Morphologically-Sensitive Domains of Phonology in a Distributed Morphology Framework

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1   Introduction

In phonology, there is a notion that phonological processes (or groups of processes) have scope over different sized domains. Some processes are usually exceptionless and seem to be unaffected by any sort of morphological structure. Other processes are sensitive to morphological boundaries. Of these morphologically sensitive processes, there seem to be two varieties; Some apply within the bounds of the phonological words while others apply to elements smaller than words.

Some theories of grammar use the domains of phonological application as predetermined structures in their architecture. That is, units smaller than words are built or worked on by a different submodule than the units of word size. The word-sized units are then manipulated by the syntax.

In Distributed Morphology (Halle and Marantz 1993, *et. seq.*), however, proposes a grammar in which the syntax is built first and information is sent from the syntax to the phonology. A major question, then, for the interface between the syntax and the phonology is:

- What is the relationship between the domains of morphologically-sensitive phonological processes and syntactic structures?

Furthermore, one of the principles of Distributed Morphology is "syntax all the way down", meaning that the atomic units of the syntax are morphemes and not words. Much work has been devoted to showing that morphemes behave in a hierarchical manner and that words are not an atomic unit for the syntax. "Syntax all the way down," however, also means that the syntax does not deal with units based on phonological domains but rather units based on morphosyntactic domains. A question for a this sort of theory, then, is:

- How are different phonological domains calculated given the information the phonology receives from the (morpho)syntax?

In this dissertation, I propose to address this question.

1.1 Introduction to the issues and examples

Stem Level   In the domain smaller than phonological word, affixes are traditionally divided into different classes or levels which have different phonological effects. For example, the suffixes *-ity* and *-ness* are traditionally divided into separate classes because the former causes stress shift while the latter does not:

(1)   Stress-shift of *-ity* but not *-ness*:
   atómic → atomícity
   atómic → atómicness

In the Distributed Morphology analysis of these affixes, they do not behave differently with regards to the morphosyntax. Rather, the only difference appears to be in their phonological behavior. This leads to the question:

- If affixes behave the same morphosyntactically, how does the phonology know which class an affixes belongs to?

Word Level   The assumption that words are not the atoms of syntax leads to a problem for phonological side of Distributed Morphology with respect to calculating the domain of the phonological word:

- If the word is not a morphosyntactic unit, what is the phonological word and how is it calculated given the morphosyntactic information?

To address this problem, it must be noted that there are a variety of mechanisms that join morphemes together for the purposes of phonological groupings. There are syntactic operations, such as head movement, which join two heads together in the syntax. There are also morphological operations, such as Local Dislocation (Embick and Noyer 2001, see §3.4.2 below), which may combine units together during part of the morphological processing, such as linearization. There are also phonological instructions or restrictions which may group morphemes (or their phonological exponents) together, such as the variety of "leaning" or prosodic attachment behaviors seen in clitics (see, e.g., Zwicky 1977, 1985 and Selkirk 1995). Questions to be asked here, then, are:

- Are these different grouping mechanisms visible with respect to their effect on the phonology?

- What is the relationship between these mechanisms and the notion of "phonological word"? Are there default or automatic phonological groupings of morphemes associated with these mechanisms?

Some of the data discussed in this section is English voice assimilation, which is progressive at the word level and applies to verbal agreement, nominal plurals, and possessive clitics, but not across two different words:

(2)   English word-level progressive voice assimilation

    a.   Applies to a variety of syntactic heads

       i.   3 sg. Agr.: *tap* /tæp/ + *s* /z̠/ → *taps* [tæps̠]

       ii.   Plural: *cat* /kæt/ + *s* /z̠/ → *cats* [kæts̠]

      iii. Possessive: *cat* /kæt/ + *'s* /z̠/ →*cat's* [kæt̠s̠]

   b. Lack of voice assimilation at Phrase-level: *the ca*[t z]*ooms* (*[d z], *[t s])

An ideal analysis will need to explain why the morphosyntactic structures that undergo voice assimilation do so while others do not.

Another issue to be discussed here is the occurrence of recursion of the word level. That is, if the calculation of the phonological word level is a dynamic processes occurring in the morphosyntax-phonology interface, there is the possibility of recursion of morphosyntactic structures that correspond with the phonological word. The data examined here includes overapplication of word-level phonology in compounds and asymmetrical application of phonology with clitics:

(3)   Recursion of word level structures

    a. Overapplication of word-level phonology in Spanish compounds:

       • Diphthongization not under stress: *c*[ue]*lgacápas* "coatrack" (*c[o]*lgacápas*)

       • *e*-Epenthesis despite preceding vowel: *guardaespaldas* "bodyguard" (*guardaspaldas)

    b. Asymmetrical syncope in Maltese words with clitics:
       /ḥataf/ + /-na/ → [ḥataf-na]   "he snatched us"
       /ʔaraj/ + /-na/ → [ʔraː-na]   "he read us"

1.2   Preliminary Proposal

The preliminary proposal made here is that there are two sets of phonological processes (stem- and word-level processes), but that there are two different mechanisms for determining when these sets should be applied.

For the stem-level processes, I propose that there are morphophonological diacritics on certain exponents that trigger the application of this level of phonology. The proposal for the stem level is discussed in Section 2.

Phonology of the word-level, on the other hand, is calculated on the basis of a morphosyntactic structure, the M-Word. That is, the basic correspondence between the morphosyntax and the phonology at the word level is between M-Words and phonological words. In addition to this basic correspondence, there is at least one processes which may create phonological words out of non-M-Word structures (Stray Terminal Grouping) and the boundaries of the phonological words may be augmented to include neighboring morphosyntactic terminals.

The proposal for the word level is discussed in Section 3. The discussion of the phonological word correspondences other than the basic one is discussed in Sections 3.2 and §3.3. The recursion of phonological words will be discussed in §3.4.

2 Stem or Exponent-Driven Phonology

Phonology at this level has as its scope a stem and a morpheme. One interesting difference between the stem level phonology and the phonological blocks of higher units (words and phrases) is that stem level phonology is regularly iterative. That is, every derivational morpheme attached to a stem is a new domain for (possible) application of the stem level phonology.

2.1 Illustrative Data

To illustrate this type of morphologically sensitive phonology, let us use some observations about English derivational morphology (from Chomsky and Halle 1968). Siegel (1974) implements an analysis of this observation by dividing affixes into two classes, examples shown in (4):

(4) Examples of English affixes in two classes   (Siegel 1974; Fabb 1988; Plag 2003)
- Class 1 suffixes: -al, -ate, -ic, -ion, -ity, -ive, -ous, $-y_N$
- Class 1 prefixes: be-, con-, de-, en-, in-, pre-, re-, sub-, para-, dis-,
- Class 2 suffixes: -able, -er, -ful, -hood, -ist, -ize, -less, -ly, -ness, -wise, $-y_A$
- Class 2 prefixes: anti-, de-, non-, re-, sub-, un-, semi-, pro-

Siegel makes several observations about the morphological and phonological behavior of these classes:

(5) Three generalizations about English Class 1 and Class 2 affixes: (Siegel 1974)
- a. Class 1 affixes attach to both words and stems while Class 2 to only words
- b. Class 1 affixes do not attach after Class 2 affixes
- c. Class 2 affixes are stress neutral while Class 1 affixes are not

A great deal of theoretical work has been given to explaining the seemingly unrelated generalizations in (5). Two theories in particular, Lexical Phonology and Stratal Optimality Theory (Stratal OT) take these generalization to be of primary importance in the formulation of the structure of grammar.

2.2 Explanations given by Lexical Phonology and Stratal OT

To explain the generalizations in (5), some theories of phonology, such as Lexical Phonology (Kiparsky 1982a; Mohanan 1986; *et. seq.*) and Stratal OT (Kiparsky 2000; Bermúdez-Otero in prep), propose distinct submodules of grammar which work on different sized units in order.

