Bracketing Paradoxes Resolved

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Abstract

Bracketing Paradoxes (BPs) have been the subject of many different analyses since the 1970s. Each of these analyses have included BP-specific machinery to account for the apparent mismatch between the syntactico-semantic and morpho-phonological structures argued to be necessary for a complete analysis of this phenomenon. This article proposes that independently necessary operations and structures in the morpho-syntactic and phonological modules allow for an analysis of BPs that avoids postulating ad-hoc tools. Specifically, a system that includes cyclic (phasal) interpretation of the morpho-syntax (Chomsky 2001; Marantz 2007) in combination with a flat (CVCV) phonological framework (Lowenstamm 1996, 1999; Scheer 2004) avoids the emergence of paradoxical structures altogether. The discussion therefore includes both current morpho-syntactic and phonological analyses of each construction proposed to give rise to a BP; comparatives (*unhappier*), Level-ordering BPs (*ungrammaticality)*, Phrasal BPs (*modular grammarian)*, Compound BPs (*particle physicist*), Particle-verbs (*podžĕg* 'set fire' [Russian]), and Reduplicated BPs (*kwíita-kwíita* 'to pour a bit' [Kihehe]). The proposal that a flat phonological framework is key in avoiding the paradoxical nature of BPs has implications for the correct structure of phonological representations generally.

Keywords

Bracketing Paradox, CVCV Phonology, Cyclic Derivation (by Phase)

> "Morphological/syntactic structure and phonological structure are independent levels of analysis subject to independent constraints and principles. If this conclusion is correct, "lexical phonology", in which phonological rules and morphological affixation work in tandem, is deeply wrong." (Marantz 1987:203)
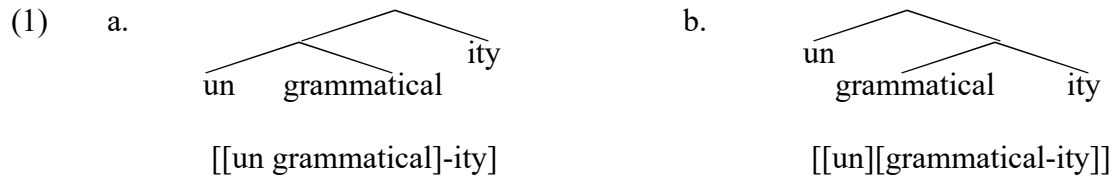
1   The problem with Bracketing Paradoxes

This paper has as its central concern the proposition in Marantz (1987) that Bracketing Paradoxes (BPs) have deep implications for the (in)correctness of certain proposals within the domain of generative phonology. Where it differs from Marantz' account, and from every previous account of BPs in the literature, is in the absence of an appeal to ad-hoc tools to eliminate these paradoxical derivations. It is argued that Bracketing Paradoxes cease to emerge if we adopt a theory wherein phonological representations are limited to (operations over) linear strings, and wherein

phonological operations must be triggered via phonological means (no Level-specific morphological diacritics or operations).

The problem posed by Bracketing Paradoxes for an appropriate analysis of both morpho-syntax and morpho-phonology is well known. Assuming a compositional semantic module, the morpho-syntactic structure of a BP must conform with its attested semantic interpretation (1a). Assuming that the phonological proximity or distance of an affix to/from its base is due to its interpretation in the same or in a different morpho-phonological cycle (as in Lexical Phonology's Level 1/2 distinction [Kiparsky 1982a; Mohanan 1982]), phonological stratum (Kiparsky 2000; Bermúdez-Otero 2017), or phase (Chomsky 2001; Marantz 2007) the structure of a BP must also conform to its surface phonological representation (1b).

(1)   a.   ity   b.   un

         un   grammatical   grammatical   ity

        [[un grammatical]-ity]   [[un][grammatical-ity]]

The structure in (1a) conforms to the compositional semantic interpretation of *ungrammaticality*; 'the state of being *ungrammatical*', and the structure in (1b) conforms to the phonological requirements that *-ity* be within the phonological domain of *grammatical* (as evidenced by stress shift) and that *un* be outside of the phonological domain of *grammaticality* (as evidenced by the lack of nasal place assimilation).

Since the 1970s, Bracketing Paradoxes have been subject to numerous analyses (among which are Allen 1979; Pesetsky 1979, 1985; Lieber 1980; Nash 1980; Williams 1981; Strauss 1982; Kiparsky 1982b; Selkirk 1982; Speas 1984; Pesetsky 1985; Marantz 1984a/b, 1987, 1989; Sproat 1984, 1985, 1988; Nespor and Vogel 1986; Beard 1991; Carnie 1991; Lieber 1992; Booij and Lieber 1993; Merchant 1995; Newell 2005a/b, 2008, 2018; Haugen and Siddiqi 2016; and Bermúdez-Otéro 2017, 2019). See Newell (2019) for a historical overview of the research on BPs. Each previous analysis of the BP problem has required the proposal of a BP-specific mechanism, such as special LF rules for prefixes (Pesetsky 1979; Williams 1981), rebracketing at PF (Williams 1981; Nespor and Vogel 1986; Marantz 1984a/b, 1987, 1989; Sproat 1984, 1985, 1988), quantifier raising of non-quantifiers (Pesetsky 1985), or suspension of Bracket Erasure (Kiparsky 1982b), to account for derivations like that in (1). Another commonality of all previous analyses is that they assume hierarchical (bracketed) structure in both the syntax and the phonology. In this article I take it as given that hierarchical structure is necessary for syntactic analyses, but it is proposed here to be unnecessary in the phonology (see also Lowenstamm 1996, 1999; Scheer 2004; Newell 2017a, 2017b, 2017c; Newell and Scheer 2017). The current, standardly assumed, hierarchical theory of phonological structure, Prosodic Phonology (Selkirk (1981 [1978]), 1982, 2011; Nespor and Vogel 1986, and seq.) proposes that phonological domain formation is regulated by the Prosodic Hierarchy (PH). The PH was proposed as a replacement for the undesirable boundary symbols found in SPE (Chomsky and Halle 1968), whose function was to explain the application or non-application of phonological rules within a particular portion of a phonological string (see Scheer 2011 for an overview of arguments against these boundary symbols). Interestingly, a consequence of this modification of phonological theory (from linear to hierarchical phonological structure) evidenced the birth of Bracketing Paradoxes. It is clear that BPs are only possible in a system wherein phonological representations are hierarchical.

(2)   ##modul+ar##grammar+ian##   →   (mɔ́dʒə)<lɹɪ> gɹə(méɹi)<ən>

In the SPE-style representation in (2) stress rules ignore the phonological segment + but are blocked by ##, ensuring that a phonological division emerges only between the two words. Morpho-syntactic constituency in SPE was translated into these phonological [-segmental] primes inserted into the linear string. As no hierarchical structure was built in representations such as (2), constituency was not at issue. Consequently, these representations were incapable of introducing Bracketing Paradoxes. Although the arguments in the literature against boundary symbols are clear and convincing (Pyle 1972; Rotenberg 1978; Devine and Stephens 1976; Kenstowicz and Kisseberth 1977; Hyman 1978, among others), the BPs introduced by Prosodic Phonology are argued here to indicate that such a theory is not the correct replacement for an SPE-style linear phonological system. The emergence of BPs is directly due to the hierarchical representations of the Prosodic Hierarchy, and therefore indicative of problems inherent to these representations. In the following sections I will discuss the syntactic derivations of all classes of word-level BP in the literature (and one phrasal example) and will demonstrate how their syntactic derivations, in combination with a non-diacritic linear phonological system (following Scheer 2008), capture the data in a uniquely satisfying way. This analysis highlights modifications that I will argue must be made to our theories of phonological representations.
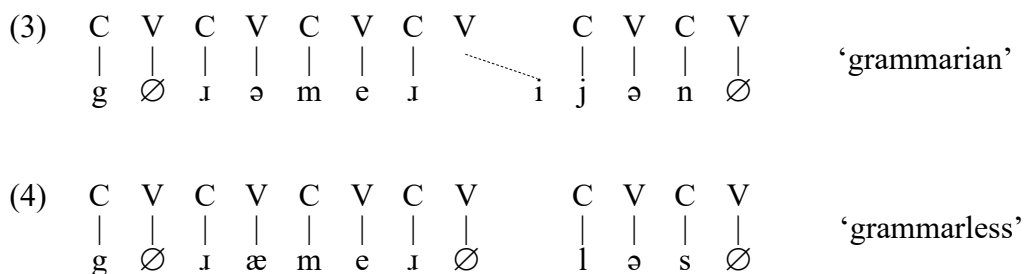
Specifically, I will argue that the timing of spell-out of each morpheme in a derivation, along with the edge-marking of phonological domains by an empty CV (following Lowenstamm 1999, Scheer 2009a) can account for derivations traditionally labeled BPs without ever giving rise to phono-syntactic paradoxes.

2   The phonological and morphosyntactic frameworks assumed herein

Newell (2016a,b, 2017c) introduces a liaison account of English Level 1/Level 2 morpho-phonology (3,4). Level 1/Level 2 will henceforth be referred to as cohering/non-cohering, following Rafelsiefen (1999), in order to abstract away from the theoretical implications of the former labels. The latter imply that an affix is treated as interior/exterior to the domain of footing and stress assignment of its base. The liaison analysis is argued to be a better account of morphological class-membership than the classic analyses in Lexical Morphology and Phonology type frameworks where affixes are either assigned to specific levels, or subcategorize for certain types of bases (Classic LMP: Mohanan 1982; Kiparsky 1982a; Giegerich 1999, LMP-OT: Kiparsky 2000, Stratal OT: Bermúdez-Otero 2017), Affix-specific phonologies (Benua 1995; Orgun 1996; Inkelas 1998; Raffelsiefen 1999, 2015; Plag 1999; Steriade 2000; Pater 2000, among others), and Output-Output/Paradigm-based correspondence models (McCarthy 1995; Steriade 2000; Downing et. al 2005; Kiparsky, 2005) for the following reasons. First, it is fully modular (Fodor 1983, 1985. See e.g. Reiss 2007; Scheer 2011 for discussion); the phonological structures proposed make no reference to either morphological classes or to morpho-phonological constraints like Alignment or Correspondence. A modular account of phonology (and of the morpho-syntactic module) is preferable in that it restricts possible phonological operations to those that are triggered via strictly phonological means. Second, it accounts for the fact that all cohering affixes in English are vowel-initial (following Raffelsiefen 1999, 2015, van Oostendoorp 1994). It is generally stated that lexical morphological classes cannot be uniformly distinguished based on their phonological shape. Although this may be true for some languages (necessitating further research to incorporate them into the modular theory argued for here), it is not strictly correct for English; there is, on the

surface, a one-way correlation between the first segment of a cohering affix and its phonological behavior (vowel-initial). Newell (2017c) argues that this one-way correlation can actually be represented as a two-way correlation; all and only cohering affixes begin with a *floating* vowel. Third, it has been shown clearly that many English affixes may have both cohering and non-cohering variants (Giegerich 1999; Bermúdez-Otero 2011). The liaison proposal accounts for the fact that affixes that are variably cohering and non-cohering do not display cohering behaviour when merged outside of another affix. Among the affixes that switch classes, their cohering variant is always root-attaching, while their non-cohering variant is always affixed to a complex base. Given that cohering affixes are not restricted to root-attachment (ex. *-al* in *govern-ment$_2$-al$_1$*) this pattern is unexpected in any system where class-membership is determined lexically.

