# DERIVING LEVEL 1/LEVEL 2 AFFIX CLASSES IN ENGLISH: FLOATING VOWELS, CYCLIC SYNTAX*

Heather Newell
Université du Québec à Montréal
newell.heather@uqam.ca

Abstract

This article is to accounts for the traditionally-labeled Level 1/Level 2 affix distinction in English by combining the predictions of floating segmental structure (e.g. Rubach 1996) and cyclic spell-out by phase (Chomsky 1999, Marantz 2007) to offer insight not only into the different phonological patterns these affixes trigger, but importantly, to explain when the same affix will trigger distinct phonological patterns (when an affix behaves sometimes as Level 1 and sometimes as Level 2). It is argued that Level 1 affixes are distinguished by an initial floating vowel in their underlying representations, and that if we combine this with the proposal that affixes that merge directly to roots are interpreted in the same phonological cycle as these roots then we can remove he reference to diacritic notions such as Level 1 and Level 2 from the grammar. This then allows for a fully modular account of English affix classes, where the phonological derivation refers solely to phonological representations.

Key words:    Level 1/Level 2 affixes, CVCV Phonology, Floating segments, Liaison,
              Distributed Morphology, Stress, Phases, Modularity.

## 0. Introduction

The traditional literature on English morphophonology highlights a phonological distinction between two classes of affixes; Level 1/Stem affixes are included in the phonological domain of the base to which they attach and, for example, affect the position of stress relative to an unaffixed base (1). Level 2/Word affixes, which are external to the phonological domain to which they attach, do not induce the effects seen in derivations with Level 1 affixation (2).[1]

(1)    a.    párent        b.    paréntal      (presence of stress shift)

(2)    a.    párent        b.    párenthood    (absence of stress shift)

---

*     I would like to thank the audiences at MOLT and the MfM, the anonymous reviewers that have read this paper, and, in particular, Tobias Scheer, Ricardo Bermúdez-Otero, Renate Raffelsiefen, and Péter Szigetvári for all of their helpful questions, comments, discussions, and suggestions.

[1]     The existence of Level 1 and 2 affixes in languages other than English will not be treated herein but of course are important for the generalizability of the analysis.

As the Level 1 vs Level 2 pattern is extremely well known, a note on the traditional and current analyses of the facts is pertinent here before entering into the details of the present proposal. We should keep in mind, however, that the large amount of ink already spilled on this subject precludes a full discussion of the topic here.

Since *The Sound Pattern of English* (SPE) (Chomsky & Halle 1968), generative grammarians have taken two types of approaches to the distinction between Level 1 and Level 2 affixes. The first has been to posit a *lexical* distinction between *classes* of morphemes. By lexical we mean that the class-membership of a given affix is a feature that not only must be memorized but also necessitates a *morphological* diacritic; a feature that cannot be linked to the semantic or phonological properties of any particular affix. By *class* we mean that groups of affixes behave cohesively. Another example of this type of lexical class membership is the division of nouns into groups based on morphological gender (as in the French *table (feminine)* 'table', *livre (masculine)* 'book'). Frameworks promoting this type of analysis for Level 1 and Level 2 affixes include SPE (Chomsky & Halle 1968) and Lexical Phonology and Morphology (LP) (Siegel 1974; Mohanan 1982; Kiparsky 1982), and other frameworks wherein affixes are marked either with certain class memberships or as triggers of particular phonological operations, such as Halle & Vergnaud (1987). Giegerich (1994, 1999) and work within Stratal Optimality Theory (SOT) (Kiparsky 2000; Bermúdez-Otero & Luis 2009; Bermúdez-Otero 2012, 2013, 2015, in prep) have noted that affix classes are unable to explain the rampant cross-classification of affixes as Level 1 and Level 2, and opt instead for a base-driven view of phonological Levels (see references in these works for detailed criticism of affix-based stratification). For the purposes of the discussion of stress below, however, the latter make the same predictions as do SPE and LP, as they presume one class of phonological rules applying at the Stem Level, and another at the Word Level. Notably, this diacritic distinction among affix classes or bases of affixation is necessary iff (i) there are, in fact, two coherent classes of affixes/strata of affixation in English, and (ii) there exists no other relevant non-diacritic distinction between the two groups of affixes/strata of affixation.

The second, and competing, approach to the morphological class division outlined above takes the stance that (i) is false. This approach will be referred to herein as the Co-Phonology framework (CP). This term is meant to subsume both works that promote co-phonologies or constraint indexation for particular affixes, and those that posit affix-specific constraints within a single ranking (to a particular form, or to paradigmatically related forms). This type of proposal is generally couched within the framework of Optimality Theory (Benua 1995; Orgun 1996; Inkelas 1998; Raffelsiefen 1999, 2015; Plag 1999; Steriade 2000; Pater 2000, among others). Some proponents of CP claim that there are not, in fact, two coherent classes of affixes, or bases, in English. It is rather held in such CP analyses that each affix must be associated with its own particular (morpho)phonological grammar, either entire (affix-specific co-phonologies), or partial (affix-specific constraints). The main motivation for CP is to capture, in the phonology, the fact that particular affixes are subject to unique output restrictions (for example: nominal *–al* only attaches to iambic bases like *survíval, withdráwal* (Aronoff 1976; Raffelsiefen 1999: 227)). Note that CP accounts are still *morphological*, in that morphological diacritics are necessary to account for the patterns, but these diacritics do not necessarily apply to *classes*. CP accounts have been criticized in Bermúdez-Otero (2012), where it is argued that affix-specific co-phonologies and constraints do not account satisfactorily for the patterns we see in the data. I concur with his arguments. CP phonological analyses will therefore not play into the main discussion of the current analysis, but, a more detailed discussion of the CP alternative can be found in §3.5.

I will argue here that no reference to specific morphological diacritics or strata is necessary to account for the English pattern of Level 1 and Level 2 affixes when it comes specifically to their effects on the syllabification and stress of their bases. I reject that the Level 1/Level 2 distinction is *morphological,* where *morphological* refers to a purely morphological diacritic or stratum, and consequently also reject the traditional morphological *class* analysis. It is important to note that I agree with the proponents of the CP literature that specific affixes must be linked to specific restrictions on affixation, which may be phonologically, morphologically, or lexically conditioned. The important distinction here is that the affix-specific restrictions proposed by these theories, being by definition ungeneralizable, are considered here to arise via allomorphy at Vocabulary Insertion (Halle & Marantz 1994) and are therefore assumed here to be distinct phenomena from the ability of an affix to affect the position of stress on its base. It is of note that if the CP patterns in the incredibly detailed accounts of English morphology in (e.g.) Raffelsiefen (1999, 2015) and Plag (1999) are considered to be morphological rather than phonological, they can be considered to be in accord with any modular realizational theory, such as Distributed Morphology or Nanosyntax, where allomorph selection is separate from and prior to phonological computation. Such pre-phonological allomorphy is not discussed herein. For more on the longstanding debate in the morphological literature over which surface alternations must be lexical (allomorphic) and which may be derived by phonological computation see, for example, Embick (2010), Haugen & Siddiqi (2013, 2016), Scheer (2016), Gribanova & Harizanov (2018), Faust, Lampitelli, & Ulfsbjorninn (2018).

To distinguish the present account from those which posit morphological distinctions between phonological classes or strata, I will not use the terms Level 1 and Level 2 below, but will use the more neutral terms (introduced in Dixon 1977 and used in Raffelsiefen 1999, 2015) *cohering* and *non-cohering*. The former entails that an affix is inside the syllabification and stress domain of the base to which it attaches, and the latter entails the opposite. Note that the classification of affixes as cohering in this paper differs from that of Raffelsiefen in that not all vowel-initial affixes are treated as cohering, as will be detailed below.

I offer a re-analysis of the phenomena in (1-2) that captures a pattern in the data that has not been dealt with previously and accounts specifically for the phonological behaviour of cohering (©) affixes that are attached outside of non-cohering affixes (N-©), as in *govern-ment*<sub>N-©</sub>-*al*<sub>©</sub>. As noted above, many (if not most) of the affixes in English may behave variably as cohering or non-cohering. The variable behaviour of these dual-level affixes is constrained in the following ways:

(3)   The Level 1/Level 2 pattern
    (i)   Affixes may have cohering, non-cohering, or variable phonological behaviour.
    (ii)   All affixes behave as cohering when affixed directly to an uncategorized root.
    (iii)   When an affix attaches to an already-categorized (complex) stem, it will display invariable morphophonological behaviour: it will always behave either as a cohering or as a non-cohering affix.

Put differently, affixes in English display only 2 patterns. Either an affix displays uniformly cohering behaviour, or an affix displays cohering behaviour when affixed to a root and non-cohering behaviour elsewhere.[2]

Any full analysis of the morphophonology of English affixation must account for (3). The pattern in (3i) has been proposed, as discussed above, to be due to the cross-affiliation of affixes and/or affixation of the same form at different strata. The pattern in (3ii) has been proposed to be due to the cyclic phonological interpretation of morpho-syntactic structure; all root-adjoined affixes are interpreted in the same phonological domain as the root; in this environment their class affiliation is overridden (see §1.2). As for (3iii), however, if grammars may assign affixes to lexical classes (or multiple individual phonologies) arbitrarily (from a synchronic point of view), then it is mysterious that no affix which displays variable (cohering and non-cohering) behaviour ever displays cohering behaviour outside the domain of the first phonological cycle. It is this pattern specifically that will be accounted for herein.

It will be argued in the sections below that class affiliation/co-phonologies/phonological strata cannot account for the pattern in (3iii). The solution to this problem will be couched within the theory of Autosegmental Phonology, and can be seen therefore as similar to the research projects in Scheer (2016), Faust, Lampitelli, & Ulfsbjorninn (2018), and Faust & Ulfsbjorninn (2018), where the underlying phonological form of morphemes is argued to better solve problems previously attributed to other, morphological, sources. Specifically, following Rubach (1996), the distinctions between the traditional Level 1/Level 2 affix classes in English will be shown to follow from the underlying phonological representations of each particular affix. It is proposed here that affixes that uniformly display cohering behaviour all contain an initial vocalic floating segment (4a). Conversely, the initial segments of non-cohering affixes (vocalic or consonantal) are underlyingly attached to skeletal positions on the CV tier (4bi, 4bii). This analysis is framed within the CVCV theory of syllabic structure where sequences on the timing tier are restricted to CV (Lowenstamm 1996; Scheer 2004; Scheer & Szigetvári 2005; Ségéral & Scheer 2008).

---

[2]     Both reviewers note that stress may shift upon affixation of *–able* to a complex base if that word is long (see also Bauer et al. 2013). This is of note as *–able* does not behave as stress-shifting outside of any 'normal' Level 1 affix: *sígn-al-able, impréss-ion-able, part-ítion-able, prodúct-ion-able or excépt-ion-able*. Where *–able* is affixed outside of a 'Level 1 affix' and does appear to shift stress is when it follows 'stress retractors' such as *–ize*: *compartméntal → compartméntalìze → compartmèntalízable*. But, the even more interesting thing here is that there is clearly secondary stress on *–ize* in *compartméntalìze*, before affixation of *-able*. Therefore, *-able* is not adding foot structure (or re-footing) *compartméntalìze*, as 'Level 1' affixes are proposed to do in this paper. It is unclear if this pattern is specific to *-able* or if it has been noticed due to its productive attachment outside certain retracting affixes (*-ary, -ate, -ize, -ify(k)*). Other non-cohering affixes in the same environments (such as *–ment* in *compartmentalízement,* or *–ness* in *halucinatóryness*), also cancel out stress retraction (by my native assessment and a pilot study of 5 other (non-linguist) native English speakers given these words in carrier sentences). This phenomenon will be left for future work as it is clearly a different sort of effect than 'Level 1' stress-shifting, to be discussed herein.

(4)  a.  -  ⬚  C  V        '-al' (parent**al**)
                  |
              ə   l

     bi.  -  C  V  C  V     '-er' (teach**er**)
                |    |
                ə    ɹ

     bii. -  C  V           '-ly' (ful**ly**)
             |  |
             l  i


The representations in (4) offer a particularly advantageous account of the relevant phonological distinctions in derivations like (1) and (2). First, the pattern in (3), and (3iii) in particular, is easily accounted for by appealing to the representations in (4). Affixes that begin with a floating vowel are predicted to emerge as cohering in any position in a word, as this vowel will link to an open position on the timing tier of its base of attachment. Affixes that do not begin with a floating segment (non-cohering affixes) will only display cohering characteristics when interpreted in the same cycle as the morpheme to which they merge (see §1). Second, this account has a clear theoretical advantage over previous proposals, as it is the only account of the phonological behaviour of English affixes that is fully modular; taking seriously the non-overlap between the morphosyntactic and phonological subcomponents of the grammar (Fodor 1985). The phonological behaviour of each affix emerges without calling for any reference to its non-phonological lexical properties, or to the non-phonological characteristics of its base. The former advantage will be the focus of the discussion below. For recent discussions of the theoretical and empirical advantages of modularity that support the type of account offered here see Bermúdez-Otero (2012) and Scheer (2012, 2016).

In the sections below, I expand on the observation in the literature that the initial segment of an affix impacts its phonological behaviour. It has been noted that traditionally-labeled Level 1 affixes tend to be vowel-initial, and Level 2 affixes tend to be consonant-initial (van Oostendorp 1999; Raffelsiefen 1999, 2015). If this pattern were absolute then we could, as in the works just mentioned, attribute the cohering and non-cohering nature of these affix classes to restrictions on syllabification; V-initial affixes would be incorporated into the metrical domain (syllable, foot) of their base due to a preference for each syllable to have an onset, while C-initial affixes would not be syllabified with their base, as they do not violate some Onset constraint.[3] However, despite the pertinence of the initial segments for an account of Level 1 vs. Level 2 phonology, the status of

---

[3]     Here I am making a generalization using the terminology of Optimality Theory (OT) for ease of exposition. The pattern can be just as easily described in a rule-based phonological (RBP) system where a CV sequence must be syllabified as onset-nucleus, and this will be done in greater detail in §2.3. This paper focuses on the structures necessary to account for the morphophonological pattern found in English. All operations discussed herein are mandatorily applied, and a discussion of constraint rankings does not seem to offer further insights. However, in some relevant places in the paper I have sketched both OT and RBP analyses.

the initial segment of a suffix as consonantal or vocalic does not uniformly correlate with its status as cohering or non-cohering (4a vs. 4bi) (see also Marvin 2002). Such non-uniformity of segmental behaviour is also seen in instances of liaison. Word-final consonants in French are either (i) always pronounced ([pul] *poule* 'chicken'), or (ii) pronounced only if the following word is V-initial ([pəti] vs [pətit] *petit(e)* 'little').[4] I show below that the same type of structural account that has been given for the French liaison facts neatly accounts for the English facts; English is also a language that displays (word-internal) liaison.

The outline of this paper is as follows. §1 offers a first view of the account proposed here, using it to introduce and motivate the theoretical assumptions that will be needed throughout the paper. Underpinning the phonological computation to come, we must adopt the notions of specified underlying representations, floating segments, an autosegmental framework (here CVCV), and extrametricality. The phonological computation, in turn, rests on the timing of the interpretation of morpho-syntactic structure. The notion of cyclicity (currently couched within a theory of phases), and its relation to Vocabulary Insertion (and allomorphy/allosemy) is therefore introduced, along with a discussion of the importance of such a modular system to the analysis presented in §2. §2 gives a detailed analysis of the pertinent cohering and non-cohering data, demonstrating how the system laid out in §1 offers an explanatory account for the patterns in (3). This section also treats apparent problems for the liaison account of English morpho-phonology, namely consonant-initial cohering affixes, and vowel-final bases of attachment for cohering affixes. In §3 I discuss previous analyses, specifically those in Halle & Vergnaud (1987), Kaye (1995), Lowenstamm (2014), Bermúdez-Otero (2018b), and Raffelsiefen (1999, 2015). This section highlights the difficulties, some well-known, some new, that the frameworks used in these previous analyses have in accounting for (3). §4 concludes with a brief discussion of the theoretical implications of the liaison analysis presented in §2.