In Lexical Phonology, it is proposed that there are different levels in the grammar which house morphological affixes and phonological processes. The strict structuring of Level 1 affixation before stress-shifting (stem-level) phonology and Level 2 affixation after stress-shifting phonology, accounts for both the generalization that Class 2 affixes are stress neutral and the fact that Class 2 affixes attach outside Class 1 affixes. In addition, defining every output of Level 1 affixation as a "word" results in Class 2 affixes only attaching to "words" (Siegel 1974).

Figure 1: Schematic of Lexical Phonology (adapted from Kiparsky 1982a and Kenstowicz 1994)
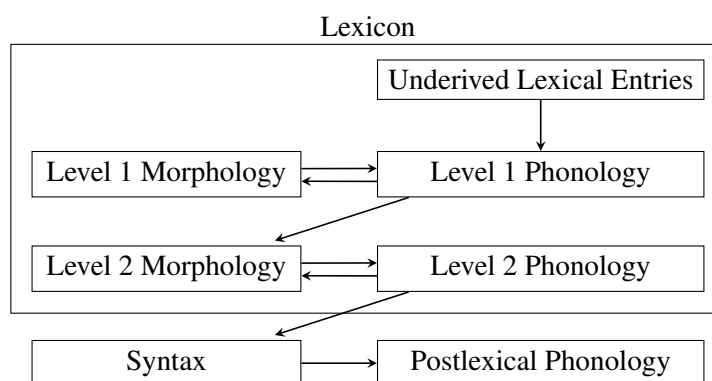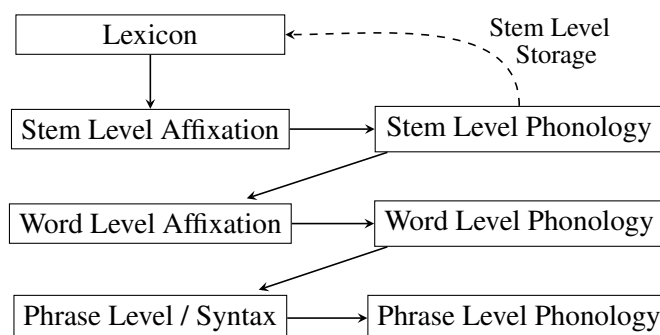
Lexicon

| Underived Lexical Entries |

| Level 1 Morphology | ⇄ | Level 1 Phonology |

| Level 2 Morphology | ⇄ | Level 2 Phonology |

| Syntax | → | Postlexical Phonology |

Figure 2: Schematic of Stratal Optimality Theory (see Bermúdez-Otero 2003, 2013)

| Lexicon | ⇠ Stem Level Storage

| Stem Level Affixation | → | Stem Level Phonology |

| Word Level Affixation | → | Word Level Phonology |

| Phrase Level / Syntax | → | Phrase Level Phonology |

As shown in the schematic in Figure 1, Lexical Phonology accounts for the generalizations by segregating the morphology and phonology into levels in the Lexicon. Underived lexical entries move only to Level 1 and the output of Level 1 becomes the input for Level 2. For English, Level 1 contains Siegel's Class 1 affixes as well as the stress shifting rule, while Level 2 contains the Class 2 affixes. This allows only Class 1 affixes to attach to stems (here, underived lexical entries), deriving generalization (5a). Any output of Level 1 Phonology, whether returning to Level 1 Morphology or moving on to Level 2 Morphology, is to be considered a "word". Ordering Level 1 strictly before Level 2 ensures that Class 1 affixes cannot attach outside of Class 2 affixes, deriving generalization (5b). Generalization (5c) is derived by having separate phonologies for Level 1 and Level 2, resulting in Class 2 affixes being stress neutral because the stress shifting rule is in Level 1 but not Level 2.

Stratal OT has a very similar basic flow of derivation, as schematized in Figure 2. Like Lexical Phonology, the layered architecture accounts for generalizations in (5), although the Levels are no longer housed in the lexicon and are now called "stem" and "word" levels. Although these levels are stated to not be in the lexicon, Stratal OT is not explicit about what exactly these levels are and how they are derived.

2.3 False Generalizations

One major problem with the Lexical Phonology and Stratal OT models is that two of the three generalizations in (5) are not true.

Although (5a) claims that Class 2 affixes only attach to words, there are cases of Class 2 affixes attaching to stems (examples of "bound roots"), as shown in (6). In addition, despite the generalization (5b) that Class 1 affixes do not attach outside of Class 2 affixes, there are cases of exactly this, as shown in (7), known as "level ordering paradoxes" (or "level ordering violations") (Kiparsky 1982a).

(6) Examples of Class 2 affixes attaching to stems: (Siegel 1974)
     ruth-less, grue-some, hap-less, feck-less, win-some, ful-some

(7) Examples of Class 1 affixes attaching outside of Class 2 affixes: (see Selkirk 1982; Fabb 1988)
     deni-abil$_2$-ity$_1$, capital-ist$_2$-ic$_1$, judg-ment$_2$-al$_1$, un$_2$-grammatical-ity$_1$[1], standard-iz$_2$-ation$_1$

In the frameworks of Lexical Phonology and Stratal OT, the exceptions in (6) and (7) are impossible under the most basic analysis. It could be claimed that the examples in (6) are examples of unaffixed roots which coincidentally (or historically but not synchronically) appear to have an affix. However, given the phonological transparency of the suffixes and the fact that they still seem to carry some semantic meaning, it seems more likely that these are examples of bound roots selecting for particular affixes which happen to be Class 2. More evidence of the decomposition of these forms comes from novel formations of these bound roots with other affixes such as *feckful* and *ruthful*.[2]

For the level-ordering paradoxes in (7), there have been several suggestions. Kiparsky (1982b, 2012) suggests that all of these instances of this sort are actually fused portmanteau morphemes, and thus should not be considered violations of the ordering generalization. Selkirk (1982) argues for reanalysis of the Class 2 suffix as part of the root in these cases.[3] However, one critical observation about these ordering paradoxes is that they are not isolated incidents restricted to a few lexical items. Rather, in these cases every instance of certain Class 2 suffixes (e.g., *-able*) seems to license the attachment of certain Class 1 suffixes (e.g., *-ity*). This is true even with nonce roots, as seen in (8):

(8) Nonce roots with level ordering paradox suffixes:
     dax-abil$_2$-ity$_1$, wug-ist$_2$-ic$_1$, blicket-ment$_2$-al$_1$

An ideal analysis would give an explanation for the generalizations about different types of affixes from (5) without ruling out the apparent exceptions from (6) and (7).

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[1] With *ungrammaticality* in order to have the correct selectional restrictions for the affixes, they must be attached in the "wrong" order. That is, Class 2 *un-* attaches to an adjective and creates and adjective and Class 1 *-ity* attached to an adjective and forms a noun. Thus, Class 2 *un-* must attach before Class 1 *-ity*.

[2] The OED cites examples of *feckful* from the New York Times, 9 Nov. 1990, and the Sunday Times, 31 Mar. 2002, and an example of *ruthful* from the New York Post, 16 June 2006.

[3] Selkirk (1982, p. 104) specifically notes that there must be two *-ment* suffixes, one of which takes *-al* and another which does not (in, for example, *employment*). Selkirk argues for a reanalysis into a root for all cases of *-ment-al*.

2.4 A Proposed DM Analysis, First Hypothesis: Inner- vs. Outer-Attachment

In Distributed Morphology, we assume that the syntax produces category-defining heads and that (at least some) of these heads cause phonological spell-out (Marantz 2001, 2007, Embick 2013, see also Marvin 2002; Embick and Marantz 2008; Embick 2010). Following Embick's (2010) proposal, we maintain that merging category-defining heads causes spell-out of their complements.

