

ENGLISH LEXICAL LEVELS ARE NOT LEXICAL, BUT PHONOLOGICAL

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UNDER REVISION, COMMENTS WELCOME

This paper aims to demonstrate that a morpho-phonological pattern that has been central to the development of morpho-syntactic theories has been misanalysed. The pattern in question is the existence of two classes of affixes in English; Level 1 affixes, which are included in the phonological domain of the base to which they attach, and Level 2 affixes, which are external to the phonological domain to which they attach.ⁱ Since *SPE* (Chomsky & Halle 1968), generative grammarians have taken it as given that the distinction between Level 1 and Level 2 affixes is lexical. That is, the class-membership of a given affix is a feature that not only must be memorized, but is also a *morphological* diacritic. This diacritic is necessary iff there is no other relevant distinction between the two groups of affixes.

It is the goal here to demonstrate that there is, in fact, another distinction between these affixes, and that this difference is the true source of the division of affixes into the Level 1 and Level 2 classes. The pertinent distinction has nothing to do with morpho-lexical classification, but is instead purely phonological. The first segment of Level 1 affixes is a floating vowel (1a), while no Level 2 affixes begin with a floating vowel (1b). This analysis is couched within a Government Phonology framework (Kaye, Lowenstamm, & Vergnaud 1985), more specifically in CVCV (Lowenstamm 1996; Scheer 2004) where each ‘syllable’ on the timing tier is a CV sequence, and C or V

positions may be null. A floating segment is one that has no link to a position on the timing (CV) tier.

(1) a. - C V ‘-al’ (parental)

| |

ə l ø

b. - C V C V ‘-er’ (teacher)

| | | |

ø ə ɪ ø

This analysis will be shown to offer a better account for the morpho-syntactic, phonological, and semantic patterns specific to the Level 1/Level 2 distinction than any analysis that that makes reference to morphological classes.

In §1 I will discuss a recent challenge to the morphological analysis of the Level 1/Level 2 distinction that has been brought to light, focusing on the current problematic status of affix classes within a Distributed Morphology framework (Lowenstamm 2014). This section will take as given that cyclicity is a syntactically governed property, its effects apparent at PF and LF. The pertinent details of this theoretical assumption for the current discussion will be exposed, and problems with Lowenstamm’s reanalysis of the Level 1/Level 2 pattern will be highlighted. In §2 I will present the details of the current analysis, outlining how a purely phonological analysis of affix classes in English avoids the problems discussed in §1, and correctly predicts the pattern we see in ways that an analysis which depends on lexical diacritics does not. In this section it will be shown how extrametricality (Hayes 1982), floating vowels, and cycles of derivation triggered by all

(not a subset of) category-defining morphemes conspire to give us the Level 1 vs. Level 2 distinction. This section will also treat apparent consonant-initial Level 1 affixes, and apparent vowel-final bases of attachment for Level 1 affixes. These will be shown to be non-issues for the floating vowel account. §3 will then conclude with a brief discussion of two other analyses in the literature (Halle & Vergnaud 1987, Kaye 1995), and of the semantic and theoretical implications of the analysis presented here.

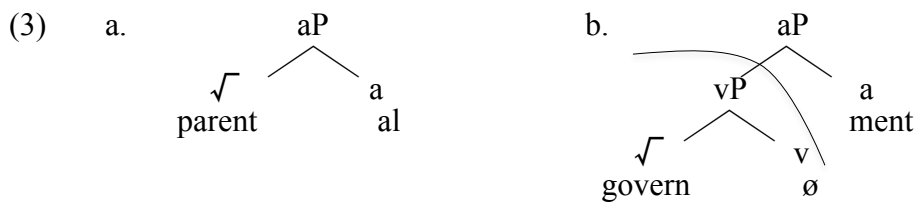
1 Lexical levels: cycles, morpho-syntax, phonology, and semantics

All previous analyses of the distinction between Level 1 and Level 2 affixes have been based on lexical diacritic class affiliations.ⁱⁱ For example, in *SPE* (Chomsky & Halle 1968) this distinction was indicated by the boundary markers (non-segment segments) + and #. These diacritics were either invisible to, blocked, or triggered phonological rules. In an *SPE* account of the distinction in stress assignment between *parental* and *government* the ‘+’ dividing *parent* from *-al* was invisible to stress assignment, while the ‘#’ dividing *govern* and *-ment* was not.

- (2) a. parent+al → English Main Stress Rule → [paréntal]ⁱⁱⁱ
b. govern#ment → English Main Stress Rule → [góvern]ment

This manner of distinguishing affixes classes has remained virtually unchanged to the present date in Lexicalist theories (Kiparsky 1982, 2000; Mohanan 1982; Anderson 1992; Bermúdez-Otero (in prep), among others). In non-Lexicalist theories, such as Distributed Morphology (Halle & Marantz 1993, 1994; Marvin 2002, 2013; Embick 2010), *some* of the Level 1/Level 2 pattern falls out from the derivation. Within DM, the distinction between affix classes has been claimed to be reduced to selectional restrictions, as

promoted by scholars such as Fabb (1988) in an affix-based account, and Giegerich (1999) in a stem-based account. In (2) a DM-style analysis proposes that *-al* in *parental* is affixed to the root *parent*, while in *government* there is a null verbalizing head between the root *govern* and the affix *ment*. Before such structures can be said to lead to the Level 1/Level 2 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, LF and PF, simultaneously, as in the following derivations of (2a,b) in (3a,b).^{iv} I follow the basic DM proposals that (i) roots are acatergorial, and (ii) derivational morphemes (the heads of vP, aP, nP) are phase heads.



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 (along with possibly other non-phasal material not considered in this article, but see Embick (2010)) are interpreted together. Various research programs have all converged on the proposal that first-phase heads are spelled out with their complements, contra the initial proposal of Nissenbaum

(2000), and Chomsky (2001b) that all phase heads send their complements to PF and LF. Marantz (2013 and previous work), Marvin (2002), and Arad (2003) demonstrate that roots cannot be semantically interpreted if they are not categorized. If the first phase head is the categorizer, then the complement of this morpheme will never be interpreted on its own.^v Embick (2010) argues that evidence from allomorphy forces the conclusion that phase heads trigger interpretation of their complement iff it contains another phase head. This gives us the same result, in that first phase heads will always be interpreted in the same cycle as the root. Newell (2008) also argues that derivational phase heads will spell out with their complements. She argues 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 (ex. 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. What all of these researchers converge upon is the conclusion that first phase heads are inside of 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 $[[[[\sqrt{\quad}] a] v] n]$, the

interpretive domains at PF and LF will be $[[[\sqrt{a}] v] n]$. This is the system within which the analysis presented in this paper will be couched.