## 1.       Lexical levels: cycles, morpho-syntax, phonology, and semantics
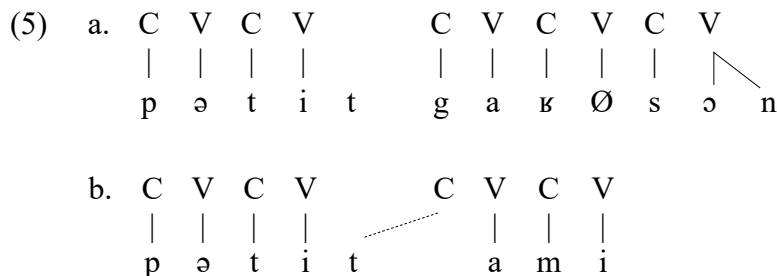
## 1.1       The Phonology : floating segments, the CVCV framework, and extrametricality

Floating segments have been argued for in countless analyses, the most well-known of which being accounts of the templatic patterns in languages such as Arabic (e.g. McCarthy 1981), as well as those accounting for liaison consonants in French (e.g. Encrevé 1988), and the behaviour of some affixes in English with regard to vowel shortening (Rubach 1996). In (5a) the final consonant of *petit* is unpronounced, as it is not associated with a position on the CV tier. In (5b), however, an onset position is available at the beginning of the following V-initial word. Within a theory where all syllables have the form CV this position comes for free, as every vocalic position on the skeletal tier is preceded by a consonantal position. The present analysis is couched within such a theory, an offshoot of the Government Phonology (GP) framework (Kaye, Lowenstamm, & Vergnaud 1985), namely CVCV (Lowenstamm 1996; Scheer 2004) where each 'syllable' on the timing tier is a CV sequence. In this framework, no morpheme begins with a V or ends with a C on the timing tier. C or V positions may be unassociated to melody (and therefore phonologically null, as in (5b)

---

before linking occurs). Conversely, a floating segment may have no link to a position on the timing (CV) tier (5a).[5]

```
(5)   a.  C  V  C  V        C  V  C  V  C  V
          |  |  |  |        |  |  |  |  |   \
          p  ə  t  i  t     g  a  ʁ  Ø  s  ɔ   n

      b.  C  V  C  V        C  V  C  V
          |  |  |  |    ....···      |  |  |
          p  ə  t  i  t           a  m  i
```

Within this type of framework, a floating vowel, just like a floating consonant, will associate with an available empty V position whenever possible, as in (6). In the case of cohering affixes, this means that these vowels will associate to the empty final nucleus of the base to which they attach. As noted above, this position will be available in every overtly consonant-final base.[6]

In the case of French liaison, linking entails association across a word boundary. In the case of English cohering affixes, linking/liaison applies within the word, whether within or across a cyclic domain (see §1.2 on cyclic domains). In both cases liaison applies whenever an open CV slot is available.

```
(6)     C  V  C  V  C  V  C  V              C  V
        |  |  |  |  |  |  |        `·.      |  |
        p  ə  ɹ  ɛ  n  Ø  t           ə  l  Ø
```

An anonymous reviewer asks how an account that proposes floating segmental structure can be distinguished from a morphological diacritic account, given that in both cases cohering and non-cohering affixes are distinguished by characteristics that are stored as part of their lexical entries. The crucial distinction here, as detailed in Scheer (2008, 2012), is that phonological analyses, such as the liaison analysis herein, appeal to a phonological structure that has predictable effects on the output of the derivation. The attachment of floating segments entails a relationship between the floating segment and the CV-tier into which it is incorporated. In a French liaison context, a floating consonant becomes the onset of the initial syllable of the following word, and must therefore meet the proper phonotactic restrictions on onsets in the language. Floating vowels in English similarly link to the nuclei of preceding syllables, and therefore are required to be parsed as part of the syllables containing the consonant to their left. The implications of this phonological integration of floating segments will be crucial to the arguments below. A morphological diacritic, on the other hand, makes no predictions regarding the phonological behaviour of the item it is associated with. There is nothing inherent in the label 'Level 1' that triggers stress-shift, just as there is nothing inherent in the SPE diacritic '+' that indicates 'Level 1' phonological behaviour.

---

[5]     Note that the reader need not have intimate knowledge of the GP or CVCV frameworks to follow the discussion herein. All crucial theoretical tools of CVCV used in the current analysis will be explained as needed. For a full account of the theory, see Scheer (2004).

[6]     See §2.1 for an argument that virtually all bases in English are consonant-final on the melodic tier.

In short, the crucial difference between a morphological diacritic and a phonological representation is that the latter makes module-internal phonological predictions; it answers the question of *why* affixes behave phonologically the way that they do, while the former is a purely descriptive device (Scheer 2008). The floating status of vowels, just like any other (auto)segmental feature of a representation, makes phonological predictions, and is therefore not diacritic. The specific prediction of the floating-vowel analysis that is the focus of this paper is the pattern in (3iii); an affix that behaves as cohering when affixed outside of another category-defining affix will always be cohering. In English, this is due to the nature of floating segmental structure. In future work this research program will expand to cover other languages, wherein I make the same prediction regardless of the exact trigger for cohering phonological behaviour in each. The predictions of a phonological analysis that accounts for the pattern in (3) cans be stated as in (7)

(7) In a liaison account of English affixation there are 3 possible types of affixes;

> A. **Affixes that merge to roots**: These affixes may or may not have an initial floating segment, but will be treated by the phonology as cohering, as all forms interior to a phonological cycle are (see §1.2 for the definition of a phonological cycle). Extrametrical elements must be final in the root+affix domain.

> - Both a root+cohering affix and a root+non-cohering affix will output a single phonological domain: [root+affix]. All affixes that merge to roots will pattern as cohering.

> B. **Affixes that merge to categorized bases**: These affixes may or may not have an initial floating segment. If they do, they will phonologically merge as part of the structure to their left (see Newell & Piggott 2014 on Phonological Merger). If they do not have an initial floating segment they will form a separately-computed phonological structure (and will be footed separately if they contain enough phonological material that is metrifiable (not extrametrical)).

> - A base+cohering affix will output a form where the affix is part of the same phonological structure as its base [base+cohering affix], while a base + non-cohering affix will output a form where the affix is not part of the same structure as its base [base] [non-cohering affix].

> C. **Affixes that may have variable bases of attachment (roots and categorized bases)**: These affixes may or may not have an initial floating segment. In the case they attach to a root they will behave as specified in (7A). In case they attach to a categorized base they will behave as in (7B).

> D. **Impossible affixes**: *Type 1*: An affix that has variable behaviour and behaves as in (7B) when attached to a root, and as (7A) when attached to a categorized base. *Type 2*: An affix that behaves as cohering when attached to some categorized bases and non-cohering when attached to other categorized bases.

Note that these impossible affixes are predicted to be possible in any account where affixes may be arbitrarily assigned to different Levels or to different Co-phonologies.[7] We will see below that they cannot arise when the distinction between cohering and non-cohering affix behaviour is due to liaison.

Final phonological items in the toolbox necessary for the following analysis are the Main Stress rule of English (Chomsky & Halle 1968, Halle 1973, Hayes 1981, Hayes 1982, Halle & Vergnaud 1987, Halle 1998 and references therein) and the notion of Extrametricality (Liberman & Prince 1977, Hayes 1982, among others). The English stress system is one wherein, at its base, trochaic feet are built right-to-left in a phonological domain (and Secondary stress feet may be built from left-to-right), and main stress is assigned to the head of the rightmost foot in the word. This pattern is affected by a system of extrametricality. It has been proposed that the final syllables of nouns and derived adjectives (8ai, 8bi) and the final consonants of verbs (8aii) and non-derived adjectives (8bii) are extrametrical, and therefore ignored for the computation of stress (e.g. Hayes 1982).

(8)    ai.    (ré)<cord> (noun)        vs.    aii.    re(cór)<d> (verb)
       bi.    pe(rú:)<sal>, (sénsu)<al>    vs.    bii.    il(líci)<t>, di(ví:)<ne>

See Scheer & Szigetvári (2005) for a discussion of how stress and extrametricality are more accurately captured within the CVCV framework than in standard metrical theories (and see Faust & Ulfsbjorninn 2018 for a proposal of how to derive extrametricality in Arabic in the CVCV framework). We will not attempt to justify any particular theory of extrametricality here, but will accept that it exists. What is important for the current analysis is that extrametrical elements are restricted to the edge of phonological domains. Extrametrical elements, and their distribution in relation to cohering and non-cohering affixes, will become important in §2.

The above phonological suppositions are all that is necessary to explain the generalizations seen in (3) above, and the distribution of stress in English derived words. As stated above, I restrict the discussion to stress, syllabification and footing as these processes display regularities that indicate synchronic phonological activity.

Note that each structural assumption above is amply independently motivated in the literature. Neither floating segments, a metrical system of stress, nor extrametricality have been primarily proposed to account for the difference between cohering and non-cohering affixes. It is the confluence of these structural assumptions that accounts for the different behaviours of English affixes argued for below. In addition to the phonological conventions above, however, a derivational, modular account of English morpho-phonology must appeal to the notion of morpho-syntactic cyclicity. This will be discussed in the following section.

## 1.2    The Morpho-Syntax : Cyclicity (phases), and its relation to modularity

As stated in the introduction, in non-Lexicalist theories, such as Distributed Morphology (Halle & Marantz 1993, 1994; Marvin 2002, 2013; Embick 2010), *some* of the cohering/non-
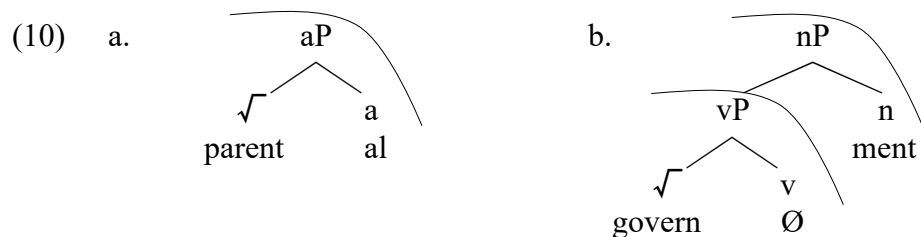
---

[7]    See §3.3 for a discussion of the wrong predictions made in the case of *base+non-cohering+cohering* constructions within a base-driven account such as Stratal Optimality Theory.

cohering pattern falls out from the derivation. Within DM, the distinction between affix classes has been claimed to be reducible to selectional restrictions, as promoted by scholars such as Fabb (1988) in an affix-based account, and much expanded upon in Giegerich (1999) and Plag (1999) in stem-based accounts. Specifically, a DM-style analysis proposes that cohering affixes (©) such as *-al* in *parental* may be affixed directly to an acategorial root (here *parent*), while in derivations like *government* there is a null verbalizing head between the root *govern* and the non-cohering affix *–ment* (N-©). In general terms, cohering affixes are *local* to the root, and non-cohering affixes are not.

(9)    a.    [parént-al]$_{aP}$
            √ -al(©)
       b.    [[[góvern-Ø]$_{vP}$ ment]$_{nP}$
            √ -Ø(©)-ment(N-©)

Before such structures can be said to lead to the cohering/non-cohering distinction, DM needs an additional tool; a syntactic theory of cyclicity, such as one that includes phases (Chomsky 1999, 2008). A phase-based account of cyclicity holds that certain syntactic heads trigger the transfer of morpho-syntactic structure to the interpretive interfaces. The default assumption in such a framework is that these interpretation-triggers (phase heads) send the domain to be interpreted to both interfaces, Logical Form (LF) and Phonological Form (PF), simultaneously, as in the following derivations of (9a,b) in (10a,b).[8] I follow the basic DM proposals that (i) roots are acategorial, and (ii) category-determining derivational morphemes (the heads of vP, aP, nP) are phase heads ( ⌐\ = the edge of a phase).

(10)    a.                 aP                    b.                  nP

                    √          a                          vP              n

                 parent       al                     √        v         ment

                                                    govern     Ø

In (10a) the categorizing *-al* is interpreted with the root *parent,* as it is the first (and only) cyclic head in the derivation. In (10b) the first categorizing head is also spelled out with the root. Here, as the *v* head is phonologically null, only the string *govern* is interpreted at PF in this first phase. In the second cycle of interpretation, *-ment* is interpreted.

Phase heads and their behaviour have been subject to much debate, and the current state of affairs regarding the status of phase heads in the derivational domain is as follows (the inflectional domain (v(oice)P, CP, DP) will not be treated in this article). The root and the first phase head that combines with it are interpreted together (along with possibly other non-phasal material not considered here (see Embick 2010). Various research programs have converged on the proposal that first-phase heads are spelled out with their complements, contra the proposal of Nissenbaum (2000), and Chomsky (2001b) that all phase heads send their complements to PF and LF. Marantz

---

8    See Marušic (2005), Newell & Piggott (2014), and d'Alessandro & Scheer (2015) for different ideas of how non-isomorphy between LF and PF could be achieved.

(2013 and previous work), Marvin (2002, 2013), and Arad (2003) demonstrate that roots cannot be semantically interpreted if they are not categorized.[9] Embick (2010) argues that evidence from allomorphy forces the conclusion that phase heads trigger interpretation of their complement iff it contains another phase head. Newell (2009) also argues that derivational phase heads will spell out with their complements. I argue there that this is due to a lack of feature checking (and subsequent lack of movement to the periphery of derivational domains) of the type that is seen in the functional domains (e.g. Wh-movement to the specifiers of *v(oice)*P and CP). The features of category-defining heads are valued, therefore there is no reason to delay their interpretation upon completion of the phase. Svenonius (2004) argues that phases are unified domains (along the lines of the Prolific Domains proposed by Grohmann 2003), and that only the merger of a morpheme that is not a member of a particular domain can indicate to the computational system that transfer to the interfaces is called for. So, upon the construction of, say, a verbal domain *v,* the merger of a non-verbal head *a* would trigger the spell out of *v* in its entirety. All of this research converges upon the conclusion that first phase heads are *local* to the root (they are inside the phonological and semantic domain of the root) and that each subsequent phase head will be interpreted outside of this first phase. Therefore, in a derivation of the syntactic structure $[[[[\sqrt{\ }] v ] n] a]$ (e.g. *govern-Ø-ment-al*), the interpretive domains at PF and LF will be $[[[\sqrt{\ } v ] n] a]$.

These cyclic domains entail that, as stated above for the derivation of (10a), a suffix that determines the category of the root, being the first phase head, will fall within the phonological cycle of the root. This automatically gives us its cohering behaviour, as there is no derivational (or representational) boundary between the root and its categorizer. All members of a phonological string that enter the phonology at the same time will be treated as a unit (a single linearized string of segments or autosegmental parts thereof). In (10b), the overt suffix, being the second phase head, will be interpreted separately from the root leading to its non-cohering behaviour; it is parsed in a different cycle from its base of attachment and therefore the default interpretation is that it forms a separate phonological domain. In this case, the segments within the second phase will be linearized in relation to each other, before the entire second phase is linearized to the right of its base of attachment. This type of derivation also allows for an analysis of 'dual-affiliated' affixes. Aronoff (1974, 1976), Siegel (1977), Selkirk (1984), Giegerich (1999), (among others) have demonstrated that many non-cohering affixes have both cohering and non-cohering behaviour, as do some affixes traditionally classed as cohering. This Level-ambiguity can be exemplified by the stress-affecting (11a) vs. stress-neutral (11b) behaviours of *–able* (see also Bermúdez-Otero 2015).

---

[9]    Marvin (2002) explicitly denies that initial phase heads are interpreted with their complements, but her derivations belie the fact that they are.
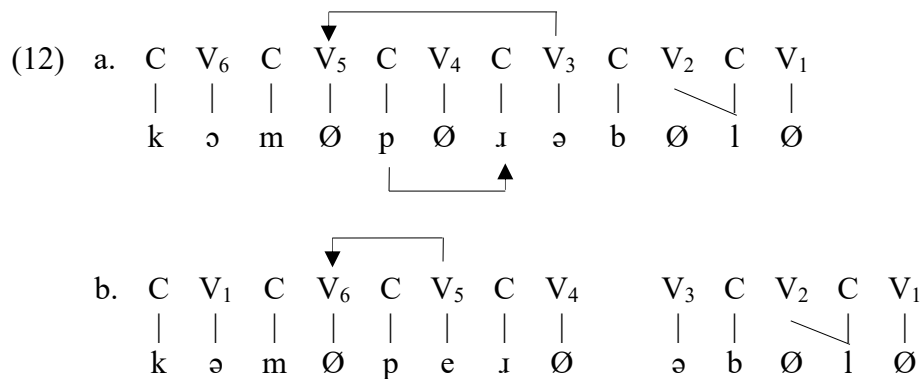
(11)  a.     kɔ́mpɹəbl̩[10]          'comparable; similar'
              [compare√-able(©)]aP

      b.     kəmpéɹəbl̩          'comparable; able to be compared'
              [compare√-Ø(©)]vP -able(N-©)]aP (cf. compáre)

The two morpho-phonological behaviours of –able fall out of a system where this affix may merge to either an acategorial root (11a) or to a verb (11b). Within CVCV we can see that in (11a) the vowel of the affix is present in the first cycle and able to govern the preceding vowel, indicated with the upper arrow in (12a). The lower arrow represents intra-constituent government between consonants that form a licit onset-onset sequence (a complex onset in traditional accounts of syllabification). Both government and intra-constituent government authorize the empty vocalic position to their left. In the case of the intra-constituent government in (12a), this renders $V_4$ invisible to $V_3$, allowing it to govern, and suppress, $V_5$. Assuming the final syllable of -*able* to be extrametrical, the stress algorithm of English will only permit initial stress in (11a), as (kɔ́mpɹə/kɔ́mpɹ̩) is the only possible foot that can be created over this melodic string. Note that in English empty vocalic positions are not always considered when computing the number of syllables to be footed (for the parametrized behaviour of empty nuclei see, for example, Kaye 1995; Scheer 2004; Scheer & Szigetvári 2005; and Faust & Ulfsbjorninn 2018).

---

[10]     An anonymous reviewer points out that this derivation has two possible pronunciations: kɔ́mpɹəbl̩ (i) and kɔ́mpɹəbl̩ (ii) and that they must both be derivable within a single cycle. This is not problematic for the current analysis. Given a CVCV structure, the melodic material (specifically the sonorant consonant) may be linked either to a vocalic (i) or a consonantal (ii) position. Variation is not unexpected here. A sequence of two empty vocalic positions, as in (ii), is normally banned within Government Phonology but is licit iff the consonants on either side of the second empty position increase in sonority/ constitute a true onset cluster.

(i)     C  V  C  V  C  V  C  V  C  V
        |  |  |  |  |  |  |  |  |  |
        k  ɔ  m  Ø  p  ɹ  Ø  ə  b  l

(ii)    C  V  C  V  C  V  C  V  C  V
        |  |  |  |  |  |  |  |  |  |
        k  ɔ  m  Ø  p  Ø  ɹ  ə  b  l

How this variation comes about depends on one's view of syllabification and/or storage. If syllabification (linking to C and V slots) occurs online, then the above distinctions may be due to statistical variation or social differences like register. If syllabification is stored underlyingly after the first parse of any particular cycle (as in the Government Phonology literature, or Stratal OT's notion of Level 1-storage) then each of the above pronunciations must be stored, and any speaker may have one, the other, or both in their lexicon. Note that Bermúdez-Otero (2013) argues that storage of a stem-based form (classically termed a Level 1 form) does not negate the need for online, synchronic stem-level phonology.