This proposal creates a distinction between affixes in the inner domain, e.g., root-attached affixes, and affixes in the outer domain, e.g., non-root-attached affixes. This distinction is necessary because, given the theoretical framework of spell-out, only a root-attached category-defining affix would be accessible during spell-out of the root. This distinction between inner and outer domains has been shown to play an important role in allomorphy and allosemy.

### 2.4.1 Inner- and outer-attachment matter for Allomorphy and Allosemy

In the inner domain, the selection of allomorphs of heads is potentially idiosyncratic to the root, but in the outer domain, it is not (Embick 2010). For example, root-attached nominal heads show a wide variety of forms, while outer attached nominal heads do not, as shown in (9):

(9) Allomorphy of nominals in inner and outer domain   (Embick 2010, pp.44–46)

    a. Nominals and allomorphy

Derived/Simple	*Gerund*
refus-al	refus-ing
marri-age	marry-ing
destruct-ion	destroy-ing
break-$\emptyset$	break-ing

    b. Structure for Root-attached *n* vs. non-Root-attached *n*

        Root-attached *n*   non-Root-attached *n*
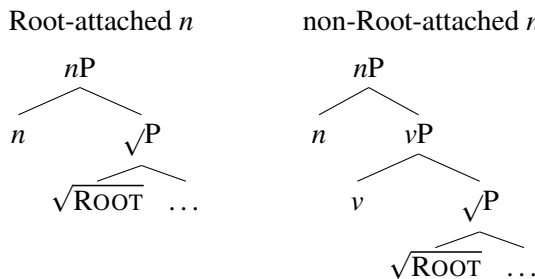
    c. Vocabulary Items for Inner vs. Outer Domain

        Inner Domain   Outer Domain

        $n \leftrightarrow$ -al / LIST1 _ $n \leftrightarrow$ -ing

        $n \leftrightarrow$ -age / LIST2 _

        $n \leftrightarrow$ -tion / LIST3 _

        $\vdots$

The data in (9a) shows a variety of allomorphs for the nominal in the root-derived and simple cases, but only one allomorph in the gerund cases. This is predicted by Embick (2010) because the root-derived and simple

cases are analyzed as being root attached *n* while the gerund cases have an intervening *v* head, as shown in (9b). The vocabulary items (9c) of the inner *n* heads are conditioned on a variety of lists to which the various roots belong, while the outer *n* head has no conditioning (or perhaps is conditioned by being next to a *v*).

The same inner- and outer-domain distinction is used in some subpart of the meaning system, namely those that relate to polysemy resolution (see, for example, Marantz 2013). That is, if a root-attached head restricts the meaning of a root to a certain subset of possible meanings, meanings not included in that subset cannot be used by outer heads.

(10) Inner- and outer-domain restrictions on meaning choice of $\sqrt{\text{FIRE}}$:

form	structure	possible meanings of $\sqrt{\text{FIRE}}$
	$\sqrt{\text{FIRE}}$	{"a chemical reaction of burning fuel", "excited, passionate", … }
fiery	$\sqrt{\text{FIRE}}+a$	{"a chemical reaction of burning fuel", "excited, passionate"}
fire	$\sqrt{\text{FIRE}}+n$	{"a chemical reaction of burning fuel"}
fire-like	$\sqrt{\text{FIRE}}+n+a$	{"a chemical reaction of burning fuel"} (crucially not {"excited"})

For example, in (10), let us assume that the root $\sqrt{\text{FIRE}}$ has several possible meanings including "a chemical reaction of burning fuel" and "excited, passionate". The head attached in the inner domain of the root may select for a subset of these meanings. The adjective head (*-y*), for example, selects for the subset which contains both those meanings while the null nominal head selects for the subset which only contains the meaning "a chemical reaction of burning fuel". Outer-domain heads cannot access meanings of the root that were excluded from the subset chosen by the inner head, so if an adjective head (*-like*) is attached to the $\sqrt{\text{FIRE}}+n$ structure, it only has access to the meaning "a chemical reaction of burning fuel" (as determined by the null nominal head) and not to the other possible meanings of $\sqrt{\text{FIRE}}$. That is, *fire-like* cannot access the root meaning "excited, passionate", and thus cannot have a meaning based upon that.

2.4.2 Inner- and outer-attachment do not matter for phonology

Given that the inner- and outer-attachment of heads is important in allomorphy and allosemy, a first hypothesis about the different phonological nature of affixes could be that inner domain affixes show stem-level phonology, while outer domain affixes would be word-level. If this correspondence were true, it would explain stem level affixes attaching to "stems" (here called "roots") while word-level affixes attach to words, since word-level affixes would attach outside a [root + functional head] structure. This hypothesis, however, is not true. There are four pieces of evidence for the falseness of this hypothesis: Class 2 affixes attaching to roots, level-ordering paradoxes, multiple Class 1 affixes, and morphosyntactically identical affixes showing different behavior depending on what exponent is inserted.

Examples of Class 2 suffixes attaching to roots were shown in (6) and examples of Class 2 suffixes attaching outside Class 1 suffixes were shown in (7). In the framework under discussion, we expect exactly one Class 1 affix attached to a root so having none (in the case of Class 2 on the root) or a Class 1 affix attached elsewhere (as in the level-ordering paradoxes) is a problem.

A further piece of evidence is that words may have multiple Class 1 suffixes, as shown in (11):

(11) Multiple Class 1 suffixes:

atom-ic_1-ity_1, educat-ion_1-al_1, monstr-os_1-ity_1, rotat-ion_1-al_1-ity_1

If only the root-attached head were able to have Class 1 phonology, there should not be the possibility of having multiple Class 1 affixes because only one syntactic head can be immediately adjacent to a root.

Finally, there are cases where the same morphosyntactic structure resulting in a difference in phonological behavior dependent on the affix inserted. For example, the data in (12) show that the same head (*n*) in the same environment (attaching to [root + *a*]) with approximately the same semantics (forming an abstract noun), results in a different phonological output depending on the exponent chosen.

(12) Same morphosyntactic structure shows stress shift in *atomícity* but not in *atómicness*
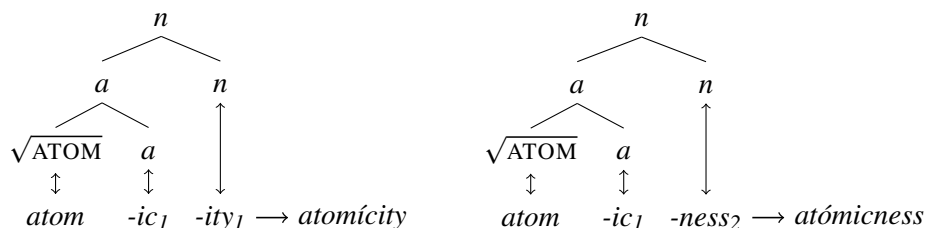
There is no morphosyntactic reason to believe that the structure of *atomicity* and *atomicness* is different[4]; Both words seem to be a noun derived from the same adjective head and root. However, the stress shift in *atomicity* shows that *-ity* is a Class 1 suffix while *-ness* is Class 2 (presuming the stress shift is a stem-level process, following Chomsky and Halle 1968; Halle and Vergnaud 1987; Halle 1998, etc.).

It is clear that every instance of a category-defining head does not cause a run of the phonological block, suggesting that the morphosyntactic spell-out process is not equivalent to a pass of the phonology (that is to say, syntactically phase-cyclic is not the same as phonologically cyclic, see Embick 2013). However, it is also not the case that the morphosyntactic structure (inner- vs. outer-attachment) can determine whether a pass of stem-level phonology is run.

If the information about whether to run the stem-level phonological block is not an automatic result of morphosyntactic spell-out or structure, then it must instead be encoded somewhere else.

2.5 A Proposed DM Analysis, Second Hypothesis: Vocabulary Item Diacritics

I will be following the analysis of Halle and Vergnaud (1987) by proposing that there are diacritics on vocabulary items which determine whether a pass of the stem-level phonology is to be run.