In the derivation of (3a), the suffix, being the first phase head, will fall within the interpretive domain of the root, giving us its Level 1 behaviour. In (3b), the overt suffix, being the second phase head, will be interpreted separately from the root, giving us its Level 2 behaviour. The above derivation also allows for an analysis of dual-level affixes. Giegerich (1999) (among other) has demonstrated that many Level 2 affixes have both Level 1 and Level 2 behaviour, as do some affixes traditionally classed as Level 1. This Level-ambiguity can be exemplified by the stress-affecting (4a) vs. stress-neutral (4b) behaviours of *-able*. (see also Bermúdez-Otero 2015).

- (4) a. kómprəbɫ ‘comparable; similar’
 compare-able(L1)
- b. kəmpɛ́rəbɫ ‘comparable; able to be compared’
 compare-able(L2) (cf. compáre)

The two morpho-phonological behaviours of *-able* synch up with a semantic pattern that has been noted in the literature (Kiparsky 1982; Marantz 2007, 2013); the Level 1 *-able* combines with the root to give a non-concatenative reading, while the non-root-attaching, Level 2 *-able*'s meaning is purely concatenative. In §3 we will return to the semantic predictions of a DM+Phase analysis, offering further support for the phonological analysis in §2.

This brings us to the heart of the subject of this article. Lowenstamm (2014) notes that the above DM+Phases system cannot account for all of the Level 1/Level 2

distinctions in English. It makes the wrong predictions for the phonological computation of Level 1 affixes, more specifically for Level 1 affixes that are not merged directly to the root. These criticisms are the subject of the following section.

1.1 DM and Level 1 affixes

The DM+Phases framework in §1 only derives the correct output when a Level 1 affix is closer to the root than a Level 2 affix (5), and in the case of stacked Level 2 affixes (6) (if we allow for the first category defining head to be null (brackets represent phonological domains/phases, bolded brackets indicate the domain of main stress assignment)).

(5) [[parént-al] -ly] ‘in a way characteristic of being parental’

√ -al(L1)-ly(L2)

*parentállly

(6) [[[góvern-ø] ment] less] ‘the state of lacking a government’

√ -ø(L1)-ment(L2)-less(L2)

*governméntless

The problematic cases are ones where Level 1 affixes are attached outside other Level 1 affixes (7) or outside Level 2 affixes (8). In these cases the phonology tells us that the Level 1 head is in the same domain as the base to which it attaches, contra the DM+Phases prediction that all outer phase heads should be interpreted separately from their complements. In (7) the suffix *-ive* affects the position of stress on its base, and is therefore demonstrably Level 1 (*subject* > *subjéctive*). And, counter to the predictions of a phase-based account of interpretation, the second affix *-ity* in (7) also affects the stress

of its base (*subjéctive* > *subjectivity*). This same unexpected effect of an outer phase head on the phonology of an inner domain occurs in the derivation of *gouvernement* (8) (cf.

gouvern > *gouvernement*)

(7) [[subject-ive] ity] ‘the state/property of being subjective’
 $\sqrt{\text{-ive(L1)-ity(L1)}}$

(8) [[[govern- \emptyset] mént] al] ‘pertaining to a government’
 $\sqrt{\text{- \emptyset (L1)-ment(L2)-al(L1)}}$

The challenge here is to reconcile the proposal that DM+Phases accounts for the phonological and semantic isomorphism seen in (4) with the fact that it makes the wrong phonological predictions in cases like (7) and (8).

1.1.1 Lowenstamm 2014^{vi}

Lowenstamm (2014) attempt to do just this, by departing radically from the traditional manner of defining Level 1 and Level 2 morphology. He correctly notes that the classification of a morpheme as category-defining, and therefore as cyclic, cannot predict the attested phonological patterns we have been discussing (main stress domains in (9) indicated by bolded brackets).

(9) a. [[[govern V]_{L1} ment N]_{L2} al Adj]_{L1} b. [a [n [v $\sqrt{\text{ }}$]]]
 [[[object V]_{L1} ion N]_{L1} able Adj]_{L2}
 [[[lead V]_{L1} er N]_{L2} less Adj]_{L2}
 [[[represent V]_{L1} ation N]_{L1} ary Adj]_{L1}

(Lowenstamm 2014)

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 (9a) all of the words given have the same morpho-syntactic structure, (9b), making their divergent phonological behaviours anomalous.

To circumvent the above problem, Lowenstamm proposes that all derivational morphemes are roots, and that roots are *not* phase heads. Phase heads in his system are null category-defining heads that project an xP. The structure of a word like *atomicity*, with two ‘Level 1’ affixes is therefore as follows in (10). 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.

(10) [[[[[atom_√]ic_√]ity_√] ø_n] → atomicity

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 xP. ‘Level 2’ affixes will therefore always merge outside of a phase head, and outside of a phonological domain. An additional restriction on these xP-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.

(11) [[[[[object_√] ion_√] ø_n] able_√] ø_a]

A third class of affix, a ‘universal selector’ may merge with either a root or an xP. This is proposed to account for the cross-listed affixes discussed above. *-able* in (11)

merges with an nP, but in (12) merges with a root, demonstrating the behaviour of a universal selector.

(12) [[[compr_√] able_√] ø_a] → comparable ‘similar’

As with all other analyses the Level 1/Level 2 distinction, this sort of appeal to lexicalized selectional restrictions boils down to a description of the attested outputs, 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.^{vii} According to Lowenstamm, *-al* selects for roots. It will therefore not be able to attach outside of a *-ment* that has selected for an xP, as xP selectors will lead to the immediate categorization of the Level 2 affix, bleeding the selectional restrictions of *-al*.