The analysis in Newell (2017c) is represented in (3) and (4). Floating vowels link to a final empty V slot on the CV tier of their base (3). This analysis presupposes a Strict-CV (CVCV) linear phonology (Scheer 2004), where the timing tier is a uniform sequence of Cs and Vs. Cs and Vs may remain unpronounced; these are indicated with a ∅. Final Empty Nuclei (FEN) are parametrically licenced. As English allows consonant-final words, it is clear that this parameter is active. Affixes normally proposed to be non-cohering have a fully linked melodic tier under this analysis, as in (4).

(3)
```
    C   V   C   V   C   V   C   V       C   V   C   V
    |   |   |   |   |   |   |    ⟍       |   |   |   |
    g   ∅   ɹ   ə   m   e   ɹ      ⟍     i   j   ə   n   ∅        'grammarian'
```

(4)
```
    C   V   C   V   C   V   C   V       C   V   C   V
    |   |   |   |   |   |   |   |       |   |   |   |
    g   ∅   ɹ   æ   m   e   ɹ   ∅       l   ə   s   ∅        'grammarless'
```

The association of the floating [i] in (3) forces a cohering analysis of the syllabification and stress of *grammarian* as the phonological system sees a single unified string of timing slots on the CV tier after linking is effected. Affixes with an initial floating vowel must merge inside of the domain to their left, as the vowel needs to link to the CV tier in order to be pronounced. This analysis is directly akin to the generally-accepted phenomenon of liaison in French (ex. *peti[ɬ] garcon* vs. *peti[t] ami*) (Encrevé 1983). In (4), however, *grammar* and *-less* are not syllabified as a single uninterrupted string. *-less* leans on the phonological string to its left (it is suffixal/clitic-like), explaining its lack of independent stress. Importantly for the discussion of BPs here is the fact that, under Newell's analysis, whether an item will be an independent word or an affix (either cohering or non-cohering) is not predictable based on syntactic structure. Both *-less* and *-ian* are affixes, regardless of how much morpho-syntactic structure separates them from *grammar*.

This non-isomorphism between morpho-syntactic and phonological domains was one of the motivations for Prosodic Phonology, but this divergence is not taken to be the norm. Typically, non-isomorphism is seen as an occasional deviation from complete isomorphism, as in Selkirk's Match Theory (2011), and that *words* are generally the phonological interpretation of (complex) X^0s. Therefore, within the framework of the Prosodic Hierarchy the difference between (3) and (4) must be that the former is a complex X^0 interpreted as a single Prosodic Word (PWd), and the latter is a complex X^0 interpreted as a nested PWd structure or a Composite Group (Vogel 2009). Unfortunately for such a theory, it is evident from the cross-linguistic variation that words are not restricted to the phonological interpretation of X^0s (Julien 2002; Haspelmath 2011; Svenonius

2016; Newell 2017a; Newell et al. 2017). Regardless, the difference between the phonological structures of (3) and (4) is clear. In (3) the phonology is sensitive to the procedure of liaison. In (4) liaison does not occur. Why *-less* is an affix and not a separate word may be due to distributional factors (ex. Julien 2002), or lexico-syntactic marking of affix-status (ex. Svenonius 2016), but a coherent theory of wordhood vs. affixhood is beyond the scope of this paper and will not be crucial to the analysis of BPs below. What is important in the discussion to follow is that the linearization of phonological objects, and the phonological operations effected over these strings, are sensitive to the underlying lexical representations of each morpheme.

An additional tool to be employed in the following pages is one proposed within the theory of Strict-CV phonology to delimit phonological domains; the cycle-initial empty CV proposed by Lowenstamm (1999) and elaborated on by (Scheer 2009a and subsequent work).[1] Scheer proposes an empty initial CV as a modular replacement for SPE's # and for the PWd of the Prosodic Hierarchy. He argues that the CV, unlike the PWd, is a native phonological object, making predictions in the phonology. An initial CV is (i) an interface-visible object (both phonological rules and rules of allomorphy must have access to the CV tier), and (ii) a non-diacritic boundary marker (see Scheer 2009b). We will see that this initial CV (in grey throughout) can block phonological rules from treating (for example) modifiers as part of a single phonological domain with their base (5).

(5)
$$
\begin{array}{ccccccccccccccccccc}
C & V & C & V & C & V & C & V & C & V & C & V & C & V & C & V & C & V \\
| & | & | & | & | & | & | & | & | & | & | & | & | & | & | & | & | & | \\
\varnothing & \varnothing & m & \textipa{A} & d\textipa{Z} & \textipa{@} & l & \textipa{@} & \textipa{*r} & \varnothing & \varnothing & \varnothing & g & \varnothing & \textipa{*r} & \textipa{\ae} & m & \textipa{@} & \textipa{*r} & \varnothing
\end{array}
$$

The empty CVs in (5) are inserted upon interpretation of *modular* and *grammar*, assuming a phase-based morpho-syntax as in much work in Distributed Morphology (Arad 2003; Marantz 2007; 2013; Marvin 2002, 2013; Newell 2008; Embick 2010 etc.). In this type of framework, categorizing adjectival, nominal, and verbal heads trigger spell out ([[modul-ar]$_a$ [grammar-Ø]$_n$]$_n$), in addition to the 'phrase-sized' vP, CP, PP, and DP phases (as in Chomsky 2001 and subsequent work in the field). In this way, cycles for the application of phonological rules are determined by the syntax. The insertion of phase-initial empty CVs is restricted phonologically, as we will discuss further in Section 3.5 when we examine particle verbs in Slavic languages.
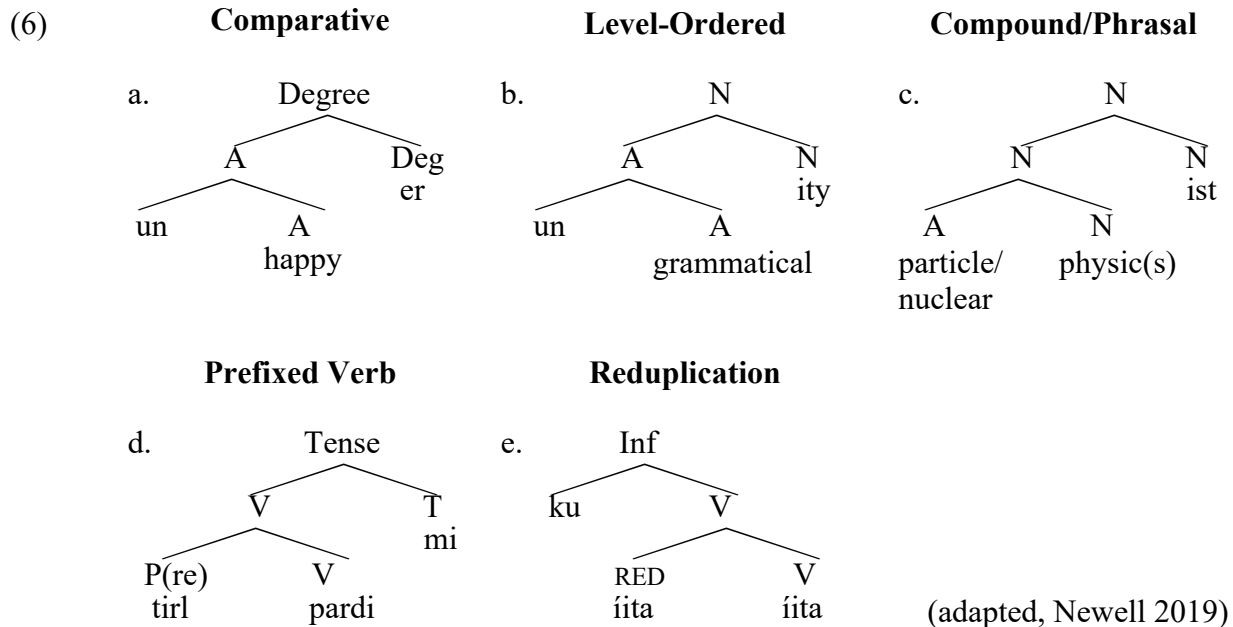
We have in this paper, therefore, a framework where spell-out domains are determined in the morpho-syntax (phases). In the phonology, strings computed in the same phase will be treated as single domains for the application of phonological operations. Inter-cyclic phonological communication is blocked by the non-interaction of melodic structure in separate cycles, sometimes with the aid of an initial empty syllable/CV. Inter-cyclic communication will, however, be forced by phonological means in the case of liaison, or any similar case of Phonological Merger (Newell and Piggott 2014) where a phonological operation is triggered, forcing the insertion of a phonological object (ex. floating feature, floating segment, unfooted syllable, tone) into a previously computed domain and triggering resyllabification (among other processes) if necessary (as in (3)). We will see below that such an analysis, when combined with the independently

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[1] Note that the grammatical insertion of syllabic space is not a proposal specific to CVCV phonology. Chierchia (1986) and Larsen (1998), for example, have proposed the insertion of syllables or morae for similar reasons. The form of the syllabic space inserted, a CV sequence, is specific to the theory assumed here.

supported morpho-syntax of the constructions at issue, eliminates both Bracketing Paradoxes and the need to appeal to the Prosodic Hierarchy.[2]

3. Kinds of Bracketing Paradoxes

Newell (2019) summarizes the literature on Bracketing Paradoxes, and notes that cross-linguistically BPs have been split into 5 types. The comparative BP is specific to English (6a) and gets its own entry due to the amount of publicity it has received, including two LI squibs: Sproat's (1992) *Unhappier is not a "Bracketing Paradox"* followed by Kang's (1993) *Unhappier really is a "Bracketing Paradox"*) (treated in Section 3.1). An example of Level-Ordered paradoxes, where a cohering affix is merged outside of a non-cohering affix can be seen in (6b) (see Section 3.2). Compound and Phrasal paradoxes are generally considered sub-categories of Level-Ordered paradoxes (6c) but in these the 'prefix' is the left-hand member of a phrase or compound. The distinct behaviours of the sub-types of (6c) will be teased apart in Sections 3.3 and 3.4.

(6)

Comparative	Level-Ordered	Compound/Phrasal

a.
```
        Degree
       /      \
      A        Deg
     / \        er
   un   A
       happy
```

b.
```
         N
        / \
       A   N
      / \  ity
    un   A
     grammatical
```

c.
```
            N
           / \
          N   N
         / \  ist
        A   N
   particle/ physic(s)
   nuclear
```

Prefixed Verb	Reduplication

d.
```
        Tense
       /    \
      V      T
     / \     mi
  P(re)  V
   tirl  pardi
```

e.
```
       Inf
      /   \
    ku     V
          / \
       RED   V
       íita  íita
```

(adapted, Newell 2019)

Additional categories of BP are prefixed verbs (ex. Warlpiri, Nash 1980 in (6d)) (see Section 3.5), and reduplicative structures (ex. Kihehe, Marantz 1987 in (6e)) (see Section 3.6).
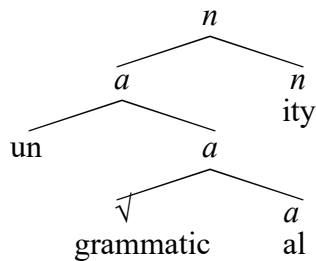
The reader may note, as Kiparsky (1982b), Newell (2005a,b, 2008) and others have, that all BPs contain one component (affix or modifier) that does not project in the syntax. While this characteristic is crucial in the accounts to follow, it will be shown that the non-projection of (prefixal) elements in the morpho-syntax may come about via different means.