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[4]If these two *n* heads (*-ity* and *-ness*) are exactly identical, this raises questions for how blocking works in this theory. We might expect only one exponent to be always inserted resulting in the other being ungrammatical. One solution would be to assume that these *n*-heads are slightly different in some way (perhaps some morpho-semantic features), but that they are the same morphosyntactically.

For Halle and Vergnaud, the composition of all morphemes takes place before all phonology (as it does in the syntax all-the-way-down model of DM). Affixes are marked diacritically for whether or not they trigger cyclic phonology (equivalent here to what I have been calling stem-level). This rejects the architectural levels or strata of Lexical Phonology (and also Stratal OT).

The difference between Class 1 and Class 2 affixes is proposed to be a difference in the instructions to the phonology, notated as $^+$ in (13) below. Vocabulary Items with the $^+$ diacritic trigger a pass of stem-level phonology, while those without the diacritic do not.

(13) English Sample "Class 1"/"cyclic"/"stem-level" vs. "Class 2"/"noncyclic" Vocabulary Items

    a. $n \leftrightarrow$ /-ity/$^+$

    b. $n \leftrightarrow$ /-ness/

Some questions to be asked here are:

- Are there any universal or language-specific generalizations to be made about what items have $^+$ diacritics?

That is, some languages may have item-by-item triggers, as in English, while others may have all exponents triggering spell out, as nearly is the case in Slovak (all suffixes are cyclic in the analysis of Rubach 1993).

- Could a language choose to have all $^+$ or not by default?

- Could a language place this diacritic by morphological features or exponents (e.g., on all n nodes) rather than on vocabulary items?

2.5.1 Addressing Selkirk's (1982) objections to diacritic-based analysis

Selkirk (1982, p.112–119) presents a diacritic-based analysis as an alternative to her context-free grammar analysis, but rejects it for several reasons. The basic scheme of her diacritic analysis given in (14):

(14) Selkirk's (1982) diacritic-based analysis   (Selkirk 1982, p. 113)

Category	Subcategorization Frame
Level 1 [Af; α, +L]	[_ $\beta_{[+L]}$] or [$\beta_{[+L]}$ _]
Level 2 [Af; α, −L]	[_ $\beta_{[\pm L]}$] or [$\beta_{[\pm L]}$ _]

where α and β are syntactic category features (noun, verb, etc.)

The idea is that affixes have a diacritic ([±L]) which is used in the subcategorization of other affixes to control what affixes can be attached. Level 1 affixes are [+L] and they can attach only to other [+L] affixes, while Level 2 affixes are [−L] but are subcategorized to attach after either [+L] or [−L] affixes, allowing them to attach after Level 1 or Level 2 affixes. Selkirk also allows for affixes that are members of both Level 1 and Level 2 (such as, in her analysis, *-able*) by having a undefined [uL] feature

One important difference between Selkirk's analysis and the analysis proposed here is that Selkirk's subcategorization corresponds to two distinct operations in Distributed Morphology, the combinatoric system

(syntactic selection) and allomorphy (15). The combinatoric system is a function of the syntax and determines whether or not a head y can be merged with a head x. Allomorphy, on the other hand, is a function of competing vocabulary items during Vocabulary Insertion and determines what phonological exponent will be inserted for a given morpheme in a given context.

(15) Schematic of Combinatorics and Allomorphy in DM   (Embick 2010)

Combinatorics		Allomorphy
✓	*	$x \leftrightarrow /\phi_1/ \ / \ \text{Context1} \_$
$\bigwedge$	$\bigwedge$	$x \leftrightarrow /\phi_2/ \ / \ \text{Context2} \_$
$x \quad y$	$z \quad y$	$x \leftrightarrow /\phi_3/$

Selkirk makes several important objections to her proposed diacritic-based analysis. They are listed in (16), and each point is addressed in turn by the bullet point below it. The first two objections can be eliminated by the Combinatorics/Allomorphy split.

(16) Selkirk's objections to a diacritic-based analysis with responses

  1. Roots must be automatically categorized as [+L] by default so that Level 1 affixes can attach to them. Why should this be the case?
     - In the combinatorics system, affixes must be root-sensitive because any given root only takes certain suffixes. For example, a root that only appears as an adjective must select for only an adjective head. In addition, heads may show allomorphy depending on their root (as discussed above). We propose that roots are included separately in the context for allomorphy frame. In addition, the contexts may include the specific affixes which license others, in the cases of level ordering paradoxes discussed above. For example *-ity* could include *-able* in its context for insertion (allowing for *-ability*) in addition to a variety of roots.
  2. By eliminating categories (i.e. stem-attachment and word-attachment) the diacritic analysis treats compounds the same as monomorphemic or affixed words, resulting in bad predictions about the grammaticality of forms such as *inlightsensitive*, where *in-* has a subcatagorization for [+L] which the compound *lightsensitive* is, assuming roots are [+L] (as noted in objection 1).
     - As noted in response to objection 1, it is not necessary for roots to have these features, so it is not necessarily the case that *in-* would have the right subcategorization for a compound. In addition, it is probable that there is a difference in structure between complex roots combining in compounding and derivational suffixes. Thus, the solution to this problem may be solved on the combinatorics side by disallowing the head spelled-out as *in-* to join to the compound structure. That is, such a situation might be not arise because it would be syntactically ungrammatical (rather than morphologically or phonologically ungrammatical).
  3. With a binary diacritic feature [±L], we would expect there to be subcategorization frames for either [+L] or [−L] affixes dependent on a context of [+L], [−L], or [±L], resulting in six posssibilities. We only see two of these possibilities in English, and thus the diacritic system in (14) is descriptively inadequate. That is, why, for example, are there no suffixes of type [+L]

that subcategorize for only [−L]?

- We propose that the diacritic is not a binary feature [±L], but is instead a privative diacritic mark which an affix may or may not have. As with privative features in phonology, we propose that subcategorization may reference the presence of this diacritic, but not the absence. We could further posit a restriction that only affixes with the diacritic can be subcategorized for the diacritic, resulting in exactly the situation we see in (14). However, it may be the case that the diacritic is unneeded in the context for insertion and is only used to trigger the phonology (see discussion below).

2.5.2 How to explain the ordering generalization

Although the ordering generalization (Class 1 inside Class 2) is not always true, we would still like to be able to explain the tendency for Class 2 affixes to attach outside Class 1 affixes. Let us assume that only the phonology-calling Class 1 affixes are marked and that Class 2 affixes are unmarked. The context for insertion (equivalent to subcategorization frames) for these exponents include various specific roots and affixes that they can attach to and, in addition, Class 1 exponents are marked to be inserted in the context of the proper morphosyntactic type of Class 1 exponents, whereas Class 2 exponents have the context of any affix of the proper morphosyntactic type (whether diacritically marked or unmarked), as shown in (17).

(17) English marked Class 1 vs. unmarked Class 2 Vocabulary Items with context for insertion

    a. $n \leftrightarrow$ /-ity/$^+$ / LIST1 _
        LIST1 = [{a,$^+$}, {a,-*able*}, etc.]

    b. $a \leftrightarrow$ /-less/ / LIST2 _
        LIST2 = [n, $\sqrt{\text{HAP}}$, $\sqrt{\text{FECK}}$, $\sqrt{\text{RUTH}}$, etc.]

The vocabulary item in (17a) is the nominal head *-ity*, which triggers the stem-level phonology. It can be inserted in the context of any diacritically marked adjective head, but also (exceptionally) after the non-marked adjective head *-able*, as well as some other contexts (such as roots). The vocabulary item in (17b) is the adjective head *-less* which does not trigger stem-level phonology. It can be inserted in the context of any nominal head as well as a list of specific roots, such as $\sqrt{\text{HAP}}$, $\sqrt{\text{FECK}}$, and $\sqrt{\text{RUTH}}$.

