phonology from the head of the phonological phrase. Furthermore, we can account for the uniformity of [*hang* [*ear*] $_{\text{Sp}}$] $_{\text{Sp}\omega}$ and [*the* [*mesa*] $_{\text{Sp}}$]$_{\text{Sp}\omega}$, versus the mixing of [*the* [[*brown*]$_{\text{Eng}\omega}$ [*mesa*] $_{\text{Sp}\omega}$]]]$_{\phi}$. I will explore the details and implications of the morphological structure *mesa* (which includes a functional head *n*), and the details of the phonology of the determiner (*the*) in phrases such as *the mesa* and *the brown mesa* in Section 4. The basic argument will be that we find uniformity within a phonological word, and language tag agreement between the head of a phonological phrase and its adjunct.[1] What emerges is the entire phonemic inventory of the relevant language being activated by the language tag which determines the segmental output. This will be articulated in Section 4.5 by invoking the Contrastive Hierarchy of Dresher (2009). Note that all of this machinery (Match Theory, co-phonologies, phonological heads, etc.) requires no new codeswitching- or bilingual-specific theory to account for bilingual behaviour; thus the approach satisfies the Null Theory criterion of Mahootian (1993). The null theory is essentially the most parsimonious theory (to quote Occam's Razor, "entia non sunt multiplicanda praeter necessitate"[2]) so we strive to not introduce specific

1. A reviewer raises the point that it is interesting to note the importance of the phonological *word* to the analysis given that neither co-phonology (emphasizing affixes) nor Distributed Morphology (with a single engine for both words and phrases) privilege the word theoretically, and wonders if my proposal over-generates. I recognize the issue and would note the paucity of research into these questions using these theoretical tools and hope that continued research will be able to resolve the question empirically.

2. "Entities must not be multiplied beyond necessity."

theoretical machinery that is dedicated to a particular population (e.g., bilinguals) that is lacking in another population (e.g., monolinguals).

2. The bilingual lexicon

The first step is to explore what we know about the interactions of words in a bilingual lexicon. There is considerable evidence for an integrated multilingual lexicon which includes the activation of more than one phonology simultaneously. Let us explore this evidence and then return to the question of why, if two phonologies are activated, we don't see phonological switching within a multimorphemic word. We will also consider the theoretical implications of roots competing for insertion.

Dijkstra, Grainger, and Heuven (1999) demonstrated that interlingual homographs (e.g. English *glad* [glæd] and Dutch *glad* [xlɑt] – meaning 'slippery') facilitate lexical activation in a monolingual task administered to bilinguals while interlingual homophones (e.g. English [lif] *leaf* versus Dutch [lif] *dear*) inhibit lexical activation in a monolingual task administered to bilinguals (as measured by response time in a lexical decision task); lexical activation is not language-specific. Such psycholinguistic effects are consistent within an integrated bilingual lexicon (M. Libben 2017).

Since Dijkstra, Grainger, and Heuven (1999) there have been some studies which have questioned and extended the core findings of homophone inhibition and homograph facilitation (e.g., Mulik and Carraso-Ortiz 2023). There are also studies which have confirmed the original Dijkstra, Grainger, and Heuven (1999) findings. Let us explore some methodological factors which implicate these differences. Dijkstra, Grainger, and Heuven (1999) had Dutch/English bilinguals tested in the L2 respond 'yes' if the stimulus word was an English word; subjects were slower and they were less accurate on interlingual homophones (e.g., English *leaf* [lif]; Dutch *lief* [lif]) compared to matched controls. Doctor and Klein (1992) used similar methodology but English/Afrikaans balanced bilingual participants could respond 'yes' if a stimulus word was a word in either English or Afrikaans. They too found subjects were slower and less accurate on homophones compared to matched controls. Lagrou, Hartsuiker, and Duyck (2011) reported that it "took bilinguals longer to recognise interlingual homophones than matched controls." They looked at Dutch-English bilinguals doing an English lexical decision task on the last word of an auditory sentence. The homophone effect was moderated but not eliminated when the final word was in a high-constraining (i.e., very predictable) sentence as shown in (7); it does not prevent the activation of the competitor/mate.

(7) *Low-constraining homophones*:
After that car accident my sister had a terrible **day**.
High-constraining homophone:
After twenty-four hours we were awake for one night and one **day**.

Schulpen et al. (2003) also showed longer RTs after an interlingual homophone prime.

However, there were studies which at first blush seemed to argue against the Dijkstra, Grainger, and Heuven findings. Haigh and Jared (2007) found that, when tested in the L2, the lexical decisions of French/English bilinguals were *faster* and more accurate for English interlingual homophones than for matched English control words. I would argue that the inhibiting effect of homophones is still present, but that lexical frequency effects can sometimes lead to variable results. The Haigh and Jared (2007) stimuli had a very skewed frequency profile: English low frequency (20 per million; French high frequency (1758 per million)). What this means is that to get facilitative homophone effects, one needs to have marked L1/L2 frequency differences (otherwise inhibition results), and one needs to be reading in the L2 (otherwise no effect is found).

Thus, I would suggest that what Dijkstra, Grainger, and Heuven (1999) were seeing was a phonological effect, and the other studies (e.g., Haigh and Jared 2007) were revealing a frequency effect. Pexman, Lupker, and Jared (2001) show that *intralingual* homophone effects (inhibition under certain frequency conditions) are most likely to be observed when the presented homophone is low in frequency but the mate is high in frequency. Lexical decisions are made more slowly for intralingual homophones when compared with control words when the "target member of the homophone pair is a low-frequency word and the nontarget member is a high-frequency word." Dijkstra, Grainger, and Heuven's English homophones had a mean frequency of 41.7 per million while the Dutch mates had a mean frequency of 29.1 per million. The frequencies were matched and thus the unmarked inhibitory effect was observed.

Even acknowledging some of the uncertainties about the exact role of phonology and frequency, such results provide clear evidence for non-selective lexical access, or an integrated lexicon. Furthermore, these studies suggest that given the inhibitory effect of interlingual homophones the bilingual architecture consists of what López (2020) refers to as an integrated PF; the phonologies of the two languages interact during lexical activation. Let us now revisit our central question: if the two phonologies are activated, what blocks phonological switching within a word; what causes phonological uniformity?

3. Grammatical machinery

We also need to provide a linguistic account of the psycholinguistic behavioural phenomena. Following Alexiadou and Lohndal (2018) I adopt a late-insertion Distributed Morphology architecture of the grammar (Halle and Marantz 1994). This accounts for the unity of word and phrasal behaviour; the word is not a privileged domain when it comes to codeswitching. There is a single engine for the generation of words and phrases. I assume, following López (2020) and G. Libben (2022), that bilinguals have a single vocabulary list containing the roots of both languages.

3.1 Distributed Morphology and the bilingual lexicon

As we prepare to talk about the process of spell-out within the late-insertion model of Distributed Morphology (DM), let us review some of the key characteristics in order to understand the processes involved. McGinnis (2016) notes that DM departs from the traditional notion of the Saussurean sign (where phonological form is directly associated with meaning) by distributing information across three separate lists. List One (the *Lexicon*) consists of the terminal nodes of a syntactic derivation whether they be a bundle of features for a functional morpheme, or a category-neutral lexical root. List One is devoid of phonological content. Such content is added to the terminal nodes via List Two (*Vocabulary*) after the syntactic structure is sent off for Spell-out. These Vocabulary Items compete for insertion into each of the terminal nodes. List Three (the *Encyclopedia*) associates (again post-syntactically) lexical roots with non-compositional aspects of meaning.

Some key properties of DM are shown in (8).

(8) Properties of Distributed Morphology:

- Functional morphemes are bundles of features (e.g., [past]) in the syntax which, via a process known as Vocabulary Insertion (VI), are spelled out phonologically.
- There is competition for allomorph selection (e.g., which plural allomorph attaches to *dog*, which attaches to *ox*, to *moose*?) but, crucially, no competition between complex multimorphemic objects.
- A syntactic derivation is sent to Spell Out (in phases) which is then sent to both phonetic form (PF) and logical form (LF). PF and LF are the interfaces with the sensory-motoric and logical-conceptual systems respectively.
- 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.

The store of category-neutral roots contains no phonological information. In DM terms, these would be represented as $\sqrt{}$dog and $\sqrt{}$chien. Grammatical categories are established in the syntax via functional heads (such as *v* or *n* or *a*) which are combined with the roots via the Merge operation.

Embick (2010) argues that there is only competition for allomorphs (i.e, between items with the same meaning but different phonological forms); there is no global parallel competition between forms other than this. However, in a bilingual context, I would argue that forms such as ‘dog’ and ‘chien’ are allomorphs competing for insertion into a syntactic tree depending on the many factors which can influence language choice (see Stefanich et al. 2019 for a discussion of codeswitching with the Modular Cognition Framework). Sharwood Smith and Truscott (2014) invoke the device of a *General Language Representation* which can influence language choice. Broadly speaking, when an individual is in bilingual mode (Grosjean 2001) this would trigger open, cooperative control mechanisms (Green and Li 2016) which would license language mixing in production.

While we must note that a traditional lexical decision task doesn't tap into syntactic structure, Nakayama and Archibald (2005) showed that the behaviour of these interlingual homographs and homophones is also revealed in a *sentence* reading task as measured by eye-tracking. Interlingual homographs had shorter fixation times while interlingual homophones had longer fixation times. So, in reading an English sentence like "The leaf/dear was a sign that autumn had come" the Dutch word [lif] and the English word [lif] were competing for insertion into the sentence. Thus, the reading times (and patterns) in the *English* sentence were explained by properties of the *Dutch* words. This seems to be competition for homographs and homophones syntactically for the bilingual.

This type of model also receives support from the cognitive neuroscience literature. Pylkkänen, Llinás, and Murphy (2006) argued in an MEG study that different senses of a polysemic word (such as *paper* in English) do not have distinct lexical entries but rather share a morphological root.

Remember that there were two key classes of lexical items: interlingual homophones (which *inhibited* activation), and interlingual homographs (which *facilitated* activation). The properties of these classes can be seen in Table 2.

Table 2. Interlingual homophones and interlingual homographs.

Interlingual homophones	**Interlingual homographs**
e.g. English/Dutch	e.g. English/Dutch
[lif] 'leaf'/'dear'	"glad" [glæd]/[xlat] (Dutch: 'slippery')
-Slower (inhibited) activation	-Faster activation
-Don't share a root (*leaf/dear*)	-Don't share a root (*glad/slippery*)
-Same spell out	-Different spell out (matched by letters, predictability, etc.)

Studies on polysemy (e.g., Pylkkänen, Llinás, and Murphy 2006) show that the different senses of a polyseme have shorter M350 latencies, while Beretta, Fiorentino, and Poeppel (2005) show that polysemy is facilitative but homonymy inhibitive in a lexical decision task. Polysemes are words which sound the same and which have related meanings while homophones are words which sound the same but which have unrelated meanings. These results are summarized in Table 3.

Table 3. Polysemes and homophones.

Polysemes	**Homophones**
The *paper* is A4.	He fell off the *bank* of the river.
The *paper* is owned by Rupert Murdoch.	She opened a savings account at the *bank*.
The *paper* is written by Luis.	Townshend stared at the *bank* of amplifiers.
-Faster activation	-Slower activation
-Share	-Don’t share root
-Same spell out	-Same spell out

So, polysemes have faster activation and related meanings. This is clearly analogous to translation equivalents in two languages. There is a rich psycholinguistic literature on translation equivalents. The role of phonology in bilingual access has been clearly demonstrated, as shown in (9). The example adopts the standard terminology of psychological approaches (to aid the reader in accessing the primary literature), but I will explain the terminology. *Cognate* translation equivalents have ‘similar’ phonology while *non-cognate* translation equivalents do not have ‘similar’ phonology (Nakayama et al. 2014).

(9) Properties of translation equivalents.

- •Cognate translation equivalents are easier to recognize than non-cognates in lexical decision tasks (Lemhöfer, Dijkstra, and Michel 2004).
- •Cognate translation equivalents are translated more quickly than non-cognate translation equivalents (Groot and Nas 1991).
- •Voga and 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).

Here we note that the semantic relatedness combined with phonological similarity leads to *facilitated access*. Note this is different from the previously-discussed interlingual homophones (Dutch/English [lif]) which had unrelated meanings and led to inhibited lexical access. Let us recast this traditional psycholinguistic terminology (*translation equivalent*) into a DM framework. English *dog* and French *chien* are translation equivalents and we can refer to them as interlingual allomorphs in that they share a root but have different spell-out at PF. In a bilingual speech context, this is analogous to polysemy.

3.2 Competition for root insertion

Traditional approaches to DM assume that there is competition for allomorphs (such as *cat[s]* versus *ox[ən]*) but not for roots (e.g., $\sqrt{}$dog versus $\sqrt{}$cat). However, Haugen (2008) and Haugen and Siddiqi (2013) argue that there is competition for roots and therefore the root is part of the Vocabulary list.

We can frame this psycholinguistic discussion in a linguistic model by incorporating insights from Distributed Morphology. In a variety of psycholinguistic tasks, translation equivalent primes – both *cognate* (i.e., those with phonological overlap) and *non-cognate* – produce facilitation effects via their shared meaning representation. Like polysemy, these translation equivalents (or *interlingual allomorphs*) share a root (or in López's (forthcoming) words "alternative exponents for the same List 1 item"). Cognate translation equivalents produce stronger priming effects than do non-cognate translation equivalents (Voga and Grainger 2007; Nakayama et al. 2013). Consider the cognate versus non-cognate translation equivalents in Japanese/English shown in (10). When activating the same root, the phonological overlap facilitates activation.

(10) Cognate versus non-cognate translation equivalents

•Cognate: /ɾemoN/ 'lemon' /lɛmən/
•Non-congnate: /d͡ʑosei/ 'woman' /wʊmən/

These architectural questions become highly relevant when we consider the question of why intraword phonological switches are not licensed when morphological switches are.