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[2] This analysis also represents a linear phonological account of the cross-linguistic pattern whereby prefixes are much more likely to be phonologically independent from their base than suffixes (ex. Newell and Scheer 2017).

3.1 Level-ordered Bracketing Paradoxes

What the above phonological analysis in Newell (2017c) entails for Level-Ordered Bracketing Paradoxes in particular is that it is only linear order, and not the Prosodic Hierarchy or spell-out within a particular phase/cycle, that determines the phonological behaviour of the relevant cohering affixes. Just like infixation (*absobloodylutely*) and Phonological Merger of unfootable material (see Newell and Piggott 2014 and Newell and Scheer 2017 on Ojibwe), liaison obscures the boundaries between phases/cycles for the simple reason that the phonology does not contain, and therefore cannot be sensitive to, a representation of hierarchical structure. In BP derivations like *ungrammaticality* there is no issue with the phonological output being non-isomorphic with the morpho-syntactic representation. The morpho-syntax is sent to spell-out in phases, and in line with the requirements of a compositional semantic module the interpretation of *ungrammaticality* is 'the property of being ungrammatical' (7); an interpretation that is consistent with the morpho-syntactic structure required by the selectional restrictions of the respective affixes. The output of phonological computation is strictly linear as in (8a-d) where the (PF) phases of interpretation in this derivation are represented. These phases follow the proposals that (i) category-defining heads (little *a*, *n*, and *v*) are phase heads that are spelled out with, or are phonologically visible to, their complements (see Arad 2003; Embick 2010; Marantz 2013 and previous work; Marvin 2002, 2013; Newell 2008), and (ii) that left-branches (adjuncts and specifiers) are interpreted (both phonologically and semantically) separately from the larger tree into which they are merged (Uriagereka 1999; Johnson 2004; Svenonius 2016; Starke 2018, among others).

(7)

```
                    n
             ┌──────┴──────┐
             a             n
        ┌────┴────┐        ity
        un        a
             ┌────┴────┐
             √         a
          grammatic    al
```
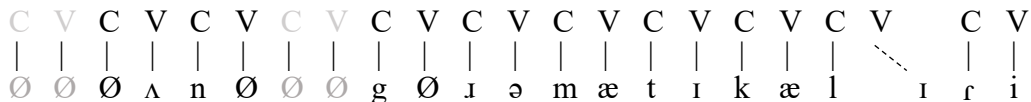
(8) a.
C V C V C V C V C V C V C V
| | | | | | | | | | | | | |
Ø Ø g Ø ɹ ə m æ t ɪ k ə l Ø

b.
C V C V C V
| | | | | |
Ø Ø Ø ʌ n Ø

c.
C V C V C V C V C V C V C V C V C V C V
| | | | | | | | | | | | | | | | | | | |
Ø Ø Ø ʌ n Ø Ø Ø g Ø ɹ ə m æ t ɪ k ə l Ø

d.
C V C V C V C V C V C V C V C V C V C V C V
| | | | | | | | | | | | | | | | | | | ⟍ | |
Ø Ø Ø ʌ n Ø Ø Ø g Ø ɹ ə m æ t ɪ k æ l ɪ ɾ i

Beginning with the phases in (8a,b), we must note that they are derived in parallel, in that neither one syntactically contains the other, and therefore neither can be said to be processed prior to the other. The prefix *un-* has been analysed in the literature as either a morphological adjunct (Newell 2005a, 2005b, 2008) or as the specifier of NegP (ex. De Clercq 2013).[3] Studies of adjunct/specifier left-branches in the syntax contend with the fact that these are islands for movement, and that they evidence prosodic and semantic separateness from their bases of attachment. I will assume in the representations here that *un-* is an adjunct, although nothing crucial hinges on this. Uriagereka (1999) proposes to account for the particular nature of syntactic left-branches by proposing that they are interpreted in a separate but parallel syntactic and phonological computation, and then merged post-spell out. Similar analyses are also assumed in a Spanning framework (Svenonius 2016), or a Nanosyntactic framework (Starke 2018). According to such proposals, both *un-* and *grammatical* (a phase itself, triggered by the category-defining head *-al*) are interpreted separately before merger to one another. This independent interpretation will endow each of these domains with an initial CV in English, separating them phonologically even under affixation (8c). This derivation offers two potential motivations for the non-assimilation of the nasal consonant in the prefix to the place of articulation of the following consonant; (i) the nasal is interpreted before affixation to the base, and therefore default place is assigned to it, bleeding assimilation, or (ii) the intervening empty CV causes the nasal to be non-local to the following consonant, blocking the application of assimilation.

Affixation of *-ity* leads to the spell-out of *n* in (7). As the head *n* c-commands the head *a*, *grammatical* will be visible to the floating vowel of *-ity* at phonological interpretation.[4] Its floating vowel will link to the final empty vowel position to its left. This linking creates a phonological structure identical to one that would have been created were *grammatical* and *-ity* to have been spelled-out in the same phase.[5] Resyllabification (or the re-analysis of Government and Licensing relations in Government Phonology (GP, including CVCV)) and stress shift therefore occur, but do not affect *un-*, as it remains insulated by empty syllabic space from the domain of syllabification of *grammatical*. What is clear in this proposed derivation of *ungrammaticality*, and of similar BPs, is that there is no paradoxical output at any point. The phonology never contains any hierarchical representation. No matter the morpho-syntactic distance of the liaison affix from its base, it must be syllabified inside the domain to its left, and the prefix in these constructions can be shown to

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[3] Newell (2005a/b, 2008) argues that *un-* (i) does not project, (ii) merges with multiple syntactic categories, and (iii) adds only compositional meaning to its base of attachment, and therefore it can be concluded that *un-* is an adjunct. Note that this analysis of verbal (*undo*), nominal (*unBirthday*), and adjectival (*unhappy*) *un-* as a single object has no bearing on the analysis of Bracketing Paradoxes herein, as each *un-* displays adjunct-like behaviour independently. This is also consistent with an analysis of *un-* as the Specifier of NegP, as in De Clercq (2013) and subsequent work, if NegP can select for verbal, adjectival, and nominal complements.

Work such as Bruening (2014) proposes that *un-* is a head. It is difficult to align such an analysis with the phonological behaviour of *un-* in a non-diacritic manner.
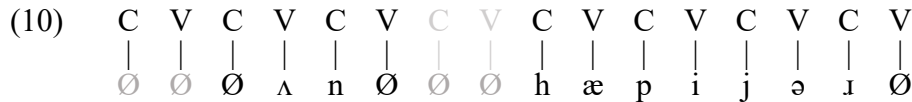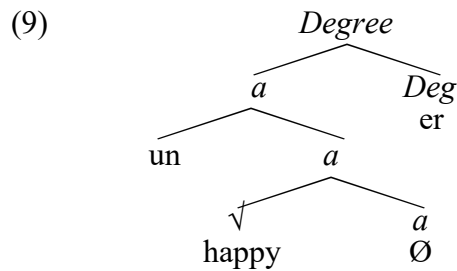
[4] There is evidence that the phonological visibility of a base is influenced by c-command relations between an affix and said base. See Kaisse (1985), Odden (1990), Newell (2008), Newell and Piggott (2014) and Kalivoda (2018) for discussion. Note that this restriction on visibility does not entail that the phonology makes direct reference to syntactic structure.

[5] See Embick (2014) and Newell (2017b,c,d) for discussions of how Phase Impenetrability does not apply to the relevant phonological structure here, allowing *-ity* to affect a previously interpreted cycle (the *a*P containing *grammatical*).

have the characteristics of any other syntactic left-branch, ensuring its interpretation in an independent phonological cycle.[6]

3.2   Comparative Bracketing Paradoxes

The derivation of comparative BPs is analogous to the above, but here the left-branch nature of *un-* insulates it from conditioning the allomorphy of the comparative (or superlative) suffix, as well as ensuring that it is not in the domain of main stress assignment. The base of attachment of the comparative morpheme that conditions its allomorphy as synthetic (*-er/-est*) or analytic (*more, most*) is the phonological domain to its left.[7] As *un-* is never syllabified within the domain of the its base of affixation, it is invisible to (or unimportant to) the phonologically-conditioned Vocabulary Insertion of the comparative suffix. The structure in (9), necessary for the correct semantic interpretation of *unhappier* ('more unhappy', rather than 'not more happy') is compatible with a linear phonological representation where the comparative is sensitive to the size of its domain of attachment, a domain that excludes *un-*.[8]

(9)

$$\begin{array}{c}\textit{Degree}\\ \textit{a}\qquad\textit{Deg}\\ \text{er}\\ \text{un}\qquad\textit{a}\\ \surd\qquad\textit{a}\\ \text{happy}\qquad\text{Ø}\end{array}$$

(10)

C	V	C	V	C	V	C	V	C	V	C	V	C	V	C	V
Ø	Ø	Ø	ʌ	n	Ø	Ø	Ø	h	æ	p	i	j	ə	ɹ	Ø

The stages of interpretation of (9) and (10) are analogous to those of *ungrammaticality*. *un-* and *happy* will be interpreted separately and then linearized after they have been merged. The degree head is then sensitive to the domain to its left; a domain that excludes *un-*. Scheer (2016) demonstrates that allomorphy may be sensitive to the CV/skeletal structure it merges with (but not to melody). The invisibility of *un-* to *-er/more* allomorphy is consequently unsurprising.

Note that this analysis does not imply that *-er/-est* need be cohering affixes; they never induce stress shift and therefore plausibly do not contain initial floating vowels. Bermúdez-Otero (2013) demonstrates that the comparative suffix is outside of the first phase/phonological cycle in Belfast English except when it conditions allomorphy of its base of attachment. He shows that in

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[6] To elaborate on the statement in fn 5, this is not a direct-access account of the interface. I am not proposing that phases or syntactic structure have any influence within the phonological module. Phases determine which chunks of syntactic structure will undergo spell-out. After Vocabulary Insertion (Halle and Marantz 1994) the phonological form of each morpheme and any empty phonological structure (either morphological, e.g. a reduplicative morpheme, or grammatically/cyclically determined, e.g. a left-edge CV) are the only objects that are considered during the phonological derivation.

[7] More complex degree derivations may evidence the effects of syntactic locality on this allomorphy in way that is not relevant to the analysis here (see Svenonius 2016 for a recent discussion).