Is $^+$ needed for context?   One question to be examined in this dissertation is whether the diacritic $^+$ is actually needs to be used in the context for insertion. It could be the case that each affix simply has a list of other affixes it can attach to (as argued for by Fabb 1988, for example). This is an empirical question about the behavior of Class 1 affixes: Can any Class 1 affixes attach to any other Class 1 affixes, or is there a more specific exponent to exponent relationship between them? If the former is true, then this is evidence for the diacritic being used in the context of insertion. If the latter is true, then it may be the case that each exponent simply has a list of morphemes it can attach to. Another data point which would differentiate the two analyses would be a case where two exponents of an outer exponent are distributed exactly on whether the inner suffix is cyclic or not. If this were the case, then it would bolster the view that the diacritic itself is being referred to.

On well behaved level orders: The argument above is based on a language with messy orderings (that is, English). However, there are languages for which a strict ordering of affix levels might hold true. In such a case, we might expect it to fall out of the syntax. That is, if all Level k suffixes are exponents of verbal heads and all Level $k+1$ heads are exponents of aspect heads, we would like to explain the ordering of Level k before Level $k+1$ as a result of the relationship between those two syntactic nodes rather than between the morphemes or exponents involved.

3 Word Level

The assumptions made by Distributed Morphology eliminate the word as a morphosyntactic unit. However, it is clear that "word" exists as a phonological unit because there are phonological processes that are sensitive to "wordhood".[5] The question remains: How is the phonological word unit calculated and what is the relationship to the information from the morphosyntax?

I propose that the phonological word (notated as ω-Word) is build from groups of linearized morphemes based on the morphosyntactic structure of the M-Word, as defined by Embick and Noyer (2001):

(18)   Morphosyntactic Word (M-Word):   (Embick and Noyer 2001)
   - A (potentially complex) head not dominated by a further head-projection

It should be noted that the M-Word is purely a morphosyntactic structure in that it defines a particular relationship between syntactic heads.

In general, the M-Word seems to roughly correspond with the domain of the phonological word, but it is not the only structure that does. There are other structures, schematized in (19), that need to be considered for determining phonological wordhood.

(19)   Possible structures corresponding to phonological words
   a. $[\,x\,y\,z\,]_M$ $\Rightarrow (\,x\,y\,z\,)_\omega$ Structural M-Word
   b. $[\,x\,y\,]_M\,Z$ $\Rightarrow (\,x\,y\,Z\,)_\omega$ Terminal outside M-Word (inclusion of clitic)
        cf. $\Rightarrow (\,x\,y\,)_\omega =Z$ (clitic "leaning")
   c.   X Y Z $\Rightarrow (\,X\,Y\,Z\,)_\omega$ Terminal nodes in same spell-out cycle
   d. $[\,[\,x\,y\,]_M\,Z/z\,]_M$ $\Rightarrow (\,(\,x\,y\,)_\omega\,Z/z\,)_\omega$ Nested M-Words (via morphological movement, compounding)

The basic M-Word $\Rightarrow$ ω-Word correspondence is shown in (19a). U propose this to be the basic case. However, there are also cases of terminals adjacent to M-Words being incorporated into the ω-Word (19b), but this is not always the case. Sometimes an adjacent terminal seems to "lean" onto the ω-Word but does not participate in the ω-Level phonology (represented as =Z here). In addition, there are cases of a group

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[5]It is unclear whether the phonological word domain is simply an edge-marking procedure or a full domain of phonological application. In the former view, phonological effects should be limited to edges or supersegmentals (stress/tone/autosegmental tiers). In the latter view, any phonological process could be applied to this domain. This proposal does not differentiate the two currently.

of adjacent terminals not in an M-Word being grouped together, as schematized in (19c). Finally, if we use the M-Word structure as the starting point for the calculation of ω-Words, there is the possibility of having nested ω-Words in precisely the places where there are nested M-Words, such as compounding or morphological movement (19d).

Each of these types is are discussed in its own subsection below.

3.1 Word Type: Structural M-Word

In the proposed basic case, the word-level phonology appears to line up with the M-Word morphosyntax giving us the M-Word ⇒ ω-Word correspondence

3.1.1 German syllable-final devoicing

For one example of word-level phonology lining up with the M-Word structure, consider syllable-final devoicing in German (20):

(20)   Syllable-final devoicing in German   (Rubach 1990; Wiese 1996)
- *Kind* [-t] "child" ~ *kindisch* [-d-] "childish"
- *Ausland* [-t] "foreign countries" ~ *Ausländer* [-d-] "foreigner"
- *trüb* [-p] "cloudy, opaque" ~ *Trübung* [-b-] "cloudiness, opacity"
- *kräftig* /-g/→/-ɣ/→[-ç][6] "strong, powerful" ~ *Kräftigend* [-g-] "bracing, invigorating"
- *Grund* [-t] "ground, bottom" ~ *grundlos* [-t-] "groundless, unfounded"
                                           ~ *Gründung* [-d-] "foundation, establishment"

Voiced obstruents in syllable coda position become voiceless, but this is calculated only with the inclusion of all the heads in the M-Word structure. That is, if this devoicing were a process applied cyclically with each affix (or if the structure for word level were a minimal complex head rather than a maximal complex head) we might expect the /d/ of *Gründing*, for example, to be devoiced at the inner verb head, before the addition of the outer noun head *-ung*, see (21).

(21)   Structure of *Gründung*[7]

Linearization: [/grund/ ⊕ ∅ ⊕ /uŋ/]_M
Phonological Grouping: (/grund   + uŋ/)_ω
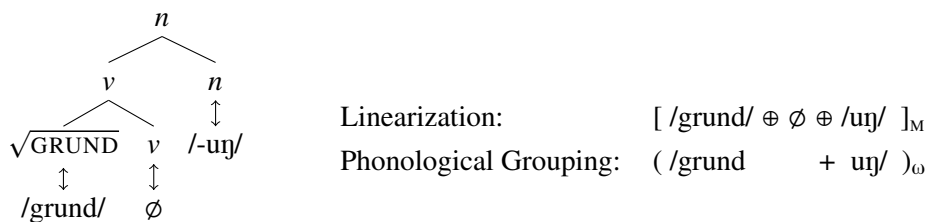
If the word-level phonology occurred at the time where only the inner *v* head and the root were in consideration, (/grund/ + ∅)_ω, we would expect the the /d/ to be devoiced because it would be syllabified in

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[6]The spirantization (and fronting) of /g/ does not happen in all dialects of German. In these dialects, forms like this end in a final [-k], as expected.

[7]For simplicity, this derivation will ignore the umlaut process.

the coda. However, the word-level process of devoicing must wait until the entire M-Word is calculated, resulting in the /d/ being syllabified in the onset of the following syllable (/duŋ/) and thus not subject to devoicing.

The story is not quite so simple, given that there are minimal pairs which show the same sequence of phonemes with devoicing in one case but not in another, data given in (22):

(22)   Minimal pairs for devoicing   (Rubach 1990)
   - Han<u>d</u>lung [-d-] "act" vs. han<u>d</u>lich [-t-] "handy"
   - ne<u>b</u>lig [-b-] "foggy" vs. glau<u>b</u>lich [-p-] "believable"
   - ei<u>g</u>nen [-g-] "own" vs. Zeu<u>g</u>nis [-k-] "testimony"

Without reference to morphological constituency, each of the pairs in (22) show the relevant consonant in approximately the same environment, but in one case there is devoicing and not in another case. Thus, it is clear that the syllabification and devoicing processes must be sensitive to morphological structure. Rubach (1990) proposes that (A) German readily uses liquids and nasals as syllable nuclei and (B) syllabification in German is cyclic. Adopting Rubach's proposal (A) and adapting Rubach's proposal (B) to mean that syllabification is a stem-level process, we can demonstrate that devoicing is still a word-level process and that the ω-Level is not calculated until the M-Word.