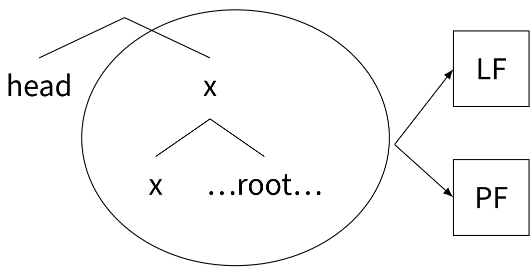
In order to explain this, MacSwan and Colina (2014) proposed the *PF Interface Condition* (an update of the earlier *PF Disjunction Theorem*) to block phonological switches. Following the principles of Minimalist architecture (Chomsky 1995), once a syntactic structure is generated it is sent off to Phonetic Form (PF) for production, and to Logical Form (LF) for interpretation. MacSwan and Colina (2014) work within a lexicalist model that assumes that morphology and phonology should pattern together in terms of language choice. Under this approach phonemes are stored in the lexicon (Spanish phonemes in Spanish words, English phonemes in English words) so when a morpheme is taken from the lexicon and inserted into the syntax the morphemes and phonemes would come from the same language. At spell-out the syntactic word is the unit of representation to be sent to PF. For bilinguals, a word could be sent to the PF of Language A or the PF of Language B but it could not be sent to both. In this sense, a lexicalist model can account for why there is *one* phonology in a morphologically-mixed word but it would have no explanation of why the one phonology should be the phonology of the affix (as López 2020, points out). Other studies support such patterning. Akinrẹmi (2016) shows that an English root with Igbo affixes is produced with Igbo phonology (as evidenced by such processes as vowel harmony which do not exist in English). Hlavač (1999) argues that English words spoken with Croatian affixes are produced with a single (Croatian) phonology.

In this paper, building on work within a non-lexicalist framework (González-Vilbazo and López 2011; López 2020), I maintain that the empirical data are consistent with Distributed Morphology (Halle and Marantz 1994; Alexiadou et al. 2015) insofar as the Vocabulary Items are delinked from their phonological spell out, and there is a single-engine underlying word and phrasal behaviour. The details of this phonological spell-out, or interpretation, are critical to the analysis presented here.

3.3 Phases and codeswitching

López, Alexiadou, and Veenstra (2017) working within Phase Theory (Chomsky 2001) propose an account of where morphological switches can take place. They argue for what they call the Phase Head Hypothesis in which "the phase head determines grammatical properties of its complement." Furthermore (pg 4) they adopt the *Block Transfer Hypothesis* which maintains that "the material that is transferred to the interfaces is sent in one fell swoop." The fact that the derivational morpheme decides the relevant phonology falls out from their Phase Head Hypothesis given that the derivational morpheme is the spell out of the functional head which is the head of a phase. Hence, under this approach, codeswitching can take place at phase boundaries but not within a phase. Marantz (2001, 6–7) notes that little *x*'s (e.g., *n*, *v*) determine the edge of a phase. So the "combination of a root and little *x* is shipped off to LF and PF for phonological and semantic interpretation" as shown in (11).[3]

(11)



So, if the phase head and its complement are sent off to PF they can be implemented with the phonology of Language A, and then if another phase is sent off to PF it can be implemented with phonology from Language B. Admittedly this is terminology from a *separationist* architecture but, as we shall see, by incorporating language tags (Blanco-Elorrieta and Caramazza 2021), we can account for distinct behaviour without separate cognitive stores. In an integrated bilingual lexicon it

3. I have kept the trees in this paper as they were originally presented. Nothing in my argument hinges on the italicization of category labels, or the difference between *x* or *x*P notation in a tree. Nor am I making a distinction between bare $\sqrt{}$root notation or $\sqrt{}$145-style notation.

would be the case that some vocabulary items would be tagged as *Spanish* (e.g., *azul*$_{\text{Sp}}$) while others would be tagged as *English* (e.g., *blue*$_{\text{Eng}}$). This type of model is one way to account for the suppression of words from a particular language (e.g., all Spanish words) in a given linguistic environment (e.g, in an English-only environment). Note that monolinguals do something similar when it comes to linguistic register where words which are encoded as casual might have a tag (e.g., *hi*$_{\text{informal}}$) while words which are encoded as formal will also have a tag (e.g., *salutations*$_{\text{formal}}$). We return to the discussion of language tags in Section 4.3.

López (2023) demonstrates that the syntactic structure can dictate aspects such as word order but does not dictate which vocabulary items get inserted. For example, if Spanish-German bilinguals produce a sentence with a Spanish inflected verb (e.g., *hizo*) then the word order will be Verb-Object (as in Spanish) even if those following lexical items are German, as shown in (12).

(12) *hizo* *nähen* // *das* *Hemd*
do.PST sew the shirt
'She/he sewed the shirt'

Examples such as these demonstrate that Vocabulary Insertion must respect the syntactic requirements but is blind to the phonological content of the word.[4] However, sentential phonology can be dictated by the syntax. The phrase in (12) with a Spanish light verb would be produced with Spanish phonological phrasing with the main verb and the complement in separate phonological phrases (where // indicates a phonological phrase boundary). To summarize, we have seen that the functional head (like *v*) dictates the uniformity of the phonology of the word (as in (5-a)), and the sentential phonology as in (12), (see also Olson 2019; Henriksen et al. 2021 who demonstrate code-switched post-lexical phonology), but the functional head is blind to the source language of the segmental phonology. For example the requirements of Spanish *hizo* can be satisfied with German *Hemd*). How can we reconcile these properties?

Chomsky (2001) proposed the Phase Impenetrability Condition (PIC) to account for a range of phenomena that had previously been accounted for by cyclic derivations. Thus, operations should not have access to the internal structure of phases from previous cycles (it is in this sense that the phase is *impenetrable*). However, Newell (2017, 21) demonstrates convincingly that phonology penetrates phases and, thus, the PIC does not apply to phonology when she shows that "the phonology has access to the phonological structure of phases that have undergone

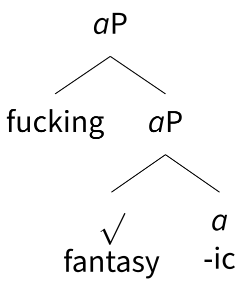
4. Interestingly, though not central to my point here, González-Vilbazo and López (2011) show that while both Spanish and German lack light verbs the codeswitched grammar of the bilingual community sanctions them. Spanish does allow *hacer* to be followed by an infinitive but the result is a causative, not a plain verbal phrase as in (12).

spell-out.”[5] She presents a range of data but I will focus on the arguments from what I will call English infixing.[6] Let us first look at some of the relevant data, and then connect it to acquisition questions. In English expletive infixing (Yu 2007) the infix attaches to the left of the final foot as seen in forms shown in (13).

(13) fan-fucking-[$_{\Sigma}$tastic]
Mani-fucking-[$_{\Sigma}$toba]

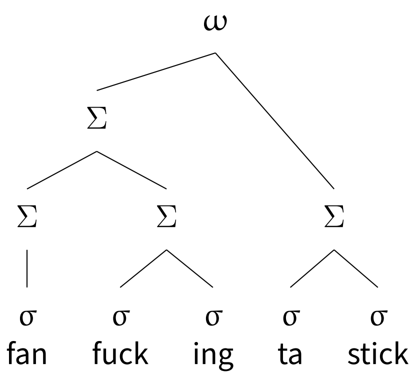
Newell notes that the target of infixation must be interpreted prior to affixation. In the case of fantastic this would be the left edge of the foot that has main stress. Since *-ic* is a stress-shifting affix it must be interpreted in the same phase as the root it attaches to in order to trigger the shift from the first syllable (*fántasy*). Thus, *fantastic* must constitute a phase (Newell and Piggott 2014). The morphological structure would be as shown in (14).

(14)



This would turn into the surface structure (with phonological structure indicated) as shown in (15).

(15)



When it comes time (derivationally) for the insertion of the expletive infix, the infixation morphological process must be able to see where the stress placement

5. I will not discuss Newell’s views on the relevance of the PIC elsewhere in the grammar.
6. See Newell and Ulfsbjorninn (2023) for a discussion of why English expletive infixing may not, in fact, be infixing.

or foot structure is; this phase is not impenetrable to the insertion of the infix. In her own words (Newell 2017, 38), "previously spelled-out domains remain accessible for phonological operations." The implications of this are that it is not the *PIC* (as is assumed by the Block Transfer Hypothesis) which blocks intraword phonological switching. This argues against the López et al. account which argues that phonological switches cannot occur with phases that have already been sent to spell-out.[7] All other things being equal, phonology can reach inside of a chunk that has already been sent to spell-out. So, why doesn't it?

Newell (2017), drawing on data concerning vowel hiatus in Ojibwe, presents the general principle of *phonological persistence* shown in (16).

(16) Phonological persistence:
In the computation of phonology, there is a tendency to retain the phonological form that has been previously mapped to each individual phase constituent during later computation; i.e., the phonology assigned to a phase will be maintained as much as possible during subsequent computation.

Dobler et al. (n.d.) summarize the principle in the following way, "phonological operations occurring between tautophasal morphemes will be more 'destructive' than operations occurring across a phase boundary." All things being equal then, this would support the idea that phonology should not switch within a morphologically-mixed phase. Later in the paper, in Section 4, I will present an analysis of why phonological persistence in ICS emerges in affixed words, but before getting to that, let us consider the question of phonological uniformity in English infixing.

3.4 Infixing and intraword codeswitching

While the literature on ICS has strongly suggested that affixes trigger the phonology of the phonological word, I would now like to briefly look at the issue of phonological uniformity in another very specific case of a type of word without affixes: English expletive infixing. Archibald and Li (2022) looked at the L2A of English infixing as in *fan-fucking-tastic*, or *Mani-fucking-toba*. While their research was concerned with the well-formedness judgments of forms such as *fan-fucking-tastic* versus **fantas-fucking-tic*, and not the phonological properties of the words, there are interesting phonological questions that arise from the study. One such question concerns the properties of the phonology of the complex, infixed form; is it uniform or mixed? Interestingly, infixed forms (like *Van-fucking-couver*) appear

7. A reviewer notes that the phase-based account is further hampered by the fact that there is disagreement still as to which categories actually constitute phases.

(based on fairly limited pilot study)[8] to respect phonological uniformity. However, one interesting difference does seem to emerge between intraword codeswitching with *affixation*, and intraword codeswitching with *infixing*. If there is a suffix, the language of the suffix dictates the language of the phonological word even if there is morphological mixing. In the Stefanich and Cabrelli Amaro (2018) example, the nonce word created from the English stem $[\text{mɪp}]_{\text{Eng}}$ became $[\text{mipeando}]_{\text{Sp}}$ in the ICS version (all Spanish phonology because of the Spanish affix).[9] I have collected pilot data with the sentence shown in (17).

(17) *No quiero vivir en [Van-fucking-couver]$_{\omega}$, quiero vivir en*
NEG want.1SG to.live in Van-*-couver want.1SG to.live in
Madrid!
Madrid
'I don't want to live in Van-fucking-couver, I want to live in Madrid!'

These data reveal some subjects who have all Spanish phonology in the phonological word ($[\text{ban-fɑkiŋ-kúber}]_{\text{Sp}\omega}$), most notably with a Spanish 'r' and the 'v' realized as [b]. Other subjects, though, have all English phonology ($[\text{væn-fʌkɪŋ-kúvər}]_{\text{Eng}\omega}$), with an English 'r' and the 'v' realized as [v].[10] While we will leave the full resolution of this question to future research, at first blush it seems that phonological uniformity (i.e., no switching within a phonological word) is still upheld; the word may be English or Spanish but there is no phonological switching within the word. However, given that *Vancouver* could be considered word in English or Spanish (thus with either an English *n* or a Spanish *n*), the phonology of the infixed phonological word can be either English or Spanish as the *n*P (*Vanfuckingcouver*) would inherit the language feature of the *n* (*Vancouver*). One can imagine a discourse context where one could choose to produce a Spanish word with Spanish phonology in an English sentence such as "Hey, is that *salsa verde* [berðe]?". But let us return to the question of phonological uniformity within morphologically complex affixed words, and the linguistic machinery that accounts for this.

3.5 Phrasal structure and codeswitching

We also need to probe the phonology/syntax interface in order to understand the structure of, in particular, determiner phrases (DPs). In English, determiners are

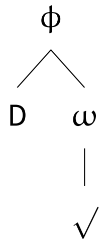
8. This was based on recording only 5 participants (L1 Mexican Spanish or simultaneous bilinguals) reciting this particular sentence. Admittedly, the data are limited at this time.

9. Acknowledging the dialect variation here, Stefanich and Cabrelli Amaro (2018) transcribe a stop (unlenited) [d] in this form.

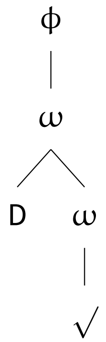
10. Admittedly my transcriptions are impressionistic. The sound quality doesn't really allow me to do an acoustic analysis yet side-by-side listening of the two versions has led me to transcribe the Spanish version with [ɑ] and the English version with [ʌ]. Of course more subjects and a proper acoustic analysis would be ideal.

free clitics (Goad and White 2006) that link directly to the phonological phrase. Spanish determiners (Harris 1989) are affixal clitics which are adjoined to the phonological word, as shown in (18).

(18) a. English free clitic: [ðə $[\text{bɪg}]_\omega$ $[\text{dɑg}]_\omega]_\phi$



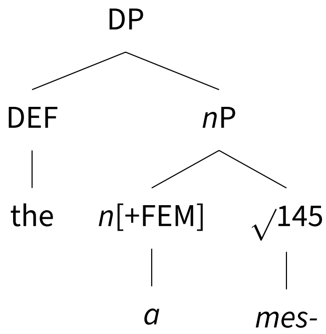
b. Spanish affixal clitic: $[[\text{ɛl } [\text{perro}]_\omega]_\omega\ [\text{grande}]_\omega]_\phi$



In order to understand the relationship between codeswitching and the phonological word, let us look at some recent data presented in Spanish/English phrasal codeswitching. Delgado, Cabrelli, and López (2022) look at codeswitching within determiner phrases (DPs) in heritage speakers of Spanish in Chicago. Participants had pictures of fifteen high-frequency Spanish nouns which were placed on a display board with coordinates labelling each of the cells on the board. When handed a picture of a particular target item (e.g., *mesa*, or *brown mesa*) with the words printed under the picture, the participant would look at the display board and state, for example, “the [noun] is in C5” or “the [adjective noun] is in D2.” Delgado, Cabrelli, and López probe the difference between the pronunciation of the determiner in a DP with a single phonological word (e.g.$[_{DP}$ $[\text{the}[\text{mesa}]_\omega]_\omega]$) versus in a DP with two phonological words (e.g., $[_{DP}$ $[\text{the } [\text{brown}]_\omega[\text{mesa}]_\omega]_\phi]$).[11] They give the morphosyntactic structure shown in (19) for *the mesa*.[12]

11. In what follows when I refer to the properties of the determiner in ‘the mesa’ or ‘the brown mesa’, this is a shorthand to refer to all of the utterances of the ‘the [Spanish noun]’ or ‘the [English adjective] [Spanish noun]’ types of structures in the Delgado, Cabrelli, and López experiment.
12. Where DEF = a definite D head.