[8] A reviewer brings up examples like **punch-drunker* or **house-prouder*, originally discussed in (Spencer 1988). The left-members of these compounds bleed the insertion of *-er*, in opposition to *un-*. These examples will be discussed in Section 3.4.

this dialect coronal stops are dentalised before /(ə).ɹ/ (11a), except when that /(ə).ɹ/ is the exponent of a non-cohering affix (11b). Importantly, in suppletive comparatives /(ə).ɹ/ triggers dentalization (11c).
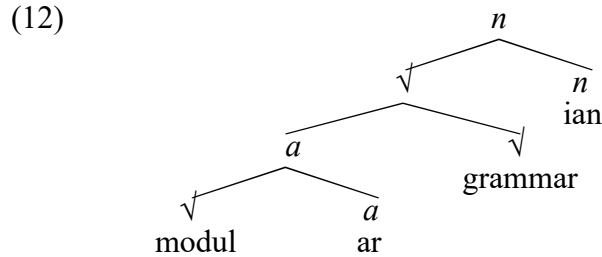
(11)　　a.　　　　Peter [ˈpit̪əˈ], ladder [ˈlad̪ə], dinner [ˈdɪn̪əˈ], pillar [ˈpɪl̪əɹ]
　　　　b.　　　　fa[t]er, lou[d]er, fi[n]er, coo[l]er
　　　　c.　　　　better [ˈbɛt̪əˈ] 'good.comparative' (cf. better [ˈbɛtəˈ] 'one who bets')

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(Bermúdez-Otero 2011: 2022)

The distinct behaviour of *better* 'good-comparative' is open to more than one explanation. First, though the adjectival head (a phase head) between the root and Deg in (10) will normally induce spell-out of its complement separately from *-er/-est*, when the complement contains a listed allomorph (good/bet) Domain Suspension (Bobaljik and Wurmbrand 2013) will prevent the *a*P from undergoing spell-out until the Deg head is merged. Bobaljik and Wurmbrand argue that morphemes which evidence outward-in allomorphy (allomorphy conditioned by an outer morpheme) will delay Vocabulary Insertion until a subsequent head is merged into the tree, allowing for the suspension of spell-out just in case allomorphic selection will be triggered by this outer head. In this case, the comparative morpheme will be included in the spell-out domain of the root, allowing for dentalization to apply. DegP will undergo spell-out in the same cycle as *a*P (still excluding the independently spelled-out *un-*). A second option, pointed out by a reviewer, is that *better* is simply monomorphemic. Bruening (2017) argues this to be the case due the unique behaviour of *better/best* as achievement verbs (*to better/best X*); an environment where comparative/superlative affixes are generally not permitted (**to wider(en)/*to widest(en)*). In either case, the data in (11) show that regular degree affixes are outside of the phonological domain to which they attach, but may still be sensitive to the phonological properties of their base; a pattern that is completely in keeping with a phonologically realizational analysis of the morpho-syntax (ex. Bobaljik 2000). Importantly for our purposes, this type of derivation is compatible with a linear representation of the phonology, avoiding the need to appeal to readjustment rules to account for the phonological separateness of *un-*. As in Section 3.1, an appeal to hierarchical structure to account for the phonological domains in the comparative derivation is unnecessary, and its inclusion would therefore be more complicated than the alternative that assumes only linear phonological representations.
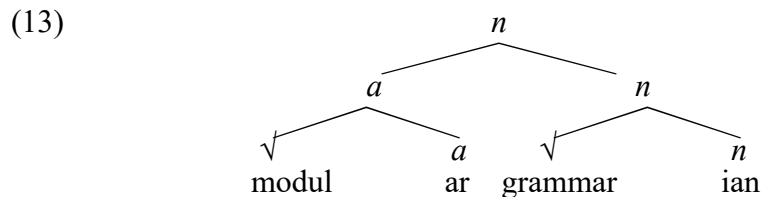
3.3　　Phrasal Bracketing Paradoxes

This section presents an analysis of Phrasal BPs, such as *nuclear physicist*, which obviates the need for any discussion of these BPs *as* BPs, the syntactico-semantic derivation of these constructions being isomorphic with the phonological interpretation under any account. In Section 3.4 I will argue that the difference in the position of stress in Compound BPs (*particle physicist*) and Phrasal BPs argues for distinctions in the analysis of these constructions. The conclusion of this section aligns with the conclusions presented for Comparative and Level-Ordering BPs above; if the correct syntax for each construction is paired with a linear phonological representation, no paradoxes emerge.

The structure normally assumed for Phrasal BPs is as in (12), where the modifier is merged below the nominalizing suffix. Here we assume a structure where the modifier, following Steddy (2019), is merged directly to the root of its modifyee.

(12)

```
                          n
                        /   \
                      √      n
                     / \     ian
                    a   √
                   / \  grammar
                  √   a
               modul  ar
```

This is proposed to be the necessary structure for such constructions as the semantics of the modifier and its base (*modular grammar*) has idiomatic properties that must be negotiated prior to the interpretation of the suffix. In other words, a *modular grammarian* is 'a practitioner of *modular grammar*' and not 'a *modular* practitioner of *grammar*'; the latter being the proposed compositional semantics for a structure where *modular* is merged outside of *-ian*, as in (13).

(13)

```
                      n
                    /   \
                  a       n
                 / \     / \
                √   a   √   n
             modul  ar grammar ian
```

There are at least two reasons to believe, however, that the structure in (13) is more appropriate for both interpretations of *modular grammarian*. Bermúdez-Otero (2017, 2019) notes that the structure in (13) is not justified by the semantics of these constructions. This becomes clear when one examines how the nominal suffix may compose with its base. He points to constructions where it is not only the combination of modifier and base that triggers idiomatic interpretation, but also the combination of the base with the suffix. Consider the following pair:

(14) a. *nuclear physicist*
   b. *nuclear physician*   (Bermudéz-Otero 2019:16)

If the semantics of [*nuclear physic*] in both of the cases above were to be negotiated before the interpretation of the suffixes *-ian/-ist* we would expect both to have an identical core meaning. This is not the case. (14a) refers to a practitioner of *nuclear physics* and (14b) refers to a practitioner of *nuclear medicine*. The semantics of *physicist* and *physician* therefore must be negotiated independently of the interpretation of *nuclear*, as expected from a structure such as (13).

How then, is the idiomatic reading of *nuclear physics* or *modular grammar* derived if the adjectival modifiers are merged outside of the nominalizing head? It must be the case that this type of interpretation is negotiated later in the derivation (as is the case for phrasal idioms such as *kick the bucket*)[9]. In support of this proposition, consider that Fábregas (in press) argues convincingly

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[9] Note that this negotiation of special meaning with a sub-part of the domain it modifies is not specific to morphologically complex constructions like *nuclear physicist*. Nominal modifiers may negotiate an idiomatic interpretation with a sub-part of the semantics of the base noun to which they are merged even in cases where the part

that qualitative and relational adjectives inhabit distinct morpho-syntactic positions, but that both are merged outside of the nominalizing head, as in (15).[10] He argues that (among other distinctions) relational adjectives must be merged as specifiers of a functional head (F_1) in the nominal domain that is lower than the functional head (F_2) that hosts qualitative adjectives. Relational adjectives are argued to be KPs (case phrases) and to therefore be too small to exhibit scalar modification (e.g. they cannot be modified by *very*). Qualitative adjectives will be interpreted as predicational modifiers and may be scalar (e.g. modifiable by *very*). (15) is the structure of a *(very) nuclear nuclear physicist*; 'a nuclear physicist who is (very) central a particular project'.

(15)
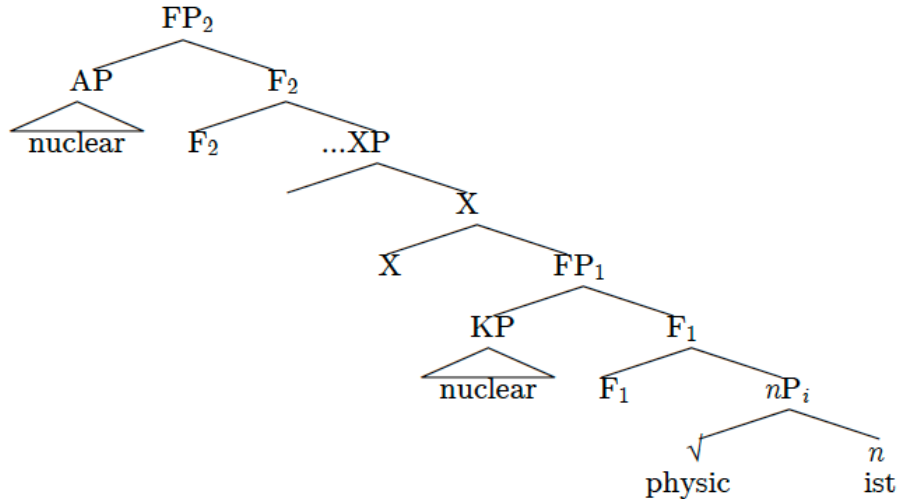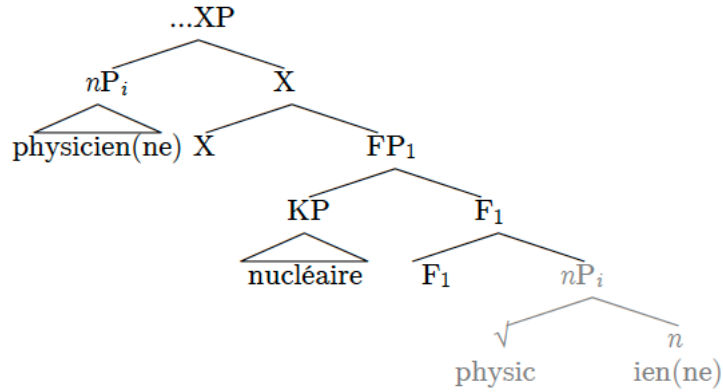

(modified from Fábregas, in press)

This type of analysis also easily allows for cross-linguistic variation of morpheme order in these constructions. Consider the French translation of FP_1; *physicien(ne) nucléaire* (16). Here the nominalizing suffix (and its concomitant gender suffix) intervenes linearly between the base (*physic*) and its modifier (*nucléaire*). This would be unexpected if *nuclear* were to modify the root directly, as linearization of a higher suffix (either *n* or gender) should not target the left-edge of *physic* in such a structure. In a Fábregas-style analysis, however, *physicien(ne)* in French raises up over its modifier, as in (16).

(16) a. *physicien(ne)*   *nucléaire*   'nuclear physicist(F)'
          physic-ien-(ne)   nuclé-aire
          physic-ist-(F)   nucle-ar

---

of the semantics of the noun that is crucial to the idiomatic interpretation is not morphologically distinguishable (and hence not the locus of adjunction of the modifier in the syntax). This is exemplified by constructions such as *beautiful chef*, which can mean either 'someone who cooks beautifully' or 'a chef who is beautiful'. In this type of example there is no possible locus for low adjunction of the modifier directly to a sub-part of the monomorphemic *chef*, but the two readings (relational and qualitative) are nonetheless available (Postal 1969). Thank you to Gillian Ramchand and an anonymous reviewer for this example.

[10] See Fábregas (in press) and references therein for detailed discussions of the syntactic properties and positions of different classes of adjectives. An in-depth discussion of these data would take us too far afield from the discussion at hand.

b.

$$...XP$$

(tree diagram)
- nP_i — physicien(ne)
- X
  - X
  - FP_1
    - KP — nucléaire
    - F_1
      - F_1
      - nP_i
        - $\sqrt{}$ physic
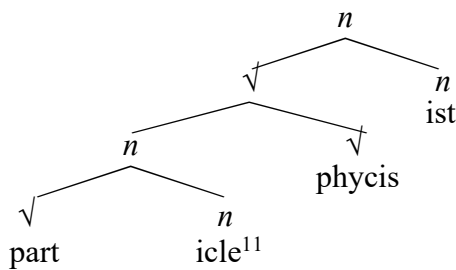   - n ien(ne)

This type of evidence suggests that all adjectival modifiers are merged outside of the domain of the nominalizing suffixes in purported Phrasal BPs. There is therefore no expectation for paradoxes to arise in these derivations. The nominalizing suffix (e.g. *-ian*) in a Phrasal BP is interpreted with its base before the modifier is merged. Relational adjectives are interpreted distinctly from qualitative adjectives due to their position of merger, but this position is nonetheless exterior to the derived nominal, explaining their phonological independence from the noun they modify.
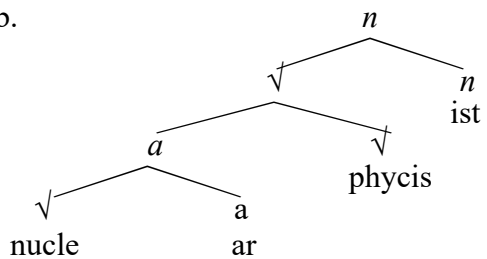
3.4 Compound Bracketing Paradoxes

Although the phrasal BPs above do not call for a derivation wherein the modifiers are merged to the root, compound BPs (such as *particle physicist*) *do* argue for a low-attachment of their left-hand members, following Harley (2009) and Steddy (2019). Steddy follows the analysis of compounding proposed in Harley (2009) and argues that the allomorphy evidenced in *physicist* is unproblematic if both adjectival modifiers like *nuclear* and nominal modifiers like *particle* are the first items merged to the root PHYSIC. First-merged items then incorporate into the head of the compound, giving the structures in (17a).