To derive, for example, the *Han[d]lung ~ han[t]lich* case, we need to assume that the inner *v* and *n* heads are marked to trigger stem-level phonology while the overt *-ung* and *-lich* are not.[8] The derivations are shown in (23):

(23)   Derivation of *Han[d]lung* vs. *han[t]lich*[9]

   a. Vocabulary Items:
      - $\sqrt{\text{HAND}}$ ↔ /hand/   • v ↔ /l/$^+$ • n ↔ /uŋ/ / v _
                                               • n ↔ $\varnothing^+$ • a ↔ /liç/ / n _
   b. Phonological Processes:
      - (Stem) Syllabification
      - (Word) Devoicing of voiced obstruents in syllable coda

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[8]For this example, at least, the inner- vs. outer-attachment distinction seems to hold up for German phonology.

[9]It is possible, given the non-transparent semantic relationship between the noun *Hand* "hand" and the verb *handel-* "act", that speakers may have two distinct roots ($\sqrt{\text{HAND}}$ and $\sqrt{\text{HANDL}}$). If this is the case, then the *v* exponent would be phonologically null but the rest of the derivation would be the same. The derivation in which both words are derived from the same root is shown here as an example of a minimal pair.

c. Structure, Linearization and Phonological Grouping of *Han[d]lung* and *han[t]lich*

$$n$$
$$v \quad n$$
$$\sqrt{\text{HAND}} \quad v$$
$$\updownarrow \quad \updownarrow \quad \downarrow$$
$$/\text{hand}/ \quad /\text{l}/^+ \quad /\text{-uŋ}/$$

$$a$$
$$n \quad a$$
$$\sqrt{\text{HAND}} \quad n$$
$$\updownarrow \quad \updownarrow \quad \downarrow$$
$$/\text{hand}/ \quad \emptyset^+ \quad /\text{-liç}/$$

Lin.:	$[\sqrt{\text{HAND}} \oplus /\text{l}/^+ \oplus n]_M$		Lin.:	$[\sqrt{\text{HAND}} \oplus \emptyset^+ \oplus a]_M$
Ph.Grp.:	$(/\text{hand}/ + /\text{l}/^+ + /\text{-uŋ}/)_\omega$		Ph.Grp.:	$(/\text{hand}/ + \emptyset^+ + /\text{-liç}/)_\omega$

d. Application of Phonology

First Affix	/hand/ + /l/$^+$	/hand/ + $\emptyset^+$	$^+$ triggers Stem Level
Stem Level Phonology:			
Syllabification:	.han.dl.	.hand.	
Second Affix	.han.dl. + uŋ	.hand. + liç	No pass of Stem Level
ω-Level Phonology:			
Devoicing:	—	han<u>t</u>.liç	
Output:	handluŋ[10]	hantliç	

This example shows that, although stem-level processes may alter the structure and change the eligibility of a segment to undergo a word-level process, the word-level phonology does not apply until the entire M-Word is under consideration.

3.1.2 English ω-Level voicing assimilation

Another example of M-Word ⇒ ω-Word is English ω-level voicing assimilation.

English has voice assimilation at both the stem and word level, but not at the phrase level, as shown in (24). Stem-level voice assimilation is regressive (24a), while word-level assimilation is progressive (24b).

(24) English voice assimilation

   a. Stem-level regressive voice assimilation: *twelve* /twɛl<u>v</u>/ + *th* /θ/ →*twelfth* [twɛl<u>f</u>θ]

   b. Word-level progressive voice assimiltaion:

      i. 3 sg. Agr.: *tap* /tæp/ + *s* /<u>z</u>/ →*taps* [tæp<u>s</u>]

   ii. Plural: *cat* /kæt/ + *s* /<u>z</u>/ →*cats* [kæt<u>s</u>]

   c. Lack of voice assimilation at Phrase-level: *the ca*[t z]*ooms* (*[d z], *[t s])

We propose that the segments that undergo voice assimilation in the structures in (24b) are inside of the M-Word and thus inside the ω-Word. We must assume that the relevant head movement as well as T-to-*v*

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[10]According to Rubach (1990), there is variation in whether *handlung* is pronounced with two or three syllables. This derivation (and Rubach's) create three. Rubach posits an optional post-cyclic rule of sonorant desyllabification which would desyllabify the *dl* sequence, resulting in two syllables.

lowering occurs in the syntax. In the structures below, the AGR node is shown attached to the T head, although the morphophonological analysis is compatible with any morphosyntactic analysis in which the AGR node is attached early enough or in such a place that it considered structurally part of the M-Word. The figures in (25) show the structure, linearization, and phonological groupings for (24b).
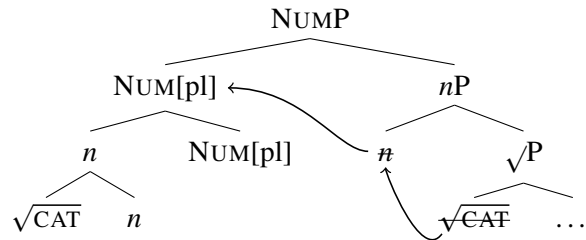
(25) a. Structure, Linearization and Phonological Grouping of *taps*
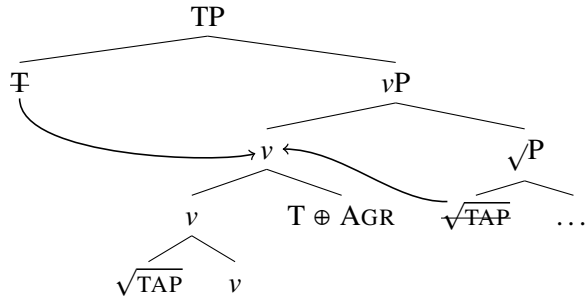
Linearization: [√TAP   ⊕   *v*   ⊕   T   ⊕   AGR   ]$_M$

Phonological Grouping: : (/tæp/   +   ∅   +   ∅   +   /-z/   )$_\omega$

b. Structure, Linearization and Phonological Grouping of *cats*

Linearization: [√CAT   ⊕   *n*   ⊕   NUM[pl]   ]$_M$

Phonological Grouping: : (/kæt/   +   ∅   +   /-z/   )$_\omega$

Compare this with the structure of the phrase in (24c) where the relevant [t z] segments are not grouped in the same M-Word and thus do not get grouped in the same ω-Word:

(26) Structure, Linearization, and Phonological Grouping of *the cat zooms*
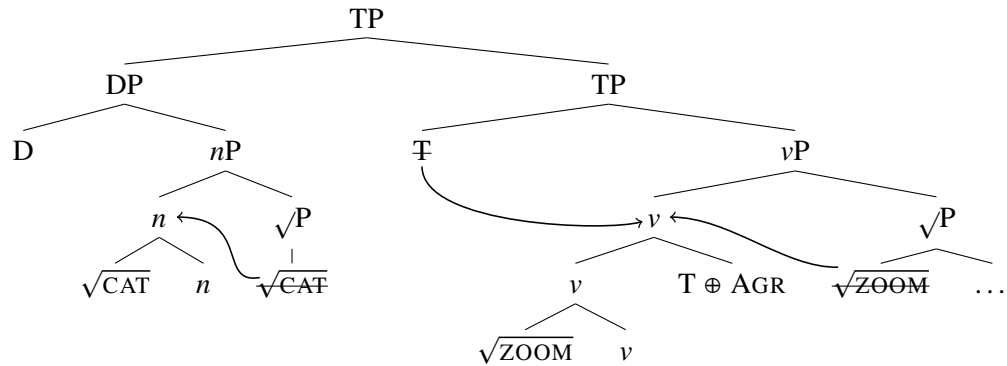
Linearization: D   [√CAT ⊕ *n*]$_M$ [√ZOOM ⊕ *v* ⊕ T ⊕ AGR]$_M$

Phonological Grouping: : *the*   (/kæt/ + ∅)$_\omega$ (/zum/ + ∅+ ∅+ /-z/)$_\omega$

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This example shows that ω-Level phonology applies within the M-Word structure, but not across M-Word structures.