(12) a.

$$C\ V_6\ C\ V_5\ C\ V_4\ C\ V_3\ C\ V_2\ C\ V_1$$

| | | | | | | | | | |
k   ɔ   m   Ø   p   Ø   ɹ   ə   b   Ø   l   Ø

b.

$$C\ V_1\ C\ V_6\ C\ V_5\ C\ V_4\ \quad V_3\ C\ V_2\ C\ V_1$$

| | | | | | | | | | |
k   ə   m   Ø   p   e   ɹ   Ø       ə   b   Ø   l   Ø

In (11b) the final pronounced vowel in *compare* is stressed (its stress/length is not represented in (12b)). Notably, the pronounced vowel in $V_5$ in (12b) will govern and supress $V_6$. After the computation of government/stress in the verbal domain, *-able* will be suffixed. As this affix contains no floating segments, it will not interact with or modify the syllabification of *compare*. As the initial syllable of the affix is too small to be footed on its own, it will not attract stress. Each cycle is computed separately in the phonology. We can think of this as the simplest option: the first cycle does not need to be reassessed by the phonology, so it will not be. Nothing more need be stated to give the cohering vs non-cohering behaviour of this type of affix. No actual representational phonological boundaries are inserted. These derivations also mirror a semantic pattern that has been noted in the literature (for example, Kiparsky 1982; Arad 2003; Marantz 2007, 2013); the cohering *–able* combines with the root to give a non-concatenative reading, while the non-root-attaching, non-cohering *-able*'s meaning is purely concatenative. In §4 we will return to the semantic predictions of a DM+Phase analysis, offering further support for the phonological analysis to come in §2.

A note here on the *Phase Impenetrability Condition* (PIC) (Chomsky 2001), presaged in the phonological literature as the preservation of metrical structure (Kiparsky 1979) or *Strict Cyclicity* (Kaye 1995), is necessary. It has been widely demonstrated in both the syntactic and phonological literature that inner cycles become, in certain ways, invisible to further computation. In the syntactic literature on Phases, it is proposed that domains that are sent to PF are no longer accessible to syntactic operations; that they are frozen (Chomsky 2001; Uriagereka 1999, and subsequent work in the field). In the phonological literature, this freezing-effect has been appealed to in different ways, some derivational (e.g. The Strict Cyclicity of Kaye (1995), the Russian Doll theorem of Bermúdez-Otero (2015)), some representational (e.g. The Prosodic Hierarchy, wherein rules apply, for example, only within a Phonological Word but not at the level of the Phonological Phrase). However, it is also abundantly clear that phonological representations and derivations are not subject to the same restrictions as are their morpho-syntactic counterparts. Operations like infixation, for example, have been demonstrated to cross cyclic boundaries, therefore modifying the output of a previous cycle of interpretation, contra the PIC. In fact, the status of the PIC has been argued to be epiphenomenal not only in the phonology, but also in the morphology and in the syntax (Bošković 2014; Embick 2014; Newell 2017). It is therefore taken as given here that phonological representations that are the output of a cycle/phase of interpretation are not modified unless the requirements internal to the phonological module necessitate it, but that previous

phonological cycles may undergo any phonologically justified modifications. The specifics of when they may be modified are taken up in §2.

We return now to the question of morphemes that fall within or outside of the first phase. If all cohering affixes were affixed within the first cycle, and all non-cohering affixes affixed within the second cycle, and if syllable and foot construction were limited to applying to cycle-internal segmental material, then the floating vowel proposal in §1.1 would be superfluous. However, the distinction between the cohering and non-cohering patterns cannot be strictly due to whether an affix is or is not interpreted within the first phonological cycle, as amply argued in the literature critical of Lexical Phonology (Fabb 1988; Halle & Vergnaud 1987; and especially Plag 1999, among others). In these works, is it shown in great detail how individual affixes have selectional restrictions that are distinctly separate from their phonological behaviour. Specifically, as pointed out in Lowenstamm (2014), DM and phases, like LP, makes the wrong predictions for the phonological computation of Level 1 affixes that are not merged directly to a root (within the first phase). These criticisms are the subject of the following section.

### 1.2.1   DM and cohering affixes

The DM+Phases framework presented in §1.2 only derives the correct output when a cohering affix is closer to the root than a non-cohering affix (13), or in the case of stacked non-cohering affixes (14) if we allow for the first category-defining head to be null.

(13)    **[[parént-al]**$_{aP}$ -ly]$_{advP}$          'in a way characteristic of being parental'
          $\sqrt{}$ -al(©)-ly(N-©)
          *parentálly

(14)    **[[[góvern-Ø]**$_{vP}$ ment]$_{nP}$ less]$_{aP}$     'the state of lacking a government'
          $\sqrt{}$ -Ø(©)-ment(N-©)-less(N-©)
          *governméntless

The problematic cases are ones where cohering affixes are attached outside other cohering affixes (15) or outside non-cohering affixes (16).

(15)    **[[subject-ive]**$_{aP}$ ity]$_{nP}$          'the state/property of being subjective'
          $\sqrt{}$ -ive(©)-ity(©)

(16)    **[[[govern-Ø]**$_{vP}$ ment]$_{nP}$ al]$_{aP}$     'pertaining to a government'
          $\sqrt{}$ -Ø(©)-ment(N-©)-al(©)

In these cases, as clearly laid out in Lowenstamm (2014), the phonology tells us that each cohering morpheme is within the stress domain of the base to which it attaches, contra the DM+Phases prediction that all outer phase heads should be interpreted separately from their complements. In (15) the suffix *–ive* affects the position of stress on its base, and is therefore demonstrably cohering (*súbject > subjéctive*). And, counter to the predictions of a strictly phase-based account of interpretation, the second, outer affix *–ity* in (15) also affects the position of stress on its base (*subjéctive > subjectívity*). This same unexpected effect of an outer phase head on the phonology

of an inner domain occurs in the derivation of *governméntal* (16) (cf. *góvern > góvernment*). In both cases the prediction is that *-ity* and *-al* should behave like non-cohering affixes; being interpreted in a separate domain from their base and having no effect on stress placement.

The challenge here is to reconcile the proposal that DM+Phases accounts for the phonological and semantic isomorphism seen in (11) with the fact that it makes the wrong phonological predictions in cases like (15) and (16). In the next two sections, we will begin to meet this challenge by clarifying two behaviours of non-cohering affixes

### 1.2.2  Phases, extrametricality, and floating vowels

To solve the above problem, we must first consider the pattern in which the phonological behaviour of affixes is leveled when they are attached directly to the root. Recall the DM+Phase-based predictions for interpretive cycles discussed in §1, repeated below as (17).

(17)    Interpretation of the syntactic structure [[[[√ ] v ] n] a] gives the following interpretive
        domains: [[[√ v ] n] a]

It is well known that some non-cohering affixes behave as cohering affixes when attached directly to a root (Giegerich 1999; Marvin 2002; Bermúdez-Otero 2015), as predicted by (17). Arad (2003), Marantz (2007, 2013), Bobaljik & Wurmbrand (2013), Bobaljik & Harley (2017), and related work in DM have argued that root-attached morphemes are also local to the root for the purposes of allomorphic selection and semantic idiomaticity. Marvin (2002), Arad (2003), Newell (2009), and Embick (2010), among others, have demonstrated that root-attached morphemes are local to the root for the purposes of phonological rule application. These non-cohering affixes *always* behave phonologically like cohering affixes when affixed to the root (Recall the discussion of *comparable* above; zero morphemes will intervene between a root and a non-cohering affix and also may have a semantic impact). The opposite is also true. Remember that non-cohering affixes (affixes that display 'Level 2' behaviour at least some of the time) *never* behave like cohering affixes *except when* they are merged to a root (3iii). This pattern is a knock-down argument against the proposal that English speakers have, for example, two *-er* affixes, one cohering (18a) and one non-cohering (as indicated by the deletion of the unsyllabifiable [g] in the first cycle of (18b)).

(18)    a.    philosopher    [phi(lóso)<pher>]    (*philosoph)
        b.    signer    [[sig**n**] er]    (cf. [si**g**nal, si**g**nature])

If the *-er* in (18a), or any other 'cross-listed' affix, had a 'Level 1' lexical diacritic, or more than one affix-specific co-phonology, we would expect this 'Level 1' affix, like other 'Level 1' affixes, to be able to attach outside other affixes and retain its cohering behaviour. Fabb (1988) proposed that very few affixes in English actually stack, but Plag (1999) demonstrated that there are many more possible combinations than originally considered by Fabb, and therefore one might expect at least one example of the 'Level 1' version of a cross-listed affix to be affixed farther from the root than its 'Level 2' counterpart. This is *never* the case for 'cross-listed' affixes. For example, the agentive nominal morpheme *-er* is permitted outside of other affixes, but in these cases, it only ever has non-cohering behaviour.

(19)   a.     [[[sign]√ al ]n Ø ]v er]n →
       b.     [[sígnal] er]     (*signáler)

As –*er* is monosyllabic and nominal, and as the final syllable in nominal domains in English is normally extrametrical, it has no effect on the position of stress in (19b) making its non-cohering nature difficult to discern. If we look at examples where -*able* is affixed outside of another affix, however, we can clearly see that it categorically displays non-cohering behaviour in this position.[11]

(20)   a.     [[[sign]√ al ]n Ø ]v able]a →
       b.     [[sígnal]ω able]ω
       c.     *[[signál]ω able]ω

This pattern, where affixes with purported cross-listed behaviour never behave as though they are cohering outside of another affix, is predicted if all affixes that merge directly with a root are interpreted in the same phase as the root and that this fact is the only motivation for the 'unexpected' inclusion of a non-cohering affix within the phonological domain of its base. There is no need here to appeal to particular phonological strata or co-phonologies.

Importantly, this calls into question the need to lexically-specify the phonological behaviour of affixes or strata at all. The behaviour of non-cohering affixes is exactly what is predicted by the DM+Phases framework. Root-attached affixes behave differently from outer affixes due to the cyclic nature of syntactically-driven phonological (and semantic) interpretation (17). The problematic data, as mentioned above, is due to the cohering affixes that are merged outside of other affixes but still behave as cohering. In this section, we have rid ourselves of the need for CP-type diacritic marking of the non-cohering affixes and/or SOT-type distinct phonological strata for stress assignment.

### 1.2.2.1 The domain of main stress: extrametricality

Before going into the divergent phonological behaviour of cohering affixes, it is important to note that the status of non-cohering affixes as those that are not included in the domain of main stress assignment in English is false (Giegerich 1999). This is evident when one looks at affixes that may display cohering and non-cohering behaviour at the same time. Examples this type of affix are -*ology, -ography, -ee,* and -*ese*.[12] In (18b) we saw that non-cohering affixes are affixed outside the

---

[11]      Remember from fn. ii that long words suffixed with –*able* where stress does shift (*inténsifÿ* → *intènsifíable*) are argued to not be counter-examples to this claim.
[12]      This is also true of -*ique*, and -*esque*. These affixes have a lexically specified accent under the present account. This lexical specification can be seen as an exemption of the final consonants of these affixes from extrametricality (as necessary to account for the stress system of non-derived adjectives and verbs). Within a strict-CV account, this is tantamount to the proposal that the final empty nucleus/nuclei is/are considered for purposes of footing, affording the affixes a size suitable for the assignment of stress (see Scheer & Szigetvári 2005 for further discussion of extrametricality in CVCV Phonology).

cycle containing the root and are therefore not present at the point of phonological interpretation of the root. This leads to final cluster simplification in the clusters *mb, ng,* and *gn* in English. These clusters are not repaired when the root containing such a sequence is affixed with a morpheme which is interpreted in the same cycle as the root, as in *signal, bombard* etc. In such derivations the final consonant of the cluster has the opportunity to be syllabified as the onset to the initial vowel of the suffix and no deletion occurs.

(21)  a.    signal, malignant          (cf. si~~gn~~, mali~~gn~~)
       b.    bombard, Thumbelina        (cf. bom~~b~~, thum~~b~~)
       c.    younger, longer            (cf. youn~~g~~, lon~~g~~)[13]

   Importantly, the affixes *-ology, -ography, -ee,* and *-ese* may behave as non-cohering affixes with respect to cluster resolution.[14]

(22)  a.    wom~~b~~ólogy, wom~~b~~ésque    'the study of wombs, like a womb'
       b.    gan~~g~~ógraphy, gan~~g~~ése    'a book on gangs, the language of gangs'
       c.    kin~~g~~ólogy, kin~~g~~ée       'the study of kings, someone who has been
                                                   kinged (as in checkers))'

These same affixes may show the same non-cohering behaviour with regard to final sonorant syllabification. Syllabic consonants before *-ology, -ography, -ee,* and *-ese* are not (re)syllabified as onsets to the following vowel.[15]

(23)  a.    puzz[l̩]ólogy, puzz[l̩]ése    'the study of puzzles, puzzle-speak'[16]

---

 (i)   C   V   C   V   C   V          (ii)   C   V   C   V
       |   |   |   |   |   |                  |   |   |   |
       Ø   ε   s   Ø   k   Ø                  Ø   i   k   Ø

The structures in (i) and (ii) allow for these two affixes to be subsumed under the account of affixal stress on *-ology* etc., immediately below.

[13]     Bermúdez-Otero (2012) shows that *–er* must be non-cohering/Level 2 *except when it conditions allomorphy* (e.g. *better*). He argues that because final C-deletion is not 100% predictable (stronger vs wronger) the output form of the root in *stronger* must be derived via allomorphy (not phonology), meaning that the *–er* is inside the phonological/allomorphic domain of the root (the literature on allomorphy argues for such locality, see Bobajik & Wurmbrand (2013)'s *Domain Suspension*). So, as Bermúdez-Otero says, in *younger* and *stronger*, *-er* must be inside the first phonological cycle; when *-er* conditions allomorphy (whether it be in the case of *bet* or *strong*) it will always behave as root-adjoined.

[14]     As pointed out by an anonymous reviewer, these affixes are cohering when affixed to a root (e.g. desi[g]nee). This is exactly what is predicted under the cyclic account of non-cohering affixes presented in the last section.

[15]     The patterns in (22) and (23) do not occur in words affixed with *-ique*, as *-ique* only affixes to certain bare roots. It does, as predicted, occur in words affixed with *-esque*, such as *gangesque* 'like a gang' and *puzz[l]esque* 'like a puzzle'.

[16]     Approximately half of the speakers consulted offered *puzzology* rather than *puzzleology* when asked to create this word. This follows if some people have a ban on multiple laterals in the

b.  butt[n̩]ógraphy, butt[n̩]ée  'a treatise on buttons, an item buttoned'
c.  butt[ɹ]ésque, flatt[ɹ]ée  'like butter, one who is flattered'
d.  bloss[m̩]ése, bott[m̩]ógraphy 'language of flowers, a book on bottoms'

This pattern is exactly that argued for in Marvin (2002) (following Chomsky & Halle 1968) as being indicative of non-cohering affixes. In the first phase, the final sonorant C is not followed by a vowel, and so is treated as syllabic in accordance with the phonotactic requirements of English (24a). When a V-initial, root-attached affix is available in the same phase as the sonorant, it is syllabified as an onset (24b).

(24)  a.  [[[twinkl]√ Ø ]ᵥ ing]ₙ  → twin.k[l̩].ing  'act of twinkling'
      b.  [[twinkl]√ ing]ₙ  → twin.kling  'a short moment'  (Marvin 2002)

Importantly, the affixes in (22) and (23) attract main stress (but do not affect the stress of their base, making their behaviour indicative of 'Level 2' affixation according to Giegerich 1999:27), even though it is clear from the syllabification data that they are non-cohering. The property of attracting stress, Giergerich notes, has been wrongly attributed to cohering affixes. The key to why these non-cohering affixes attract stress is their phonological size.

As noted in (7), English stress patterns are affected by a lexically-specified pattern of extrametricality. If we take all of the non-cohering affixes (from Mohanan 1986; Halle & Vergnaud 1987; Fabb 1988; and Lieber 1992) as containing a final extrametrical syllable (the final overt vowel and all that accompanies it) this leaves nothing to be footed in (25).

(25)  *-<ness>, -<ment>, -<hood>, -<less>, -<ful>, -<y>(adj), -<ly>, -<al>ₙ,*
      *-<ing>, -<ed>, -<er>, -<some>, -<en>, -<age>, -<ish>, -<ist>, -<ism>,*
      *-a<ble>*[17,18]

The only affix in this list that retains a non-extrametrical nuclear element is *-able*, but, as English has a word-minimality requirement for lexical (as opposed to functional) stressable

---

same phonological domain discussed in Raffelsiefen (1999), but cannot explain why no speakers considered *bottology* rather than *bottleology* to be grammatical.

[17]   Exceptions here are affixes like *-like* and *-wise* whose diphthongs (dubbed semi-suffixes in Raffelsiefen 2015, following Marchand 1969), being long like the vowels in *-ee* and *-ese,* should attract stress. See Dalton-Puffer & Plag (2000) and Bauer et al. (2013) for a discussion of this type of derivation and why it cannot be compounding, despite the compound stress pattern on words like *hómelike* and *páirwise*. *-eer* and *-(e)teria* also attract stress and should behave like *-ology* etc. with regards to cluster repair and sonorant syllabification (Siegel 1974:179), but I have found no appropriate contexts in which to test them. To my mind, nonce words like *bottleer* and *bottleteria* contain syllabic [l]s, as predicted.