(19)



Target items included both single-language phrases (e.g., *the table*; *la mesa*) and switched-language phrases (e.g., the mesa; the brown mesa). Contra some earlier proposals (Burkholder 2018; Moro Quintanilla 2014) they argue that this type of switch is infrequent but licit (examples of this type are found in both the Bangor Miami corpus and in the Bilingual Chicago Corpus). It is worth noting, though, that in the Bangortalk corpora the sentences seem to be primarily in English where the verb and determiner are in English as shown in (20).

(20)

…and put all the muebles (furniture)
…she brought the manguera (hose)

Similar examples (e.g., Spanish/German *la hose*, 'the pant'; Spanish/English *la house*) have been cited in González-Vilbazo (2005).

3.6 The Matrix Language framework

The matrix language framework (MLF) was proposed by Myers-Scotton (2002) as a means of characterizing the mixing of languages within a sentence. Without getting into too many details, one of the key claims of the model is that one of the two languages of the bilingual will be the matrix language (which provides the morphosyntactic frame (i.e., functional elements; what are called in MLF 'syntactically relevant system morphemes' of the sentence) while the other will be the *embedded* language (which provides certain lexical items that can be inserted into the matrix language frame).

López (2020) provides a valuable commentary on the MLF model in which he presents three major problems (which I will refer to only briefly). The first is that the MLF is essentially a lexicalist model with all of the challenges arising from this. The second is that the MLF assumes a separationist architecture in which codeswitching is seen as "putting pieces from two puzzles together." Finally, the MLF has no machinery with which to handle the dependencies which arise *between* words of different languages. Thus, while the surface, descriptive facts presented in the MLF may be appealing, the explanatory force (found in López's Minimalism Distributed Morphology (MDM) approach) is lacking (see also MacSwan 2005 for a valuable critique of the MLF).[13] Indeed, as noted in González-Vilbazo and López (2011, 847), the MLF "is explicitly a theory concerned with the performance aspects of bilingualism and not with the underlying knowledge."

3.7 Previous studies of mixed DPs

There have been several previous studies which have looked at codeswitching in Determiner Phrases (DPs), several within the MLF model. Blokzijl, Deuchar, and Parafita Couto (2017) focus on Determiner+Noun codeswitching in Spanish/English from Miami, and in Spanish/English creole in Nicaragua. They argue that the language of the Determiner is predicted by the matrix language (drawing on Jake, Myers-Scotton, and Gross 2002). Their diagnostic of the matrix language was the language of the finite verb in the sentence. The correlation they note then is that the language of the Determiner is the same as the language of the finite verb. They give the examples in (21) and (22).

(21) *my mom got the <u>manguera</u>*
my mom got the hosepipe
'My mom got the hosepipe.'

(22) *eso fue en el <u>front</u> <u>desk</u> en el <u>reception</u>*
that was at the front desk at the reception
'That was at the front desk, at the reception.'

In the first example, English is coded as the matrix language (because of *got*), while in the second example Spanish is (because of *fue*). Furthermore, note that (21) has an English determiner while (22) has a Spanish determiner.

They draw their data from two bilingual corpora: the Miami corpus (Deuchar et al. 2009-11); and the Nicaragua corpus (Koskinen 2010). The Miami corpus consists of conversations between Spanish-English speakers in Miami, while the Nicaragua corpus consists of sociolinguistic interviews collected in Nicaragua. They looked at DPs in finite clauses only. In the Miami corpus there was a match of 98% between the language of the determiner and the matrix language. In the Nicaragua corpus there was a match of 99.7% between the language of the determiner and the matrix language.

Parafita Couto and Gullberg (2019) also look at codeswitching within DPs drawing data from three corpora: Welsh-English (Deuchar et al. 2014); Spanish-English

13. As MacSwan (2005, 12) notes, it is difficult to comment on the phonological predictions of the MLF as both the System Morpheme Principle, and the Morpheme Order Principle "are silent about the phonological properties."

(the previously referred to Miami corpus) and Papiamento-Dutch (Gullberg, Indefrey, and Muysken 2009). The results from all three corpora show that the determiners match the matrix language in the vast majority of instances.

Parafita Couto and Stadthagen-Gonzalez (2017) report on acceptability judgements of determiner/noun code-switches. Participants judged sentences like those shown in (22).

(23) a. *Edgar wanted estos shoes.*
b. *Edgar quería estos shoes.*
c. *Edgar wanted these zapatos.*
d. *Edgar quería these zapatos.*

In their first experiment, they used (a) a Likert-scale acceptability judgement task where a score of 1 stood for 'never permitted' while 5 stood for 'always permitted.' In the second experiement, participants were presented with a forced-choice task. When presented with two sentences (e.g., drawn from (23) above), subjects were asked which was more acceptable. In both experiments, the preferred pattern is when the determiner matches the language of the finite verb.

These three studies provide valuable support for the fact that codeswitching with DPs is a robust, well-attested phenomenon across a range of languages. All three also argue in favour of the MLF which maintains that the language of the determiner should match the language of the finite verb.

It is worth noting, however, that there are some counter-examples to these claims. González-Vilbazo (2005) presents the examples from German/Spanish bilinguals given in (24).

(24) *Die Frau fue salvada.*
Der Mann fue salvado.
Das kind fue salvado.

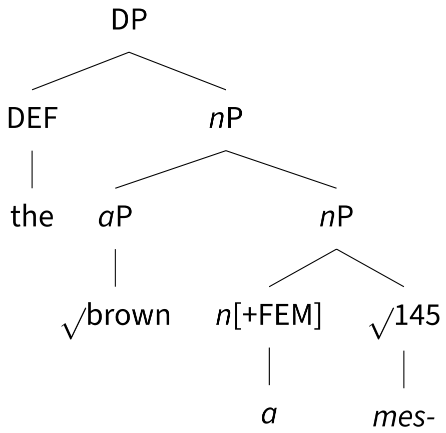
Note that the finite verb (*fue*) is in Spanish while the determiners (*die/der/das*) are in German. Such forms highlight the fact that the correlation between the finite verb and the determiner noted in the MLF studies is not inviolable. More to the point, and reminiscent of the earlier critique of the MLF, the model provides no theoretical mechanism by which such a cross-lexical dependency could arise (see Parafita Couto et al. 2024 for further discussion).

4. Accounting for observed patterns

We must ask what sort of grammatical machinery could account for these observed patterns in codeswitching. López, Alexiadou, and Veenstra (2017) argued that phrases are externalized in "one fell swoop" and that *n* supplies the phonology for the whole word. So, in (16) above *n* is Spanish (given the [+FEM] feature) so the phonological word (made up of a phase head plus a root) is sent to 'Spanish phonetics.' We will see this Spanish influence below in both the consonant and vowel of the determiner. Broadly speaking, my position is similar to Lightfoot (2020) or Westergaard (2021) where we see an integrated I-language or repository but with representational devices available to encode language differences such that the phonetic implementation of, say, Spanish words can be systematically different from the phonetic implementation of English words. As we will develop later in Section 4.3, *language tags* (Green and Abutalebi 2013) can be invoked. Let us consider what might explain this phonetic implementation of *the*. First of all the phonological material is coming from English (it's *the* not *la*), but phonologically we see an influence of Spanish. The Subset Principle can account for why the English vocabulary item is inserted into a node with no gender feature. McGinnis (2016) noted that the vocabulary item "associates a phonological exponent with an array of syntactic/semantic features…Vocabulary items often have underspecified syntactic/semantic features, since these features serve only to match syntactic terminal nodes with their phonological exponents. Vocabulary items compete for insertion into a given terminal node; the competition is generally won by the most highly specified item whose features are a subset of those of the terminal node." Therefore *the* and *la* will compete to be inserted but *la* can't be inserted because it has an extra feature ([+FEM]) that isn't in the terminal node. The *d* functional head of the DP is lacking gender and is thus clearly English. Furthermore, the English determiner attaches to the phonological phrase not the phonological word. Interestingly, this would be evidence of borrowing and codeswitching behaving in the same way. A vocabulary item is inserted with segments from Language A that are then processed by the phonology of Language B. I will return to this in Section 4.5 when discussing the role of the contrastive hierarchy.

Now, let us consider a DP which consists of two phonological words: $[_{\text{DP}}$ [the $[[\text{brown}]_{\omega}\ [\text{mesa}]_{\omega}]]_{\phi}$. In this case, they argue that *the* in *the brown* does not have to go to Spanish phonetics. While they don't provide the structure, I assume it would be something like the structure shown in (25).

(25)



The lower *n*P is a constituent (and a phase domain) which explains why it gets sent off to Spanish phonology (or perhaps more precisely, why Spanish phonology gets inserted). Interestingly we note that *brown mesa* is also a *n*P but later will probe whether there is phonological uniformity within this constituent or whether a switch is allowed.

Structurally the adjectival head (*a*) is English (as it has no probe for gender features) so therefore it would be sent to English phonology (or English phonology would be inserted). Having a new functional head dictates a new phonological word (i.e, a separate phonological word from the lower *n*). Delgado, Cabrelli, and López's research question is to ask if having a nominalizing head (*n*) with a gender feature (i.e., Spanish *n*) will affect the whole DP (i.e., *the brown mesa*) or whether its effect will be more local (i.e., only the lower phonological word). They predict that *the brown* will be in English phonology while *mesa* will activate Spanish phonology. In other words, they predict phonological uniformity within *each* phonological word. In this case as well, each functional head (*n* and *a*) is a phase head, and we find the Spanish *n* triggering Spanish phonology in its complement (√mesa), and the English *a* (√brown) triggering English phonology.

They tested this experimentally in a production task. Participants produced sentences of the forms shown in (26).

(26) a. The table is in A1.
b. La mesa está en A1.
c. The <u>mesa</u> is in A1.
d. The brown <u>mesa</u> is in A1.

I would note that there were no sentential contexts of the form "The brown mesa está en A1" which would have been interesting for comparison purposes.[14] To

14. It would also be interesting to look at sequences such as 'La brown mesa' to see how the free- versus affixal-clitic status of English versus Spanish determiners plays out, but sadly that's

discover something about the behaviour of the determiner, they compared the phonetic quality in the determiners in the sentences like (26-a) and (26-c). Here is a summary of some of their findings:

(a) the vowel in *the* in the phrase *the mesa* was significantly different from the vowel in *the* in the phrase *the table* suggesting that *the mesa* was more Spanish-like. However the vowel quality in *the* in the phrase *the mesa* was also significantly different from the vowel in *la* in the phrase *la mesa* which suggests that *the* in *the mesa* was not being spelled out with the same phonology as the Spanish determiner *la*. Phonetically, the 'mixed' vowel was intermediate (in both F1 and F2) compared to the 'English' vowel and the 'Spanish' vowel. In *the mesa*, the consonant /ð/ is realized as a stop [d] not a fricative.

(b) the vowel in *the* in the phrase *the brown mesa* was significantly different from the vowel in *la* in the phrase *la mesa* which suggests that *the* is in English. Interestingly, the vowel in *the* in *the brown mesa* was not significantly different from the vowel in *the* in the phrase *the table* which suggests that *the brown* has activated English phonology.

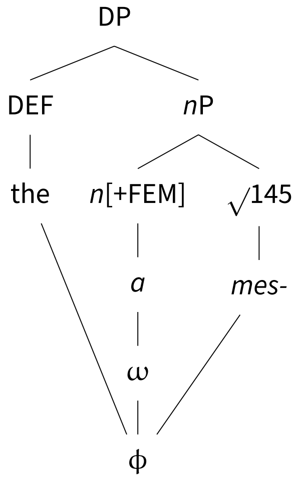
The Miami corpus, however, appears to provide no mixed examples of the determiner + adjective + noun type with English determiners so it does not add to the Delgado, Cabrelli, and López dataset. There are some English determiners followed by Spanish nouns (e.g. 'the *madre*') which could potentially provide some additional data, however. In listening to the example of "I saw the *madre*" (where the finite verb is English and the determiner is also English) it sounds as if the intial consonant in the determiner is a [d] though the sound quality is insufficient to support a detailed acoustic analysis. This phonological behaviour seems to be consistent with the Delgado, Cabrelli, and López data.

To summarize, the implications thus far: the *n* with a gender feature (Spanish *n*) did not affect the whole DP but only affected the local complement of the phase head.

Let us add the phonological structure to the syntactic structures for *the mesa* and *the brown mesa* given in (27) and (28) in order to take the next step in discovering the properties and domains of phonological uniformity in intraword codeswitching.

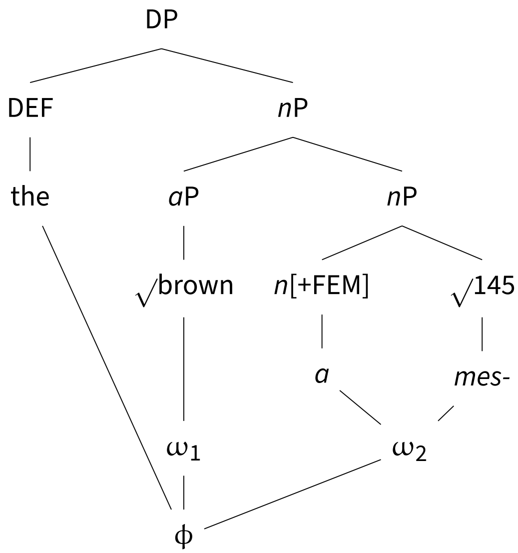
not where the adjectives normally go in Spanish. Potentially, we could look at the phonology in phrases such as 'The gran man' versus 'the man grande' but that is for another day.