3.2 Word Type: M-Word with additional terminal

Another possible configuration for a ω-Word is a structural M-Word plus an adjacent terminal.

With this structure, there seems to be two different phonological possibilities. In some cases there the word-level phonology seems to apply to the adjacent terminal as well as the M-Word (27a) while other cases it seems that the M-Word is the phonological word and the non-head A leans onto it but never undergoes the word-level phonology (27b).

(27) Possible M-Word + terminal correspondences

    a. $[\sqrt{\text{ROOT}}\ x\ y\ ]_M\ A \Rightarrow (\ \sqrt{\text{ROOT}}\ x\ y\ A\ )_\omega$

    b. $[\sqrt{\text{ROOT}}\ x\ y\ ]_M\ A \Rightarrow (\ \sqrt{\text{ROOT}}\ x\ y\ )_\omega\ =A$

An example of (27a) is given in §3.2.1 and an example of (27b) is given in §3.2.2.

3.2.1 Apparent word level

One case an adjacent terminal being included into an M-Word is English ω-Level voicing assimilation with the possessive clitic. We saw in (24) above that the English has progressive voice assimilation at the ω-Level but not at the phrase level. The possessive clitic in English is not part of the structural M-Word but does participate in the ω-Level voicing assimilation.

(28) Possessive clitic incorporated into ω-Word:
    cat /kæt/ + *'s* /z̠/ →*cat's* [kæt̠s̠]

The possessive clitic has interesting behavior syntactically it attaches to a phrase, but phonologically it depends only on the final word of that phrase regardless of the morphosyntactic category of that word (Zwicky 1987).

(29) Examples of English possessive clitic *'s* with hosts of different categories   (Zwicky 1987, p.136)
    • the oxen's yoke   (noun)
    • the person I talked to*'s* theories   (preposition)
    • the person who's talking*'s* theories   (verb)

We must posit that, in the syntax, the possessive clitic is generated outside the M-Word of its future host, as shown in (30). The M-Word ⇒ ω-Word equivalence should treat the possessive clitic as outside the ω-Word and thus not subject to the ω-Level voice assimilation. However, since the possessive clitic does participate in the ω-Level voice assimilation, it must get incorporated into the ω-Word.

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(30)

Linearization:	D	[√CAT ⊕ *n*]$_M$	D[poss]	[√PIANO ⊕ *n*]$_M$
M-Word ⇒ ω-Word:	*the*	(/kæt/ + ∅)$_ω$	/z/	(/piæno/ + ∅)$_ω$
Actual Phonological Grouping:	*the*	(/kæt/ + ∅ + /z/)$_ω$		(/piæno/ + ∅)$_ω$

In the phrase *the cat's piano*, the possessive clitic is generated outside the phrase it attaches to (here shown as the D of the possessee DP), but gets included into the ω-Word linearly on its left. The phrasal-level hierarchical behavior of this clitic is thus explained by the syntactic movement allowing any DP to move out above the possession D, but the linear phonological behavior of the clitic is explained by its inclusion in the M-Word to its left after Linearization has applied.

> Question: Could all instances of this be reduced to cases of Local Dislocation, parallel to the case of nested M-Words in §3.4?

3.2.2 No apparent word level

In some cases, neighboring terminals are not incorporated into the adjacent ω-Word, instead the terminal seems to "lean" onto the ω-Word. "Leaning" here is used to mean that the terminal in question does not participate in the ω-Word phonology, but often is not a well-formed word on its own and seems to be treated like part of the same "word" for phrasal purposes. While the exact nature of this behavior needs to be examined, the important information here is that it does not behave like the case of "inclusion in the word level" discussed above.

One example of this situation the Makassarese absolutive clitic, which "leans" onto the host but does not cause any changes in the phonology of the the word.

(31) Makassarese Data   (Basri et al. 2000)

	V-stem	C-stem	{r,l,s}-stem
Adjective stem	*lómpo* "big"	*gássiŋ* "strong"	*rántasaʔ* "dirty"
Comparative suffix /-aŋ/	*lompó-aŋ* "bigger"	*gassíŋ-aŋ* "stronger"	*rantás-aŋ* "dirtier"
Absolutive clitic /-aʔ/	*lómpo-aʔ* "I am big"	*gássiŋ-aʔ* "I am strong"	*rántasak-aʔ* "I am dirty"

In Makassarese, the segments /r/, /l/, or /s/ are illicit word-finally. Roots ending in these segments take an epenthetic /ak/~/aʔ/ at the word level in order to comply with this. In the comparative form of adjectives, the additional suffix blocks the epenthesis because the illicit segment is never word-final, thus it is *rantásaŋ*

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"dirtier" and not *rantasakaŋ.[11] If the absolutive clitic were incorporated into the ω-Word like the English possessive clitic above, we would expect it to behave like the comparative suffix; it should block epenthesis because the illicit segment would not be word final. However, this is not the case; Epenthesis still occurs even when the absolutive clitic is attached, as evidenced by the form *rántasak-aʔ* "I am dirty" and not *rántas-aʔ*. The absolutive clitic thus is not to be part of the phonological word because it does not change the stress or epenthesis. The linearization and phonological grouping of Makassarese adjectives with the absolutive clitic is as shown in (32):

(32)   Linearization and Phonological Grouping of Makassarese Adjective and Absolutive Clitic
       Linearization: [adjective]$_M$ absolutive
       Phonological Grouping: (adjective)$_\omega$ absolutive

> Question: Is there a principled way to determine what terminals will be incorporated (or what ω-Words serve as hosts) or is this behavior idiosyncratic?

Polish P-N Agreement   One further case study (to be examined) is a comparison of person-number agreement clitics and the irrealis marker *-by* in Polish. The person-number agreement clitics cause stress change and affect o-raising while *-by* does not (Embick 1995; Booij and Rubach 1987). A first-look analysis suggests that the person-number clitics are included in the ω-Word while the irrealis marker *-by* is not.

3.3   Word Type: Terminal nodes in same (phonological) spell-out cycle

Some word level phonological processes occur when terminal nodes are not in the same M-Word but are in the same (phonological) spell-out cycle.

One example is from auxiliary contraction in English. A pronoun with a contracted auxiliary, for example, *you* and *'ll*, has a different phonological relationship than a full NP with that auxiliary. In (33a), the pronoun and contracted auxiliary form a single syllable and there is a change to the underlying vowel (/u/→[ʊ]), whereas this phonology can not apply in the cases of full noun phrases in (33b):

(33)   Phonology of English Contraction   (Zwicky 1970; MacKenzie 2012; Embick 2012)

       a.   You'll have to do that. ([jʊl])

       b.   i.   The people with you'll have to do that. (*[jʊl], ✓[ju.əl])

            ii. Sue'll have to do that. (*[sʊl], ✓[su.əl])

For the cases in (33b), it appears that the *'ll* auxiliary is behaving like a non-included clitic, discussed in §3.2.2 above.

The case where the pronoun *you* is embedded in an full NP is shown in (34). The *n* head causes spellout of its complement, causing *you* to be spelled-out and grouped together with the P to its left. Because the *you*

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[11]The adjective must undergo syntactic movement up to the comparative head, since it always appears suffixed to the adjective and is part of the ω-Level phonology.

is already grouped, when the T node is spelled out later, there is no terminal next to it for it to be grouped with, so it forms its own ω-Word. In this case, *you* and *'ll* are not in the same ω-Word and so do not undergo the ω-Level phonology together.