(17) a.

(tree diagram for a.)
- n
  - $\sqrt{}$
    - n
      - $\sqrt{}$ part
      - n icle[11]
    - $\sqrt{}$ phycis
  - n ist

*b.

(tree diagram for b.)
- n
  - $\sqrt{}$
    - a
      - $\sqrt{}$ nucle
      - a ar
    - $\sqrt{}$ phycis
  - n ist

(Steddy 2019)

A reviewer correctly points out, however, that there is a well-known distinction in stress patterns between modifier-noun derivations and compound-noun derivations. In *nuclear physicist*, the dominant stress falls on *physicist*, while in *particle physicist* (a primary compound in the terminology of Harley 2009) the dominant stress falls on *particle*, just as it does in synthetic

---

[11] Whether the root and affix in *nuclear* or *particle* are synchronically separable is not pertinent to the discussion here.

compounds like *truck-driver*).[12] If we take this distinction to be due to the position of Nuclear Stress, and following Cinque (1993), propose that Nuclear Stress is assigned to the most embedded word in the above constructions, then the stress in (17a) is consistent with the left-hand member being more embedded than its head noun, but the stress of (17b) is not. Phonological evidence therefore supports the analysis of Phrasal BPs discussed in the previous section; the correct derivation for *nuclear physicist* is therefore not (17b), but (15). In (15) neither *nuclear* nor *physicist* contain one another structurally. Each will therefore be sent to PF upon merger of their category-defining heads, and each will be endowed with a Left-Edge CV. Nuclear Stress will be assigned to each word. After *nuclear* has been merged into the specifier of the functional structure above *physicist* the two words will be linearized, but phrasal Nuclear Stress will fall on *physicist*, as it is structurally lower than its modifier. The final linear phonological structure of *nuclear physicist* is therefore as in (18).

(18)

```
C V C V C V C V C V C V C V C V C V C V C V C V
| | | | | | | | | | | | | | | | | | | | | | | |
Ø Ø n u k Ø l i j ə ɹ Ø Ø Ø f ɪ z ɪ s ɪ s Ø t Ø
```

In the derivation of *particle physicist,* the distinct determination of stress is predicted by the derivation where the left member of the compound is incorporated into the head noun, as in (17a). In this derivation, *particle* is contained within the structure of *physicist* and therefore will be sent to spell-out prior to interpretation of the head noun. In this cycle, *particle* will receive word and Nuclear Stress, as well as a Left-edge CV. In the subsequent cycle of interpretation, *physicist* will be interpreted. As *particle* is c-commanded by *physicist*, the latter will neither be the most embedded element at spellout, nor the leftmost in its spell-out domain. It will therefore receive word stress (it will be footed), but will receive neither Nuclear Stress nor a Left-Edge CV. The linear representation of *particle physicist* is therefore as in (19).[13]

(19)

```
C V C V C V C V C V C V C V C V C V C V C V C V
| | | | | | | | | | | | | | | | | | | | | | | |
ø ø p a ɹ Ø t i k ə l Ø f ɪ z ɪ s ɪ s Ø t Ø
```

This distinction in phonological structure receives support from the behaviour of degree allomorphy in compound structures. A reviewer brings up examples like **punch-drunker* or **house-prouder*, originally discussed in (Spencer 1988). The left-members of these compounds bleed the insertion of the synthetic degree allomorphs *-er/-est*. This can be directly compared to the non-bleeding of synthetic degree morphology in derivations prefixed with *un-* (e.g. *unhappier*), as discussed in §3.2.[14] This distinction is easily explained in terms of phonological domain

---

[12] Some compounds have unexpected stress on the rightmost member (c.f. APPLE *cake* vs. *apple* PIE). These exceptions will not be treated here. Main stress falling on the left member of a compound is assumed here to be the default pattern.

[13] The maintenance of word stress on each member of the compound is predicted as the procedural (as opposed to representational) derivation stresses first *particle* then the newly-inserted morphemes in *physicist.* As *physicist* contains no floating elements/segment, interactions between the two words is not predicted regardless of the absence of an intervening empty CV. How the position of stress in such a derivation is distinguished from the position in a suffixed form such as *governmental* is left to future work.

[14] It may also be the case that allomorphy of the degree head is sensitive to the position of Nuclear Stress, which would be too far from the right edge in a compound to trigger selection of the synthetic suffixes. Note that *-er* suffixation is also complicated by non-compound modification (e.g. *??incredibly whiter*). See Newell (2008) and references therein for a discussion of these constructions.

distinctions. The two words in a compound like *house-proud* are not separated by an empty CV, and therefore at the point of Vocabulary Insertion for the degree head, the entire phonological string *house-proud* is visible and available to condition allomorphy. The *-er/-est* allomorphs do not select for bases that are bi-syllabic which end in stops (c.f. exceptions such as *politer*) and therefore the output of such a derivation will be *more/most house-proud*.

The conclusions of Sections 3.1-3.4 are as follows. First, procedural cyclicity is important for determining the position of stress in phrasal, compound, and prefixed structures. The most embedded element in each receives Nuclear Stress. Default nasal place will be assigned to *un-* in its first cycle of interpretation, bleeding place assimilation. In cases of incorporation/compounding, the procedural account of stress placement argues for a distinct representational output from phrasal compounds; notably, the two members of compounds are not separated by an empty CV. This falls out of the predictions of the system but is then confirmed by the behaviour of compounds in degree derivations. All in all, none of these derivations, traditionally thought to give rise to variations of Level-Ordering-type BPs, give rise to bracketing paradoxes.

3.5   Particle Verb Bracketing Paradoxes

The first full description of a BP was Pesetsky (1979)'s analysis of Russian Yer deletion in Prefixed verbs.[15] Pesetsky follows the traditional analysis of Yer vowels, wherein they are underlying high vowels (realized as mid-vowels) or unpronounced. These options are derived via the two following rules:

(20)   Yer lowering: Lower a Yer in a syllable preceding another Yer (I/U $\rightarrow$ e/o / __C_0 I/U)

(21)   Yer deletion: Delete any non-lowered yers.

When multiple Yers are evidenced in a row in Russian, we can see that the rule of Yer-Lowering applies from left-to-right, as in the following derivation of *denĕček* 'day-diminutive-diminutive-nominative'.

(22)   Underlying   [[[[dIn] Ik] Ik] U]

Cycle 1   ---
Cycle 2   e
Cycle 3   e
Cycle 4   e
Yer-Deletion   Ø
Other rules   *denĕček*

(Pesetsky 1979:7)

This pattern has been reanalyzed within the CVCV framework promoted here. In Scheer (2004), Scheer and Ziková (2010), and Ziková (2008) it is proposed that Yers are floating vowels. The

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[15] Here when I say prefixed verbs or particle verbs, I refer to lexical (not supralexical) constructions in Slavic, and to separable (not fused) constructions in Germanic. The literature on different kinds of particle verbs is large and the variation in the behaviour of distinct types of particles is beyond the scope of this paper.

melody of these alternating vowels will link to the CV tier only if ungoverned (if they are not followed by an overt vowel in the cycle/phase in which they are interpreted). Non-alternating vowels, such and the NOM.SG suffix in (22), are proposed to contain no melodic content, while alternating vowels are proposed to be mid-vowels underlyingly. Unlinked vowels will not be pronounced. In (23), underlyingly unlinked vowels are grey.

(23)   Underlying   [[[[den] ek] ek] Ø]

        Cycle 1   den
        Cycle 2   ek
        Cycle 3   ek
        Cycle 4   Ø
        Other rules   *denëček*

If vowel linking were applied from Right-to-Left in the fully formed noun, the predicted form would be the ungrammatical *denček (*denkk in Pesetsky's lowering analysis).[16] The relevant paradox comes into view when considering prefixed verbs. There, the realization of the vowel in the prefix varies depending on whether the following syllable contains a pronounced vowel (see also Matushansky 2002 and Gribanova 2012 for discussions of the morpho-phonology of particle verbs in Russian).

(24)   a.   *podo-žeg-l-Ø* →   *podžëg*   'set fire'
              under-burn-past-masc.

        b.   *podo- žeg-l-a* →   *podožgla*   'set fire'
   under-burn-past-fem.

Note that the output of (24a) is distinctly *not* the pattern that occurs in (22/23) where all unlinked/alternating vowels (except the last) are realized. The attested pattern is predicted if the prefix is merged after (structurally outside of) the masculine suffix, and the derivation proceeds cyclically as in (25)[17].

(25)   Underlying   [podo[[žeg] l-Ø]]

            Cycle 1   žeg
            Cycle 2   žeg-l-Ø
            Cycle 3   podožeg-l-Ø
            Other rules   *podžëg*

---

[16] See Ziková (2008) and Scheer and Ziková (2010) for a discussion of the Havlík pattern of Yer realization where the Old Czech form of the double diminutive shows the pattern predicted by right-to-left government (*domček* 'house-DIM-DIM').

[17] Matushansky (2002) proposes that the prefix is marked as non-cyclic, causing it to be ignored by cyclic rules like Yer-Lowering. As argued in the previous sections, this analysis is diacritic and non-modular and therefore cannot be adopted here. We will see that there is a fully modular explanation for the behavior of these morphemes. Note also that Cycles 1 and 2 in (25) may be collapsed.

The problem here is that the prefix is decidedly *not* merged outside/after the final -Ø 'MASC'. Firstly, the semantic interpretation of particle verbs, including this one, may be idiomatic. Here the meaning 'set fire' is not predictable from the simple composition of the meanings of the particle and the verb. It is generally held that all members of an idiom must be found within a certain domain, at the phrasal level, proposed to be the *v*P (Marantz 1984b, 1997). Also, the syntactic literature on particle verbs has converged upon the conclusion that the particle heads a PP/Small Clause complement to the verb, as in (26). For the detailed syntactic motivations behind this type of analysis see Wurmbrand (1998), Taraldsen (2000), Ramchand and Svenonius (2002), Svenonius (2004), Caha and Ziková (2016) and references cited within.

(26)
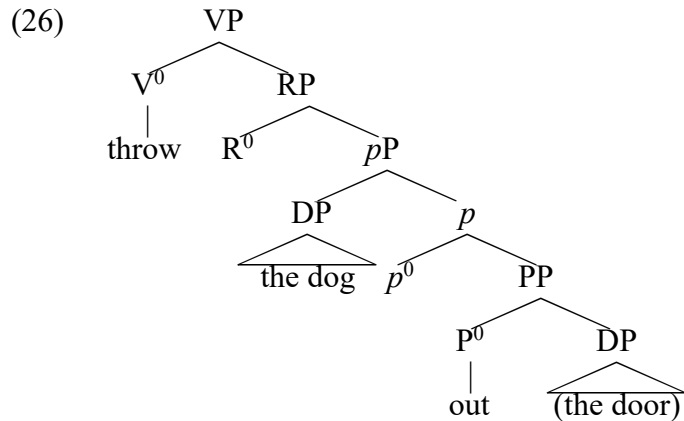
(Svenonius 2004: 222)

It is clear in many languages that the particle does not remain in-situ (hence the possibility of reordering within the VP in (26); *throw out the dog*). In Slavic languages these particles are always preverbal and cannot be separated from the verb. There have been two different types of proposal in the literature explaining how the Slavic particles come to be pronounced in this position.[18] The first is that they raise via head-movement, as in (27).