(13) [[[[attach_√] ø_v] ment_√] ø_n] (* al_√)

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

(14) [[[[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.^{viii}

(15) 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 2010)

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

(16) [[[[attach_V] ment_V] al_V] ø_a] ly_V] ø_{adv}]

In (16) the first phonological domain is *attachmental*. In order to explain why this cannot be the case, we need to remember that English verb stress is sensitive to whether the verb ends in a *weak cluster* (short V plus C) or a *strong cluster* (long V (plus C), or short V plus CC). Assuming the last C of a verb is extrametrical, following Hayes (1982), predicts penultimate stress on the former class (ex. (*édi*)<*t*>), and ultimate stress on the latter (*a(mú)*<*se*>, *a(dór)*<*n*>). Now, if extrametrical consonants are restricted to an edge, in accordance with the Peripherality Condition (Hayes 1982), no consonant that precedes *-ment* in a derivation like (16) should be extrametrical. This predicts that all C-final syllables preceding *-ment* should be heavy, and therefore should display the ability to attract stress. We know that stress clash is not required to be resolved when stress does precede *-ment* (17a), therefore the lack of stress on the closed syllable preceding *-ment* in (17b) runs counter Lowenstamm's predictions.

- (17) 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>)

What is clear from the above is that the complement of *-ment* in (26a,b) forms its own phonological domain, complete with extrametrical consonants (mana<g>e, arres<t>). *-ment* is therefore not root-attaching in the above derivations. Given the grammaticality of these 'X-mentally' forms, *-al*, and any Level 1 affix, is permitted to merge to a Level 2 (xP-attaching, non-cohering) affix. The distributional claims in Lowenstamm's account do not follow through.

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; outer Level 1 affixes cohere to their bases even though a cyclic account predicts that they should not.

Lowenstamm (2014), like all previous analyses of Level 1/Level 2 distinctions, proposes that different subsets of the class of derivational affixes are *lexically specified* to be inside or outside of a phonological domain. This type of proposal is argued below to miss a certain generalization that demonstrates that this cannot be the case, and that allows for a cleaner analysis of 'lexical' classes.

2 Phases, extrametricality, and floating vowels

To solve the above problem, let us begin by returning to the DM+Phase-based predictions for interpretive cycles discussed in §1, repeated below as (18).

- (18) Interpretation of the syntactic structure $[[[[\sqrt{\quad}] a] v] n]$ gives the following interpretive domains: $[[[\sqrt{\quad} a] v] n]$

It is well known that some Level 2 affixes behave as Level 1 affixes when attached directly to a root, as predicted by (18) (Marantz 2007). What has not been noted is that this pattern completely eliminates the need for cross-specification of Level 2 affixes. Level 2 affixes *never* behave like Level 1 affixes when they are not merged to a root. This is a knock-down argument that there are not, say, two *-er* affixes, one Level 1 (attaching to bound roots as in (19a)) and one Level 2 (as indicated by the deletion of the unsyllabifiable [g] in the first cycle of (19b)), as proposed in numerous accounts of ambiguous affixes (refs).

- (19) a. philosopher [phi(lóso)<pher>]
 b. signer [[sign] er] (cf. [signal, signature])

If the *-er* in (19a) had a Level 1 lexical diacritic, we would expect this Level 1 affix, like other Level 1 affixes, to be able to attach outside other affixes. This is *never* the case for ‘cross-listed’ Level 2 affixes. The morpheme *-er* is permitted outside of other affixes, but in these cases it only ever has Level 2 behaviour.

- (20) a. $[[[sign]_{\sqrt{\quad}} al]_n \emptyset]_v er]_n \rightarrow \square$
 b. $[[s\acute{ign}al]_{\omega} er]_{\omega}$

As *-er* is monosyllabic and nominal, it is extrametrical and has no effect on the position of stress in (20b), making its Level 2 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 Level 2 behaviour in this position.

- (21) a. [[[sign]_v al]_n ∅]_v able]_a → □
 b. [[sɪgnəl]_ω able]_ω
 c. *[[signál]_ω able]_ω

This pattern, where affixes with purported cross-listed Level 1/Level 2 behaviour never behave as though they are Level 1 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 is what leads to the ‘unexpected’ inclusion of a Level 2 affix within the phonological domain of its base.

Importantly, this calls into question the need to lexically-specify the phonological behaviour of Level 1 and Level 2 affixes at all. The behaviour of Level 2 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 (18). That said, the remaining problem is how to deal with the divergent behaviour of Level 1 affixes. As we have rid ourselves of the need for diacritic marking of the Level 2 affixes, let us attempt (and succeed) in doing so for the Level 1 affixes.

2.1 The domain of main stress: extrametricality

Before going into the divergent phonological behaviour of Level 1 affixes, it is important to note that the status of Level 2 affixes as those that are not included in the domain of main stress assignment in English is false. This is evident when one looks at affixes that

display Level 1 (stress affecting) and Level 2 (non-cohering) behaviour at the same time. Examples of this type of affix are *-ology*, *-ography*, *-ee*, and *-ese*.^{ix} In (19b) we saw that Level 2 affixes that are not affixed directly to a root are 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 affixed with a Level 1 morpheme, interpreted in the same phase as the root. In such derivations the final consonant of the cluster can be syllabified as the onset to the initial vowel of the suffix.

- (22) a. signal, malignant (cf. sign, malign)
 b. bombard, Thumbelina (cf. bomb θ , thumb θ)
 c. younger, longer (cf. young g , long g)

Importantly, the affixes *-ology*, *-ography*, *-ee*, and *-ese* behave as Level 2 affixes with respect to cluster resolution (Geigerich 1999).

- (23) a. wom θ ólogy, wom θ ésque ‘the study of wombs, like a womb’
 b. gangógraphy, gangése ‘a book on gangs, the language of gangs’
 c. kingólogy, kingée ‘the study of kings, someone who has been kinged (as in checkers)’

These same affixes show the same Level 2 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.^x

- (24) a. puzz[ɹ]ólogy, puzz[ɹ]ése ‘the study of puzzles, puzzle-speak’^{xi}
 b. butt[ŋ]ógraphy, butt[ŋ]ée ‘a treatise on buttons, an item buttoned’
 c. butt[ɹ]ésque, flatt[ɹ]ée ‘like butter, one who is flattered’

- d. blossom[ɹ]ése, bott[ɹ]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 Level 2 affixes. In the first phase, the final C is not followed by a vowel, and so is treated as syllabic in accordance with the phonotactic requirements of English (25a). When a V-initial, root-attached affix is available in the same phase as the sonorant, it is syllabified as an onset (25b).