(27)



My assumption is that the Spanish *n* will project an affixal clitic phonologically (i.e., attaching to the phonological word) as part of the phonological interpretation process even though the vocabulary item is English. The phonological phrase, then, will be tagged as Spanish. The complex DP structure is as shown in (28).

(28)



My assumption here though is that the determiner is a free clitic adjoined to the phonological phrase *brown mesa*. We will probe the phonological consequences of these distinct structures shortly.

4.1 Possible mechanisms of phonological uniformity

So, given these constructions, what might be blocking phonological switching in a morphologically-mixed word (like *mip-eando*) or a morphologically-mixed phrase (like *the mesa*)? Let me quickly rule out two possibilities before proposing the analysis which I am advocating. I will focus my examples here at the word level.

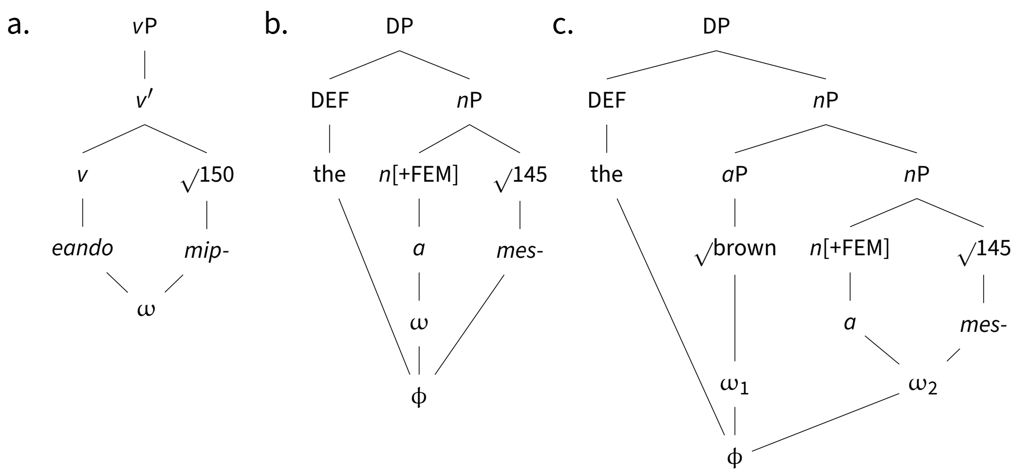
First of all, it is not a psycholinguistic switch cost which prohibits intraword phonological switching. Blanco-Elorrieta, Emmorey, and Pylkkänen (2018) looked at bimodal bilinguals when they were simultaneously using two languages (ASL and English) and what happened neurolinguistically when they disengaged and used only one language. They found that there was no additional processing cost to using two languages simultaneously. That is to say, activating an additional language did not recruit regions devoted to cognitive control. There was, however, increased neural activity (in the anterior cingulate cortex) when switching from simultaneous language use to single-language production. This suggests it would not be more costly for an individual to produce a mixed (English+Spanish) form like [[mɪp]$_{\text{Eng}}$-[eando]$_{\text{Sp}}$] than a uniform (Spanish) [mip-eando]$_{\text{Sp}}$ form.

Nor would an intraword phonological switch be problematic for the *listener*; listeners can adapt. Reinisch and Weber (2012) report on a study where native Dutch listeners were exposed to Hungarian-accented Dutch. Dutch has variable stress placement while Hungarian primary stress is initial. The control group was exposed to Dutch words with initial stress pronounced with a Hungarian accent (which would also result in initial stress). The experimental group was exposed to both Dutch words with initial stress and Dutch words with non-initial stress pronounced with a Hungarian accent. Thus, in the experimental condition, some words would be pronounced with targetlike initial stress while others would have a non-targetlike initial stress because of the transfer of Hungarian stress rules. The results showed that the experimental group very quickly (hearing fewer than thirty tokens) adapted to be able to correctly recognize Dutch words with non-targetlike stress pronunciations. Furthermore, Gwilliams et al. (2018) demonstrate how monolinguals can process ambiguous phonemic input and still successfully activate a lexical item. Imagine that a hybrid consonant is synthesized that includes some of the properties of a [s] and some of the properties of a [f]; let us call that hybrid [s/f]. English speakers who listen to a string 'gi[s/f]t' will hear *gift* while people who listen to 'ki[s/f]s' will hear *kiss*. The point is that ambiguous input signals do not derail the parser (see also Ganong 1980). They do not block lexical activation. Archibald (2019) explored this approach to reconciling intelligibility with word recognition (but not explicitly within an integrated-grammar model) by demonstrating that the parser maps segments onto higher-level phonological structures. It seems straightforward to extend such a model to mixed-language input. For me, the implications of these works is that listeners (who have an integrated I-grammar) who hear a mixed (English+Spanish) form like [[mɪp]$_{\text{Eng}}$ - [eando]$_{\text{Sp}}$] - rather than a uniform (Spanish) [mip- eando]$_{\text{Sp}}$ form – would be able to adapt and activate the appropriate lexical item (especially in a dense codeswitching environment). Indeed such input might be helpful to the learner as it would cue the listener that a language switch had occurred and this may aid in bring both languages to equal states of activation (in the sense of Truscott and Sharwood Smith 2016).

It is neither a functional principle of intelligibility, nor a neurolinguistic cost that would prohibit phonological switches in a morphologically-switched word. So from what does phonological uniformity derive?

Critically, we note that we maintain phonologically uniform items such as $[\textit{mipeando}]_{\text{Sp}}$ and $[\textit{the mesa}]_{\text{Sp}}$ while allowing phonological switching in forms such as $[\textit{the brown}]_{\text{Eng}}$ $[\textit{mesa}]_{\text{Sp}}$. Let us look at what unifies the behaviour of first two forms, and distinguishes them from the third. *Mipeando* and *the mesa* both have a single phonological word, while *the brown mesa* consists of two phonological words, as shown in (29).

(29) Phonological words



What we see is that phonological uniformity respects constituents, but it respects *phonological constituents*, i.e., the phonological word. In (a) and (b) we see uniform Spanish phonology, in (c) we see English phonology in ω_1 but Spanish phonology in ω_2. In what follows I will build an argument to show how we need to look at both phonological and syntactic structure to explain the behavioural facts.

Let us now look at the derivation of these structures in order to understand what leads to the phonological properties. To do this we need to probe the nature of the phonology/syntax interface.

4.2 *The phonology-syntax interface*

There is a long history in the field of trying to determine how syntactic structure and prosodic structure relate (e.g., Selkirk 1984). Chomsky and Halle (1968) had noted that syntactic phrasing and phonological phrasing were not the same when we compare the two structures shown in (30).

(30) a. Syntax:
This is [$_{\text{DP}}$ the player [$_{\text{CP}}$ that shot [$_{\text{DP}}$ the puck [$_{\text{CP}}$ that fooled [$_{\text{DP}}$ the goalie]]]]]

b. Phonology:
(This is the player) (that shot the puck) (that fooled the goalie).

Sometimes, phonological rules can refer to syntactic elements. For example in English sentential stress is marked on the rightmost lexical category, as shown in (31).

(31)

								x
	x			x	x			x
[A	minimalist]	and	[a	functionalist]	[walk	into	a	bar]

Sometimes, phonological rules make no reference to syntactic elements, as shown in the triggering of intrusive [ɹ] intervocalically between sentences in (32).[15]

(32) Look at all the dee[ɹ]! Are they eating your flowers?

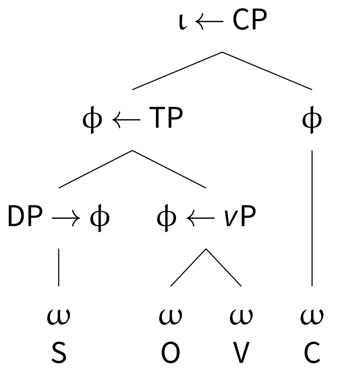
Miller (2020) provides a clear outline of three of the most common interface models: (1) Relational Mapping (Nespor and Vogel 1986; Vogel 2019); (2) Syntax-Driven Mapping (Selkirk 2011); (3) Syntactic Spell-Out (Chomsky 2001; Collins and Stabler 2016; López, Alexiadou, and Veenstra 2017). He provides a summary of the successes and shortcomings of each of these models, but proposes a new model which he calls Tri-P Mapping (referring to Phase-based Prosodic Phonology). Some key properties of this model are:

i The phase head is included in the Spell-Out domain.
ii "Phonology may reference any spelled-out phase to map to prosodic structure, but phonology itself does not apply cyclically."
iii Morpheme-level phases map to ω.
iv Clause-level phases (such as *v*) map to ϕ.
v C's phase maps to ι.

The following example of phonology/syntax correspondences is drawn from Archibald and Croteau's (2021) study of L2 Japanese and shows the syntax/phonology correspondences given in (33).

15. Though the linking [ɹ] is licensed by the pragmatics of the situation in that if the topic of the two sentences is not the same the linking [ɹ] does not appear; see Nespor and Vogel (2007).

(33)



Note that the XPs are phonological phrases while the X^0s are phonological words. Therefore, phonological operations can make reference to phonological structures.

This is consistent with Selkirk's (2011) Match Theory which stipulates a preferred (though violable) mapping of (a) syntactic heads onto phonological words, and (b) syntactic phrases onto phonological phrases, as shown in (34).[16]

(34) $XP \rightarrow \phi$
$X^0 \rightarrow \omega$

Match Theory's monolingual assumption that syntactic and phonological structure are isomorphic can be easily extended to bilinguals through language tags (Green and Abutalebi 2013; Blanco-Elorrieta and Caramazza 2021) as shown in (35).

(35) $XP_{\text{Spanish}} \rightarrow \phi_{\text{Spanish}}$
$X^0_{\text{Spanish}} \rightarrow \omega_{\text{Spanish}}$

The language of the syntax is the one which generates the language of the affixes, and Match Theory dictates that the phonological word match the language of the X^0. While Match Theory sets out some of the basic facts of the phonology/syntax interface, more recent work has suggested that Match Theory overgenerates which is what leads to the adoption of Sande, Jenks, and Inkelas's (2020) co-phonologies by phase analysis that I will develop in Section 4.4.

4.3 Language tags

We can account for these data representationally by introducing *language tags* (see Archibald and Libben 2019). This formal construct is well-represented in the literature (Amaral and Roeper 2014; Blanco-Elorrieta and Caramazza 2021; Green 2018; López, forthcoming; Sharwood Smith and Truscott 2014; Truscott and Sharwood

16. Büring and Truckenbrodt (2021) propose a Correspondence version of Match Theory to account for syntactic consituents which have undergone movement (*Each overt XP must have a corresponding p-phrase* ϕ) but nothing in this paper hinges on this distinction.

Smith 2016). By way of example, a verb's contextual restrictions for insertion might include such things as: appearing in a transitive construction; taking an animate subject; adjoined to an English functional head. Given that multilingualism is more common than monolingualism, and given that unpredictable information about lexical items needs to be stored somewhere (even in an integrated I-grammar) in any theory, the default assumption should be that vocabulary items include information on which language they belong to.[17] As González-Vilbazo and López (2011, 834) articulate, "what is distinctive of bilingual speakers is that they have a 'duplication' of functional and lexical items. For instance, a German/Spanish bilingual will have a Spanish T with the [±perfect] distinction as well as a German T without this feature." But this doesn't mean that bilinguals are fundamentally different (to use Bley-Vroman's (1990) term) than monolinguals.

MacSwan (2017) discusses some of these issues in the context of codeswitching when he refers to *constraint-free approaches* to the matter (Pfaff 1979; Sankoff and Poplack 1981; Woolford 1983; Lipski 1985; Di Sciullo, Muysken, and Singh 1986; Santorini and Mahootian 1995) which require no special grammatical machinery to account for codeswitching. Notably, MacSwan rejects the device of language tags because, in his view, the tag label (e.g., English) is the class of expressions defined by the grammar (G) so the a variable L cannot be incorporated into G because L is defined by G. He further suggests that such a device would be 'extra' machinery in that it is not required of monolinguals. While there are models which propose mechanisms of codeswitching which are unique to bilinguals (e.g., Myers-Scotton and Jake 2009), this is not desirable (see Londahl and Putnam 2024 for further discussion of the 'Null Theory' approach of Mahootian 1993 in terms of philosophy of science). While originally designed to account for codeswitching data, it has been extended to heritage speakers (Londahl et al. 2019). Following MacSwan (1999) we seek to articulate a bilingual architecture that requires no principles which are not found in monolingual grammars. This would stem from a parsimony metric (i.e., Occam's Razor).

There are two key theoretical assumption which MacSwan adopts which I would like to call into question: (1) two lexicons, and (2) two PFs. He says there is one computational system but two lexicons. But his lexicons come labelled (*x* and *y*). Furthermore, he assumes two PFs (call them *x* and *y*). So a lexical entry from lexicon *x* or lexicon *y* would be inserted into a syntactic tree. Lexical items from lexicon *x* would build a language *x* tree, and then at the end of the derivation, the output of that tree would be sent to PF *x*. we note that this architecture requires the

17. A reviewer raises the question of learner variability and language tags. The learnability of features taps into a big literature. These would be non-phonological/morphological features. Following Archibald and Libben (2019) I lean toward the idea that such algebraic tags would be part of UG, and that the nature of the input cues to trigger them would be quite robust in a range of learners (heritage, L*n*, bilingual).

introduction of variables (like *x* and *y*) to label the lexicons and the PFs; surely this is akin to introducing a language tag; how else could we state the matching rule that says lexicon *x* trees are sent to PF *x*? MacSwan's claims are also problematic on the empirical front as shown at two levels. First, the psycholinguistic literature makes it clear that the lexicons are not encapsulated. Interlingual homographs can facilitate response times in a lexical decision task while interlingual homophones can inhibit response time. Crucially, when listening to or reading language *y*, the items from language *x* are activated and compete with items from language *y* (Dijkstra, Grainger, and Heuven 1999). For example, there is a word in English spelled *glad* and a word in Dutch spelled *glad*. The Dutch word means 'slippery' and is pronounced [xlɑt]. These words are known as interlingual homographs (they share orthography but not phonology or semantics). When a Dutch/English bilingual reads one of these words they read it faster than frequency- and length-matched controls. This is in contrast with interlingual homophones. There is an English word pronounced [lif] *leaf* and a Dutch word pronounced [lif] *lief* which means 'dear'. When a Dutch/English bilingual reads one of these words they read it more slowly than frequency- and length-matched controls. Clearly, the items in a multilingual's lexicon interact in a comprehension task.