(27) a.   *Samoljot   pere-letajet   granicu*
           plane   across-flies   border
   'The plane is flying across the border' (Russian)

(Svenonius 2004:220)

---

[18] The motivation for movement of the particle is proposed to be the necessity of the null *ground* operator (perhaps incorporated into the particle itself, to scope over and bind a variable in Asp(ect)P, a phrase that sits above VP (see 30). This is proposed by Svenonius (2004) to explain the perfectivizing effect of particles. Note that in Germanic languages the particle may be separated from the verb by the object (English : threw the dog out) by morphology (German: Part-zu-Verb) or by V2 movement (German: *AUF hat Peter die Tür gemacht (nicht zu)* 'Peter has opened the door' (Wurmbrand 1998:272)). This behaviour is consistent with an XP movement account of particles, to be supported in this section.

b.

VP
V⁰ — R⁰ pere- 'across', V⁰ let- 'fly'
RP — t_figure, R — t_R, DP granicu 'border'
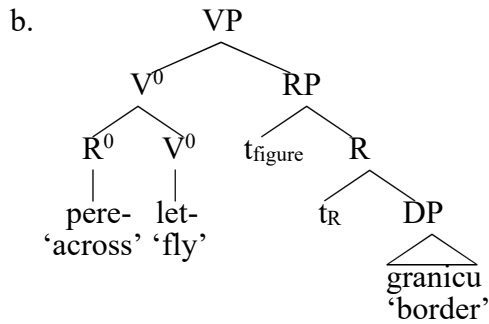
(Svenonius 2004:223 (analysis not adopted by Svenonius, but see Rojina 2004))

The second proposal is that particles come to precede the verb via phrasal movement, as in (28).

(28)

AspP
PP, AspP
vP, Asp
VP, v
PP, V
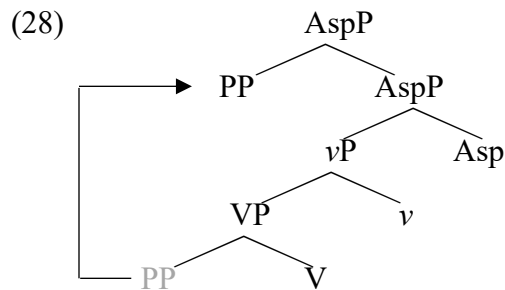
(Caha and Ziková 2016: line 442)

Wurmbrand (1998) for German, Svenonius (2004) for Russian, Taraldsen (2000) for Norwegian, and Caha and Ziková (2016) for Czech give arguments that the particle, even in Slavic languages where it is never separated from the verb, moves to the left of the verb via XP movement. The evidence for this for Czech in Caha and Ziková (2016) is especially striking.[19]
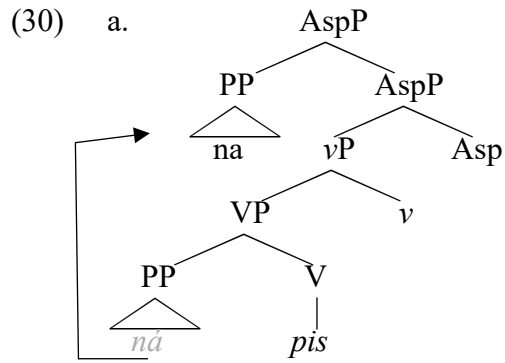
Caha and Ziková (2016), following (Ziková 2012; Scheer 2001), note that there is a difference in the vowel length of the prefix in Czech depending on whether it finds itself within the scope of an aspectual head. If it is base-generated below Asp, the particle must raise (to scope over and bind the perfectivity-inducing variable in Asp^0 (following Svenonius 2004)). If there is no Asp^0 in the structure there is no trigger for raising and the prefix stays low (ex. in root VP nominalizations). If the particle remains in the VP, its vowel is spelled-out as long (length is indicated by an acute accent), and if it raises its vowel is short.

(29) a. *Petr na-psal dopis*
Petr on-wrote letter
'Peter wrote the letter'

b. *ná-pis*
on-write
'a sign'

(Caha and Ziková 2016: line 76)

---

[19] Note that the object of the particle must evacuate the Particle Phrase before XP movement or the object would always intervene between the particle and the verb (Ora Matushansky p.c.). The XP movement of the Particle Phrase is therefore an instance of Remnant Movement as argued for in (e.g.) Nkemnji (1995), Müller (1996), and Koopman (1996), among others.

(30) a.

```
                    AspP
              ┌──────┴──────┐
            PP            AspP
           ╱△╲         ┌────┴────┐
          na          vP        Asp
                   ┌───┴───┐
                  VP       v
              ┌────┴────┐
             PP         V
            ╱△╲         │
            ná         pis
```

b.

```
              n/aP
          ┌────┴────┐
         VP        n/a
      ┌───┴───┐
     PP       V
      │       │
      P      pis
      │      write
     ná
     on
```
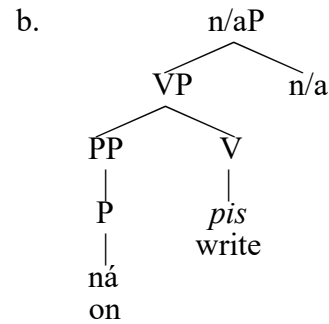
(Caha and Ziková 2016: line 329)

Caha and Ziková demonstrate this correlation very clearly with reference to verbal, participial, and 'high-nominalization' (outside of *v*P) constructions (short vowel) versus adjectives and 'low nominalization' (inside *v*P) constructions (long vowel). All of the constructions with short vowels are shown to be perfective, hence containing an AspP, while the constructions with long vowels are not perfective, indicating the absence of AspP; the trigger for PP raising. The motivation for vowel lengthening is proposed to be templatic.[20] Inside a PWd (inside *n*P/*a*P) the vowel will be long and outside the PWd (in AspP) the vowel will be short.[21] Importantly for the discussion of the syntactic structure, Caha and Ziková argue that this spell-out distinction is only possible if the particle has escaped spellout in the domain of *v*P (as in 30a) or remained in the spell-out domain of an *n*P (as in 30b). Caha and Ziková's analysis aligns with the fact that the particle is not in the same phonological domain (standardly considered the PWd) as the verb in constructions containing AspP, aligning it with the analysis of Svenonius (2004), where XP-movement of the PP to Spec,AspP is responsible for the aspectual effects of lexical particles in Slavic languages. If the particle were to move via head-movement, this distinction would not be predicted. Morphemes that are co-members of a complex head are almost uniformly considered to be spelled out in the same cycle/PWd.

3.5.1   Particle Verb Bracketing Paradoxes resolved

Based on the evidence from Caha and Ziková's analysis of Czech, from Svenonius' arguments for Russian, from the separability of particles and verbs in Germanic languages, and from a host of other data that indicate a cross-linguistic pattern whereby particles are interpreted separately from the verbs with which they combine, we can argue that XP movement is the means by which particles are spelled out to the left of the verb. This will allow for a uniform analysis of the cross-linguistic particle verb BPs exemplified (but by no means exhausted) by the following data.

First let us consider the Russian BP. Here the particle will project a PP in the complement of *v*P.

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[20] Scheer (2001) proposes that the prefix vowel alternations are due to lengthening, while Ziková (2012) and Caha and Ziková (2016) argue that the alternation must be due to vowel shortening. Regardless of which analysis is correct, the two distinct behaviours are clearly linked to the presence or absence of perfective aspect.

[21] Another option for explaining the vowel-length difference in these examples might be that the vowel is spelled out as short if interpreted alone (when moved, following Johnson 2004's theory of numerphology), and long if spelled out in combination with another morpheme. A correlation has been noted in the literature between the licensing of long vowels and diphthongs and the presence of a following vowel (see Lowenstamm 1996, Kaye 1990). This distinction, however, could not be generalized to all long and short vowels in Czech.

(31)
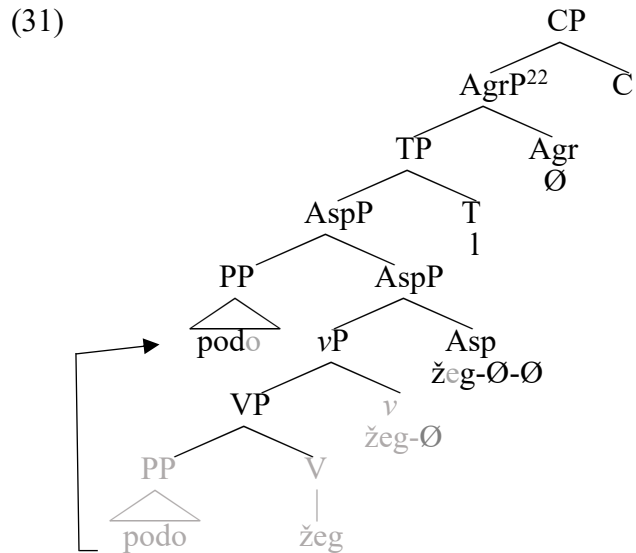
In the derivation above, the particle will be spelled out in PP, assuming PP is a phase. Even if PP were not a phase, it would undergo spell-out upon movement to Spec,AspP. Remember that left-branches (adjuncts, as well as specifiers) must undergo interpretation before (re)merger into the tree according to Uriagereka (1999) and Johnson (2004). The output of the first cycle of interpretation is therefore (32). In (32), the final Yer is unlinked/floating as it is final in the string. Recall that in Section 2 we saw that Final Empty Nuclei (FEN) are parametrically licenced. As Russian allows consonant-final words, it is clear that this parameter is active in the language.

(32)   C   V   C   V
          | | |
          p   o   d   o

The following cycle will see the spell-out of the verb and its suffixes. Gribanova (2013) argues that the verb in Russian moves to a position above *v*P and below TP; AspP in (31). As the verb has raised out of *v*P it will undergo spell-out in the CP phase with its suffixes (the first and second cycles in (25) are thus collapsed). Here the output of the CP phase will be as in (33).

(33)   C   V   C   V   C   V
          | | | |
          ž   e   g   Ø   l   Ø
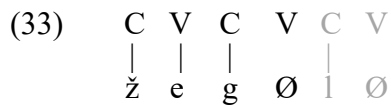
In (33) the final Yer remains unpronounced for the reasons stated above, and the *l* deletes (deletion is indicated in grey) for independent reasons. As the root vowel is ungoverned, it must be linked and pronounced. Subsequent to this cycle of spell-out the particle and verb are linearized (34).

(34)   C   V   C   V   C   V   C   V   C   V
          | | | | | | | | |
          p   o   d   o   ž   e   g   Ø   l   Ø

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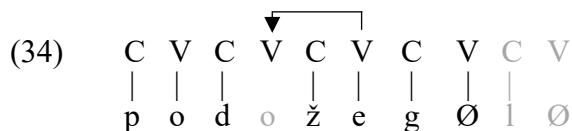
[22] AgrP is included here for expository purposes. Should agreement not project in the tree, but rather emerge due to checking relations in the syntax, nothing will change about the analysis herein. (see Embick (1997) on dissociated morphemes).