- (25) a. [[[twinkl]√ ∅]√ ing]_n → twin.k[∅].ing ‘act of twinkling’
 b. [[twinkl]√ ing]_n → □ twin.kling ‘a short moment’
- (Marvin 2002)

The affixes in (23) and (24) attract main stress, even though it is clear from the syllabification data that they are Level 2. This stress-attracting property is proposed to be specific to Level 1 affixes. The key to why these Level 2 affixes attract stress, I propose here, is their phonological size.

English stress patterns are affected by a lexically-specified pattern of extrametricality (Hayes 1982). The final rhymes of nouns and derived adjectives are extrametrical, and therefore ignored for the computation of stress.

- (26) a. ré<ord> (noun) (vs. recórd (verb))
 b. Perú<al>, sénsu<al> (vs. ilícit, divíne)

If we take all of the level 2 affixes (from Mohanan (1986); Halle & Vergnaud (1987); Fabb (1988); Lieber (1992)) as containing a final extrametrical syllable (the final overt vowel and all that accompanies it) this leaves nothing to be footed in (27).

- (27) -<ness>, -<ment>, -<hood>, -<less>, -<ful>, -<y>(adj), -<ly>, -<al>, -<ing>, -<ed>, -<er>, -<some>, -<en>, -<age>, -<ish>, -<ist>, -<ism>, -a<ble>^{xii,xiii}

The only affix in this list that retains a nuclear element is *-able*, but, as English has a word-minimality requirement for lexical (as opposed to functional) stressable domains, the remaining short vowel is unfootable.^{xiv} As there is nothing to build a foot on in any of the Level 2 morphemes above, and assuming foot structure (or a head-dependent relationship between to morae/vowels) is (i) a prerequisite for determining the placement of stress, and (ii) does not span a phase boundary, the presence of these affixes will obviously not enable stress-shift. The final foot in a word affixed with a suffix in (27) will be within the base to which said morpheme is attached (ex. (*édit*)-a<ble>).

The affixes *-ology*, *ography*, *-ee*, and *-ese*, on the other hand, are all Level 2 affixes that are large enough to be footed even given final syllable extrametricality. The first two in this list are tri-syllabic^{xv}, the second two contain long vowels. The doubly-linked nature of these long vowels ensures that they are subject to geminate integrity, and therefore the final syllable cannot be made extrametrical in these cases, although the final consonant might be.

- (28) -(óla)<dʒi>, (ógrə)<fi>, (i:), (i:)<z>

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 (29).^{xvi}

- (29) a. [[[[gang]√ ∅]_n → □(PF) (gǎ)<ŋ>

b. $[[[g\grave{a}ng]_{\vee} \emptyset]_n \text{ology}]_n \rightarrow (\text{PF}) \quad (g\grave{a}\grave{e})\langle\eta\rangle\langle\acute{o}l\grave{a}\rangle\langle d\acute{z}i\rangle$

‘the study of gangs’

The phonological output in (29b) requires some discussion. In (29a) 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 (29b) 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 $[\eta]$ 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 ($(g\grave{a}\grave{e})\langle\eta\emptyset\rangle\langle\acute{o}l\grave{a}\rangle\langle d\acute{z}i\rangle$). The $[\eta]$ in *gang* therefore retains its extrametrical status.

This proposal makes it clear which domain must be referenced when speaking of the ‘peripherality’ of extrametrical items.

(30) Peripherality condition:

$[X]_{[+ex]} \rightarrow [-ex] / \text{ ________ } Y]_D$

Where $Y \neq \Phi$ 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 (29b) would be illicit. That an element in a domain interior to a word may retain its extrametricality throughout a derivation leads to the following revision of (30).

(31) Revised Peripherality condition:

$$[X]_{[+ex]} \rightarrow [-ex] / \text{---}Y]_D$$

Where D is the phonological output of a cycle/phase

Therefore, only when a phonological element from outside the phase is merged *inside* the phonological domain of the first phase will the extrametricality determined at the first phase be impacted. If the output of the second phase does not interact (ex. through syllabification) with the output of the first phase, the structural output of the first phase will persist. It is here where we see the effects that led to Kaye's (1995) formulation of Strict Cyclicity, or Chomsky's ((2001) and subsequent) formulation of the Phase Impenetrability Condition. 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 and 'condition' on derivations. This is due to a, here 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 the above derivation there is no motivation for resyllabification and no violation of the Peripherality Condition, so no relevant alterations will be made. We will see how the account of Level 1 affixes here brings to light how some affixes will

force a violation of the Peripherality Condition that affects stress placement in §2.2. First through, we will finish this section with a demonstration of how a sequence of Level 2 affixes causes 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. $[[\text{govern}]_{\sqrt{\emptyset}}]_{\text{v}} \rightarrow \text{[g} \acute{\lambda} \text{v} \emptyset \text{]}_{\langle \text{n} \rangle}$
 b. $[[[\text{govern}]_{\sqrt{\emptyset}}]_{\text{v}} \text{ment}]_{\text{n}} \rightarrow \text{[g} \acute{\lambda} \text{v} \emptyset \text{]}_{\langle \text{n} \rangle} \langle \text{ment} \rangle$
 c. $[[[\text{govern}]_{\sqrt{\emptyset}}]_{\text{v}} \text{ment}]_{\text{n}} \text{less}]_{\text{a}} \rightarrow \text{[g} \acute{\lambda} \text{v} \emptyset \text{]}_{\langle \text{n} \rangle} \langle \text{ment} \rangle \langle \text{les} \rangle$

The CVCV structure of (32c) is the following (33). Note that, as noted in Raffelsiefen (1999), the C-initial affixes have no motivation to be syllabified with the previous domain (domains below are indicated by dashes, extrametrical elements are bolded).^{xvii} As no nuclear elements outside of the first domain are visible to the footing or stress algorithms, the environment for stress shift is not met.

- (33) C V C V C V C V - C V C V C V - C V C V
 | | | | | | | | | | | | | | | | | |
 g λ v \emptyset **n** \emptyset **m** ϵ **n** \emptyset **t** \emptyset **l** \emptyset **s** \emptyset

This account of the lack of stress shift upon affixation of Level 2 affixes crucially does not reference any lexical diacritic specific to this class of morphemes. 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/Level 2 debate.