The encapsulation claim is also problematic on the production (i.e., Phonetic Form (PF)) end of things as the phonetic drift literature (Chang 2019b) and the attrition literature (Cabrelli 2023) clearly show that the phonetic spell-out (like the phonology) is not encapsulated; the L2/L3 can influence the L1/L2. Phonetic *drift* (Chang 2019a, 2019b) is short-term while phonetic *attrition* (de Leeuw 2019) is long-term. Even drift would be of interest here because it shows that the interface is not encapsulated. As Cabrelli (2023) notes, "any system can affect a previously acquired system, just as it has been established in the L2 and L3 acquisition literature that existing systems can (and do) affect subsequently acquired systems." Even traditional L2 speech accounts like the SLM-r claim that L1 and L2 sounds coexist in a single phonetic space.

Shifts in VOT are commonly cited in the drift literature but other phenomena are discussed; there are many factors that influence such drift but space precludes me from getting into them. I will allow (Cabrelli 2023, 324) to summarize, "phonemic contrasts can transform into allophonic alternations, as seen in the production data for clear and dark laterals in de Leeuw, Tusha, and Schmid (2018) and in the perception data of stops versus approximants in (Chapin 2018). The inverse is also true; Dmitrieva, Jongman, and Sereno (2010) found that "L2 acquisition strengthened a voicing contrast that is part of the L2 but that is (incompletely) neutralized in the L1." Balukas and Koops (2015) showed that Spanish-English bilinguals are aware of upcoming codeswitches as revealed by their shortening of English VOT (closer to Spanish VOT) in anticipation of a switch into Spanish. Note that this is contra Gosselin (2022) who argued that the balanced bilingual in her case study showed phonological encapsulation because she produced consonant clusters in English words and modified clusters in Spanish words. All of this shows that the later-acquired languages can have an effect on the earlier-acquired ones; the phonology and phonetics are not encapsulated.

I have addressed this question at length to argue that the theoretical and empirical arguments against language tags do not stand. We know that monolinguals have sub-lexicons (see Amaral and Roeper 2014; Giegerich 2005) which encode things like Latinate versus non-Latinate vocabulary (in English) to explain such things as the dative alternation (compare *I gave the library a book* versus **I donated the library a book*). Similarly, the construct of phonological strata (Itô and Mester 2017) in Japanese (e.g. native (or *Yamato*); *Sino-Japanese*; sound-symbolic (or *mimetic*); and recent *borrowings*) in which different types of words evidence different constraints on syllable structure, and even different phonemes. The Vocabulary Items must receive a representational coding in a monolingual's grammar.

Multilinguals are no different. What this suggests is that all lexical roots and affixes (and, potentially, functional heads and prosodic domains) in a given language would, in fact, be tagged (as English, or German, or Danish) even in monolingual speakers. Green and Abutalebi (2013) and Green (2018) noted how we can suppress the language items which, while activated, do not belong to the language of the conversation or context. As Green and Li (2016, 10) note, speakers "establish a competitive relationship between the schemas for speech production in each language and so restrict entry of non-target language items into the planning layer by suppression of non-target items." Which items get suppressed? The items coded with particular language tag.[18] In an explicit representational theory of any domain of cognitive science (Fodor 1983; Jackendoff 1990; Carroll 2001) the only elements to which our explanations can refer need to be represented; multilingual competence is no exception.

I would suggest that this goes beyond mere diacritic marking in lexical entries but taps into the very basic of machinery of grammar acquisition.[19] Yang (2002, 2005) has explored in depth the processes underlying children's first language acquisition. As Yang (2002, 329) notes, "children must discover, and subsequently generalize, the language-specific regularities that reside in their finite linguistic experience." Language learners both store arbitrary lexical forms but move on to establish rule-based generalizations about the relationships between the forms

18. See Blanco-Elorrieta and Caramazza (2021) for a model which incorporates language tags but does not invoke suppression.

19. There is much of great interest to explore as to the exact nature of the representation of language tags. A reviewer notes that they are reminiscent of (van Oostendorp 2008; Zimmermann 2017; Trommer 2015) in colored containment theory, and that they seem to meet Scheer's (2011, 2012) criterion for diacritic-free morphophonology. I am afraid I must leave such explorations to future research.

(which can be evidenced by the onset of over-regularization errors. Yang argues that these developmental trends in grammars are categorical and not gradient which suggests a representationally-based change as representations are categorical. Once it is discovered that, say *-d* is the productive past tense marker in English then it gets applied to all verbs (i.e., generalizes beyond the input), and, in an English context, to all *English* verbs; both *verb* and *English* are represented. Yang's (2002, 2005) Tolerance Principle is a way to formally model the categorical emergence of productivity in which regularities and irregularities are tracked. Once too many (based on types not tokens) irregularities stack up then a rule is formulated. Space precludes a detailed consideration of the Tolerance Principle here but the main point is that the mechanism of generalizing beyond the input that is fundamental to L1A, L2A, L3A, etc. is grounded in tracking patterns in the roots and exponents which lead to a generalization which accounts for those roots and exponents (i.e., the rules of English, or German, etc.).

Distributed Morphology vocabulary items, then, include language tags. López (forthcoming) opens the door to having tagged functional heads in describing Norwegian/English bilinguals when he suggests, "we could hypothesize that an 'English' *v* triggers [a form like *taught*] while a 'Norwegian' *v* does not." The grammar must have some way of recognizing the difference between the two *v*'s, and parsimony suggests that independently motivated language tags are the way to go. This is reminiscent of the González-Vilbazo and López (2011) analysis of T in English and German referred to earlier.

I conceive of labels such as 'English' or 'Norwegian' to be essentially algebraic in that they are not meant to encode anything like the E-language or political entity that might be called English, or Norwegian (see MacSwan 2017 for further discussion). We could represent them as v_{E} or v_{N}. Such notation would be acquired as part of the standard learnability accounts of representational structures. Extending the representational system in this way would have the benefit of facilitating a representationally-based process of induction or analogy where all elements with an E- or N-subscript might be implicated in a particular process.[20]

As we will see shortly, language tags also play a role in phonological interpretation in the post-syntactic spell-out. Let us return to issues related to the syntax/phonology interface.

4.4 Co-phonologies

We have seen that the Block Transfer Hypothesis combined with the Phase Impenetrability Condition may not be sufficient to account for the observed patterns

20. Goldrick, Putnam, and Schwarz (2016) address these issues within the model of Gradient Symbolic Representation arguing that bilinguals do not have two roots competing but rather a blended weighted representation. This approach might face problems with a blended English and Norwegian v_{EN}.

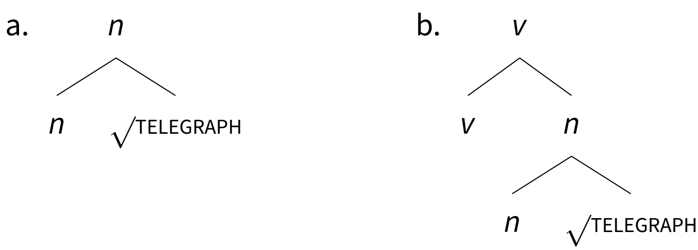
of phonological uniformity in intraword codeswitching. We turn now to proposal which can account for these data. Miller (2020, 9) notes that his Tri-P model is compatible with the Co-phonologies by Phase (CBP) model of Sande, Jenks, and Inkelas (2020) where vocabulary items each have their "own prosodic specification and... the specific phonological patterns are enforced automatically via competition." CBP assumes "a process which transforms a syntactic tree into a phonological string." This process of *phonological interpretation* has three parts: vocabulary insertion; morphological composition; phonological evaluation. As we shall see, I propose that phonological evaluation involves the representation of language tags.

Let us begin with a discussion of some of the points made in Sande and Jenks (2018) and Sande, Jenks, and Inkelas (2020) concerning the integration of DM, phase theory and phonology. Like Miller (2020), they assume that morphology ends with vocabulary insertion, that phonological content is spelled out at each phase, and that the spellout of a phase includes the phase head (not just the complement). They go beyond Miller's (2020) model, however, in fleshing out the vocabulary insertion machinery to include specifications that can "override the default phonological grammar of the language during Spell-Out of the phase containing that vocabulary item" – though later we will see that this proposal is problematic for the ICS data. The vocabulary items now include morpheme-specific subrankings of constraints (rather than traditional DM readjustment rules). This machinery, designed to account for variable behaviour, is referred to as a *co-phonology*. These morpheme-specific co-phonologies scope over syntactic phases. Thus, vocabulary items would have the three components shown in (36).

(36) a. Featural content (F): Tonal or segmental features of vocabulary items.
b. Prosodic content (P): Prosodic selection or subcategorization.
c. A constraint subranking (R): A partial constraint ranking, which overrides a default master ranking.

A vocabulary item, therefore, is represented as a set F, P, R. They give the example of the Hebrew noun and denominal verb structures shown in (37).

(37)



Examples of the relevant Hebrew Vocabulary items from Sande and Jenks (2018) are given in (38):[21]

(38)

a. $[\sqrt{\text{TELEGRAPH}}] \leftrightarrow$ {F: /télegraf/}
{P^1: $\emptyset$}
{R^1: $\emptyset$}

b. $[n] \leftrightarrow$ {F: $\emptyset$}
{P^2: $[_\omega$ X]}
{R^2: $\emptyset$}

c. $[v] \leftrightarrow$ {F: /ie/}
{P^3: $[_\omega$ X]}
{R^3: $\omega{=}\sigma\sigma{>>}$FAITH}

Vocabulary Insertion (standardly) replaces the morphosyntactic features with phonological content. Phonological composition, then, involves (following Embick 2010) concatenation of terminal nodes (i.e, n + $\sqrt{\text{TELEGRAPH}}$ and then v + $[_\omega$ telegraf]. In addition, though, there is also a unification of the prosodic and co-phonological requirements (e.g., R^{1+2}; P^{1+2}).

Now let us look at some enhancements to this model discussed in Sande, Jenks, and Inkelas (2020). CBP makes explicit the notion of morpheme-specific co-phonologies as part of the entries for the vocabulary items. As they say (2020, 1214), "every language contains multiple phonological sub-grammars which apply in different morphosyntactic environments." Note that this is applicable to both monolingual and bilingual grammars, and thus is consistent with the Null Theory criterion.

An example of their tri-partite representation is given in (39) for the English plural morpheme.

(39)

a. [pl] $\leftrightarrow$ z
b. [pl] $\leftrightarrow$ -en/ {$\sqrt{\text{OX}}$, …} ___
c. [pl] $\leftrightarrow$ $\emptyset$/ {$\sqrt{\text{MOOSE}}$, …} ___

Vocabulary Insertion can be default or contextually-restricted. There have been proposals to index co-phonologies to different grammatical categories (Smith 2011) and to specific morphological constructions (Inkelas and Zoll 2007). My main innovation here is to introduce the marking of language tags into the representational

21. The vowels in (38-c) are associated with the pronunciation of the verbalizing head and do not concern us directly here.

component of vocabulary items in order to make the machinery (a) relevant to the multilingual domain, and (b) explanatory of intraword codeswitching.

The first thing we need to account for is why the language of the affix governs the phonology of the phonological word. Following Alexiadou and Lohndal (2018) and others, I assume that the generation of a sentence begins in one language (English *or* Norwegian; Spanish *or* German) and thus the basic syntactic properties of one language derive the syntactic tree. Morphological insertion (either derivational or inflectional) spells out those syntactic features. Thus, the language of the affix is what dictates the phonology of the word. Following Sande, Jenks, and Inkelas (2020, 1221), "cophonologies are introduced by vocabulary items and scope over the phase in which they are phonologically interpreted."

4.5 Co-phonologies and codeswitching

Now let us turn to the data presented earlier from Delgado, Cabrelli, and López (2022), and explore how and where language tags might work for forms such as *the mesa*, and *the brown mesa*. Let us first consider the vocabulary item triads in which (building on Sande, Jenks, and Inkelas 2020) I have included language tags as shown in (40).

(40)

			Description
$\sqrt{}_{\text{Sp}}$mes-	$\leftrightarrow$	{F: /mes/$_{\text{Sp}}$} {P1: [$_{\omega\text{Sp}}$ X]} {R1: Spanish}	The Spanish root 'mes-' (*table*)
[*n*]$_{\text{Sp}}$	$\leftrightarrow$	{F: /a/$_{\text{Sp}}$} {P^2: [X -]$_{\omega\text{Sp}}$} {R^2: Spanish}	The Spanish category-defining nominal head which builds a Spanish phonological word. Will project an affixal clitic determiner.
[*a*]$_{\text{Eng}}$	$\leftrightarrow$	{F: $\emptyset$} {P^3: [$_{\omega\text{Eng}}$X]} {R^3: English}	The English category-defining adjectival head which builds an English phonological word.
$\sqrt{}_{\text{Eng}}$BROWN	$\leftrightarrow$	{F: /brawn/$_{\text{Eng}}$} {P^4: [$_{\omega\text{Eng}}$X]} {R^4: English}	The English root 'brown.'
$\sqrt{}_{\text{Eng}}$THE	$\leftrightarrow$	{F: /ðə/$_{\text{Eng}}$} {P^5: [$_{\phi\text{Eng}}$X-]} {R^5: English}	The English determiner is a free clitic which attaches to the phonological phrase.

For the purposes of this paper, I am assuming that the language tag is represented in each of the three components. I leave it to future work to see if it is possible to develop a cascading model where the tag at one level could be derived from another.

A language tag at the segment level (F) is necessary because the segments in question are the phonemes and those are language-specific. Activating a language tag would trigger the entire contrastive hierarchy (Dresher 2009) for a particular language. This is an advantage of the contrastive hierarchy approach as the activation of a language tag can activate the entire phonological system.[22] A language tag also has to go in the R-level. Co-phonologies are designed to account for when a phonological process happens in a restricted environment. If a process only applies to one of a bilingual's two languages then that is definitely a restricted environment. There also needs to be a language tag at the P-level because this is about prosodic selection or subcategorization. For example the plural entry for English and Spanish would be spelled out differently phonologically. We could revisit the listings presented in (26) to incorporate representations in an integrated I-grammar, as in (41).