In (34) the root-Yer has been linked to the CV tier prior to the linearization of the particle and the verb (33). The full vowel of the root therefore governs the final vowel of the particle, allowing it to remain unlinked and unpronounced.[23]
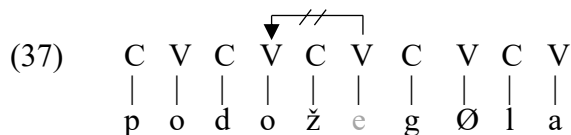
Of note here is the distinction in edge-marking between Russian and the English examples we saw above. Russian phase edges will not be marked by an empty CV; there is no empty CV between the particle and the verb. This lack of marking is independently supported in Lowenstamm (1999) and Scheer (2009a). Initial CVs are supported only in languages whose onsets uniformly conform to the Sonority-Sequencing Principle. In onsets that rise in sonority, the relationship of Infrasegmental Government (IG) applies (Scheer 2004, Scheer and Cyran 2018). IG allows for a sonorant to govern a preceding obstruent consonant (indicated by the straight, grey arrow in (35)). This permits the cluster-internal vowel to remain unpronounced. This unpronounced vowel will be licensed by the full vowel to its right (indicated by the dashed arrow in (35)), and this, in turn, allows the cluster-internal vowel to govern (and suppress) the vowel of the initial empty CV. For more details on the workings of IG, see the sources cited.

(35)
$$\begin{array}{cccccc} C & V & C & V & C & V \\ | & | & | & | & | & | \\ \emptyset & \emptyset & p & \emptyset & l & e \end{array}$$
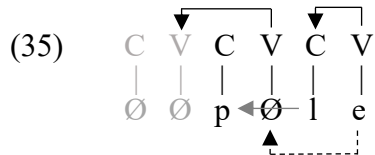
In languages where sonorants are not uniformly in a position to Infrasegmentally Govern an obstruent in complex onsets (e.g. Russian), the vowel separating the two consonants must be governed by the following overt vowel (and not by IG). The cluster-internal vowel is therefore unlicensed, leaving no governor for an empty vowel in an initial CV. As ungoverned vowels must be pronounced, and as no word-initial vowels are epenthesized, there can be no initial CV in such languages.

(36) *
$$\begin{array}{cccccc} C & V & C & V & C & V \\ | & | & | & | & | & | \\ \emptyset & \emptyset & p & \emptyset & s & e \end{array}$$
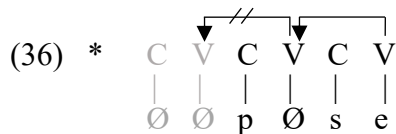
Therefore, when the particle and verb are linearized in (34), the root vowel of the verb is local to the final vowel of the particle, allowing for Government to operate between them. This explains why the realization of the prefix Yer is dependent on the pronunciation of the following vowel. In derivations where the following vowel is not pronounced, as in the feminine *podožgla* the particle's Yer is ungoverned (as well as non-final) after linearization, and therefore must be pronounced.

(37)
$$\begin{array}{cccccccccc} C & V & C & V & C & V & C & V & C & V \\ | & | & | & | & | & | & | & | & | & | \\ p & o & d & o & ž & e & g & \emptyset & l & a \end{array}$$

This configuration also explains why phonological operations are not blocked in general across the particle-verb boundary in Russian. Particle-final consonants in Slavic languages are not devoiced; they are not domain-final. Vowels in particles can affect stress placement/resist unstressed vowel reduction in pretonic position; they are stressed during spell-out prior to linearization with the verb and a stressed vowel is not a target for pretonic vowel reduction. It is also the case that prefix-final consonants in Russian trigger retraction of following front vowels instead of undergoing palatalization. Retraction applies to $C_{[+back]}V_{[-back]}$ sequences that are linearized post-cyclically. The members of a C-V sequence spelled out within a cycle will be adjacent on the CV tier, while a C-V sequence that is linearized post-cyclically will be separated by a VC sequence; in CVCV phonology each domain must begin with a C and end with a V on the CV tier. Prefix-verb C-V sequences are therefore actually $C_{[+back]}VCV_{[-back]}$ sequences, while verb-suffix C-V sequences, spelled out in a single cycle, are simply $C_{[+back]}V_{[-back]}$. Exactly how the empty CV positions lead to retraction rather than palatalization is beyond the scope of this paper, but it is clear that the predictions of the system argued for here lead to two distinct phonological derivations and structures depending on the timing of spell-out of these strings. The same pattern will also explain why hiatus is not resolved across a particle-verb boundary (/po + obedatj /→ [poobedatj] (*pobedatj) 'to have lunch' (Gribanova 2008:224), as hiatus resolution is demonstrably a cyclic rule. This means that, like for the discussion of $C_{[+back]}V_{[-back]}$ sequences, a segmental sequence of two vowels interpreted within a cycle will have a different phonological structure than the same segmental sequence that is linearized after each vowel has been interpreted in a separate cycle. One concrete proposal, mentioned above, is that (some or all) suffix-initial vowels in Slavic languages are floating, as argued in Scheer and Ziková (2010), Ziková (2008, 2009), and for English in Section 2 and in Newell (2017c). Importantly, in none of these instances do we need to appeal to hierarchical phonological structure to distinguish distinct domains of application for these phonological operations.

The paradox related to particle verbs can now be resolved by stating, following Ramchand and Svenonius (2002), that the idiomatic interpretation of particle verbs comes about in the same way that other *v*P idioms do (see Marantz 1984b, 2007; Biskup 2019 for *v*P domain restrictions on clausal idioms like *He kicked the bucket*). The phonological separateness of particles and verbs in many languages is due to the need for the PP to raise into Spec,AspP. Some languages allow for further syntactic operations that separate the particle and the verb (ex. Germanic) and others do not (ex. Slavic). Derivations like the preceding can easily be extended to explain other particle-verb phonological patterns cross-linguistically, including but not limited to, Hungarian vowel harmony (which does not cross the particle-verb domain (38)), Warlpiri vowel-harmony, stress-assignment, and verb conjugation class which is sensitive to the domain of the verb and not to the particle (39), and compound stress patterns and the separability of the particle verb in German (40). In these languages, onsets obey the sonority sequencing principle, and therefore cyclic spell-out ensures that there is an empty CV sequence separating the phonological domains of the particle and the verb.[24]

(38) a. *át-lép-és*   b. *le-tartóztat-ás*
          across-step-dev   down-hold-dev
          'transgression'   'arrest'
                                    (front/back harmony: Kenesai 1995/1996:158)

---

[24] See also Biskup, Putnam and Smith (2011) for a discussion of verb-particle spell-out.

(39)　a.　*pirri-kuju-rnu*　　　b.　*pirri-kiji-rni*
　　　　preverb-throw-PAST　　　　preverb-throw-nonPAST
　　　　'to scatter'　　　　　　　'to scatter'

<div align="right">(i/u vowel harmony: Nash 1980:140)</div>

(40)　a.　*áuf-gèben*　　　c.　*ver-gében*
　　　　part-give　　　　　　prfx-give
　　　　'give up'　　　　　　'forgive'

<div align="right">(particle vs. prefix stress: Wurmbrand 1998)</div>

To conclude this section, particles are interpreted separately from the verb with which they combine due to the fact that they undergo phrasal movement out of the *v*P. This movement ensures that particles undergo spell-out separately from the verbs that select for them. Subsequent to movement, particles will be treated as separate phonological domains in languages that mark the left edge of a phase with an empty CV (ex. German, Warlpiri), but may interact with the phonological domain of the verb in languages that do not have the ability to CV-mark their phonological domains (ex. Russian, Czech), although this interaction will be sensitive to operations that have taken place in the independent phonological cycles that occur prior to the linearization of the prefix and verb. Left branches (adjuncts and specifiers) will be spelled-out separately from the structures they combine with. This generalization over spell-out domains, the independently supported proposals that particles undergo XP movement (Wurmbrand 1998, Taraldsen 2000, Svenonius 2004, Caha and Ziková 2016) and a flat theory of phonology combine to erase any paradoxical nature of particle verb constructions. The question of why there is a general tendency for particles to cliticize to verbs can be subsumed under the question of why phonological clitics behave as dependents in general; a question that is beyond the scope of this article (See Svenonius 2016 for a recent proposal).

3.6 Reduplication Bracketing Paradoxes

Finally, let us turn to the discussion of a reduplication paradox presented in Marantz (1987), taken from Odden and Odden (1985). This section will demonstrate how the analyses of BPs in the sections above can be easily extended to cover the Kihehe-type domain mismatches in Full Reduplication as exemplified in (41) below.[25]

(41)　a.　ku-tova-RED　　→　　*ku-tova-tova*　　　'to beat a bit'
　　　　Inf-beat-RED

　　　b.　ku-íita-RED　　→　　*kwíita-kwíita*　　　'to pour a bit'
　　　　Inf-pour-RED

　　　c.　kú-lu-íita-RED　　→　　*kú-lwiita-lwíita*　　　'to pour it a bit'
　　　　Inf-it-pour-RED

---

[25] C.f. the unreduplicated forms found in Odden and Odden (1985):
i)　　kú-mu-tóva　　'to hit him'　　(499)　ii)　　kw-íita　　'to spill'　　(499)
iii)　kú-lw-iíta　　'to pour it'　　(499)　iv)　neléke　　'may I cook'　　(498)

d.　　　n-teléka-RED　　　　$\rightarrow$　　*neleka-neleka*　　　'I will cook a bit'
　　　　　1SG-cook-RED

<div align="right">(Marantz 1987)</div>

In (41a) we see the output of a reduplicated consonant-initial verb. It is clear that the reduplicative marker scopes outside the domain of the verb (copied), and under the infinitive (not copied). Yet, as pointed out by Marantz, there are two environments where an outer affix will apparently 'tuck in' under the reduplicative morpheme, even though this causes a mismatch between the phonological and morpho-syntactic domains. In (41b,c) we see constructions with V-initial verbs following prefixes that end in a high round vowel. This vowel (together with a preceding consonant) will syllabify in the onset of a following V-initial morpheme (as a C-glide onset). In (41d) the 1SG prefix is underlyingly a floating nasal feature. This feature associates to the segmental structure of the consonant to its right. In cases where gliding or featural association combine with reduplication the affix that syntactically scopes over the reduplicative morpheme behaves as though it sits within the reduplicative domain. Note that the reduplicated domain is the stem, not the verb root (final vowels and other suffixes are reduplicated if present).[26] In (42) I suggest that the RED affix sits in AspP and the Infinitival prefix in TP. These labels are not crucial. It is also not crucial whether the 1SG marker scopes above or below RED, as unlike the *u*-final prefixes, the behaviour of the nasal feature is not phonologically variable. The nasal associates with the onset position to its right regardless of the featural content of that position. What is crucial for an explanation of the variable behaviour of the *u*-final prefixes is that RED scopes over the *v*P, and under the position of the Infinitival marker.