[18]   This analysis obviously owes much to Hayes (1982). For Hayes, the entire affix was deemed extrametrical. This is firstly, unnecessary, as we can account for the behaviour of these affixes with the same extrametricality tools we use for underived words, and secondly, it is anti-modular and therefore incompatible with a framework that holds that morpho-syntax and phonology are separate systems.

domains, the remaining short vowel is unfootable.[19] As there is nothing to build a foot on in any of the non-cohering morphemes above, and assuming foot structure (or a head-dependent relationship between two morae/vowels) is (i) a prerequisite for determining the placement of stress, and (ii) does not span a cyclic/phase boundary, the presence of these affixes will obviously not enable stress-shift (see Newell & Piggott 2014 for identical requirements in Ojibwe). The final foot in a word affixed with any suffix in (25) will be within the base to which said morpheme is attached (e.g. *(édi)<t>-a<ble>*).[20]

The affixes *-ology, -ography, -ee,* and *-ese*, on the other hand, are all non-cohering affixes that are large enough to be footed even given final syllable extrametricality. The first two in this list are tri-syllabic[21], the second two contain long vowels. The doubly-linked nature of these long vowels ensures that they are subject to geminate integrity (Kenstowicz & Pyle 1973; Suh 1997; Honeybone 2005), and therefore the final syllable cannot be made extrametrical in these cases, although the final consonant might be. In CVCV long vowels are not linked to adjacent Vs, as VV is an illicit structure on the timing tier, but rather straddle a C position. The representation of *–i:* is therefore bi-syllabic, as in (26b).

(26)    a.        *-(ɔ́lə)<dʒi>, (ɔ́grə)<fi>, (i:), (i:)<z>*

        b.        C    V    C    V

                  |          \   /
                  Ø          i

---

[19]    I use the term *foot* here as shorthand for any system which groups syllables into Strong and Weak alternating units.

[20]    Bermúdez-Otero (2018b: 116) notes that the initial schwa of *–able* is also ignored for stress purposes. Stress will fall on the preantepenultimate syllable in the case of a light antepenult (e.g. indúbitable). This may indicate that the final syllable, headed by a consonantal nucleus does not count as a final syllable head for the purposes of extrametricality rendering the entire suffix extrametrical. A purely representational phonological account of this is left for future work.

[21]    Each of these morphemes may be, of course, analyzed as bi-morphemic, if the *-y* is taken to be a cohering nominal suffix meaning 'action or occupation associated with X'. If we bisect them this way, they become a non-issue. *-o<logue>* and *-o<graph>* can be added to the list in (26). Their behaviour after affixation of *-y* then falls under the discussion in the following section. The reason that these affixes are treated in the list of monomorphemic affixes here is that their stress-attracting nature has been used to motivate their membership in the group of 'Level 1' affixes (Mohanan 1986), and some examples do not readily allow segmentation; the *-y*-less forms are non-attested (e.g. *\*lexicograph, \*climatologue)*. Additional evidence for the cohering behaviour of *-ology* and *-ography* (as evidenced by the pronunciation of the [n] in *hymnology*) falls out of the fact that - *ology* and *-ography* may both be affixed to roots (as evidenced by the bound root bases of *phonology* and *biography*). Therefore, under an alternate bi-morphemic analysis, - *olog-y* and *-ograph-y* are identical to any other stress-attracting Level 2-Level 1 sequences, like - *ment-al* in *governmental*. Neither *-ologue* nor *-ograph* is inherently cohering. They allow for a syllabification of final sonorants that belies their non-cohering status and do not affect stress (when not affixed to a bound root), but will have Level 1 behaviour when root-attached.

Therefore, even when these affixes are not root-attached, they will contain enough structure to force the re-application of the MSR, which ensures that main stress falls on the rightmost foot in a word, as in (27).[22]

(27)  a.    [[[gang]√ Ø ]ₙ            → (PF)        (gǽ)<ŋ>
      b.    [[[gàng]√ Ø ]ₙ ology]ₙ → (PF)        (gæ̀)<ŋ>(ɔ́lə)<dʒi>
            'the study of gangs'

The phonological output in (27b) requires some discussion. In (27a) we see the output of the first morpho-syntactic phase, which is sent to PF to undergo Vocabulary Insertion and subsequent phonological operations. *gang* is footed, and stressed in accordance with the MSR. In (27b) we see the structure of the second morphosyntactic phase, and its phonological output. Here the suffix -*ology* will undergo phonological interpretation first, as the Vocabulary Insertion of this morpheme introduces new melodic elements. These segments will undergo syllabification and footing exactly as did the segments in *gang* on the first cycle. The 'old' structure built around *gang* will not be modified, as there is no phonological motivation to do so. It is evident that there is no re-syllabification of the final consonant of *gang*, as [ŋ] is an illicit onset in English and we also have the possibility of inserting a glottal stop in the empty onset position preceding the suffix even when an overt consonant precedes it ((gæ̀)<ŋØ>(ʔɔ́lə)<dʒi>). The [ŋ] in *gang* therefore retains its extrametrical status. It is important here to note the distinction between coda consonants in traditional syllabic theories and in CVCV. Codas, strictly speaking, do not exist in a CVCV framework, where every consonant is followed by a vocalic position. What are labeled as codas are in reality consonants that are followed by an unpronounced vocalic position. This position, in the case of *(gæ̀)<ŋØ>* is not occupied by the initial vowel of *(ɔ́lə)<dʒi>*, as this initial vowel is not floating. That the initial vowel of *(ɔ́lə)<dʒi>* is linked to a V position of its own implies the presence of a preceding empty C position. Therefore, the [ŋ] in *(gæ̀)<ŋØ>(ɔ́lə)<dʒi>* does not sit in the onset of the following syllable (28).

(28)   C  V  C  V  C  V  C  V  C  V
       |  |  |  |  |  |  |  |  |  |
       g  æ  ŋ  Ø  (ʔ)  ɔ  l  ə  dʒ  i

This is exactly the type of structure proposed to underlie word-final multi-morphemic clusters in English. Kaye (1995) proposes that exceptional clusters such as those found in [si:pt] 'seeped' are pseudo-clusters, in that they are in reality a sequence of two onsets.

(29)   C  V₄   C  V₃  C  V₂  C  V₁
       |       |       |  |  |  |
       s       i       p  Ø  t  Ø

In (29) *pt*, unlike in the *pr* sequence in (11a)'s *kɔ́mpɹəbļ* is not a possible onset cluster in English. The null vocalic position that falls between *p* and *t* is therefore ungoverned via Infra-segmental

---

22    This article leaves aside the question of stress retraction (e.g. Liberman & Prince 1977). It, under any account, necessitates extra machinery. The account herein will not meet any issues with accounting for retraction that is not encountered in any other analysis.

Government. Recall that in the CVCV version of Government Phonology null vowels may be found (i) interior to onset clusters, (ii) in a syllable preceding a full (pronounced) vowel, and (iii) in the final position in a phonological domain (Final Empty Nuclei (FENs)). In (29) the null V in $V_2$ satisfies neither (i) nor (ii). It does, however, satisfy (iii) if one considers the cyclic application of phonological rules/operations. The tense morpheme *-ed* in English is parsed in a separate cycle from regular verbs. Therefore, *seep* and *-ed* constitute separate phonological domains, and each domain may licence a FEN. In (29) the null vocalic position following [ŋ] is also a cycle-final FEN. This proposal helps clarify which domains must be referenced when speaking of phonological 'peripherality'; the same domains that licence FENs in Kaye (1995) licence extrametrical structure (for more on this link see Faust & Ulfsbjorninn 2018). In Hayes (1982) the Peripherality Condition determines the placement of Extrametrical items and is relativized to stress domains.

(30)   Peripherality Condition:
       $[X]_{[+ex]} \rightarrow [-ex] / \_\_\_\_Y]_D$
       Where $Y \neq \emptyset$ and D is the domain of stress rules          (Hayes 1982:270)

In the above formulation of the Peripherality condition, if D were taken to be the word, then the phonological representation in (29) would be illicit. Roca's (1994) revision of the peripherality condition, however, gets the domains right for FEN licencing and extrametricality. He proposes that "Extrametrical elements must be peripheral in their domain." (213) (for additional work on peripherality see Harris 1983, 1993; Milliken 1988; Clements 1990, 1997; Hayes 1995).

(31)   Revised Peripherality condition:
       $[X]_{[+ex]} \rightarrow [-ex] / \_\_\_\_Y]_D$
       Where D is the phonological output of a cycle/phase

The formulation in (31) specifies the cyclic nature of the pertinent domains referred to in Roca.

    Therefore, the output of any phonological cycle may contain licit edge-elements (FENs/extrametrical melody). We can then conclude that only when a phonological element from outside the phase is exceptionally merged *inside* the phonological domain of the first phase will the FENs or extrametrical elements determined at the first phase be impacted; if a phonological element is merged into the right-edge of a domain, any element to its left is no longer at the right edge. If, on the other hand, the output of the second phase does not interact (e.g. through syllabification) with the output of the first phase, the structural output of the first phase will persist. This is what allows for the sequence of two FENs in (29); each FEN is at the right-edge of a cyclic domain ([[seep$_{vP}$]ed$_{TP}$]). It is here where we see the type of effect that led to Kaye's (1995) formulation of Strict Cyclicity. Elements inside a previously interpreted domain will, unless forced by a specific phonological requirement, not be altered on a subsequent cycle. This, I argue here, is not due to any 'condition' on derivations. This is due to a phonological inertia that has been previously noted by McCarthy (1988). To paraphrase the latter, if the environment for the application of a phonological rule is met, then the rule will apply. In neither (28) nor (29) is there any motivation for the application of resyllabification. Extrametrical structure and FENs are therefore permitted in their structural outputs and no violation of the Peripherality Condition occurs. We will see how the account of cohering affixes below in §2.2 brings to light how liaison

affixes will force a violation of the Peripherality Condition in a way that affects syllabification, footing, and stress placement. First through, we will finish this section with a demonstration of how a sequence of non-cohering affixes results in the emergence of multiple domains, which may each contain extrametrical elements. This in turn leads to a phonological output structure that could not result in the shift of stress to the right. Consider the derivation of *governmentless* below.

(32)  a.    [[govern]$_\sqrt{}$ Ø ]$_v$ → (gʌvɚ)<n>
      b.    [[[govern]$_\sqrt{}$ Ø ]$_v$ ment]$_n$ → (gʌvɚ)<n><mənt>
      c.    [[[govern]$_\sqrt{}$ Ø ]$_v$ ment]$_n$ less]$_a$ → (gʌvɚ)<n><mənt><ləs>

The CVCV structure of (32c) is the following (33). Note that, as pointed out in Raffelsiefen (1999, 2015), the C-initial affixes have no motivation to be syllabified with the previous domain (domains below are indicated by dashes as an expositional device only, extrametrical elements are bolded).[23] As all nuclear elements outside of the first domain are extrametrical, and therefore invisible to the footing or stress algorithms; the environment for stress shift is not met.**[24]**

(33)    C  V  C  V  **C  V  C  V**  -  **C  V  C  V  C  V**  -  **C  V  C  V**
        |  |  |  |  |  |  |  |      |  |  |  |  |  |      |  |  |  |
        g  ʌ  v  ə  **ɹ  Ø  n  Ø**     **m  ə  n  Ø  t  Ø**     **l  ə  s  Ø**

        This account of the lack of stress shift upon affixation of non-cohering affixes crucially does not reference any lexical diacritic specific to this class of morphemes, and does not appeal to any particular strata for the application of stress rules. What we see here is the default case, as predicted within a DM+Phase analysis of phonology. That (most) affixes are equipped with final extrametrical syllables is the only lexical specification we need to account for this pattern, a specification that is necessary independently of the 'Level 1(Stem)/Level 2(Word)' debate.

        In the following section, we will see that a liaison account of cohering affixes in English will allow for an elegant account of the distribution of cohering affixes. It will predict that their phonological behaviour will result in outputs that are non-isomorphic with their morpho-syntactic structure, meeting the challenge of how to reconcile a DM+Phases morphosyntactic computation with the seemingly problematic phonological non-isomorphism.

---

[23]    This is also the case for any V-initial affix that begins with a vowel that is not floating, a pattern not accounted for in Raffelsiefen (1999). As the final C of the first phase and the initial V of the second phase will not be in the same phonological domain, no refooting will occur. In (i) stress does not shift, as lone [ə] is unfootable.

(i)  C  V  **C  V**  -  C  V  **C  V  C  V**
     |  |  |  |      |  |  |  |  |  |
     s  ɪ  **ŋ  Ø**     **Ø**  ə  **b  Ø  l  Ø**

[24]    Note that final coronal Cs in Germanic clusters exhibit a specific distribution that allows for the licit sequence of two empty nuclei in the representation of 'ment' (Scheer 2004: 425-6).

## 2. Cohering affixes all begin with floating vowels

The above sets the stage for the current novel analysis of cohering affixes. The question is, if morpho-lexical diacritics or strata are undesirable, and definitely unnecessary to account for the behaviour of non-cohering affixes, can we do away with them in an account of cohering affixes as well? As previewed in the introduction, the answer is yes. It is proposed here that all cohering affixes begin with floating vowels. Note that all cohering affixes begin with a vowel.[25]

(34)    Level 1 affixes
        *-al$_a$, -ic, -(at)ion, -ous, -astic, -y(noun), -an, -ant, -ance, -ity, -ive, -oid, -ite, -on, -ode, -ide, -i*[26]

The floating-vowel analysis automatically gives us the universally cohering nature of these affixes. Cohering affixes merged directly to a root will behave just as non-cohering affixes do; there is no 'class distinction' between affixes in the first phonological cycle. A cohering affix attached outside a non-cohering (or another cohering) affix will have the effect of masking the phonological boundary between the two. In the first and second phases of the derivation of a word like *governmental,* the non-cohering affix *-ment* will not incorporate into the phonological domain of *govern* as it contains no floating segments. The extrametricality of *-ment* explains the lack of stress-shift (35a). Upon interpretation of the third phase, containing *-al*, the floating vowel of this affix will force the merger of the phonological domains of *-ment* and *-al*. The domain of *govern* remains unaffected (35b). In a rule-based phonological framework (RBP) where rules are triggered when their structural conditions are met, we can account for this merger by proposing a rule of vowel association: an unassociated vowel will link to an empty CV unit within its base.[27] In an OT

---

[25]    Affixes that begin with consonants that are traditionally classed as Level 1 will be dealt with in §2.2. The one exception to the generalization that all Level 1 affixes begin with vowels may be *-en* [n]. This is not a true counterexample though, as this sonorant consonant patterns as a nucleus, as discussed below.

[26]    The weak stress retractors *-oid, -ite, -on, -ode, -ide, -i* attach almost exclusively to bound roots, making it difficult to determine whether they are 'Level 1' or if they always emerge inside the first phonological cycle. The strong retractors *-ate, -ary, -ade, -ote, -ine* (e.g. vóluntàry) and the long retractors *-ene*, *-use*, *-ide, -ize*, *-ify(k)*, *-ory*, *ite*, *-ative* (hallúcinatòry), not included in this list, need additional machinery in any account to explain why, in words to which they affix, main stress does not fall on the rightmost stressed syllable. Liberman & Prince (1977:276) note that "retraction in complex words is largely controlled by suffix type, but admits of considerable lexical variation, particularly among the less productive morphological categories". An anonymous reviewer points out that the less productive of these retractors are 'Level 1'. Assuming they mean root-attaching, then this is just the environment where lexical exceptions are predicted to occur. Exceptions must be admitted in any theory, the first cycle of interpretation being the most likely to become lexicalized. See Bermúdez-Otero (2013, 2018a) on why this lexicalization does not obviate the need for the application of regular phonological rules/constraints at 'Level 1'.

[27]    The RBP assumed herein is that of Government Phonology, but this is not important to the exposition of the analysis as very few operations are proposed, and each proposed operation is obligatorily applied (and surface-true). "One salient characteristic which sets Government Phonology apart from other current theories is the rejection of the orthodox rewrite rule, and with

framework the realization of melody would need to outrank the ban on creation of new relations between segments in the output (FAITH-seg >> DEP-association line).

(35)    [[[[govern]√ Ø ]ᵥ ment ]ₙ al]ₐ

a.  C  V  C  V  **C  V  C  V**  -  **C  V  C  V  C  V**
    |  |  |  |  |  |  |  |     |  |  |  |  |  |
    g  ʌ  v  ə  ɹ  Ø  **n**  Ø     **m  ə  n**  Ø  t  Ø

b.  C  V  C  V  **C  V  C  V**  -  C  V  C  V  **C  V**            C  V
    |  |  |  |  |  |  |  |     |  |  |  |  |  |          ⟍            |  |
    g  ʌ  v  ə  ɹ  Ø  **n**  Ø     m  ɛ  n  Ø  t                ə  l  Ø

c.  (gʌ̀və)<ɪn>(mɛ́n)<təl>

What is crucial here for the stress algorithm of English is that upon association of the vowel of -*al* with the final empty vocalic position associated with -*ment*, the latter is no longer final within its domain according to the Revised Peripherality Condition (indicated with a lack of bolding in (35b)). The two affixes have merged their phonological structure, and therefore it is only the final syllable of this merged domain, namely [təl], that can be marked as extrametrical (35c). Within either an RBP or an OT derivational system this overriding of the extrametrical status of [mɛnØ] is statable as a restriction on output structure, as in *Eσ (no extrametrical syllables may precede a pronounced syllable upon computation of a domain). In OT this constraint would have to be ranked higher than a constraint on Faithfulness to underlying extrametricality. In RBP this constraint would be applied across-the-board. Within CVCV Phonology, if extrametricality can universally be linked to the presence of empty nuclei (as in Scheer & Szigetvári 2005) then it is clear that the association of a vowel to a FEN's vocalic position will nullify that position's status as extrametrical. Such a structural analysis is preferable to an unmotivated constraint on surface structures. In any of these cases, the bi-syllabic (or heavy) [mɛnØ], as it is no longer extrametrical, must be footed. It constitutes, therefore, the rightmost foot in the word, and the MSR reapplies to reflect this fact, as the environment for the application of this rule has been modified. Within a Government Phonology type of RBP, resyllabification and refooting after liaison is a justified exception to the theory-internal proposal that government/syllabification relations are lexically stored and are not modified during a derivation.