2.2 So-called Level 1 affixes all begin with floating vowels

The above sets the stage for the current analysis of Level 1 affixes. The question is, if morpho-lexical diacritics are undesirable, and definitely unnecessary to account for the behaviour of Level 2 affixes, can we do away with them in an account Level 1 affixes as well? As previewed in the introduction, the answer is yes. It is proposed here that all Level 1 affixes begin with floating vowels. Note that all Level 1 affixes begin with a vowel.^{xviii}

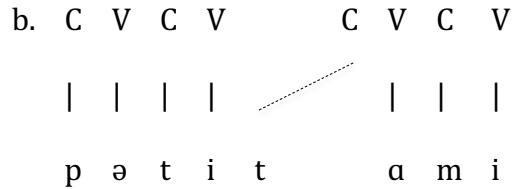
(34) Level 1 affixes^{xix}

-al, -ic, -(at)ion, -ous, -astic, -y(noun), -an, -ant, -ance, -ity, -ive

This analysis will give us the universally cohering nature of these affixes, again without proposing any tools that are not independently necessary. Floating segments have been argued for in countless analyses, the most prevalent of which being accounts of the templatic patterns in languages such as Arabic (McCarthy 1981), as well as accounting for liaison consonants in French (Encrevé 1988). An example of the latter can be seen below. In (35a) the final consonant of *petit* is unpronounced, as it is not associated with a position on the CV tier. In (35b), 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 (Lowenstamm 1996, Scheer 2004) this position comes for free.

(35) a. C V C V C V C V C V
 | | | | | | | | | \

p ə t i t g a v ø s ɔ n



Within this type of framework, a floating vowel, just like a floating consonant, will associate with an available empty V position. In the case of Level 1 affixes, this means that these vowels will associate to the empty final nucleus of the base to which

they C V C V C V C V - C V attach. Affixation directly to a root, or outside of a category-defining head, will be lead p ə ɹ ε n ø t ə l ø to indistinguishable phonological outputs.^{xx}

(36) $[[\text{parent}]_{\sqrt{\emptyset}}]_n] \text{al}]_a \sim [[\text{parent}]_{\sqrt{\emptyset}}]_n] \text{al}]_a$

What (36) depicts is that, like in the case of liaison, a stray segment will associate to an available position, even across a cyclic domain. In the case of liaison this entails association across a word boundary (35). Here, in the case of Level 1 affixes, it is across a word-internal phase boundary (36). Now, as noted above, the phonology of Level 1

affixes will mask any null category-defining heads that intercede between them and a root, as their floating vowel will associate to the final empty V regardless of whether a phase boundary intervenes. What this gives us, is that a Level 1 affix attached outside a Level 2 (or another Level 1) affix will also 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 Level 2 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 (37a). 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 (37b).

(37) [[[[govern]_v ∅]_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 ∅ n ∅ m ε n ∅ t ∅

b. C V C V C V C V - C V C V C V C V
 | | | | | | | | | | | | | |
 g ʌ v ə ɹ ∅ n ∅ m ε n ∅ t ə l ∅

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 (37b)). The two affixes have been merged phonologically, and therefore it is only the final syllable of this merged domain, namely -

[təl], that can be marked as extrametrical. Now the bi-syllabic [mənø], 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. It is also the case that the position of stress on the inner domain will be preserved, and will receive a secondary stress, as nothing has altered the metrical structure of the inner domain. The final consonants of *govern* remain extrametrical, and the sequence [ɪnm], phonotactically banned morpheme internally, remains unrepaired, as the [m] never sits within the phonological domain to its left.

The analysis above does away with the need for lexical specification of morpheme classes altogether. Independently motivated phonological structures, extrametricality, peripherality, and floating segments, are all that is needed to account for the behaviour of the Level 1 vs. Level 2 affix classes. Two potential problems with the above analysis, namely the affixation Level 1 affixes to vowel-final bases, and the existence of consonant-initial Level 1 affixes, are easily dealt with in the following sections.

2.2.1 Floating vowels and V-final bases

One potential problem for a floating vowel analysis of Level 1 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, as are the floating consonants in French when they precede a C-initial word as in (35a). What is clear, however, is that the initial vowels of Level 1 affixes are always pronounced, even after ostensibly vowel-final bases, as in, for example, *protazoal*. Here we see that the

hiatus between the base and the affix is not resolved through deletion, but rather by epenthesis of a glide.

(38) C V C V C V C V C V C V
 | | | | | | | | | | | |
 p ø ɪ o t ə z o w ə l ø

There are two options for resolving this issue here. The first is to say that hiatus is resolved at the segmental level in English, and that it forces the epenthesis of an overt consonant between the final vowel of *protazo* and the initial vowel of *-al*. 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.

(39) a. C V C V C V C V - C V →
 | | | | | | | | | |
 p ø ɪ o t ə z o ə l ø

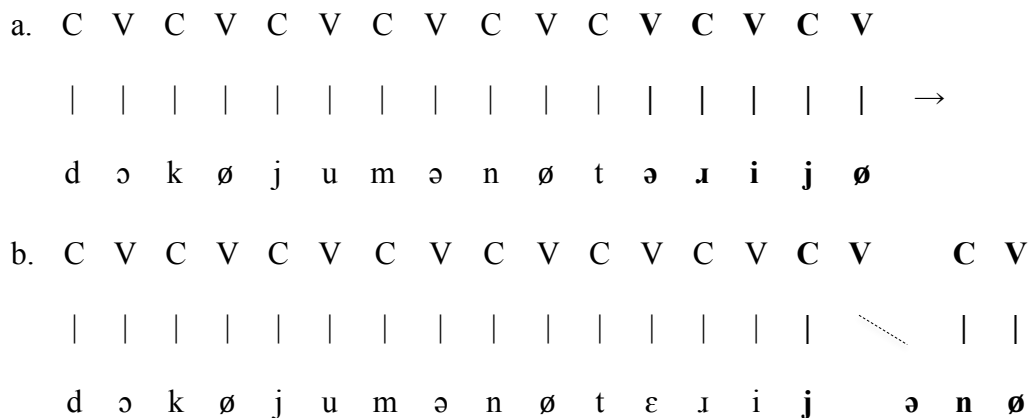
b. C V C V C V C V C V C V C V
 | | | | | | | | | | \ | |
 p ø ɪ o t ə z o w ə l ø

The second option to account for the hiatus resolution pattern seen in the case of Level 1 affixes is to propose that there are no V-final bases in English. This is what is proposed in Sigetvári (in press) 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. **br*). If the final long vowels in English are all actually diphthongs; Vs followed by a glide, as proposed by Sigetvári, then there are no vowel-final items that serve as bases of attachment for Level 1 affixes in English. The ‘problem’ of hiatus resolution in the case of Level 1 initial floating vowels is therefore non-existent. The derivation of *protazoal* is consequently one where the base comes with the final glide and its following empty vocalic position. (39b) is the entire derivation of such a word.