(41)
a. $[\mathrm{pl}]_{\mathrm{Eng}} \leftrightarrow$ z
b. $[\mathrm{pl}]_{\mathrm{Eng}} \leftrightarrow$ -en/ $\{\sqrt{\mathrm{OX}}, \ldots\}$ ___
c. $[\mathrm{pl}]_{\mathrm{Eng}} \leftrightarrow$ $\emptyset$/ $\{\sqrt{\mathrm{MOOSE}}, \ldots\}$ ___
d. $[\mathrm{pl}]_{\mathrm{Sp}} \leftrightarrow$ -s/ {V___}
e. $[\mathrm{pl}]_{\mathrm{Sp}} \leftrightarrow$ -es/ {C___}

Such entries would capture the fact that there are subcategorization restrictions on the types of roots that the plurals attach to. In monolingual contexts, Spanish plurals attach to Spanish root, English plurals to English roots. However, in particular environmental contexts, where an individual is in bilingual mode (Grosjean 2001) this triggers Green and Li's (2016) open, cooperative control mechanisms which licenses language mixing. This is what allows forms such as *mipeando* or *kalpify* or *the mesa* to occur at all.

4.6 The phonetics-phonology interface

From these types of co-phonological, multi-level representations, we still need to articulate the phonetics interface in order to understand the nature of the spell-out. I am assuming the broad architecture of Natvig and Salmons (2021) and Dresher (2009) as shown in Figure 2.

In such a model, categorical constituents are rendered into gradient variable pronounceable items in a step-by-step manner.

22. An output-based system could also achieve this kind of activation but the stipulation of the Richness of the Base would have to be relaxed. See Archibald (2023) for further discussion.

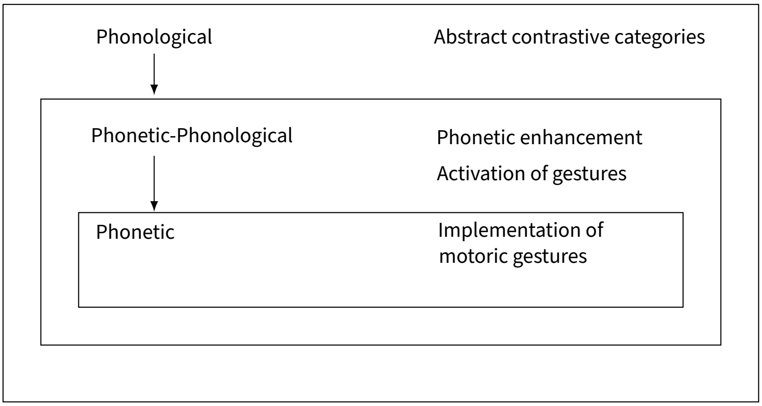


Figure 2. The phonetics-phonology interface.

With this background, then, let us consider how the phrasal forms of Delgado, Cabrelli, and López (2022) are combined. So, the noun (*mesa*) after vocabulary insertion and composition would be as shown in (42).

(42) $/\text{mesa}/_{\text{Sp}}{}^{(\text{P1+2, R1+2})} \longrightarrow [\text{mesa}]_{\text{Sp}\omega}$

And the simple DP would be as shown in (43).

(43) $/\text{ðə}/_{\text{Eng}} + /\text{mesa}/_{\text{Sp}\omega} \longrightarrow [\text{ðə}\ [\text{mesa}]_{\text{Sp}\omega}]$

But it is not only the syntax that determines the phonetic implementation. As shown before in (23), the Spanish determiner is an affixal clitic adjoined to the phonological word. In (43) the determiner slot is filled with the English vocabulary item *the* which is realized phonetically as something like [dʌ] (where, as we saw, the consonant is a stop not a fricative, and the [ʌ] is not like either the English [ə] or the Spanish [a]). This would be the result of the English Vocabulary Item /ðə/ being parsed by the Spanish contrastive hierarchy due to the fact that *the* is an affixal clitic to the Spanish head *mesa*. The phonetics of the affixal clitic is determined by the adjoined phonological word which is the head of the phonological phrase, and this phonological word is anchored by the Spanish functional head *n*. Archibald (2023) outlines the contrastive hierarchy algorithm and shows that the mechanism accounts for both borrowings (Herd 2005) and L2 accent. Such an approach can account for the differential substitution effects which result in, say, Japanese learners of English replacing the input /θ/ with [s] while Russian learners of English replace the /θ/ with [t]. This is true of loanwords as well where English 'health' is borrowed as [herusu] in Japanese, while English 'thriller' is borrowed as [triler] into Russian. In this case, the analogue of the L2 accent would be to produce an English vocabulary item (like *the*) with Spanish phonology. When the Spanish contrastive hierarchy parses an English /ð/, it would be parsed (and pronounced) as

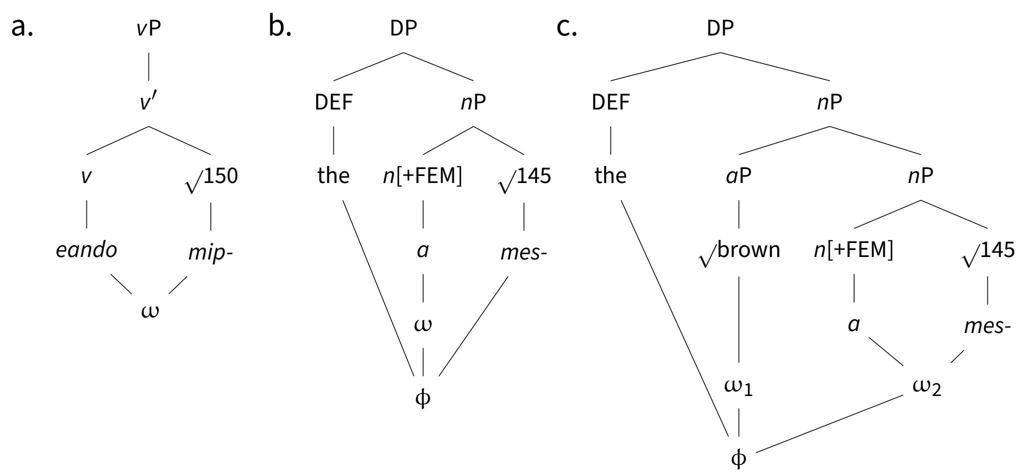
[d]. I would argue that the quality of the vowel (which is intermediate between the English [ə] and the Spanish [a]) emerges from inserting an English vocabulary item into a Spanish prosodic structure (in this case part of the phonological word). To make the comparison explicit, in a form like *la mesa* we have a Spanish vocabulary item being adjoined to a Spanish phonological word (and Spanish [a] emerges); in a form like *the table* we have an English vocabulary item being adjoined to an English phonological phrase (and English [ə] emerges; in a form like *the mesa* we have an English vocabulary item being adjoined to a Spanish phonological word (and intermediate [ʌ] emerges).

What about the more complex DP? It would be derived as shown in (44) with English phonology for *the brown* and Spanish phonology for *mesa*.

(44) $/\text{mesa}/_{\text{Sp}}{}^{(\text{P1+2, R1+2})} \rightarrow [\text{mesa}]_{\text{Sp}\omega}$
$/\text{brown}/_{\text{Eng}}{}^{(\text{P4, R4})} \rightarrow [\text{brown}]_{\text{Eng}\omega} + [\text{mesa}]_{\text{Sp}\omega}$
$/\text{ðə}/\ [[\text{brown}]_{\text{Eng}\omega}\ [\text{mesa}]_{\text{Sp}\omega}] \rightarrow [\text{ðə}\ [\text{brown}]_{\text{Eng}\omega}\ [\text{mesa}]_{\text{Sp}\omega}]_{\text{Eng}\phi}$

Remember that the phonetic quality of *the* in *the brown mesa* was not significantly different from the phonetic quality of *the* in *the table*. This suggests that the phonetics of the free clitic in the phonological phrase is inherited from the prosodic word to its right (*brown*). The question then arises as to why the adjacent word is the trigger and not the head of the syntactic phrase (which would be the noun (*mesa*) in (45-c)).

(45)



In order to motivate the answer to this question, let us turn to a further discussion of the syntax/phonology interface. Büring and Truckenbrodt (2021) explore aspects of sentential stress assignment and syntactic movement (which, of course, is not our concern here). However, their theory of phrasal stress is relevant. Their

Stress-XP constraint enforces that “each XP must contain a beat of phrasal stress.” At the intonational phrase level, there is a principle which strengthens one of the phrasal stresses in a sentence (what they call Nuclear Stress Rule (NSR)-*i*). The default of this is to stress the rightmost phrasal stress in an intonational phrase. Examples are given in (46) where stressed words are indicated with double underlining.

(46) a. Peter sliced the salami with a knife. Stress-XP
b. Peter sliced the salami with a knife. NSR-*i*

Representationally, phrasal stress is the prosodic head of a phonological phrase. A given sentence may have different words focused depending on pragmatic contexts, as shown in (47).

(47) a. George has plans to leave.
b. George has plans to leave.
c. George has plans to leave.

In each of the examples in (38) the focused word becomes the head of the phonological phrase. Finally, they note that in terms of information structure is that constituents with given information reject stress (Ladd 1983, 164) as shown in the example in (48).

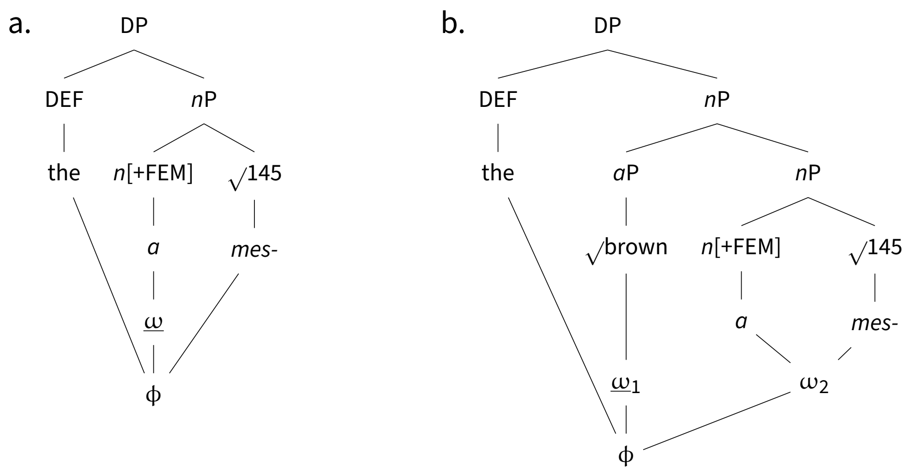
(48) a. What about Fred?
b. I don’t like Fred.

Let us consider the nature of the task in Delgado, Cabrelli, and López (2022) where participants had to read out the following types of sentences given in (49):

(49) a. the mesa
b. the brown mesa

While we cannot tell for sure from the reported data, a felicitous contrast would be between *the mesa* and *the brown mesa* when it comes to indicating which item is being referred to as they seek out the placement of the given picture on the display board with coordinates. My assumption is that *brown* would receive contrastive focus which would make it the head of the prosodic phrase. Thus, the relevant structures would be as shown in (50) where the heads of the phonological phrase are underlined.

(50)



In (50-a) the determiner is an affixal clitic adjoined to the phonological word and inheriting the language tag of the head (*mesa* in 'the mesa'). Similarly, in (50-b) where the determiner is a free clitic adjoined to the phonological phrase then it matches the phonology of the phonological word that is the head of the phonological phrase (*brown* in (contrastive-focused) 'the brown mesa'). These structures, then, account for the observed phonological facts.

However, the CBP model does not account for the codeswitching data in one particular way. The problem that the CBP encounters is related to how conflict between co-phonologies is resolved. Sande, Jenks, and Inkelas (2020) describe a monolingual situation where two co-phonologies apply in separate spell-out domains because they are separated by a phase head. They note that, "we expect both co-phonologies to apply in turn, and if in conflict, CBP predicts that the effect of the higher co-phonology will overwrite the effect of the lower during phonological evaluation of the higher phase domain." As we have seen, this does not work for the co-phonologies evident in the codeswitching of *the brown mesa*. The English *n* of *the brown* does not override the lower Spanish *n* and result in a phonologically uniform [the brown mesa]. Rather we get [$_{\text{Eng}}$ the brown] [$_{\text{Sp}}$ mesa]. How can we account for this?

I would argue that the solution is to ensure that phonological uniformity is licensed by the phonological word head which is exactly what we have seen in an example such as (50) above. When we introduce language tags into the three levels of representation of the vocabulary items, then phonological uniformity results at the phonological word level. As Blanco-Elorrieta and Caramazza (2021) have shown, we need language tags for independent reasons, this is not adding complexity to our theoretical model; no special architecture is required.

5. Conclusion

The study of the interaction of phonology and morphosyntax in codeswitching is still in its infancy. What we have seen in this paper is that the phenomenon of phonological uniformity in bilinguals is systematic and can be accounted for by the same constructs as are already posited for monolinguals; no special machinery is necessary. The devices of co-phonologies, augmented with language tags, mesh nicely with distributed morphology to produce an integrated I-grammar parsimonious account of multilingual competence and performance.

Competing interests

The author has no competing interests to declare.

References

Akinrẹmi, Ihuọma I. 2016. Phonological adaptation and morphosyntactic integration in Igbo-English insertional codeswitching. *Journal of Universal Language* 17 (1): 53–79.

Alexiadou, Artemis, and Terje Lohndal. 2018. Units of language mixing: A cross-linguistic perspective. *Frontiers in Psychology* 9. https://doi.org/3389/fpsyg.2018.01719.

Alexiadou, Artemis, Terje Lohndal, Tor A. Åfarli, and Maren Berg Grimstad. 2015. Language mixing: A Distributed Morphology approach. In *NELS 45: Proceedings of the Forty-Fifth Annual Meeting of the North East Linguistic Society: Volume 1,* edited by Thui Bui and Deniz Özyıldız, 25–38. Amherst, MA: GLSA.

Amaral, Luiz, and Tom Roeper. 2014. Multiple grammars and second language representation. *Second Language Research* 30 (1): 3–36. https://doi.org/10.1177/0267658313519017.