(42)　　　CP
　　　　　／＼
　　　　　　　TP
　　　　　　／＼
　　　　　T　　AspP
　　　　　ku　／＼
　　　　　　*v*P　　Asp
　　　　　／＼　RED(moderative)
　　　tova/íita
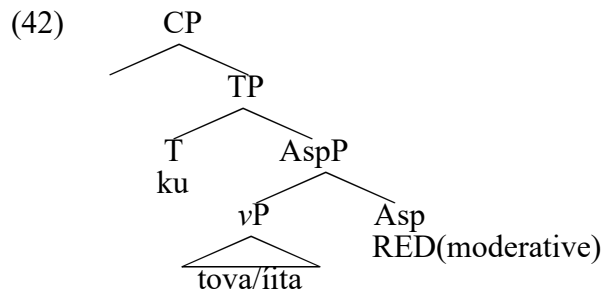
Marantz argues that "The Kihehe reduplication involves a morpheme unit, not some unit that is phonologically definable independent of the stem." (204). He proposes (along with Sproat 1985) that BPs are caused by a phonologically-induced rebracketing, as in (43b)

(43)　a.　　Phonological structure isomorphic with (42)　　　b.　　Rebracketed structure

　　　　　　　／＼　　　　　　　　　　　　　　　　　　　　　　　／＼
　　　ku　　／＼　　　　　　　　　　　　　　　　　　　　　　／＼　　RED
　　　　tova/íita　RED　　　　　　　　　　　　　　　　　ku　　íita

---
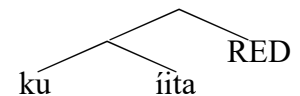
[26] One example of many in Odden and Odden (1985) is the following.
i)　　　sa-kúu-novagi-nov-ag-i　　　　　　　　　　　　　'he never hits me' (root -tov-)
　　　　neg.3sgSubj.-asp-redupl(lsg obj)-hit-habit-FV　　　　　　　　　　　　　　(502)

<div align="center">- 24 -</div>

Marantz proposes that adjacency at phonological structure is associative. This entails that [ku[íita RED]] is equal to [[ku íita] RED]. The requirement in Kihehe that high-round segments syllabify as onsets if possible is what triggers this re-bracketing in the case of vowel-initial stems. Therefore, at spell-out, RED will scope over the relevant prefixes, explaining their inclusion in the reduplicative domain.

The translation of Marantz' solution into a derivation that functions in the linear system proposed here is not difficult. First, we must consider the evolution of syntactic theory, and the subsequent effect of phases on phono-syntactic relations. Assuming the verb stem is the spell-out of vP, we can see that Marantz was mistaken in his statement to the effect that the domain of reduplication is not definable in the phonology. The reduplicated domain is the entire phonological string that is the output of the first phase.

(44) vP
         ⟋‾‾‾‾⟍   →   *tova/íita*
         tova/íita

Next, we have to define how the RED morpheme targets this domain for doubling. In a modular system, phonological reduplication cannot target the morpho-syntactic node that dominates *tova* or *íita,* as phonological outputs cannot contain morphological information. RED can only target a phonological object, as its copy-function is operative over the phonological output of the previous phase. But, Marantz is also correct that the RED morpheme cannot be of a specific phonological size (syllable, foot), as the size of the reduplicated domain tracks the size of the stem. This type of pattern is easily captured within the system of reduplication found in Raimy (2000). According to Raimy, reduplication adds a loop to the linearization algorithm of a string of segments. Licit targets for the beginning and end of a loop include first and last segments, consonants, vowels, etc. Full reduplication, as seen in Kihehe, is the insertion of a loop that originates at the final segment and terminates at the first segment of a phonological domain. According to this type of system, the output of the vP phase will be a strictly linearized string as in (45), where # signals the beginning and % the end of the string.
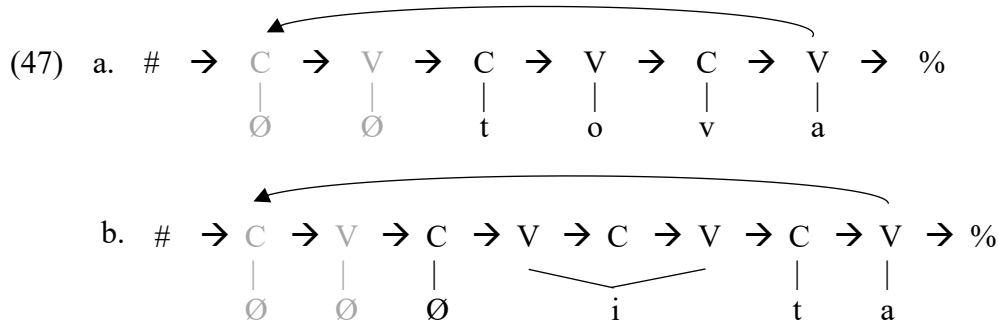
(45)   #→t→o→v→a→%   or   #→í→i→t→a→%[27]

If we translate this into a CVCV framework and insert an empty initial CV to mark the edge of the domain, we get the following outputs of vP at PF
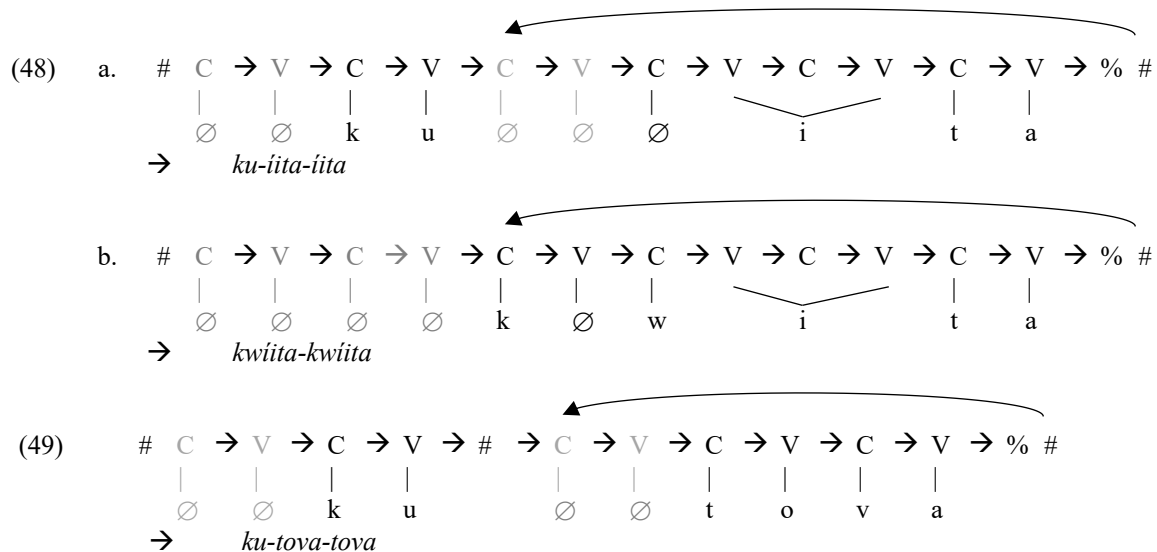
(46)   a.   # → C → V → C → V → C → V → %
                    | | | | | |
                    Ø   Ø   t   o   v   a

        b.   # → C → V → C → V → C → V → C → V → %
                    | | | ⟍ ⟋ | |
                    Ø   Ø   Ø   i   t   a

---

[27] Note that Raimy's # and % are not elements in the string like # and + were in SPE. Here they are included solely to clarify the beginnings and endpoints of strings.

In the CP phase in (42), the RED and infinitival affixes will be spelled out. RED, as stated above, will insert a loop from the last to the first segment of the domain in its scope (here to its left, as RED in Kihehe is suffixal). Note that this loop targets positions on the CV-tier (and not melodic nodes), and therefore includes the initial CV inserted at the spellout of *v*P.

(47) a. # → C → V → C → V → C → V → %
$$\qquad\qquad\quad |\qquad |\qquad |\qquad |\qquad |\qquad |$$
$$\qquad\qquad\quad \varnothing\qquad \varnothing\qquad t\qquad o\qquad v\qquad a$$

 b. # → C → V → C → V → C → V → C → V → %
$$\qquad\qquad |\qquad |\qquad |\qquad\qquad\qquad\qquad\quad |\qquad |$$
$$\qquad\qquad \varnothing\qquad \varnothing\qquad \varnothing\qquad\quad i\qquad\quad t\qquad a$$

The infinitival (or person agreement/object clitic) affix will then be inserted. The *u* of the prefix (or the [nasal] feature) will scan the melodic tier (48a). If there is a vowel to its right, the prefixal melodic material will merge into the appropriate domain (48b). In a case where the environment for merger is not met, the prefix will sit outside of the domain to its right (49). The predicted phonological outputs are obtained. The prefix is included in the previously-determined domain of the RED loop iff the output of the *v*P phase begins with a vowel on the melodic tier.[28] No change is made in the phonological representation of the domain of reduplication. The output of the phonological computation at the CP phase will, however, reflect whether the prefix is internal or external to the domain of RED.

(48) a. # C → V → C → V → C → V → C → V → C → V → C → V → % #
$$\qquad\quad |\quad |\quad k\quad u\quad |\quad |\quad |\qquad\quad i\qquad t\quad a$$
$$\qquad\qquad \varnothing\quad \varnothing\qquad\qquad \varnothing\quad \varnothing\quad \varnothing$$
    →   *ku-íita-íita*

 b. # C → V → C → V → C → V → C → V → C → V → C → V → % #
$$\qquad\qquad \varnothing\quad \varnothing\quad \varnothing\quad \varnothing\quad k\quad \varnothing\quad w\qquad i\qquad t\quad a$$
    →   *kwíita-kwíita*

(49)   # C → V → C → V → # → C → V → C → V → C → V → % #
$$\qquad\qquad \varnothing\quad \varnothing\quad k\quad u\qquad\qquad \varnothing\quad \varnothing\quad t\quad o\quad v\quad a$$
    →   *ku-tova-tova*

---

[28] Extra empty CVs (as in (48b) may be deleted in the final representation, but they are maintained below for ease of exposition.

In this way, the phonological output of the CP phase is not inconsistent with the morpho-syntactic bracketing. As seen in the previous sections, it is in fact impossible for a bracketing mismatch to occur in a linear phonological system.[29]

4.   Conclusion

In this paper I have argued for a fully modular derivational system, where only strictly phonological objects and operations are present in the phonological module of each derivation. Hierarchical phonological structures, if included in the derivation, only serve to create Bracketing Paradoxes that would otherwise not arise. Once these BPs are admitted into the system, then they must be repaired. Over the last 40 years, linguists have been proposing ad-hoc operations in various attempts to rid the system of BPs. I have demonstrated here that, using proposals that have been independently motivated; phases, the independent spell-out of adjuncts and specifiers, linearization, lateral relations between segments, CVCV phonology, liaison, and modularity, we have a system in which all the types of Bracketing Paradoxes that have troubled morpho-phonologists over the last decades do not arise, and therefore do not need to be repaired. A system that doesn't produce impossible structures is clearly preferable to one that does, and this distinction should inform our global evaluation of possible phonological representations.

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[29] Marantz discusses two other examples of reduplication BPs. The first is a Tagalog reduplication pattern that interacts with an operation of root truncation. It is clear from Carrier (1979) that these examples are cases of allomorphy, and not phonological derivation. The second is a case from Mende where initial consonant mutation occurs in certain syntactic environment (generally when the word in question follows its complement). There is a debate in the literature over whether the Mende case is triggered by a morpheme or by a strictly phonological environment (Conteh, Cowper and Rice 1986; Cowper and Rice 1985, 1987; Lieber 1983, 1987; Rice and Cowper 1984; Seidl 2001; Iosad 2008, 2010). In either case, there is a requirement that the trigger of mutation be directly to the left of the relevant consonant, indicating that a linear phonological analysis is feasible. Evaluating the various analyses of Mende mutation cannot be accomplished herein.

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