In line with the above, the hiatus ‘problem’ also goes away for Level 1 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* /ɪrɪj/, *-ory* /ɔrɪj/, *-ary* /erɪj/, *-ology* /ɔlədʒɪj/, *-ography* /ɔgrəfɪj/, *-ee* /i:j/, *ify* /ɪfaj/), and therefore all contain a final empty nucleus that may house the floating vowel of a Level 1 affix. Such a derivation occurs phase-by-phase as follows.

(40) [[[document]√ary]_v an]_n



The stress-attracting nature of the Level 1 affix (*documéntary/documentárian*) is explained exactly as in §2.2. Incorporation of the floating vowel merges the domains of

the output of the two phases, allowing for the visibility of the previously extrametrical segments to the metrical structure.

The rare cases where we might propose that a short vowel does precede a Level 1 affix offer evidence for the epenthesis account, where hiatus is resolved on the segmental tier, above. 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 (\Leftrightarrow in (41)) into the inner domain, searching for an empty V position. In doing so, the final vowel of the first phasal domain will become visible, and hiatus resolution will trigger the insertion of a CV unit. As the features of the final *a* cannot determine the features of an epenthetic glide, the glide will share features with the following high front vowel. 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).

(41) [[[algebra]_V ic]_a

a.	C	V	C	V	C	V	C	V	C	V				
	ø	æ	l	ø	dʒ	ə	b	ø	ɪ	ə				
b.	C	V	C	V	C	V	C	V	C	V	C	V		
c.	ø	æ	C	ø	dʒ	ə	b	ø	ɪ	e	j	ɪ	k	ø
	ø	æ	l	ø	dʒ	ə	b	ø	ɪ	e	j	ɪ	k	ø

In any case, vowel-final bases are not an issue for the current account, as any account must propose a hiatus resolution rule to repair these VV sequences in English.

2.2.2 C-initial Level 1 affixes

Another potential issue for the above analysis would be if there were any consonant-initial Level 1 affixes. This would be problematic, as C-initial affixes would obviously not be accounted for within an analysis that attributes the cohering nature of Level 1 affixes 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*.

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

I argue here that the first four affixes in above are not, in fact, Level 1 affixes. Rather, we have no evidence for the Level 1 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 have Level 1-type cohering behaviour 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.

The final affix in (42), *-tion*, is interesting in that it has multiple allomorphs; TION = {*-tion*, *-ation*, and *-ion*}.

- (43) a. absorp-tion b. randomiz-ation c. amalgam-at-ion

Remarkably, the consonant-initial allomorph in (43a) 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). Outside of other affixes, TION always has a vowel-initial exponent; *-ation* in the environment of *-ize* and *-ify(k)*, 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, that the [i]-initial form is present in (43c), as otherwise we could not explain the cohering and stress shifting nature of the affix (*amálgamate/amalgamátion*).

One interesting possible exception 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 (44a) and is banned from following sonorants, including glides (44b) (Raffelsiefen 1999).^{xxi}

- (44) a. toughen, weaken, widen, lengthen
b. *warmen, *bluen, *greyen, *dullen

This restriction is explained if the underlying form of *-en* is a floating C, [n]. As a sonorant consonant, it will be able to attach to a final empty nucleus, just as a floating vowel would. Here a phonotactic restriction on onsets being less sonorous than their nucleus would disallow the attachment of [n] to an empty position following a sonorant consonant, ruling out forms like those in (44b).

(45) [[[wide]_v 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 entails 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. The only V-initial affix that can be attached outside of *-en* is *-ing* in its Level 2 form, as indicated by the fact that the [n] retains its syllabic status in forms such as *widening*.

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 Level 1 affixes.

3 Alternate analyses, a note on semantics, and Conclusions

The above account, and the account of Lowenstamm, are absolutist. What I mean by this is that they are accounts where the Level 1 Level 2 distinction is not morphological or lexical. Either no affix triggers a morphosyntactic or phonological cycle as in Lowenstamm (2010, 2014), or all affixes trigger a cycle, as in the account promoted here. There are two other possibilities, both relative, and both appearing in the literature. It could be the case that only Level 1 affixes are cyclic, as promoted by a theory such as Halle & Vergnaud (1987), or it could be the case that only Level 2 affixes are cyclic, as in Kaye (1995). Both of these accounts have been translated into a phase-based

framework in Scheer (2011). I discuss them briefly here to demonstrate the shortcomings of these traditional analyses.

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.

(46) Derivation of *governmental*

Phonological cycle 1 (triggered by the root): góvern

Phonological cycle 2 (triggered by *-al*): gòvernmentál

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.^{xxii} 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 a diacritic 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. The famous discussion of *comp[ə]nsation* vs. *cond[ɛ]nsation*, is based on the proposal that the former has no independent verbal base and the latter does; *cond[é]nse*. This leads to the non-reduction of the [é], as it was stressed on a previous cycle. What is often overlooked is that this 'stress copying' (H&V 1987:66) applies unpredictably. Consider the nouns *cons[ə]ltation* 'consultation' or *infl[ə]mation* 'inflammation' derived from the verbs *cons[ʌ]lt* 'consult' and *infl[é]me* 'inflammation' whose stressed vowels are never saved by stress-copy.