Archibald, John. 2019. A unified model of mono- and bilingual intelligibility: Psycholinguistics meets pedagogy. *Journal of Monolingual and Bilingual Speech* 1 (1): 8–31.

Archibald, John. 2023. Using a contrastive hierarchy to formalize structural similarity as I-proximity in L3 phonology. *Linguistic Approaches to Bilingualism* 13 (5): 614–637. https://doi.org/10.1075/lab.22051.arc.

Archibald, John, and Nicole Croteau. 2021. Acquisition of L2 Japanese WH questions: Evidence of phonological contiguity and non-shallow structures. *Second Language Research* 37 (4): 649–679. https://doi.org/10.1177/0267658319897786.

Archibald, John, and Gary Libben. 2019. Morphological theory and second language acquisition. In *The Oxford handbook of morphological theory,* edited by Francesca Masini and Jenny Audring, 522–540. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199668984.013.36.

Archibald, John., and X. X. Li. 2022. *The second language acquisition of English expletive infixing: Universals and complexity at the phonology/morphology interface in multilingual grammars.* Poster at the *Mental Lexicon Conference*. Niagara-on-the-Lake. October.

Balukas, Colleen, and Christian Koops. 2015. Spanish–English bilingual voice onset time in spontaneous code-switching. *International Journal of Bilingualism* 19:423–443. https://doi.org/10.1177/1367006913516035.

Bandi-Rao, Shoba, and Marcel den Dikken. 2014. Light switches: On V as a pivot in codeswitching, and the nature of ban on word-internal switches. In *Grammatical theory and bilingual codeswitching,* edited by Jeff MacSwan, 161–183. Cambridge, MA: MIT Press.

Beretta, Alan, Robert Fiorentino, and David Poeppel. 2005. The effect of homonymy and polysemy on lexical access: an MEG study. *Cognitive Brain Research* 24.

Blanco-Elorrieta, Esti, and Alfonso Caramazza. 2021. A common selection mechanism at each linguistic level in bilingual and monolingual language production. *Cognition* 213:104625. https://doi.org/10.1016/j.cognition.2021.104625.

Blanco-Elorrieta, Esti, Karen Emmorey, and Liina Pylkkänen. 2018. Language switching decomposed through MEG and evidence from bimodal bilinguals. *Proceedings of the National Academy of Sciences* 115 (39): 9708–9713. https://doi.org/10.1073/pnas.1809779115.

Bley-Vroman, Robert. 1990. The logical problem of foreign language learning. *Linguistic Analysis* 20 (1–2): 3–49.

Blokzijl, Jeffrey, Margaret Deuchar, and M. Carmen Parafita Couto. 2017. Determiner asymmetry in mixed nominal constructions: The role of grammatical factors in data from Miami and Nicaragua. *Languages* 2 (4): 20. https://doi.org/10.3390/languages2040020.

Büring, Daniel, and Hubert Truckenbrodt. 2021. Correspondence between XPs and phonological phrases. *Linguistic Inquiry* 52 (4): 791–811. https://doi.org/10.1162/ling_a_00391.

Burkholder, Michele. 2018. Language mixing in the nominal phrase: Implications of a Distributed Morphology perspective. *Languages* 3 (2): 10. https://doi.org/10.3390/languages3020010.

Cabrelli, Jennifer. 2023. Language attrition and L3/Ln. In *The Cambridge handbook of third language acquisition,* edited by Jennifer Cabrelli, Adel Chaouch-Orozco, Jorge González Alonso, Sergio Pereira Soares, Eloi Puig-Mayenco, and Jason Rothman, 317–353. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108957823.014.

Carroll, Susanne. 2001. *Input and evidence: The raw material of second language acquisition.* Amsterdam: John Benjamins.

Chang, Charles. 2019a. Language change and linguistic inquiry in a world of multicompetence: Sustained phonetic drift and its implications for behavioral linguistic research. *Journal of Phonetics* 74:96–113. https://doi.org/10.1016/j.wocn.2019.03.001.

Chang, Charles. 2019b. Phonetic drift. In *The Oxford handbook of language attrition,* edited by Monika Schmid and Barbara Köpke, 191–203. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198793595.013.16.

Chapin, K. B. 2018. Phonological remapping in native English speakers. Master's thesis, Universitat Pompeu Fabra.

Chomsky, Noam. 1995. *The Minimalist Program.* Cambridge, MA: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: The framework. In *Step by step: Essays on Minimalist syntax in honor of Howard Lasnik,* edited by Roger Martin, David Michaels, and Juan Uriagereka, 89–155. Cambridge, MA: MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A life in language,* edited by Michael Kenstowicz, 1–52. Cambridge, MA: MIT Press.

Chomsky, Noam, and Morris Halle. 1968. *The sound pattern of English.* New York: Harper & Row.

Collins, Chris, and Edward Stabler. 2016. A formalization of Minimalist syntax. *Syntax* 19 (1): 43–78. https://doi.org/10.1111/synt.12117.

de Leeuw, Esther. 2019. Phonetic attrition. In *The Oxford handbook of language attrition,* edited by Monika Schmid and Barbara Köpke, 204–217. Oxford: Oxford University Press.

de Leeuw, Esther, Aurela Tusha, and Monika S. Schmid. 2018. Individual phonological attrition in Albanian–English late bilinguals. *Bilingualism: Language and Cognition* 21 (2): 278–295. https://doi.org/10.1017/S1366728917000025.

Delgado, Rodrigo, Jennifer Cabrelli, and Luis López. 2022. *Code-switching in the phonological word.* Paper presented at the UIC Bilingualism Forum. October.

Deuchar, Margaret, Peredur Davies, Jon Herring, M. Carmen Parafita Couto, and Carter Diana. 2014. Building bilingual corpora. In *Advances in the study of bilingualism,* edited by Enlli Môn Thomas and Ineke Mennen, 93–110. Bristol: Multilingual Matters. https://doi.org/10.21832/9781783091713-008.

Deuchar, Margaret, Maria del Carmen Parafita Couto, Peredur Davies, Kevin Donnelly, Fraibet Aveledo, Diana Carter, Marika Fusser, et al. 2009-11. *Bangortalk corpora.* https://bangortalk.org.uk.

Di Sciullo, Anne-Marie, Pieter Muysken, and Raj Singh. 1986. Government and code-switching. *Journal of Linguistics* 22 (1): 1–24.

Dijkstra, Ton, Jonathan Grainger, and Walter J.B. van Heuven. 1999. Recognition of cognates and interlingual homographs: The neglected role of phonology. *Journal of Memory and Lanugage* 41 (4): 496–518.

Dmitrieva, Olga, Allard Jongman, and Joan Sereno. 2010. Phonological neutralization by native and non-native speakers: The case of Russian final devoicing. *Journal of Phonetics* 38 (3): 483–492.

Dobler, Eva, Heather Newell, Glyne L. Piggott, Tobin Skinner, Mina Sugimura, and Lisa de Mena Travis. n.d. *Narrow syntactic movement after spell-out.* Unpublished manuscript, McGill University.

Doctor, Estelle Ann, and Denise Klein. 1992. Phonological processing in bilingual word recognition. In *Cognitive processing in bilinguals,* edited by Richard Jackson Harris, 237–252. Amsterdam: North Holland.

Dresher, B. Elan. 2009. *The contrastive hierarchy in phonology.* Cambridge: Cambridge University Press.

Duyck, Wouter, Eva Van Assche, Denis Drieghe, and Robert J. Hartsuiker. 2007. Visual word recognition by bilinguals in a sentence context: Evidence for nonselective lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 33 (4): 663–679. https://doi.org/10.1037/0278-7393.33.4.663.

Embick, David. 2010. *Localism versus globalism in morphology and phonology.* Cambridge, MA: MIT Press.

Fodor, Jerry A. 1983. *RePresentations: Philosophical essays on the foundations of cognitive science.* Cambridge, MA: MIT Press.

Ganong, William F. 1980. Phonetic categorization in auditory word perception. *Journal of Experimental Psychology* 6 (1): 110–125. https://doi.org/10.1037/0096-1523.6.1.110.

Giegerich, Heinz. 2005. *Lexical strata in English: Morphological causes, phonological effects.* Cambridge: Cambridge University Press.

Goad, Heather, and Lydia White. 2006. Ultimate attainment in interlanguage grammars: A prosodic approach. *Second Language Research* 22 (3): 243–268.

Goldrick, Matthew, Michael Putnam, and Lara Schwarz. 2016. Coactivation in bilingual grammars: A computational account of code mixing. *Bilingualism: Language and Cognition* 19 (5): 857–876. https://doi.org/10.1017/S1366728915000802.

González-Vilbazo, Kay. 2005. Die Syntax des Code-Switching. Esplugisch: Sprachwechsel an der Deutschen Schule Barcelona. PhD diss., Universität zu Köln.

González-Vilbazo, Kay, and Luis López. 2011. Some properties of light verbs in code-switching. *Lingua* 121 (5): 832–850. https://doi.org/10.1016/j.lingua.2010.11.011.

Gosselin, Leah. 2022. Bilinguals have a single computational system but two compartmentalized phonological grammars: Evidence from code-switching. *Glossa: a journal of general linguistics* 6 (1): 147. https://doi.org/10.16995/glossa.5800.

Green, David W. 2018. Language control and code-switching. *Languages* 3 (2): 8. https://doi.org/10.3390/languages3020008.

Green, David W., and Jubin Abutalebi. 2013. Language control in bilinguals: The adaptive control hypothesis. *Journal of Cognitive Psychology* 25 (5): 515–530. https://doi.org/10.1080/20445911.2013.796377.

Green, David W., and Wei Li. 2016. Code-switching and language control. *Bilingualism: Language and Cognition* 19 (5): 883–884. https://doi.org/10.1017/S1366728916000018.

Groot, Annette de, and Gerard Nas. 1991. Lexical representation of cognates and noncognates in compound bilinguals. *Journal of Memory and Language* 30 (1): 90–123. https://doi.org/10.1016/0749-596X(91)90012-9.

Grosjean, Francois. 2001. The bilingual's language modes. In *One mind, two languages: Bilingual language processing,* edited by Janet Nicol, 1–22. Oxford: Wiley-Blackwell.

Gullberg, Marianne, Peter Indefrey, and Pieter Muysken. 2009. Research techniques for the study of code- switching. In *The Cambridge handbook of linguistic code-switching,* edited by Barbara E. Bullock and Almeida Jacqueline Toribio, 21–39. Cambridge: Cambridge University Press.

Gwilliams, Laura, David Poeppel, Alec Marantz, and Tal Linzen. 2018. Phonological (un)certainty weights lexical activation. In *Proceedings of the 8th workshop on cognitive modeling and computational linguistics (CMCL 2018),* edited by Asad Sayeed, Cassandra Jacobs, Tal Linzen, and Marten van Schijndel, 29–34. Salt Lake City, Utah: Association for Computational Linguistics. https://doi.org/10.18653/v1/W18-0104.

Haigh, Connie A., and Debra Jared. 2007. The activation of phonological representations by bilinguals while reading silently: Evidence from interlingual homophones. *Journal of Experimental Psychology. Learning, Memory, and Cognition* 33 (4): 623–644.

Halle, Morris, and Alec Marantz. 1994. Some key features of Distributed Morphology. *MIT working papers in linguistics* 21:275–288.

Harris, James W. 1989. The stress erasure convention and cliticization in Spanish. *Linguistic Inquiry* 20 (3): 339–363.

Haugen, Jason. 2008. *Morphology at the interfaces: Reduplication and noun incorporation in uto-aztecan.* Amsterdam: John Benjamins.

Haugen, Jason, and Daniel Siddiqi. 2013. Roots and the derivation. *Linguistic Inquiry* 44 (3): 493–517. https://doi.org/10.1162/LING_a_00136.

Henriksen, Nicholas, Andries W. Coetzee, Lorenzo García-Amaya, and Micha Fischer. 2021. Exploring language dominance through code-switching: Intervocalic voiced stop lenition in Afrikaans–Spanish bilinguals. *Phonetica* 78 (3): 201–240. https://doi.org/10.1515/phon-2021-2005.

Herd, Jonathon. 2005. Loanword adaptation and the evaluation of similarity. *Toronto Working Papers in Linguistics* 24:65–116. https://twpl.library.utoronto.ca/index.php/twpl/article/view/6195.

Hlavač, Jim. 1999. Phonological integration of english transfers in Croatian: Evidence from the Croatian speech of second-generation Croatian-Australians. *Filogija* (32): 39–74.

Inkelas, Sharon, and Cheryl Zoll. 2007. Is grammar dependence real? A comparison between cophonological and indexed constraint approaches to morphologically conditioned phonology. *Linguistics* 45 (1): 133–171.

Itô, Junko, and Armin Mester. 2017. The phonological lexicon. In *The handbook of Japanese linguistics,* edited by Natsuko Tsujimura, 62–100. Oxford: Wiley. https://doi.org/10.1002/9781405166225.ch3.

Jackendoff, Ray. 1990. *Consiousness and the computational mind.* Cambridge, MA: MIT Press.

Jake, Janice L., Carol Myers-Scotton, and Steven Gross. 2002. Making a Minimalist approach to codeswitching work: Adding the matrix language. *Bilingualism: Language and Cognition* 5 (1): 69–91.

Koskinen, Arja. 2010. Kriol in Caribbean Nicaragua schools. In *Creoles in education: An appraisal of current programs and projects,* edited by Migge Bettina, Isabelle Leglise, and Angela Bartens, 133–166. Amsterdam: John Benjamins.

Ladd, D. Robert. 1983. Even, focus, and normal stress. *Journal of Semantics* 2 (2): 157–170. https://doi.org/10.1093/semant/2.2.157.

Lagrou, Evelyne, Robert J. Hartsuiker, and Wouter Duyck. 2011. Knowledge of a second language influences auditory word recognition in the native language. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 37 (4): 952–965. https://doi.org/10.1037/a0023217.

Lemhöfer, Kristen, Ton Dijkstra, and Marije Michel. 2004. Three languages, one ECHO: Cognate effects in trilingual word recognition. *Language and Cognitive Processes* 19 (5): 585–611. https://doi.org/10.1080/01690960444000007.