It is also the case that the position of stress on the inner domain (*govern*) will be preserved, and will receive a secondary stress, as nothing has altered its metrical structure. The final consonants of *govern* remain extrametrical (35c), and the sequence [ɹnm], phonotactically banned

---

it the notion of rule ordering, as the correct way of formalising phonological processes. Instead, phonological events are conceived of as occurring freely in direct response to structural and segmental conditions which are locally present in the phonological representation. This results in an extremely impoverished theory of phonological activity." (Harris 1990:255) Phonological operations are therefore limited to operations such as the determination of government and licencing, and the addition or deletion of association lines and elements (phonological features in standard theories of segmental structure).

morpheme internally, remains unrepaired, as the [m] never sits within the phonological domain to its left.[28] This analysis also predicts that the phonology of cohering affixes will mask any null category-defining heads that intercede between themselves and a root, as their floating vowel will associate to the final empty V regardless of whether a phase/cyclic boundary intervenes – a nice indication that this boundary is not actually present in the phonological representation. It is therefore possible to parse a word like *tonal* as [[ton √]-al ₐ] or [[[ton √]-∅ ₙ]-al ₐ]. I assume a speaker will adopt the former parse unless forced to propose null morphosyntactic structure between the root and the affix. A case where a null affix might be proposed, for example, is when a syntactic causative morpheme emerges as linearly adjacent to a verbal root but unpronounced event structure morphology must intervene hierarchically between the two overt morphemes in order to explain the semantics of the construction. In cases like the much-discussed *(cònden)(sá)<tion>*, where the second vowel may surface as full or reduced, two possible morphological structures may be proposed; [[condens √] –ation ₙ] or [[[condens √] -∅ ᵥ] –ation ₙ]. The derivation of the former will be effected in a single cycle and the surface form will contain a reduced vowel [(kɔ̀ndən)(sé)<ʃən>], while the derivation of the latter will include the inner cycle [kən(déns)] and the output of the second cycle will be [(kɔ̀ndɛn)(sé)<ʃən>]. In this final output form the second vowel remains full, as its features have been determined on a previous cycle. Refooting after affixation of *–ation* will alter constituency but will not necessarily impact melodic structure. Under this analysis, the variability of the output form of *condensation* must be due to the variable parses in the morpho-syntax, and not to the variable application of vowel reduction or stress-retention (see also Kiparsky 2005; Bermúdez-Otero 2018b). Note that this opens up the possibility that these two derivations would have distinct semantic interpretations (à la *comparable*) but that nothing requires a single-cycle derivation to be idiomatic. Lack of idiomaticity in the form with a reduced vowel is not an argument against a single-cycle derivation. Forms that never contain the full vowel that would be predicted by a bi-cyclic derivation such as *inflammation* [(ìnflə)(mé)<ʃən>] will be analysed by speakers as mono-cyclic ([[inflam √] -ation ₙ]). Under the current analysis this variation will not be due to phonological factors such as Paradigm Uniformity (PU) (e.g. Steriade 2000; Downing et. al 2005 among many others).[29]

---

[28]   An anonymous reviewer notes that the [n] in *government* may be optionally deleted. It is notable that the deletion of [n] seems to be restricted to the idiomatic meaning 'the governing body of a country' for most of the speakers I've surveyed (thanks to Lisa Travis p.c., who received this comment from Gabe Daitzchman, a student in her undergraduate morphology class), and is not possible for the transparent meaning 'the act of governing'. It appears that the former has been reanalyzed as monomorphemic and therefore cannot countenance a sequence of two null vowels as the second is not final in its domain (rnm is illicit). Deletion of the syllable containing 'n' repairs this impossible situation.  Another reviewer points out that this n-deletion also occurs for speakers of non-rhotic dialects, and therefore more is going on here than a ban on two empty nuclei in a row.

[29]   The debate over whether PU is tractable as an explanation for cyclic effects is too large to enter into in this paper. For arguments for PU, see the works just cited. For arguments against PU see, for example, Bobaljik (2008) and Bermúdez-Otero (2015). For a direct reply to Steriade (2000) see Kiparsky (2005) and Bermúdez-Otero (2018b).

The analysis above does away with the need for lexical specification of morpheme classes altogether, and works to explain the phonological behaviour of all cohering and non-cohering affixes when it comes to stress-placement. Like in the derivation of *governmental,* other root-af$_{N-©}$-af$_©$ sequences will have two domains for syllabification and footing on the surface (e.g. *de(vèlo)<p>(mén)<tal> cf. de(vélo)<p><ment>, (rèla)<tiv>(ístic) cf. (réla)<tiv><ist>, (àrgu)(mén)<tive> cf. (árgu)<ment>*). In the case of root-af$_©$-af$_©$ derivations, the entire string will always behave as though monomorphemic with regards to syllabification and footing (e.g. *(mòn)(strósi)<ty> cf. (món)<strous>, (ìnstru)(mèn)(táli)<ty> cf. (ìnstru)(mén)<tal>*). Autosegmental structure, extrametricality, peripherality, floating segments, and cyclic derivation (all independently-motivated) are all needed to explain the cohering vs. non-cohering behaviour of English affixes, but, notably, diacritic affix classes are not.

Two potential problems in the data with the above analysis, namely the affixation of cohering affixes to vowel-final bases, and the existence of consonant-initial cohering affixes, are dealt with in the following sections.

## 2.1 Floating vowels and V-final bases

One potential problem for a floating vowel analysis of cohering morphology would be if an affix with an initial floating vowel were to follow a vowel-final base. In such a derivation, we might expect the floating vowel to remain unpronounced, just as the unattached floating consonants in French are when they precede a C-initial word as in ((5a) *peti(t) garçon*). What is clear, however, is that the initial vowels of cohering affixes in English are always pronounced, even after ostensibly vowel-final bases, as in, for example, *heroic*. Here we see that the hiatus between the base and the affix is not resolved through deletion, but rather by epenthesis of a glide.

(36)      C   V   C   V   C   V   C   V
          |   |   |   |   |   |   |   |
          h   ə   ɹ   o   **w**   ɪ   k   Ø


There are two options for resolving this issue here. The first is to say that hiatus is resolved at the melodic level in English, and that it forces the epenthesis of an overt consonant between the final vowel of *hero* and the initial vowel of *-ic*. As this consonant is pronounced, it must be linked to a C on the CV tier. As all linked Cs on the CV tier must be followed by a V within CVCV theory, this epenthesis creates a position to which the floating vowel of the suffix may be linked.

(37)   a.   C   V   C   V   -       C   V   →
           |   |   |   |           |   |
           h   ə   ɹ   o           ɪ   k   Ø

       b.   C   V   C   V   C   V           C   V
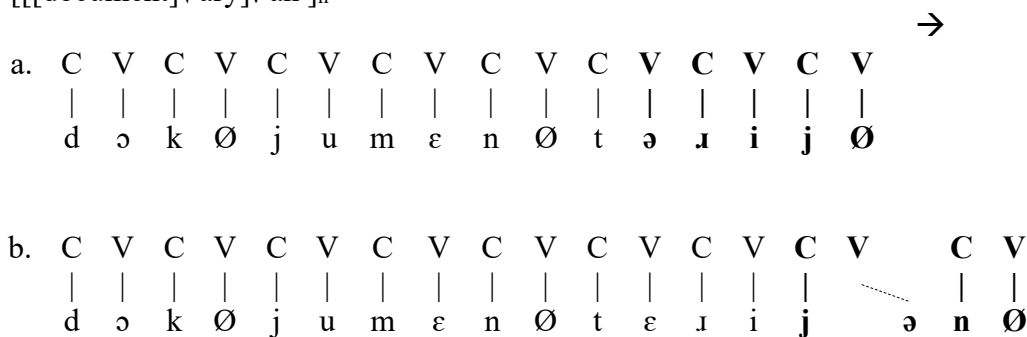           |   |   |   |   |                   |   |
           h   ə   ɹ   o   w               ɪ   k   Ø

The second option to account for the hiatus resolution pattern seen in the case of cohering affixes is to propose that there are no (or very few) V-final bases in English. This is what is proposed in Szigetvári (2016) for British English. Note that English notoriously does not permit a lax, short, vowel in the final open syllable of a lexical (as opposed to functional) word (*bi:* 'bee' vs. *\*bɪ*). If the final long vowels in English are all actually diphthongs; Vs followed by a glide, as proposed by Szigetvári, then these are consonant-final items that serve as bases of attachment for cohering affixes in English as discussed in the previous sections of this article. The 'problem' of hiatus resolution in the case of initial floating vowels is therefore non-existent. The derivation of *heroic* is consequently one where the base comes with the final glide and its following empty vocalic position. (37b) is the entire derivation of such a word.

In line with the above, the hiatus 'problem' also goes away for cohering affixes attached outside of other suffixes. All vowel-final affixes in English end in a long vowel or a diphthong. They are, therefore, glide final *(-ity /ɪrij/, -ory /ɔɹij/, -ary /ɛrij/, -ology /ɔlədʒij/, -ography /ɔgrəfij/, -ee /iːj/, -ify /ɪfaj/)*, and therefore all contain a final empty nucleus that may house the floating vowel of a cohering affix. Such a derivation occurs phase-by-phase as follows.
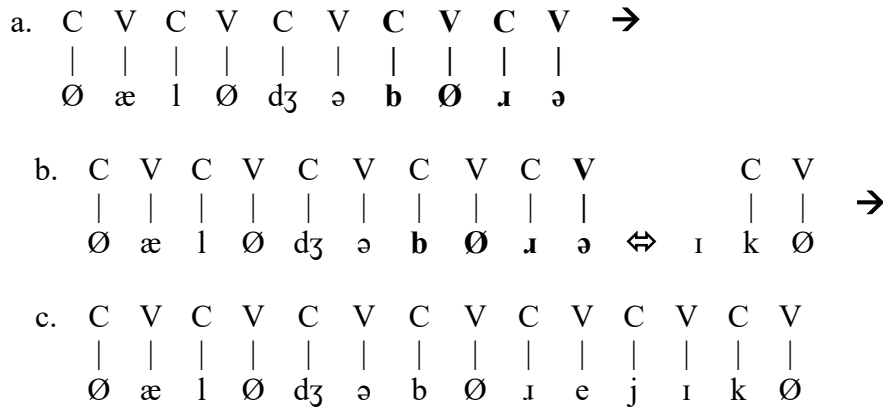
(38)  [[[document]√ ary]ᵥ an ]ₙ

→

a.  C  V  C  V  C  V  C  V  C  V  C  **V**  **C**  V  **C**  V
    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
    d  ɔ  k  Ø  j  u  m  ɛ  n  Ø  t  ə  ɹ  i  **j**  Ø

b.  C  V  C  V  C  V  C  V  C  V  C  V  C  **V**      **C**  V
    |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |
    d  ɔ  k  Ø  j  u  m  ɛ  n  Ø  t  ɛ  ɹ  i  **j**      ə  **n**  Ø

The stress-attracting nature of the cohering affix (*documéntary/documentárian*) is explained exactly as in §2. Incorporation of the floating vowel merges the output domains of the two phases, forcing the footing of previously extrametrical segments ((*dɔkju)(mént ə)<ɹij>/ (dɔkju)(mən)(téɹij)<ən>*, where the third syllable in the latter is unstressed for some speakers due to clash resolution).

The rare cases where we might propose that a short vowel does precede a cohering affix may offer evidence for the epenthesis account of hiatus resolution. Words like *algebraic* and *moraic* (Bermudéz-Otero, pc.) cannot be accounted for by proposing an underlying glide in the representation of the root. In these cases, the floating vowel will probe (represented as ⇔ in (39)) into the inner domain, searching for an empty V position. This probing is no different from what is normally assumed to occur in, say, French liaison; the system verifies the phonological properties of the adjacent string. In doing so, the final vowel of the first phasal domain will become visible. This derivation ensures that the high vowel's features are structurally adjacent to the final *a*, giving us a structure where *a* undergoes pre-'vocalic' tensing and vowel shift (Jensen 1993). English does not permit lax vowels prevocalically (Liberman & Prince 1977). Hiatus resolution will trigger the insertion of a CV unit and the appropriate glide. Note that whether CV insertion precedes or follows tensing is not at issue here, and I offer no analysis of how tensing is derived.

(39)   [[[algebra]√ ic]ₐ

a.   C   V   C   V   C   V   **C**   **V**   **C**   V   →
     |   |   |   |   |   |   |   |   |   |
     Ø   æ   l   Ø   dʒ   ə   **b**   **Ø**   **ɹ**   ə

b.   C   V   C   V   C   V   C   V   C   **V**          C   V
     |   |   |   |   |   |   |   |   |   |              |   |   →
     Ø   æ   l   Ø   dʒ   ə   **b**   **Ø**   **ɹ**   ə   ⇔   ɪ   k   Ø

c.   C   V   C   V   C   V   C   V   C   V   C   V   C   V
     |   |   |   |   |   |   |   |   |   |   |   |   |   |
     Ø   æ   l   Ø   dʒ   ə   b   Ø   ɹ   e   j   ɪ   k   Ø

Vowel-final bases are not an issue for the current account, as any account must propose a hiatus resolution operation to repair these VV sequences in English. Within RBP a rule of hiatus resolution will apply before the linking of floating segments (as the conditions for CV-insertion are present underlyingly, and the conditions for linking are only present after CV-insertion). In an OT-type account, FAITH-v will outrank DEP-CV, allowing for the pronunciation of all floating vowels. A third option is that these forms are no longer phonologically derived (they are either stored or the roots are subject to allomorphy). Note that all vowel-initial affixes select for the diphthong-final base (algebr[ɛi]-ize, algebr[ɛi]- ism, algebr[ɛi]-ic) (Raffelsiefen p.c.). If so, neither RBP nor OT will have anything to say about this alternation within a modular theory, as exceptions must be relegated to the domain of (pre-phonological) allomorphy.

## 2.2  C-initial cohering affixes

Another potential issue for the analysis proposed herein would be if there were any consonant-initial cohering affixes. This would be problematic, as C-initial affixes would obviously not be accounted for within an analysis that attributes their cohering nature to the presence of an initial floating vowel. I will argue here however, as in §2.2.1, that this possible problem is non-existent.

There are some C-initial affixes that have been proposed to be 'Level 1' in the literature, namely -t, -th, -st, -rd, and -tion.

(40)   a.      weigh-t      b.      fir-st, thi-rd, ten-th      c.      absorp-tion

I propose here that the first four affixes in (40) are not, in fact, cohering affixes. Rather, we have no evidence for such a classification of these affixes, save the fact that they merge with bound roots. Remember that *all* affixes, both those traditionally classed as Level 1 or as Level 2 are cohering when interpreted within the first phase; when affixed directly to a root. As the nominalizing -t and the ordinal -st, -rd, and -th affixes are *only* ever affixed to roots we have no

way of determining if they would be cohering outside of another affix.[30] The liaison account promoted herein predicts that they would not be.

The final affix in (40), *-tion,* is interesting in that it has multiple allomorphs; TION = {*-tion, -ation, -ition,* and *-ion*}.

(41)    a. interven-tion        b. randomiz-ation        c. defin-ition        d. amalgam-at-ion

Remarkably, the consonant-initial allomorph in (41a) is restricted to derivations where TION is attached to a root; where it would be cohering regardless of the status of its initial segment(s). No examples of words containing overt affixes between the root and *-tion* exist, and *-tion* causes phonological effects such as vowel shortening (cf. *intervene*) that are typical of cohering affixes (Rubach 1996). Outside of other affixes, TION always has a vowel-initial exponent; *-ation* in the environment of *-ize* and *-ify(k)*, *-ition* in the environment of a subset of coronal-final bases (ending in [n] *definition,* [z] *transposition,* [r] *apparition* and [d] *addition*), and *-ion* after *-ate*. It is evident that the form of the latter is an allomorph rather than due to the deletion of [t] after the [t] of *-ate*, as there is another allomorph, *-ation* that would permit a more faithful output form (*\*amalgamatation*). It is also clear that, within the current framework, the [i]-initial form is present in (41d), as otherwise we could not explain the cohering and stress shifting nature of the affix (*amálgamate/amalgamátion*). No allomorph of this suffix contravenes the liaison analysis of affixation in English.

One interesting possible true exception to the proposal that all cohering affixes begin with a floating vowel is the verbal affix *-en* as in *widen* or *lengthen*. In addition to the restriction that this affix attach to monosyllabic bases, a characteristic that does not receive a better account here than in any other framework, it is also restricted to following obstruent consonants (42a) and is banned from following sonorants, including glides (42b) (Raffelsiefen 1999, 2015).[31]
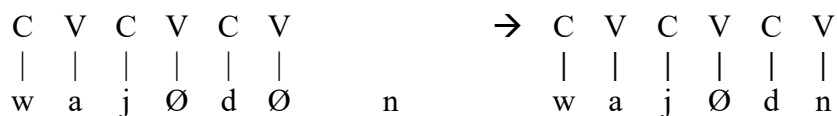
(42)    a. toughen, weaken, widen, lengthen

        b. *warmen, *bluen, *greyen, *dullen

---

[31]     A reviewer notes that *dullen* is grammatical for some speakers, and I have also found *greyen* and *greyening* used online. It is beyond the scope of this article to investigate where and when exceptions to this pattern are permitted, but it is clear, to me and to the reviewer, that these sonorant-final stems may not be followed by a syllabic nasal. Perhaps there are different levels of restrictions across speakers, where some permit non-nasal sonorants before *-n* with a concomitant epenthesis. This restriction on sonorant-final bases does not apply in the same way to the participial affix *-en*, as in the indisputably acceptable *(be)fallen*. This affix must have an underlying initial vowel, meaning that these two *-en* suffixes are not homophonous.

This restriction is explained if the underlying form of *-en* is not [ən], as traditionally assumed, but is rather a floating C, [n]. As a sonorant consonant, it will link to a final empty nucleus, just as a floating vowel would (note that sonorant Cs are licit nuclei in English). As onsets must be less sonorous than their nucleus according to the phonotactic restrictions of English (and most languages), [n] may not link to an empty position following a sonorant consonant, ruling out forms like those in (42b).