It is apparent that the phonology is not reapplied to the entire string upon the application of phonological rules triggered by Level 1 affixes, despite the ability of main stress to shift. As noted in §2, we can see that consonant clusters disallowed within a morpheme or within the first cycle of phonological computation are still permitted after the phonology treats a string affixed with an outer Level 1 morpheme. A word like *governmental* does not treat the sequence [ɪnm] as though it were part of a single phonological domain (ex. by epenthesizing a vowel, or deleting a consonant to bring the sequence in line with English phonotactics). Additionally, stress troughs created by the addition of an outer Level 1 affix might be expected to be leveled out, if syllabification, footing, and stress rules were to be reapplied to the entire string (and if Stress-Copy is an unreliable tool), but this is not true. Consider a word like *probabilistic*.

(47) Derivation of *probabilistic*

Phonological cycle 1 (root): [pròbable]_√

Phonological cycle 2 (L1): [[[pròbable]_√íst]_{L2ic}]_{L1}

Note that the cycle 2 stress pattern in (47) indicates a foot structure that leaves the final syllable of the root domain unfooted: (*pròba*)*ble(ístic)*. If one were to refoot the entire string after the addition of the outer Level 1 *-ic* the default assumption would be that a right-to-left trochaic parse (H&V 1987's English Alternator Rule) would give the ungrammatical **pro(bàbl)(ístic)* (cf. *a(rìsto)(crátic)*), or (*prò*)(*bàbl*)(*ístic*) (cf. (*tì*)(*cònde*)(*róga*)).^{xxiii} In fact, were metrical phonological rules to reapply to the entire string upon affixation of *-ic*, we should expect the syllabic [l] (and the preceding [b]) in *probab[l]* to be resyllabified as the onset of the following syllable, giving the ungrammatical four-syllable form *(*próba*)(*blístic*). I contended above in §2 that the reason this expected parse is impossible is that a Level 1 affix can only trigger refooting in the domain into which it is merged, here the domain of the Level 2 affix *-ist*. *-ist*, on the other hand, does not incorporate into the phonological domain of the root. The boundary between the root and the Level 2 affix persists, allowing for the apparent stress trough in (47), as well as the persistence of the [ɹnm] cluster in *governmental* and the [...b](i...) syllabification in *probabilistic*.

The third issue with H&V's account is that it accounts solely for the morpho-phonological patterns involved with classes of affixes and does not account for the semantic cyclic effects mentioned above. The relationship of semantic interpretation and word-internal cycles is an issue for all theories discussed herein save the floating vowel analysis. This is therefore detailed separately below in §3.3.

The conclusion here is therefore that a H&V-type account, where Level 1 affixes trigger the reinterpretation of cyclic phonology across an entire string (word) does not solve the problem we had with the DM+Phase account of cycles, as it introduces too many problems of its own.

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 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 (and cross-linguistically) at Level 1 (48). Also, vowels must be short in closed syllables within a root+Level 1 domain, just as within a morpheme (49). These restrictions do not hold when a Level 2 affix is attached.

- (48) a. [in-licit]_{L1} → i[l]icit ‘illicit’
 cf. [[un]_{L2} [lawful]_{L1}] → u[nl]awful ‘unlawful’
- (49) a. [keep + t(past)]_{L1} → k[ε]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 domains created at previous cycles (cyclic domains indicated by bolded brackets).

- (50) [[parent-al]_{L1} -ly]_{L2} → [[paréntal] ly]
 $\sqrt{-al(L1)-ly(L2)}$
 *parentállly

Kaye’s system therefore also captures the phonological behaviour of Level 1 affixes attached outside other morphology. 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*.

(51) Phonological cycle 1: [próbable_√]

Phonological cycle 2: [[pròbable_√] íst_{L2}ic_{L1}]_{WORD}

One problem with Kaye's derivation that is immediately apparent is that stress assignment needs to be exempt from *strict cyclicity*. Stress shift is not discussed in Kaye (1995) as he does not treat any forms with multiple affixes. A conclusion similar to this, but without Kaye's problem, was promoted in §2; the MSR reapplies whenever its environment is altered.

What is clear is that Kaye's no-look-back analysis does not have the problem with refooting/resyllabification that underlies the issues with a framework that does not include something akin to *strict cyclicity*, like H&V's account. It does, however, share with the H&V the problems related to the fact 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. It also carries the problem discussed below related to semantic cycles. Kaye predicts any sequence of Level 1 affixes attached to the root, and no sequence involving a Level 2 affix, to be potentially allosemantic, a pattern that is not attested.^{xxiv}

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

Level 1 morphology is allomorphic.

- (52) a. [weave-PAST]_{L1} → wove (listed)
b. [parent-al]_{L1} → parental (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.^{xxv} 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 [[*(pròba)ble*](*istic*)], 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, ex. *thoracic* ([θo:ɹæ̀sɪk], cf. [θó:ɹæ̀ks], /θo:ɹæ̀ks-ɪk/)) should eradicate this boundary; there are no phonological boundaries within an allomorph. Kaye's proposed system is clearly not able to account for phonological patterns triggered by Level 1 affixes that sit outside of Level 2 morphology.

3.3 Advantages of the floating vowel theory of Level 1 vs. Level 2 affixes

The analysis herein, unlike those of H&V and Kaye, does away with the longstanding idea that there are lexical levels in English. Lexical levels are unnecessary to account for the phonological patterns triggered by English affixes, therefore by any metric of simplicity it must not be the case that Level 1 and Level 2 affixes are

differentiated in the by morphological diacritics in the lexicon. English affixes are neither specified to be cohering or non-cohering (to project their own Prosodic domain or not), nor are they specified to trigger a cycle of phonology, or not. The phonology 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 expected pattern. This, importantly, distinguishes the two classes of affixes in a way that makes phonological predictions. A floating vowel has the inherent property of inducing phonological cohesiveness (and a floating [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 frameworks.

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 (53a) into the domain of the modifier *ini* (53b) 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 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.^{xxvi} As can be seen below, hiatus remains unresolved between the degenerate foot in (53b) 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 output, but it does not occur as the structure of (53b) does not allow for refooting of an adjunct (adverb) and the domain that it modifies (the verb).

- (53) a. [ni [(ini)]_{aP} [(á:)(gamò)(sè:)]_{vP}]_{CP} ‘I walk there in snowshoes’
 1P AWAY SNOWSHOE.WALK
- b. [~~nɪ~~ [(nidi)(ni)]_{aP} [(á:)(gamò)(sè:)]_{vP}]_{CP}

This is just one other example of the many found cross-linguistically where one affix, for purely phonological reasons, incorporates into the phonological domain of its host. That this should also occur in English is unsurprising.