Libben, Gary. 2022. From lexicon to flexicon: The principles of morphological transcendence and lexical superstates in the characterization of words in the mind. *Frontiers in Artificial Intelligence* 4. https://doi.org/10.3389/frai.2021.788430.

Libben, Maya. 2017. Non-selective language activation and bilingualism as the default mental lexicon. In *Bilingualism: A framework for understanding the mental lexicon,* edited by Maya Libben, Mira Goral, and Gary Libben, 103–122. Amsterdam: John Benjamins. https://doi.org/10.1075/bpa.6.05lib.

Lightfoot, David W. 2020. *Born to parse: How children select their languages.* Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/12799.001.0001.

Lipski, John. 1985. *Linguistic aspects of Spanish-English language switching.* Tempe, AZ: Center for Latin American Studies, Arizona State University.

Londahl, Terje, and Michael T. Putnam. 2024. The importance of features and exponents: Dissolving feature reassembly. *Linguistic Approaches to Bilingualism* 14 (1): 1–36. https://doi.org/10.1075/lab.23023.loh.

Londahl, Terje, Jason Rothman, Tanja Kupisch, and Marit Westergaard. 2019. Heritage language acquisition: What it reveals and why it is important for formal linguistic theories. *Language and Linguistics Compass* 13 (12): e12357. https://doi.org/10.1111/lnc3.12357.

López, Luis. 2020. *Bilingual grammar: Toward an integrated model.* Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108756181.

López, Luis. 2023. The ideal speaker-hearer might be bilingual. In *From formal linguistic theory to the art of historical editions: The multifaceted dimensions of Romance linguistics,* edited by Natascha Pomino, Eva-Maria Remberger, and Julia Zwink, 333–346. Vienna: Vienna University Press. https://doi.org/10.14220/9783737015530.333.

López, Luis. Forthcoming. Distributed Morphology and bilingualism: Code-switching and mixed languages. In *The Cambridge handbook of Distributed Morphology,* edited by Artemis Alexiadou, Ruth Kramer, Alec Marantz, and Isabel Oltra-Masuet. Cambridge: Cambridge University Press.

López, Luis, Artemis Alexiadou, and Tonjes Veenstra. 2017. Code-switching by phase. *Languages* 2 (3): 9. https://doi.org/10.3390/languages2030009.

MacSwan, Jeff. 1999. *A Minimalist approach to intrasentential code switching.* New York: Garland Press.

MacSwan, Jeff. 2000. The architecture of the bilingual language faculty evidence from intrasentential code switching. *Bilingualism: Language and Cognition* 3 (1): 37–54. https://doi.org/10.1017/S1366728900000122.

MacSwan, Jeff. 2005. Codeswitching and generative grammar: A critique of the MLF model and some remarks on "Modified Minimalism". *Bilingualism: Language and Cognition* 8 (1): 1–22.

MacSwan, Jeff. 2017. A multilingual perspective on translanguaging. *American Educational Research Journal* 54 (1): 167–201. https://doi.org/10.3102/0002831216683935.

MacSwan, Jeff, and Sonia Colina. 2014. Some consequences of language design: Codeswitching and the PF interface. In *Grammatical theory and bilingual codeswitching,* 185–210. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/8338.003.0011.

Mahootian, Shahrzad. 1993. A null theory of code switching. PhD diss., Northwestern University.

Marantz, Alec. 2001. *Words.* Paper presented at the West Coast Conference on Formal Linguistics 20. Los Angeles, CA.

McGinnis, Martha. 2016. Distributed Morphology. In *The Cambridge handbook of morphology,* edited by Andrew Hippisley and Gregory Stump, 390–423. Cambridge: Cambridge University Press.

Miller, Taylor L. 2020. Navigating the phonology-syntax interface and Tri-P mapping. In *Proceedings of AMP 2019.* https://doi.org/10.3765/amp.v8i0.4718.

Moro Quintanilla, Monica. 2014. The semantic interpretation and syntactic distribution of determiner phrases in Spanish English codeswitching. In *Grammatical theory and bilingual codeswitching,* 213–226. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/8338.003.0013.

Mulik, Stanislav, and Haydée Carraso-Ortiz. 2023. Different effects of L1 and L2 phonology on L3 lexical learning: An ERP study. *Second Language Research* 39 (2): 493–518. https://doi.org/10.1177/02676583211054448.

Myers-Scotton, Carol. 2002. *Contact linguistics: Bilingual encounters and grammatical outcomes.* Oxford: Oxford University Press.

Myers-Scotton, Carol, and Janice L. Jake. 2009. A universal model of codeswitching and bilingual language processing and production. In *The Cambridge handbook of linguistic code-switching,* edited by Barbara E. Bullock and Almeida Jacqueline Toribio, 336–357. Cambridge: Cambridge University Press.

Nakayama, Mariko, and John Archibald. 2005. *Eyetracking and interlingual homographs: Evidence for non-selective access to the bilingual lexicon.* Poster at the *Canadian Linguistic Association Annual Conference*. London, Ontario. June.

Nakayama, Mariko, Christopher Sears, Yasushi Hino, and Stephen Lupker. 2013. Masked translation priming with Japanese-English bilinguals: Interactions between cognate status, target frequency and L2 proficiency. *Journal of Cognitive Psychology* 25 (8): 949–981. https://doi.org/10.1080/20445911.2013.839560.

Nakayama, Mariko, Rinus Verdonschot, Christopher Sears, and Stephen Lupker. 2014. The masked cognate translation priming effect for different-script bilinguals is modulated by the phonological similarity of cognate words: Further support for the phonological account. *Journal of Cognitive Psychology* 26 (7): 714–724. https://doi.org/10.1080/20445911.2014.953167.

Natvig, David, and Joseph Salmons. 2021. Connecting structure and variation in sound change. *Cadernos de Linguística* 2 (1): 1–20. https://doi.org/10.25189/2675-4916.2021.v2.n1.id314.

Nespor, Marina, and Irene Vogel. 1986. *Prosodic phonology.* Dordrecht: Foris.

Nespor, Marina, and Irene Vogel. 2007. *Prosodic phonology: With a new forward.* Berlin: Mouton de Gruyter.

Newell, Heather. 2017. Nested phase interpretation and the PIC. In *The structure of words at the interfaces,* edited by Heather Newell, Máire Noonan, Glyne Piggott, and Lisa deMena Travis, 20–40. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198778264.003.0002.

Newell, Heather, and Glyne Piggott. 2014. Interactions at the syntax–phonology interface: Evidence from Ojibwe. *Lingua* 150:332–362. https://doi.org/10.1016/j.lingua.2014.07.020.

Newell, Heather, and Shanti Ulfsbjorninn. 2023. *A specific fucking pattern: The precise nature of stress-pivot infixation.* North American Phonology Conference. Montreal. May.

Olson, Daniel J. 2019. Phonological processes across word and language boundaries: Evidence from code-switching. *Journal of Phonetics* 77 (100937). https://doi.org/10.1016/j.wocn.2019.100937.

Özçelik, Öner. 2017. The foot is not an obligatory constituent of the prosodic hierarchy: Stress in Turkish, French and child English. *The Linguistic Review* 34:1–57. https://doi.org/10.1515/tlr-2016-0008.

Paradis, Johanne, Elena Nicoladis, and Fred Genesee. 2000. Early emergence of structureal constraints on code-mixing: Evidence from French-English bilingual children. *Bilingualism: Language and Cognition* 3 (3): 245–261. https://doi.org/10.1017/S1366728900000365.

Parafita Couto, Maria Carmen, and Marianne Gullberg. 2019. Codeswitching within the noun phrase: Evidence from three corpora. *International Journal of Bilingualism* 23 (2): 695–714. https://doi.org/10.1177/1367006917729543.

Parafita Couto, Maria Carmen, Charlotte Pouw, Rodi Laanen, and Luis López. 2024. The role of INFL in code-switching: A study of a Papiamento heritage community in the Netherlands. *Frontiers in Language Sciences* 2:1288198. https://doi.org/10.3389/flang.2023.1288198.

Parafita Couto, Maria Carmen, and Hans Stadthagen-Gonzalez. 2017. El book or the libro? Insights from acceptability judgments into determiner/noun code-switches. *International Journal of Bilingualism* 23 (1): 349–360. https://doi.org/10.1177/1367006917728392.

Parafita Couto, Maria del Carmen, Kate Bellamy, and Felix K. Ameka. 2023. Theoretical linguistic approaches to multilingual code-switching. In *Cambridge handbook of third language acquisition,* edited by Jennifer Cabrelli, Adel Chaouch-Orozco, Jorge González Alonso, Sergio Miguel Pereira Soares, Eloi Pug Mayenco, and Jason Rothman, 403–436. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108957823.017.

Pexman, Penny M., Stephen J. Lupker, and Debra Jared. 2001. Homophone effects in lexical decision. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 27:139–156.

Pfaff, Carol. 1979. Constraints on language mixing: Intrasentential code-switching and borrowing in Spanish/English. *Language* 55 (2): 291–318. https://doi.org/10.2307/412586.

Poplack, Shana. 1980. Sometimes i'll start a sentence in Spanish y termino en español: Toward a typology of codeswitching. *Linguistics* 18 (7–8): 581–618. https://doi.org/10.1515/ling.1980.18.7-8.581.

Pylkkännen, Liina, Rodolfo Llinás, and Gregory Murphy. 2006. The representation of polysemy: MEG evidence. *Journal of Cognitive Neuroscience* 18 (1): 97–109.

Reinisch, Eva, and Andrea Weber. 2012. Adapting to suprasegmental lexical stress errors in foreign accented speech. *Journal of the Acoustical Society of America* 132 (2): 1165–1176. https://doi.org/10.1121/1.4730884.

Sande, Hannah, and Peter Jenks. 2018. Cophonologies by phase. In *North East Linguistic Society (NELS) 48,* edited by Sherry Hucklebridge and Max Nelson, 2:39–52. Amherst, MA: GLSA.

Sande, Hannah, Peter Jenks, and Sharon Inkelas. 2020. Cophonologies by ph(r)ase. *Natural Language and Linguistic Theory* 38:1211–1261. https://doi.org/10.1007/s11049-020-09467-x.

Sankoff, David, and Shana Poplack. 1981. A formal grammar for code-switching. *Papers in Linguistics* 14:3–45.

Santorini, Beatrice, and Shahrzad Mahootian. 1995. Codeswitching and the syntactic status of adnominal adjectives. *Lingua* 96 (1): 1–27. https://doi.org/10.1016/0024-3841(94)00026-I.

Scheer, Tobias. 2011. *A guide to morphosyntax-phonology interface theories: How extra-phonological information is treated in phonology since Trubetzkoy's Grenzsignale.* Berlin: Mouton de Gruyter.

Scheer, Tobias. 2012. *Direct interface and one-channel translation.* Berlin: Mouton de Gruyter. https://doi.org/10.1515/9781614511113.

Schulpen, Béryl, Ton Dijkstra, Herbert Schriefers, and Mark Hasper. 2003. Recognition of interlingual homophones in bilingual auditory word recognition. *Journal of Experimental Psychology: Human Perception and Performance* 29 (6): 1155–1178.

Selkirk, Elisabeth. 1984. *Phonology and syntax: The relationship between sound and structure.* Cambridge, MA: MIT Press.

Selkirk, Elisabeth. 2011. The syntax-phonology interface. In *The handbook of phonological theory,* 2nd edition, edited by John Goldsmith, Jason Riggle, and Alan C. L. Yu. New York: Blackwell. https://doi.org/10.1002/9781444343069.ch14.

Sharwood Smith, Michael, and John Truscott. 2014. *The multilingual mind: A modular processing perspective.* Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139644044.

Smith, Jennifer L. 2011. Category-specific effects. In *The Blackwell companion to phonology,* vol. 4, edited by Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume, and Keren Rice, 2439–2463. Malden, MA: Wiley-Blackwell. https://doi.org/10.1002/9781444335262.wbctp0102.

Stefanich, Sara. 2019. A morphophonological account of Spanish/English word-internal codeswitching. PhD diss., University of Illinois Chicago.

Stefanich, Sara, Jennifer Cabrelli, Dustin Hilderman, and John Archibald. 2019. The morphophonology of intraword codeswitching: Representation and processing. *Frontiers in Communication* 4 (54). https://doi.org/10.3389/fcomm.2019.00054.

Stefanich, Sara, and Jennifer Cabrelli Amaro. 2018. Phonological factors of Spanish/English word-internal code-switching. In *Code-switching: Theoretical questions, experimental answers,* edited by Luis López, 195–222. Amsterdam: John Benjamins. https://doi.org/10.1075/ihll.19.08ste.

Trommer, Jochen. 2015. Moraic affixes and morphological colors in Dinka. *Linguistic Inquiry* 46 (1): 77–112. https://doi.org/10.1162/LING_a_00176.

Truscott, John, and Michael Sharwood Smith. 2016. Representation, processing and code-switching. *Bilingualism: Language and Cognition* 20 (5): 903–916. https://doi.org/10.1017/S1366728916000742.

van Oostendorp, Marc. 2008. Incomplete devoicing in formal phonology. *Lingua* 118 (9): 1362–1374. https://doi.org/10.1016/j.lingua.2007.09.009.

Voga, Madeleine, and Jonathan Grainger. 2007. Cognate status, and cross-script translation priming. *Memory and Cognition* 35 (5): 938–952.

Vogel, Irene. 2019. Life after the Strict Layer Hypothesis. In *Prosodic studies: Challenges and prospects,* edited by Hongming Zhang and Youyong Qian, 10–60. London: Routledge.

Westergaard, Marit. 2021. Microvariation in multilingual situations: The importance of property-by-property acquisition. *Second Language Research* 37 (3): 397–407. https://doi.org/10.1177/0267658319884116.

Woolford, Ellen. 1983. Bilingual code-switching and syntactic theory. *Linguistic Inquiry* 14 (5): 520–536.

Yang, Charles. 2002. *Knowledge and learning in natural language.* Oxford: Oxford University Press.

Yang, Charles. 2005. On productivity. *Linguistic Variation Yearbook* 5 (1): 333–370.

Yu, Alan. 2007. *A natural history of infixation.* Oxford: Oxford University Press.

Zimmermann, Eva. 2017. *Morphological length and prosodically defective morphemes.* Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198747321.001.0001.