(43)  [[[wide]√ en]ᵥ (*dullen)

| C | V | C | V | C | V | → | C | V | C | V | C | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| w | a | j | Ø | d | Ø | n | w | a | j | Ø | d | n |

What the above derivation also predicts is that no affixes with initial floating vowels will be permitted to affix to a form containing verbal *-en*, as there is no final empty nucleus following the suffixal consonant, and no hiatus would trigger the epenthesis of a vocalic slot when merging a floating V to the n-final domain. This is the case (see also Plag 1999:70 for a discussion of other restrictions on affixation to *-en*). The only suffixes that can be attached outside of *-en* are non-cohering, as demonstrated by the maintenance of the syllabic *n*, as in *widening, toughenable, awakenment,* and *flattenee.*

In the end, as with the non-issue of vowel-final bases of attachment in §2.2.1, consonant-initial affixes pose no problem for the initial floating vowel analysis of cohering affixes. Additionally, the account of *-en* as a floating consonant offers motivation for the phonotactic restrictions on *–en*-affixation that have up to now been stipulated.

## 2.3    Summary of the computation

Before moving on to a discussion of previous analyses, let us review the phonological computational systems implied by the above. As this analysis places great weight on the specific underlying representations of morphemes (CVCV) and can be simply explained using the tools of an RBP system such as Government Phonology, I will only give a detailed account of the derivation in these terms. This, of course, does not imply that an OT account of the liaison analysis of English stress could not be built (I have pointed to some of its necessary rankings throughout the discussion), but it appears to me that the RBP account better captures the proposal that each operation is triggered directly by phonological structural relations.

In an RBP system like GP, rules are triggered when the environment for their application is met, and not otherwise. Rules that are always triggered upon spell-out (in each cycle) will therefore be syllabification and footing. Proponents of GP generally promote the proposal that CV and metrical structure is stored, but allow that for newly acquired lexical items rules of syllabification and metrification must be active in the language (this concurrent Stem-level phonological computation and Stem-storage is similar to what is proposed in Stratal OT). In any case, upon spell-out is where these operations will apply, when they do. Extrametricality is not derived here by a rule, but is rather part of the underlying representation. Syllabification and Footing will apply only to new segmental strings introduced upon phonological interpretation of each cycle. These rules will not re-apply to the output of previous cycles because this re-application

cannot be structurally motivated; previously computed strings already have syllabic and metrical structure. In a second cycle, if any floating melodic material is present, a rule of linking will apply. This linking rule will be preceded by a rule of CV-epenthesis iff hiatus resolution is triggered on the melodic tier. The linking of a floating vowel to a position that used to be empty necessitates a re-calculation of syllabic relations (governing relations in CVCV). If the position linked to was extrametrical, it will not be any longer, as it is now not the rightmost structure in its string. This recalculation has a domino effect throughout the affected domain, but goes no further than it must. Specifically, any CV string or syllable that is modified will be recomputed. This recomputation of phonological structural relations will not breach an independent domain because, for example, the final segment in a string like *govern* has no structural relationship to the first segment of the following domain *-ment*, in *government*. Therefore, resyllabification and footing of *-ment* after the affixation of *-al* in *governmental* will not impact the structure of *govern*. Primary vs. Secondary stress will be determined over the entire word, and will therefore be assigned post-cyclically.

In sum, within each cycle operations will apply in the following order;

    A. Search: floating material will search for empty structure on the CV tier.
    B. Hiatus Resolution (may be unnecessary): If, upon Search, a hiatus is discovered, insert a consonant on the melodic tier and its associated CV structure on the CV tier.
    C. Link: Link any floating melody to any linearly available empty positions on the CV tier. (Unlinked melody will not be pronounced, linked-to structure will lose its status as extrametrical).
    D. Syllabify (compute government relations over newly introduced melody and over any strings that are modified by this computation)
    E. Foot (compute metrical relations for newly built syllables/government relations)

## 3.      Alternate analyses

The above account is one where neither the Level 1~Level 2 morphological distinction nor the Stem vs. Word-level phonological computations (of e.g. SOT) exist; distinctions between affixes and their behaviour is neither morphological nor lexical. All (category-defining) affixes trigger a syntactic, and therefore a phonological, cycle, and all affixes are subject to the same phonological computation.

In the sections below, I will consider three other accounts of the distinction between cohering and non-cohering affixes and two accounts that claim, like the analysis here, to do away with such a distinction. In the first group is Halle & Vergnaud (1987), wherein only Level 1 affixes are cyclic (§3.1), Kaye (1995), where only Level 2 affixes are cyclic (§3.2).[32] and in §3.3 Bermúdez-Otero's (2018b) analysis of the derivation of words that contravene the Level Ordering Generalization. In the second group is Lowenstamm (2014), in which Level 1 and Level 2 affixes are all root morphemes (§3.4), and the Co-phonology (CP) approach exemplified by Raffelsiefen (1999, 2015), where there are no lexical distinctions among affixes; each affix lexically determines its unique phonological behaviour (§3.5). I discuss only the directly relevant sections of each of

---

[32]      Both of these accounts have been translated into a phase-based framework in Scheer (2011).

these analyses for reasons of space, in order to compare them to the floating-vowel solution offered here.

## 3.1    Halle & Vergnaud 1987

For Halle & Vergnaud (H&V), Level 1 affixes are cyclic, in that they trigger the application of cyclic phonological rules. A H&V derivation of a word where a Level 1 (cyclic) affix (*-al*) is attached outside a Level 2 (non-cyclic) affix (*-ment*) is therefore as follows.

(44)    Derivation of *governmental*
        Phonological cycle 1 (triggered by the root):        góvern
        Phonological cycle 2 (triggered by *-al*):        gòvernméntal

The above derivation, unlike in phase theory as it is currently understood, does not call upon a principle, such as the Phase Impenetrability Condition (Chomsky 1999. 2001a), that restricts the modification of previously interpreted cycles. For H&V, upon merger of the cyclic affix *-al* the entire string *governmental* is reassessed phonologically (cyclic rules are reapplied) allowing for a demotion of the primary stress on the first syllable of the root. This analysis encounters at least three problematic issues. The first is common to all accounts that distinguish Level 1 and Level 2 affixes with lexical diacritics; A theory that allows affixes that may behave as though they are Level 1 or Level 2 indiscriminately makes determining when to apply a phonological cycle complicated in ways not dealt with in H&V. In such an account, each dually affiliated affix must be stored as two independent affixes, a complication that reduces the analysis to a description of when phonology has applied.

The second problem encountered by H&V's account is that the reapplication of cyclic phonological rules (specifically here, syllabification and stress assignment) across the entire word upon affixation of an outer Level 1 affix is arbitrarily applied. Consider the discussion of *comp[ə]nsátion* vs. *cond[ɛ]nsátion* in §2.

Thirdly, it is apparent that the phonology is not reapplied to the entire string upon the application of phonological rules triggered by outer Level 1 affixes, despite the ability of main stress to shift. As noted in §2, we can see that syllabification on an inner domain is not reassessed in a root-affix$_{N-©}$-affix$_©$ construction. Consider a word like *probabilistic*, with an output form as in (45) (*-ic* is not extrametrical cf. *héro ~ heróic*).

(45)    [(pɹɔ̀.bə)bl̩(í.stɪk)]

The output in (45) indicates a foot structure that leaves the final syllable of the root domain untouched. Were syllabification and metrical phonological rules to reapply to the entire string upon affixation of *–ic*, we should expect the syllabic [l̩] (and the preceding [b]) in *probab[l̩]* to be resyllabified as the onset of the following syllable, giving the ungrammatical four-syllable form *(próba)(blístic)*. The analysis in §2, however, gets the expected parse in (45).

## 3.2    Kaye 1995

Turning to Kaye (1995), it is interesting that the translation of his morpho-phonological system found in Scheer (2011) comes the closest of any of the previous analyses to the one proposed here. There are, however, issues that are not discussed in Scheer's translation that are important distinguishing factors between Kaye (1995) and the current analysis, in addition to the general issues with analyses that depend on a lexicalized distinction between Level 1 and Level 2 affixes.

For Kaye, Level 2 affixes are labeled 'analytic' and Level 1 'non-analytic'. His account is the contrary of H&V's: Level 2 affixes are cyclic, while Level 1 affixes are not. A further distinction between Kaye and H&V is that the former only trigger a cycle of interpretation on their complement; Level 2 affixes are outside the phonological domain to which they attach. Kaye notes, correctly, that a non-analytic morpheme affixed to a root is phonologically indistinguishable from a monomorphemic form. In root+Level 1 domains the phonotactics and the restrictions on syllabification inherent to English phonology all hold. For example, the Level 1 prefix *in-* cannot precede an *l*-initial morpheme, as the sequence *nl* is illicit in English at Level 1 (46).[33] Also, vowels must be short in closed syllables within a root+Level 1 domain, just as within a morpheme (47). These restrictions do not hold when a Level 2 affix is attached.

(46)    a.    [in-licit]$_{L1}$ → i[l]icit                'illicit'
              cf. [[un]$_{L2}$ [lawful]$_{L1}$] → u[nl]awful  'unlawful'


(47)    a.    [keep + t(past)]$_{L1}$ → k[ɛ]pt            'kept'
              cf. [[s[i:]p]$_{L1}$ t(past)]$_{L2}$        'seeped'
              c.f [æpt]                                   'apt'

In a form like *parentally* the first affix will be interpreted in the domain of the root, and the second will be an outer affix; adjoined phonologically. This is exactly what we expect in the DM+Phase analysis and for that matter, in H&V as well. The additional distinction between H&V and Kaye (besides which affixes are considered cyclic) comes in the form of a no-look-back device in the latter's framework. Kaye institutes a precursor to Chomsky's Phase Impenetrability Condition (PIC) based on Chomsky's (1973) *Strict Cyclicity*, and formulated as follows. "The principle of *strict cyclicity* states that the association created in the inner domain cannot be undone in an external domain." (307). The fact that, in Kaye's system, a word-level cycle of phonology must apply causes this phonological PIC to be necessary in order to ensure the persistence of

---

[33] Note that the question of the behaviour of prefixes in particular is not detailed in this article. It is clear that there is a Level 1/Level 2 distinction between prefixes, as is shown in (46). However, it is also clear that prefixes have a tendency to be non-cohering cross-linguistically. Many syntactic theories (e.g. nanosyntax, anti-symmetry) propose that linear order be read off of syntactic structure. If these theories are correct, then the syntactic structure of prefixes is by default that of a specifier, and they are therefore predicted to be interpreted in separate PF cycles from their bases (Uriagereka 1999). This then predicts that all prefixes should be non-cohereing, which is clearly not the case. This is a topic that I have discussed, for example in Newell (2009), and will discuss again in future work.

domains created at previous cycles (cyclic domains indicated by bolded brackets). Note that this is my own extension of Kaye's predictions, as he does not treat any multiply-affixed forms.

(47)    **[[**parent-al**]**L1 –ly**]**L2    →        [[paréntal] ly]
√-al(L1)-ly(L2)
\*parentálly

Kaye's system therefore can also capture the phonological behaviour of Level 1 affixes attached outside other morphemes. In a word like *probabilistic* the analytic affix *-ist* will be outside of the phonological domain of its complement, and the phonological cycle at the word level ensures that *–ist* and the outer Level 1 affix are in the same domain; a domain that remains separate from the one determined in the first phonological cycle due to Kaye's version of *strict cyclicity*.

(49)    Phonological cycle 1: **[**próbable√**]**
Phonological cycle 2: **[[**pròbable√**]** ístL2icL1**]**WORD

Kaye's no-look-back analysis does not have the problem with refooting/resyllabification that underlies H&V's account. It does, however, share with H&V the problem that Level 2 affixes may also be 'cross-listed' as Level 1 affixes, making the triggering of a phonological cycle in any of these accounts purely descriptive.

One issue that is unique to Kaye's system that is not discussed in Scheer (2011) is that Kaye proposes that the affixation of a Level 1 morpheme does not trigger a cycle of phonology, but rather triggers the search for a listed form. In essence, for Kaye all Level 1 morphology is allomorphic.

(50)    a.        [weave-PAST]L1 → wove (listed)
b.        [parent-al]L1 → paréntal (listed)

Kaye claims that Level 1 (non-analytic) forms must be listed due to the fact that pseudo-processes such as velar softening (*electricity*) and tri-syllabic laxing (*opacity*) that occur at Level 1 are impossible to formulate in Government Phonology.[34] Here is where Kaye's system diverges from the predictions in Scheer's phase-compatible translation. If Kaye's proposal is to be taken seriously, we have two options. The first is that any form where a Level 1 affix is attached outside a Level 2 affix must be listed and non-listed at the same time. If we consider again [(pɹɔ̀.bə)b]l(í.stɪk)], the phonological domain boundary between *probable* and *–ist* exists, indicating productive phonology has been applied, but at the same time the non-analytic, allomorphic, cycle triggered by the affixation of *–ic* (an affix that does trigger velar softening, e.g. *thoracic* ([θoɹǽsɪk], cf. [θóɹæks], /θoɹæks-ɪk/)) should eradicate this boundary; there are no phonological boundaries within an allomorph. In fact, as mentioned above, Kaye's proposal is that all listed forms must be phonologically indistinguishable from monomorphemic words. This is clearly not the case.

---

[34]     The debate over whether these 'rules' are synchronic or allomorphic is not restricted to the Government Phonology literature. See also Bermúdez-Otero (2013) within a Stratal Optimality Theory framework, and the relevant literature cited in Scheer (2011).

## 3.3    Bermúdez-Otero 2018

Kaye's proposal is similar to the most recent proposal in Stratal OT for accounting for Level-2 > Level-1 sequences of affixation (Bermúdez-Otero 2018b). Within Stratal OT, level of affixation is determined by the base and not by the affix (following Giegerich 1999; Kiparsky 2005). Bermúdez-Otero argues that, in a word like *develop-ment-al*, the base of attachment of *-al* must be a Stem and that the Stem-Level nature of *development* is discernable via its inability to host inflectional morphology (\**develop-ment-s-al*).[35] He concludes that the *develop-ment* to which *-al* is affixed must have been derived at the Stem Level. As the Word-Level phonology has not applied before affixation of *-al*, or before the affixation of any outer Stem-Level affix, there should be no Word-Level (non-cohering) phonological effects internal to Stem-Level (cohering) affixes. Besides this being untrue (see the discussion of *probabilistic* among other examples above), it is unclear how the system itself would determine that *-ment* is to be treated as Stem-Level before the affixation of *-al,* given that it must be a Word-Level affix before the affixation of other Word-Level affixes (e.g. *develop-ment-less*). It appears here that the level of the base is being determined by an outer-affix, a look-ahead device that is neither desirable, nor necessary within the liaison account of affixation. In the end, this analysis is subject to the same criticisms as is Kaye (1995).

## 3.4    Lowenstamm (2014)

Lowenstamm (2014) proposes what at first appears to be a fairly radical divergence from the traditional Level-affiliation accounts. He notes that the classification of a morpheme as category-defining, and therefore as cyclic in DM, cannot predict the attested phonological patterns in English, as discussed in §1.2. He says, "At the risk of belaboring the obvious: in pre-Phasal Spellout theories, domains of phonological interpretation (cycles) are projected from properties of affixes. In DM, in sharp contrast, domains of phonological interpretation (phases) are defined in strictly categorial fashion, and irrespective of what particular Vocabulary Item may eventually ornate a given category." Yet in (51a) all of the words given have the same morpho-syntactic structure, (51b), making their divergent phonological behaviours anomalous.

(51)    a.    [[[ govern V]$_{L1}$  mént N ]$_{L2}$ al Adj]$_{L1}$          b.    [a [n [v √ ]]]
            [[[ objéct V]$_{L1}$  ion N]$_{L1}$  able Adj ]$_{L2}$
            [[[ léad V]$_{L1}$  er N ]$_{L2}$ less Adj ]$_{L2}$
            [[[ represent V]$_{L1}$  átion N]$_{L1}$  ary Adj]$_{L1}$          (Lowenstamm 2014:239)

To circumvent the above problem, Lowenstamm proposes that all derivational morphemes are roots, and that roots are not phase/cyclic heads/Level-affiliated. Phase heads in his system are null category-defining heads (*a, v, n*). The structure of a word like *atomicity*, with two 'Level 1' affixes is therefore as follows in (52). The three roots, *atom*, *ic*, and *ity* are merged with the null head *n*, which sends its complement to PF and LF. A single cycle of phonology is predicted.

---

[35]    Note that in the case of the *develop-ment-less*, inflection is likewise banned from appearing between affixes (e.g. \**develop-ment-s-less*). The non-appearance of inflection inside of a derived word appears to have nothing to do with the distinction between Stem-Level and Word-Level affixes, but is rather due to the position of these morphemes with regards to the syntactic functional structure.

(52)    [[[[atom√]ic√]ity√] Ø ₙ]    →    atomícity

A 'Level 2' affix in this system is also a root, but unlike a 'Level 1' affix (which selects for a root as its complement) it selects for an already categorized structure; an *n*P, *v*P, or *a*P. 'Level 2' affixes will therefore always merge outside of a phase head, and outside of a phonological domain (reminiscent of Kaye 1995 in §3.2). An additional restriction on these *x*P-attaching affixes is that they must immediately be categorized; their 'root-hood' is never accessible to further selection. A word like *objectionable* will therefore have the following structure.

(53)    [[[[[ object√] ion√] Ø ₙ] able√] Ø ₐ]

A third class of affix, a 'universal selector' may merge with either a root or an *x*P. This is proposed to account for cross-listed affixes. *-able* in (53) merges with an *n*P, but in (54) merges with a root, demonstrating the behaviour of a universal selector.