The analysis in this paper offers a cleaner analysis both of the phonological facts attributed to Level 1 and Level 2 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, 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 (Kiparsky 1982, Arad 2003, Marantz 2013). 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 (54).

- (54) a. [[globe]_v ∅]_n ‘sphere’
 b. [[globe]_v al]_a ‘pertaining to the world/*sphere’
 c. [[[globe]_v ∅]_n less]_a ‘without a sphere/*world’
 d. [[[glob]_v al]_a ity]_n ‘property of pertaining to the world/*sphere’

Note that *-∅* 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 Level 1 (*-ity*) or Level 2 (*-less*) is completely irrelevant to whether it may affect the semantics of its base.^{xxvii} 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.

In conclusion, the DM+Phase analysis of the phonology of English derivational affixation, in combination with independently necessary phonological tools and a closer

look at the distribution and form of Level 1 and Level 2 affixes allows for us to maintain the insights of a cyclic, realizational theory of morpho-syntax such as DM, while easily 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 Level 1/Level 2 morphology in other languages may be similarly recast. Whether this is indeed the case remains to be seen.

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ⁱ The existence of Level 1 and 2 affixes in languages other than English will not be treated herein.

ⁱⁱ The only account that comes close to being an exception to this that I am aware of is Raffelsiefen (1999), where, like in the analysis in the present article, it is proposed that it is the vowel-initial nature of Level 1 affixes that drives their cohering behaviour.

Raffelsiefen's analysis will be discussed below in §2. It is noteworthy that she proposes morpheme-specific phonologies (constraint rankings), and therefore her account is not a counter-example to the statement that all previous analyses make reference to lexical diacritics.

ⁱⁱⁱ A thorough discussion of the English Main Stress Rule in its various formulations is beyond the scope of this paper. The stress system of English is taken to (where stress is not otherwise lexically-specified) build weight-sensitive trochaic feet from right to left, ignoring any extrametrical syllables/segments at the right edge of a domain. The specifics of what constitutes a domain and which elements are listed as extrametrical will be further elaborated in §2. A thorough discussion of the English stress system and the

scholarly history of its analysis are beyond the scope of this article. The reader is referred to Chomsky & Halle (1968), Hayes (1982), Halle & Vergnaud (1987), Marvin (2002) and references therein.

^{iv} See Marušić (2005), Newell & Piggott (2014), and d’Alessandro & Scheer (2015) for different ideas of how non-isomorphy between LF and PF could be achieved.

^v Marvin (2002) explicitly denies that initial phase heads are interpreted with their complements, but her derivations belie the fact that they are.

^{vi} First published online as an ms. in 2010.

^{vii} 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.

^{viii} 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*.

^{ix} This is also true of *-ique*, and *-esque*. These affixes, borrowed from French, 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 taken into account for purposes of footing, affording the affixes a size suitable for the assignment of stress.

<p>(i) C V C V C V</p> <p style="padding-left: 40px;"> </p> <p style="padding-left: 40px;">∅ ε s ∅ k ∅</p>	<p>(ii) C V C V</p> <p style="padding-left: 40px;"> </p> <p style="padding-left: 40px;">∅ i k ∅</p>
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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.

^x The patterns in (23) and (24) 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[!]*esque** ‘like a puzzle’.

^{xi} Approximately half of the speakers consulted offered *puzzology* rather than *puzzleology* when asked to create this word. This follows if some people have the ban on multiple laterals in the same phonological domain discussed in Raffelsiefen (1999), but cannot explain why no speakers thought *bottology* rather than *bottleology* to be grammatical.

^{xii} Exceptions here are affixes like *-like* and *-wise* whose diphthongs, being long like the vowels in *-ee* and *-ese*, should attract stress. But, words like ‘hómelike’ and ‘páirwise’, given their stress patterns, could be analyzed as compounds. *-eer*, also attracts stress and should behave like *-ology* etc. with regards to cluster repair and sonorant syllabification, but I have found no appropriate contexts in which to test this affix.

^{xiii} 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. The present analysis is couched within such a framework.

^{xiv} I use the term *foot* here as shorthand for any system which groups syllables into Strong and Weak alternating units.

^{xv} Each of these morphemes may be, of course, analyzed as bi-morphemic, if the *-y* is taken to be a Level 1 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 (27). Their behaviour after affixation of the Level 1 *-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 (ex.

**lexicograph, *climatologue*). Additional evidence for the Level 1 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 Level 2 status and do not affect stress (when not affixed to a bound root), but will have Level 1 behaviour when root-attached.

^{xvi} This article leaves aside the question of strong and weak retractors (ex. Liberman & Prince (1977)). They, under any account, necessitate extra machinery. The account herein will not meet any issues with accounting for them that are not encountered in any other analysis.

^{xvii} 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

^{xviii} Affixes that begin with consonants that are traditionally classed as Level 1 will be dealt with in §2.2.2. 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.

^{xix} The Level 1 stress retractors not dealt with herein also all begin with vowels: *-ate*, *-ade*, *-ote*, *-ene*, *-use*, *-ide*, *-ize*, *-ify(k)*, *-ary*, *-ory*, *ite*, *-oid*, *ative*

^{xx} It is perhaps this derivational uncertainty that leads to the variability of stress-copy (Halle & Vergnaud 1987) in words like *cond[ɛ]nsátion* ‘condensation’ vs. *cons[ə]ltátion* ‘consultation’, both of which are built on a base that may stand alone.

^{xxi} This restriction does not apply to the participial affix *-en*, as in *befallen*. This affix must have an underlying initial vowel.

^{xxii} See Bošković (2007, 2014), and Newell (in press) for arguments that the PIC is epiphenomenal.

^{xxiii} One might call on the fact that English displays a preference for stressing initial syllables in long words (Pater 2000) to explain this pattern, but this is a tendency, not an absolute, and does not rule out a parse where no syllable is left unfooted.

^{xxiv} This is true only on the translation of Kaye’s account into DM+Phase based terms. Kaye (1995) does not discuss semantic cycles.

^{xxv} 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).

^{xxvi} For more information on why the final syllables of adjuncts cannot incorporate into the verbal domain, see Newell (2008, 2015) and Newell & Piggott (2014).

^{xxvii} 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.