(54)    [[[ compr√] able√] Ø ₐ]    →    cómparable    'similar'

As with all other analyses of the Level 1/Level 2 distinction, this sort of appeal to lexicalized selectional restrictions boils down to a description of the attested outputs, and it sneaks Level-affiliation back in through the guise of these selectional restrictions. But Lowenstamm's account has further issues. I will focus here on one of these issues that clearly demonstrates the wrong predictions made by this type of framework, leaving other complications aside for reasons of space.

Lowenstamm notes, following Ross (1974, 1979), Aronoff (1976), and Fabb (1988), that *-al* disprefers attaching outside of *-ment* if the latter is affixed to a verb (*segmental* vs. *\*attachmental*). If this is the case, Lowenstamm contends, it appears that *-al* can 'see through' to the complement of *-ment*, a pattern of selection that is unexpected given locality constraints generally assumed in the morpho-syntactic literature.[36] According to Lowenstamm, *-al* selects for roots. It will therefore not be able to attach outside of a *-ment* that has selected for an *x*P, as *x*P

---

[36]    It is not true that *–al*'s selectional restrictions here need see the complement of *-ment*. Any deverbal nominalizer will have a particular effect on the argument structure of a verb (Chomsky 1970). *-ment* does not saturate the external argument of the verb to which it attaches, as evidenced by this argument's ability to fill a possessor position while maintaining an AGENT theta-role.

(i)    Seonaid's [accomplish]ᵥ -ment (of the task).

(ii)    *Seonaid's [seg √] -ment (of the item). (where Seonaid = AGENT)

Assuming that *-al* can be sensitive to the unsaturated argument structure of its base, it will be able to 'see' this argument-structure information at the level of *-ment* and does not need access to *-ment's* complement. The discussion in Lowenstamm therefore attempts to solve a non-existent problem. Nonetheless, the proposed solution makes the wrong phonological predictions, which is pertinent to the present discussion.

selectors will lead to the immediate categorization of the Level 2 affix, bleeding the selectional restrictions of -al.

(55)    [[[[ attach√] Ø ᵥ] ment√] Ø ₙ](* al√])

But, as -ment is a universal selector, when it affixes to a root rather than to a verb the root-selecting -al will be permitted to merge.

(56)    [[[[ seg√] ment√] al√] Ø ₐ]

What is interesting is that, in addition to the three well-known exceptions to this rule (*governmental, developmental, judgemental*) Lowenstamm notes that the affixation of -ly outside of -al causes many more (perhaps all) *VERB-ment-al* forms to become grammatical.[37]

(57)    Stupid jerk who continually forgets to include a specified attachment within an email.
        Don't be alarmed if Bob had to send you that spread sheet a few times, he's a little
        **attachmentally** challenged.                                    (Lowenstamm 2014:255)

For Lowenstamm, this pattern means that -ment here attaches to the root *attach* rather than the verb, giving the following structure.

(58)    [[[[ attach√] ment√] al√] Ø ₐ] ly√] Ø ₐdᵥ]

In (58), just like in the Stem-Storage solutions of Kaye and Bermúdez-Otero, Lowenstamm predicts that the domain from the root to -al will behave as if it were phonologically monomorphemic. But, the stress pattern of -ment nouns always depends on the stress pattern of the verbal base to which -ment is attached when this base exists independently, as is the case for *attachmental*. We know that stress clash is not required to be resolved when stress precedes -ment (59a), therefore the lack of stress on the heavy syllable preceding –ment in (59b) runs counter Lowenstamm's predictions.

(59)    a.    She's a cop who can't arrest people. She's ar(rést)(méntal)<ly> challenged.
        b.    They couldn't manage their way out of a paper bag. They're
              (mána)<ge>(méntal)<ly> challenged. (*ma(náge)(méntal)<ly>)
        Given the grammaticality of these 'X-*mentally*' forms, -al, and any Level 1 affix, is permitted to merge to a Level 2 (*x*P-attaching, non-cohering) affix. The distributional claims in Lowenstamm's account do not follow through.[38]

---

[37]    The details of the suppression of an external theta role and its relation to -al and -ly affixation will be left for future study. Note that proposed statistical solutions to the inability of -al to attach to certain bases like that in Hay (2002) cannot account for the sudden grammaticality of these forms after affixation of -ly.
[38]    It is also of note that forms like *attachmental* can be exceptionally found in print, as in the following example, and therefore it seems to be the case that their rarity is not due to their ungrammaticality.

For reasons like the above, Lowenstamm's (2014) proposed solution to the phonological challenge to the DM+Phases framework cannot be correct. This takes nothing away, however, from the point he raises that is at the core of the floating vowel proposal herein; outer Level 1 affixes cohere to their bases even though a cyclic account predicts that they should not.

## 3.5    Raffelsiefen (1999, 2015)

Raffelsiefen's work goes into incredible detail regarding the restrictions on the bases of affixation of vowel-initial affixes in English. She proposes that all vowel-initial affixes are cohering, and that their syllabification with their bases (due to a highly-ranked Onset constraint) explains their ability to condition stem-allomorphy.[39] Citing Raffelsiefen (1999), an anonymous reviewer asks why I ignore this type of non-metrical data as an indicator of domain-size. They note that "… practically every affix that triggers morpho-phonological changes has its own patterns of alternation with regard to very different phonological properties (of which the overwhelmingly discussed stress shifts or resyllabification are only two among many." and they argue that the varying behaviour of individual affixes must lead to the conclusion that the cohering/non-cohering distinction is too simplistic, and that affix-specific co-phonologies must be appealed to. However, these additional restrictions must all be classed as allomorphy, rather than phonology, within a modular theory. An example of such a pattern discussed by Raffelsiefen (2015) is the restriction on sibilants flanking an unstressed vowel to explain why *-ation* will not affix to *-ize*-final bases (e.g. *fantas[aj]ze* but *\*fantas[ɪ]zation*). That this pattern needs to be a restriction on bases of affixation of *-ation* and not a general rule of English phonology is clear (cf. *class[ɪ]sm, hors[ɪ]z* and all of the forms created by the various *-s* inflectional affixes in the language). The motivation for including this restriction in the *phonological* grammar (of *-ation*), however, is not so clear. The inclusion of any allomorphic restrictions in the co-phonology of an affix mixes two distinct types of operations and makes global predictions regarding domains of allomorphy that are not borne out (see Embick 2010 for a manuscript-length discussion of this issue). This clash of analyses raises a question that is central to the formulation of phonological theories; should we include affix-specific patterns within a theory of phonology, or are lexically listed properties the domain of morphology?[40] The CP approach argued for by Raffelsiefen posits that many (or all) affix-

---

(i)      "Our concern here is with the theoretical continua themselves, and it is evident that the continuum of attachment or positive motives and behaviours is truncated at the lower levels compared to aggression and withdrawal." (Bailey 1987: 188)

[39]      See Plag (1999) and Bermúdez-Otero (2018b) on some exceptions to the affix-specific phonologies of Raffelsiefen (1999) and later work in (2005).

[40]      For discussion of the impact of this debate on phonological theorizing see, for example, the helpful analogy on a website of Tobias Scheer "In current phonological theory, a major problem is that there is no agreement on the set of phenomena that are phonological in kind and hence constitute the input to theory-building. …As a result, the Popperian competition among theories is biased: a theory that accounts for the k-s alternation in the phonology cannot be compared to a theory considering that k-s has nothing to do with phonology: the set of things to be explained is not the same, and wildly diverges at the scale of a language, or of phonology as such. Before theories can compete, the question what a true phonological phenomenon is thus needs to be addressed…" (http://mshs.unice.fr/?page_id=7880).

specific alternations (which are often admitted to be allomorphic) are governed by the phonological computation alongside the regular phonological operations of the language. Accordingly, each alternation is evidence for another phonological rule or constraint that must be included within the phonological computational system of the language under discussion. Level 1(Stem)/ Level 2(Word) analyses (SPE, Lexical Phonology, Stratal Optimality Theory, and to an extent Distributed Morphology), on the other hand, generally advance a hybrid position; certain phonological alternations and restrictions are determined either the morphology or via particular pre-specified properties of the lexical entry of a morpheme (for the latter see Scheer 2016), while regular phonological rules/constraints fall within the domain of phonological computation. It is proposed here that this latter type of analysis effectively bleeds the necessity for affix-specific phonological rules, constraints, or co-phonologies without any loss of explanatory power. What is gained by such an account is a modular framework, wherein there are precise restrictions on which elements of the grammar may interact: morphological and phonological constraints or rules apply in separate grammatical modules. A more detailed motivation for the rejection of affix-specific phonologies can be found in Bermúdez-Otero (2012). Importantly, a CP account predicts that domains for allomorphy should be distinct from domains of phonology, leaving the fact that consonant-initial outer affixes neither condition nor undergo allomorphy to an unexplained factor that is different from their non-cohering behaviour.

## 4. Concluding thoughts on the advantages of a liaison theory of English affix classes

The analysis herein argues that English affixes are neither specified to be cohering or non-cohering (or to project their own Prosodic domain or not (e.g. Booij & Rubach 1984), specified to trigger a cycle of phonology (or subject to specific strata of phonological rules), nor specified with affix-specific phonologies (or constraints). The liaison account of English stress and syllabification can be distinguished from all previous accounts in that it takes only regular phonological patterns to belong in the realm of phonology, while all 'affix-specific' patterns are relegated to the purview of morphology. The phonology-proper of English behaves exactly the same way regardless of the affix that is merged into a derivation. Affixes that are merged outside of the first interpretive cycle, defined as the root and the first category-defining head, are non-cohering by default. The independently-necessary operation of linking stray, floating, segments to available empty positions on the CV tier causes the only divergences from the pattern expected within a Distributed Morphology approach to the morpho-syntax/phonology interface. Liaison, importantly, distinguishes the two groups of affixes we see in English in a way that makes phonological predictions. A floating vowel has the inherent property of inducing phonological cohesiveness (and the floating syllabic [n] in -en has visible phonotactic effects). It is true that whether an affix begins with a floating vowel or not is a lexical property, but it is not an arbitrary one like that found in lexicalist/diacritic frameworks, as it makes testable, falsifiable, and importantly, phonological, predictions. Interestingly, in CVCV phonology, the default is for there to be an empty final V position in words that end with an overt consonant, and for there to be an initial empty C position in words that begin with an overt vowel. Liaison of consonants in French targets this initial C

---

In other words, depending on which alternations a phonologist puts in their morphology or in their phonology, their theory of phonology may look very different. I assume here that lexical exceptions, including allomorphic alternations, do not derive from the phonological computation, but are rather stored in the lexicon.

position, and liaison of vowels in English targets this final V position. These two options therefore appear to be the most 'natural' liaison behaviours according to CVCV.

The Phonological Merger (Newell & Piggott 2014) of an affix into the phonological domain to which it attaches is neither surprising nor specific to English. Newell & Piggott demonstrate a similar type of phonologically-triggered incorporation in Ojibwe. In this language, a monomoraic prefix, being too small to be footed, will incorporate into the domain to its right. Interestingly, like in the English patterns seen here, this Phonological Merger has no effect on a previously determined word-internal 'boundary'. Monomoraic, degenerate feet are permitted in the language, but only as a last resort. The incorporation of the person prefix in (60a) into the domain of the modifier *ini* (60b) creates the environment for the creation of a degenerate foot in the middle of the word (and for hiatus resolution between the first pair of string-adjacent vowels). Like in English, we see a vocabulary item merging into an adjacent domain, along with a concurrent lack of phonological effect on domains that have not been altered. As can be seen below, hiatus remains unresolved between the degenerate foot in (60b) and the following syllable. A parse where the degenerate foot is incorporated into the following foot would be consistent with Ojibwe foot structure and would give a more optimal surface output, but it does not occur as the structure of (60b) does not allow for refooting of an adjunct (adverb) and the domain that it modifies (the verb) (see Newell 2009 & Kalivoda 2018 for links between phonological spell-out and morpho-syntactic c-command that offer further insight into this kind of pattern).

(60)  a.  [ni [(inì)]$_{aP}$ [(á:)(gamò)(sè:)]$_{vP}$]$_{CP}$  'I walk there in snowshoes'
         1P  AWAY  SNOWSHOE.WALK

      b.  [n̶i̶ [(nidì)(nì)]$_{aP}$ [(á:)(gamò)(sè:)]$_{vP}$]$_{CP}$

This is just one other example of the many found cross-linguistically where one affix or segment, for purely phonological reasons, incorporates (or does not) into the phonological domain of its host. For further discussion see (for example) Harris (1993) on syllabification in Spanish and Catalan, Yu (2007) on cross-linguistic patterns of infixation, van Oostendorp (1994) on affixation, syllabification and stress in Dutch and Yidin$^y$ (originally from Dixon 1977), and Piggott et al. (2015) on the pronunciation of person prefixes before C-initial bases iff necessary to meet word minimality requirements in Maybrat. In each of these languages resyllabification will be effected due to language-specific restrictions on possible phonological structures. That this phenomenon should also occur in English is unsurprising.

The liaison analysis in this paper offers a cleaner analysis both of the phonological facts attributed to cohering and non-cohering affixes in English, and of their morpho-syntactic distribution. As Fabb (1988) said, "English suffixation is constrained only by selectional restrictions". The Level 1/Level 2 distinction never captured the affix-ordering patterns in English (as expanded on in great detail in Plag 1999), and now we can also remove the need for it to account for the cohering/non-cohering phonological pattern. What actually accounts for the attested and non-attested orders of affixes, given that selectional restrictions cannot be the entire story, must be independent of the phonological patterns seen here.

Finally, I argue that the analysis herein is the only one that will also properly account for the fact that there is a single word-internal domain for special semantic interpretation; defined by the root+1st category-defining head (Aronoff 1976; Kiparsky 1982; Arad 2003; Marvin 2001, 2013; Marantz 2013, and see Raffelsiefen 2010 for a different but I believe ultimately compatible view). Marantz (2013) argues that, as is the case for the conditioning of allomorphy, the conditioning of allosemy is restricted to a local relation between morphemes that are present within the same domain of interpretation; the phase.

If only the first category-defining head is ever in the same phasal domain as the root, we expect only these root-attached affixes to condition its allosemy. This conditioning of semantic special meanings by root-attached affixes, but not by outer affixes, can be seen in (61).

(61)  a.  $[[\text{globe}]_{\sqrt{}} \varnothing ]_n$          'sphere'
      b.  $[[\text{globe}]_{\sqrt{}} al ]_a$          'pertaining to the world/*sphere'
      c.  $[[[\text{globe}]_{\sqrt{}} \varnothing]_n less]_a$     'without a sphere/*world'
      d.  $[[[\text{glob}]_{\sqrt{}} al ]_a ity ]_n$     'property of pertaining to the world/*sphere'

Note that -$\varnothing$ and -*al* may, as first phase heads, condition allosemy on the root, but the outer affixes -*less* and -*ity* may not. Importantly, the status of the outer affix as cohering (-*ity*) or non-cohering (-*less*) is completely irrelevant to whether it may affect the semantics of its base.[41] This is completely in accordance with the DM+Phase based account of both phonological and semantic interpretation, and fully consistent with a purely phonological account of the non-isomorphism of phonological and semantics domains promoted here. This unification of phonological, semantic, and morpho-syntactic cycles can only be a desirable outcome.

In conclusion, the liaison analysis of cohering and non-cohering affixes allows for us to maintain the insights of a cyclic, realizational theory of morpho-syntax such as DM, while accounting for the behaviour of the two classes of affixes phonologically, morphologically, and semantically. The universal predictions of this framework; that all derivational morphemes are phase heads, come with the expectation that all accounts of cohering/non-cohering morphology in other languages may be similarly recast. Whether this is indeed the case remains to be seen.

---

[41]     Some authors, notably Alexiadou & Lohndal (2013), Harley (2014) and Lowenstamm (2010, 2014) have proposed that this root+1st category-defining head domain is not always the domain in which allosemy is determined. They note examples like *edit-or-ialize* 'to express an opinion in the form of an editorial' (Merriam Webster) and *person-al-ity* 'the set of emotional qualities, ways of behaving, etc., that makes a person different from other people' (Merriam Webster) as counter-examples, given their idiomatic meanings. It is of note that (i) idiomatic domains that are larger than the first phase must be countenanced in any theory. Idioms like *kick the bucket* would not exist otherwise. See Marantz (2013) for a more detailed discussion of the distinction between allosemy and idiomaticity. What is interesting to note here is that the two examples listed above demonstrate an important fact not noted in the discussion on allosemy and idiomaticity in the literature; that neither Level 1 (-*al*) nor Level 2 affixes (-*or*) block a possible idiomatic reading of a word. Within Lowenstamm (2010), or any account where Level 1 affixes are cohering both semantically and phonologically, the prediction is that only sequences of Level 1 affixes would permit this type of semantic non-compositionality, counter to the facts.

## References

Alexiadou, Artemis & Terje Lohndal. (2013). On the division of labor between roots and functional structure. Paper presented at the Workshop on little v. Leiden University.

Arad, Maya. (2003). Locality constraints on the interpretation of roots: The case of Hebrew denominal verbs. *Natural Language & Linguistic Theory*, *21*(4), 737-778.

Aronoff, Mark. (1974). "-able," in J. Hankamer and E. Kaisse, eds., Papers from the Fifth Annual Meeting of the North Eastern Linguistic Society, Harvard University, Cambridge, Massachusetts.

Aronoff, Mark. (1976). Word Formation in Generative Grammar, Cambridge, Mass.: MIT Press

Bailey, Kent. (1987). *Human Paleopsychology: Applications To Aggression and Pathological Processes*. Psychology Press.

Bauer, Laurie; Lieber, Rochelle; Plag, Ingo. (2013). The Oxford reference guide to English morphology. Oxford: Oxford University Press.

Bermúdez-Otero, Ricardo. (2013). The stem-level syndrome. *UPenn Linguistics Department Speaker Series. Philadelphia*, *11*.

Bermúdez-Otero, Ricardo. (2015). Paradigmatic effects without output-output correspondence: the role of lexical acquisition. Paper presented at Spell-out and the Syntax-Phonology Interface. Tromsø.

Bermúdez-Otero, Ricardo. (2018a). In defence of underlying representations: Latin rhotacism, French liaison, Romanian palatalization. *To appear in Probus*, *30*(2).

Bermúdez-Otero, Ricardo. (2018b). Stratal Phonology. In S.J. Hannahs & Anna R. K. Bosch (eds), The Routledge handbook of phonological theory, 100-134. Abingdon: Routledge.

Bermúdez-Otero, Ricardo. In preparation. *Stratal Optimality Theory* (Oxford Studies in Theoretical Linguistics). Oxford: Oxford University Press.

Bobaljik, Jonathan. D. (2000). The ins and outs of contextual allomorphy. *University of Maryland working papers in linguistics*, 10, 35-71.

Bobaljik, Jonathan. D. (2008). Paradigms, Optimal and Otherwise: A case for Skepticism. In Asaf Bachrach and Andrew Ira Nevins, eds. *Inflectional Identity*. Oxford University Press, 29-54.

Booij, Geert & Jerzy Rubach. (1984). Morphological and prosodic domains in Lexical Phonology. *Phonology Yearbook 1*, 1–27.

Bošković, Želko. 2007. 'On the Locality and Motivation of Move and Agree: An Even More Minimal Theory' *Linguistic Inquiry*, 38. 4: 589-644

Bošković, Želko. 2014. 'Now I'm a phase, now I'm not a phase: On the variability of phases with extraction and ellipsis' *Linguistic Inquiry*, 45.1: 27-89.

Charette, Monique. (2006). The end of the (Turkish) word. SOAS Working Papers in Linguistics, 14, 23-40.

Chomsky, Noam. (1970). Remarks on nominalization. In Roderick, J. & P. Rosenbaum (Eds). *Readings in English transformational grammar*. Ginn and Company. Waltham, Mass. 184-221.

Chomsky, Noam. (1973) "Conditions on Transformations," in S. Anderson and P. Kiparsky, eds., A Festschrift for Morris Halle, Holt, Rinehart and Winston, New York.

Chomsky, Noam. (1999). Derivation by phase (Vol. 18, pp. 1-52). MIT, Department of Linguistics.

Chomsky, Noam. (2001a). Beyond Explanatory Adequacy. MIT Occasional Papers in
         Linguistics 20, 1-28. In Adriana Belletti, ed. Structures and Beyond. The
         Cartography of Syntactic Structures, Vol. 3. Oxford: Oxford University Press.

Chomsky, Noam. (2001b). Derivation by phase. Ken Hale: A life in language, ed. by Michael
         Kenstowicz, 1-52. MIT Press.

Chomsky, Noam. (2008). On phases. *Current Studies in Linguistics Series*, *45*, 133.

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

Clements, George. (1990). The role of the sonority cycle in core syllabification. In *Papers in
         Laboratory Phonology I*, John Kingston and Mary Beckmann (eds.), 283-333.
         Cambridge: Cambridge University Press.

Clements, George. (1997). Berber syllabification: derivations or constraints? In *Derivations
         and Constraints in Phonology*, Iggy Roca (ed.), 289-330. Oxford: Clarendon.

d'Alessandro, Roberta, & Tobias Scheer. (2015). Modular PIC. *Linguistic Inquiry* 46.4: 593-624.

Dalton-Puffer, Christiane; Plag, Ingo. (2000): Categorywise, some compound-type morphemes
         seem to be rather suffix-like: On the status of-ful,-type, and-wise in present day English.
         In: *Folia Linguistica* 34 (3-4), 225–244.

Dixon, Robert. (1977). Some Phonological Rules of Yidin[y]. *Linguistic Inquiry* 8, 1-34.

Downing, Laura. J., Hall, T. Alan, & Raffelsiefen, Renate. (Eds.). (2005). *Paradigms in
         phonological theory*. Oxford University Press.

Embick, David. (2010). *Localism versus globalism in morphology and phonology* (Vol. 60).
         MIT Press.

Embick, David. (2014). Phase cycles, φ-cycles, and phonological (in) activity. *The form of
         structure, the structure of forms: Essays in honor of Jean Lowenstamm*, pp.270-286.

Encrevé, Pierre. (1988). *La liaison avec et sans enchaînement* (Vol. 15). Seuil.

Eychenne, Julien, & Bernard Laks. (2017). La liaison en français contemporain: normes, usages,
         acquisitions. *Journal of French Language Studies*, *27*(1), 1-12.

Fabb, Nigel. (1988). English suffixation is constrained only by selectional restrictions.
         *Natural Language & Linguistic Theory*, *6*(4), 527-539.

Faust, Noam, Nicola Lampitelli, & Shanti Ulfsbjorninn. (2018). Articles of Italian unite! Italian
         definite articles without allomorphy. *Canadian Journal of Linguistics/Revue canadienne
         de linguistique*, 1-27.

Faust, Noam & Shanti Ulfsbjorninn. (2018). Arabic stress in strict CV, with no moras, no
         syllables, no feet and no extrametricality. *The Linguistic Review*. 35(4): 561–600.

Giegerich, Heinz J. (1994). Base-Drivan stratification: morphological causes and
         phonological   effects of "strict cyclicity". In Weise, R (ed.) *Recent developments in
         Lexical Phonology*. (Theorie des Lexikons. Arbeiten des Sonderforschungsbereichs 282;
         56). Düsseldorf: Heinrich Heine Universität.

Giegerich, Heinz J. (1999). *Lexical strata in English: Morphological causes, phonological
         effects* (Vol. 89). Cambridge University Press.

Grohmann, Kleanthes. K. (2003). *Prolific domains: On the anti-locality of movement
         dependencies* (Vol. 66). John Benjamins Publishing.

Halle, Morris, & Alec Marantz. (1993). Distributed morphology and the pieces of inflection. In
         Kenneth Hale and J. Keyser (Eds). *The view from building 20.* Cambridge, Mass.: MIT
         Press. pp 11-176

Halle, Morris, & Alec Marantz. (1994). Some key features of Distributed Morphology. *MIT working papers in linguistics*, 21(275), 88.

Halle, Morris & Jean-Roger Vergnaud. (1987). *An essay on stress*. MIT press.

Harizanov, Boris & Vera Gribanova. (2018). Whither head movement?. *Natural Language & Linguistic Theory*, 1-62.

Harley, Heidi. (2014). On the identity of roots. *Theoretical linguistics*, *40*(3-4), 225-276.

Harris, John. (1990). Complexity and Phonological Government. *Phonology*, Vol. 7, No. 2, Phonological Government (1990), pp. 255-300

Harris, James. (1983). *Syllable Structure and Stress in Spanish*. Cambridge, Mass.: MIT Press.

Harris, James (1993). Integrity of prosodic constituents and the domain of syllabification rules in Spanish and Catalan. In Hale, K. & J. Keyser (Eds*.) The view from building 20: Essays in linguistics in honor of Sylvain Bromberger*. MIT Press. 177-193

Haugen, Jason & Danny Siddiqi. (2013). Roots and the derivation. *Linguistic Inquiry* 44 (3):493–517

Haugen, Jason & Danny Siddiqi. (2016). Towards a Restricted Realization Theory. In Siddiqi, D. & H. Harley (Eds.) *Morphological metatheory*, Routledge, 343-386.

Hay, Jennifer. (2002). From speech perception to morphology: Affix ordering revisited. *Language*, 527-555.

Hayes, Bruce. (1982). Extrametricality and English stress. *Linguistic inquiry*, *13*(2), 227-276.

Hayes, Bruce. (1995). *Metrical Stress Theory. Principles and Case Studies*. Chicago, London: University of Chicago Press.

Honeybone, Patrick. (2005). Sharing makes us stronger: process inhibition and segmental structure. Headhood, elements, specification and contrastivity: phonological papers in honour of John Anderson. Amsterdam: John Benjamins, 167-192.

Inkelas, Sharon (1998). The theoretical status of morphologically conditioned pho- nology: a case study of dominance effects. Yearbook of Morphology 1997. 121-155.

Jensen, John T. (1993). *English phonology* (Vol. 99). John Benjamins Publishing.

Kalivoda, Nick. (2018). Syntax-Prosody Mismatches in Optimality Theory. Doctoral dissertation, UC Santa Cruz.

Kaye, Jonathan. (1995). Derivations and interfaces. *Frontiers of phonology: Atoms, structures, derivations*, 289-332.

Kaye, Jonathan, Jean Lowenstamm, & Jean-Roger Vergnaud. (1985). 'The internal structure of phonological elements: a theory of charm and government'. *Phonology* 2.1: 305-328.

Kenstowicz, Michael, & Charles Pyle. (1973). *On the phonological integrity of geminate clusters*. Issues in phonological theory, 27-43. Chicago. DeGruyter.

Kilbourn-Ceron, Oriana. (2017). Speech production planning affects phonological variability: a case study in French liaison. In Proceedings of the Annual Meetings on Phonology (Vol. 4).

Kiparsky, Paul. (1979). Metrical structure assignment is cyclic. Linguistic Inquiry 10(3), 421–41.

Kiparsky, Paul. (1982). From cyclic phonology to lexical phonology. *The structure of phonological representations*, *1*, 131-175.

Kiparsky, Paul. (2000). Opacity and cyclicity. *The Linguistic Review*, *17*(2-4), 351-366.

Kiparsky, Paul. (2005). Paradigm uniformity constraints. Ms, Stanford University. Available at www.stanford.edu/~kiparsky/Papers/LexConservatism.pdf .

Laks, Bernard. (2005). La liaison et l'illusion. *Langages*, (2), 101-125.

Liberman, Mark & Alan Prince. (1977). On stress and linguistic rhythm. *Linguistic inquiry*, *8*(2), 249-336.

Lieber, Rochelle. (1992). *Deconstructing morphology: Word formation in syntactic theory*. University of Chicago Press.

Lowenstamm, Jean. (1996). CV as the only syllable type. Current trends in phonology: Models and methods, 2, 419-441.

Lowenstamm, Jean. (2010). Derivational affixes as roots (phasal spellout meets English stress shift). *Ms., Université Paris-Diderot and CNRS*.

Lowenstamm, Jean. (2014). Derivational affixes as roots (phasal spellout meets English stress shift). In Alexiadou, A., Borer, H., & Schäfer, F. (Eds.). *The syntax of roots and the roots of syntax* (Vol. 51). Oxford University Press. pp. 230-258.

Marantz, Alec. (2001). *Words*. Handout. http://users.uoa.gr/~wlechner/Marantz%20words.pdf

Marantz, Alec. (2007). Phases and words. *Phases in the theory of grammar*, 191-222.

Marantz, Alec. (2013). Locality domains for contextual allomorphy across the interfaces. Distributed Morphology Today: Morphemes for Morris Halle, 95-115.

Marchand, Hans. (1969). *The Categories and Types of Present-Day English Word Formation. A Synchronic-Diachronic Approach*. 2nd ed. München: Beck.

Marušič, Franc. (2005). *On non-simultaneous phases*. Doctoral dissertation, Stony Brook University.

Marvin, Tatiana. (2002). *Topics in the stress and syntax of words* (Doctoral dissertation, Massachusetts Institute of Technology).

Marvin, Tatiana. (2013). Is Word Structure Relevant for Stress Assignment?. *Distributed Morphology Today: Morphemes for Morris Halle*, 79-93.

McCarthy, John J. (1981). A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry*, *12*(3), 373-418.

McCarthy, John J. (1988). Feature geometry and dependency: A review. *Phonetica*, *45*(2-4), 84-108.

Milliken, Stuart. (1988). Protosyllables: A theory of underlying syllable structure in nonlinear phonology. Ph.D dissertation, Cornell University.

Mohanan, Karuvannur P. (1982). Lexical Phonology. Doctoral dissertation. MIT.

Mohanan, Karuvannur P. (1986). *The theory of lexical phonology*. Dordrecht: Reidel.

Newell, Heather. (2009). Aspects of the morphology and phonology of phases. Doctoral dissertation, McGill University.

Newell, Heather. (2015) Phase Shift. Paper presented at Spell-Out and the Syntax-Phonology Interface. Universitetet I Tromsø.

Newell, Heather. (2017). 'Nested Phase Interpretation and the PIC'. In Word Structure at the interfaces. H. Newell, M. Noonan, G. Piggott, et L. Travis eds. OUP. 20-40.

Newell, Heather. & Máire. Noonan. (2018). A (Re)Portage on Spanning. In Lochbihler, B., I. Paul, & L. Kalin (Eds.) *Moving A Head: Linguistic treats for Lisa Travis. McGill Working Papers in Linguistics*.

Newell, Heather.& Glyne Piggott. (2014). Interactions at the syntax–phonology interface: Evidence from Ojibwe. *Lingua* 150:332-362.

Nissenbaum, Jon. W. (2000). *Investigations of covert phrase movement*. Doctoral dissertation, Massachusetts Institute of Technology.

Orgun, C. Orhan (1996). Sign-based morphology: a declarative theory of phonology-morphology interleaving. PhD dissertation, University of California, Berkeley.

Pater, Joe. (2000). Non-uniformity in English secondary stress: the role of ranked and lexically specific constraints. *Phonology*, *17*(02), 237-274.

Piggott, Glyne, Lisa Travis, & Heather Newell. (2015). The phonology of possession. Presented at the *Old World Conference on Linguistics* (OCP) 13. Eötvös Loránd University/ Hungarian Academy of Sciences

Plag, Ingo. (1999). *Morphological productivity: structural constraints in English derivation*. Berlin: Mouton de Gruyter.

Raffelsiefen, Renate. (1999). Phonological constraints on English word formation. In *Yearbook of Morphology 1998* (pp. 225-287). Springer Netherlands.

Raffelsiefen, Renate. (2004). Absolute ill-formedness and other morphophonological effects. *Phonology* 21 (1), 91–142.

Raffelsiefen, Renate. (2010). Idiosyncrasy, regularity, and synonymy in derivational morphology: evidence for default word interpretation strategies. In S. Olsen (Ed.), New impulses in word-formation (pp. 173–232). Hamburg: Buske.

Raffelsiefen, Renate. (2015). Phonological restrictions on English word-formation. In Müller, P., I. Ohnheiser, S. Olsen, & F. Rainer (Eds.) Word-Formation. An international handbook of the languages of Europe. Vol. 2. De Gruyter. 894-917.

Ross, John R. (1974) 'Wording Up', Lectures given at the 1974 Linguistic Institute, University of Massachusetts.

Ross, John R. (1979) 'Five years Later', Lecture given at Tel Aviv University.

Rubach, Jerzy. (1996) Shortening and ambisyllabicity in English. *Phonology* 13. 197–237

Scheer, Tobias. (2004). *What is CVCV and why should it be?* (Vol. 68). Walter de Gruyter.

Scheer, Tobias. (2008). Why the Prosodic Hierarchy is a diacritic and why the Interface must be Direct. Sounds of Silence: Empty Elements in Syntax and Phonology, edited by Jutta Hartmann, Veronika Hegedüs & Henk van Riemsdijk, 145-192. Amsterdam: Elsevier.

Scheer, Tobias. (2011). *A guide to morphosyntax-phonology interface theories: how extra-phonological information is treated in phonology since Trubetzkoy's Grenzsignae*. Walter de Gruyter.

Scheer, Tobias. (2012). Direct Interface and One-Channel Translation. A Non-Diacritic Theory of the Morphosyntax-Phonology Interface. Vol. 2 of A Lateral Theory of phonology. Berlin: Mouton de Gruyter.

Scheer, Tobias. (2016). Melody-free syntax and phonologically conditioned allomorphy. *Morphology*, *26*(3-4), 341-378.

Scheer, Tobias & Péter Szigetvári (2005) Unified representations for stress and the syllable. *Phonology* 22/1. 37–75

Selkirk, Elizabeth .O. (1982). The syntax of words (Linguistic Inquiry Monograph 7). *Cambridge, MA*.

Siegel, Dorothy. (1974). Topics in English Morphology, Doctoral dissertation, MIT , Cambridge, Massachusetts.

Siegel, Dorothy. (1977). "The Adjacency Condition and the Theory of Morphology," in M. J. Stein, ed., Proceedings of the Eighth Annual Meeting of the North East Linguistic Society, University of Massachusetts, Amherst.

Szigetvári, Péter. (2016). No diphthong, no problem. In *Phonology, its faces and interfaces* Jolanta Szpyra-Kozłowska and Eugeniusz Cyran (eds.) Frankfurt am Main: Peter Lang.

Steriade, Donca. (1999). Lexical conservatism in French adjectival liaison. In J.-Marc Authier, Barbara E. Bullock & Lisa Reid (eds.), *Formal perspectives on Romance linguistics: selected papers from the 28th Linguistic Symposium on Romance languages* (LSRL XXVIII), University Park, 16-19 April 1998 (Current Issues in Linguistic Theory 185), 243-70. Amsterdam: John Benjamins.

Steriade, Donca. (2000). Paradigm uniformity and the phonetics-phonology boundary. In: Michael B. Broe und Janet B. Pierrehumbert (Hg.): Papers in Laboratory Phonology V: Language Acquisition and the lexicon. Cambridge: Cambridge University Press, 313–334.

Suh, Chang-Kook (1997). Consonant geminates: towards a theory of integrity and inalterability. Doctoral dissertation. University of Arizona.

Svenonius, Peter. (2004). On the edge. In *Peripheries* (pp. 259-287). Springer Netherlands. van Oostendorp, M. (1994). Affixation and integrity of syllable structure in Dutch. *Linguistics in the Netherlands*, 11(1), 151-162.

Yu, Alan C. (2007). *A Natural History of Infixation*. OUP.