(34)　Derivation of Full NP + Auxiliary: the people with *you'll* /ju.əl/
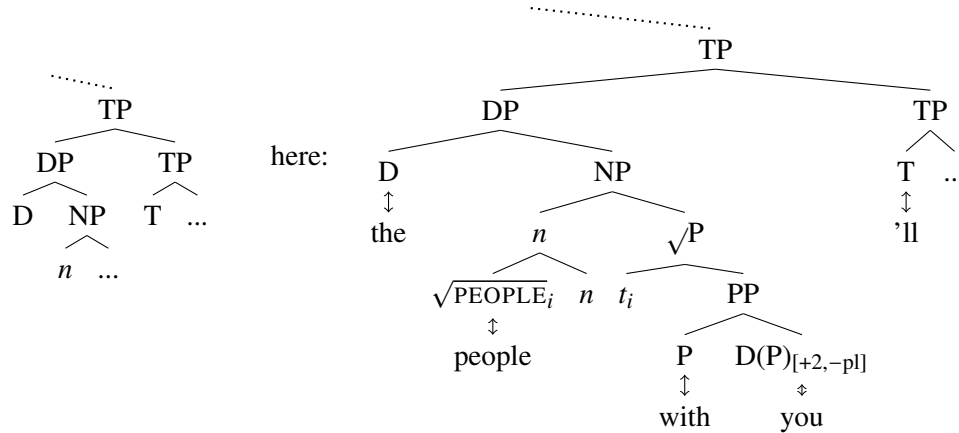
Insertion of *n* causes linearization of complement of *n*

Linearization:	[$\sqrt{\text{PEOPLE}}$ *n*]$_\text{M}$ P DP
Phonological Grouping:	($\sqrt{\text{PEOPLE}}$ *n*)$_\omega$ P DP[12]
Spellout and ω-Level phonol.:	*people with* /ju/

Spell out of remaining structure

Linearization:	D (NP) T
Phonological Grouping:	D (*people with* /ju/) T
Spellout and ω-Level phonol.:	*people with* /ju/ /l/
	→/ju/ /əl/

The same analysis is applicable for the case of the proper name in (33b).

In the pronoun + auxiliary case (35), however, there is a difference in the structure.

(35)　Structures for noun and pronoun with auxiliary
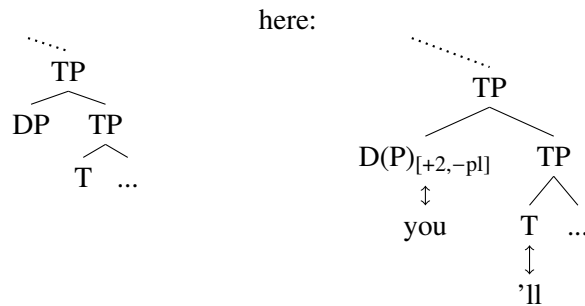
Linearization:　DP T

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[12]This P and DP will be grouped together into a ω-Word by Stray Terminal Grouping (discussed below).

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Assuming pronouns are not full noun phrases (see, e.g., Déchaine and Wiltschko 2002), this means they are not immediately dominated by a cyclic head. Because of this, the pronoun will not undergo spellout separately from the neighboring auxiliary. This results in two adjacent terminal nodes that are not separately part of an M-Word.

I propose that these two terminal nodes are being grouped together into a ω-Word of their own despite not being part of an M-Word.

3.3.1 Stray Terminal Grouping

The structures above show that there is a difference between the cases of full NP + auxiliary and pronoun + auxiliary, but they do not answer the question of why terminal nodes (that are otherwise un-spelled-out) in the same spell-out cycle are grouped together as a phonological word.

I propose a principle of "Stray Terminal Grouping": Terminals that are not part of a M-Word may be grouped together into a ω-Word.[13] A schematic example is given in (36):

(36) Stray Terminal Grouping: Assume x, y, and z are heads and A, B, and C are not
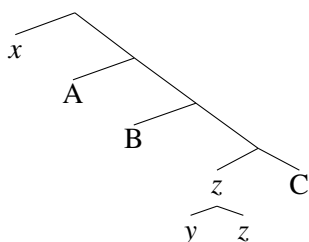
Morphological Grouping

Linearization: $[\,x\,]_M$ A B $[\,y\,z\,]_M$ C

M-word = ω-word: $(\,x\,)_\omega$ A B $(\,y\,z\,)_\omega$ C

Stray Terminal Grouping: $(\,x\,)_\omega$ $(\,A\,B\,)_\omega$ $(\,y\,z\,)_\omega$ $(\,C\,)_\omega$

Phonological Grouping

Stray Terminal Grouping will take the linearization output from (35) and group together the pronoun and auxiliary into a ω-Word. Assuming that the syllabification and vowel reduction processes are ω-Level, this explains the outcome of this case:

(37) Derivation of Pronoun + Auxiliary: *you'll* → /jʊl/

Linearization: DP T

Phonological Grouping: $(\text{DP T})_\omega$

Spellout and ω-Level phonology: /jʊl/
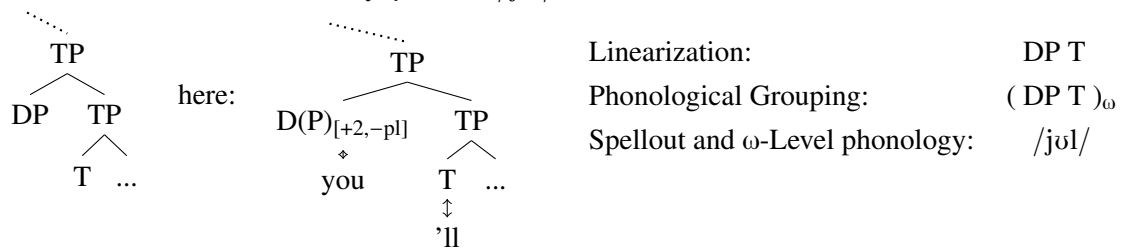
In the case of the bare pronoun and the contracted auxiliary, there are no M-Words in the relevant part of the linearization, so the nodes are combined together by Stray Terminal Grouping into an ω-Word. In the cases with the full NP, there are M-Words in the structure which are converted into ω-Words. Because of this, the noun and the auxiliary are not able to be grouped in the same ω-Word and thus do not share the same phonological interaction as seen in the case of the bare pronoun.

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[13]This principle is similar to the observation made by Selkirk (1995) that function words are aligned with nearby prosodic structures.

A note on [ju.əl]: It should be noted that, while [jʊl] is the most natural way to pronounce the bare pronoun and auxiliary *you'll*, in the case of (33a), it is also possible to use the pronunciation [ju.əl]. It must be the case, then, that Stray Terminal Grouping is variable or optional in some way. As a first hypothesis, I suggest that the application of Stray Terminal Grouping is sensitive to something like focus or prosodic stress in such a way that the DP+T structure can be grouped as (DP)ω=T if there is a reason to keep the DP grouped alone. The conditioning factors on this variation need to be investigated further.

> Question: Could this optionality explain why coordination behaves like embedding? Perhaps there is enough stress/focus on the second member of a coordination structure that it wants to be grouped on its own.

AAVE copula contraction: A similar analysis can also be applied to the case of *i's*, *tha's*, *wha's* in African American Vernacular English (AAVE). In AAVE, there is variable contraction and deletion of the copula, but the inanimate pronoun subjects *it*, *that*, and *what* with the copula *is* appear categorically as *i*[s], *tha*[s], and *wa*[s]. By using animacy and pronoun subject as conditioning for allomorphy and Stray Terminal Grouping to put the pronoun and copula in the same ω-Word, the categorical nature and phonology of these forms can be explained. For a fuller discussion see Shwayder and McLaughlin (2013) handout from NELS44.

3.4 Word Type: nested M-Words

Given that we have a morphosyntactic structure that corresponds to the phonological word. We expect cases of recursion of that morphosyntactic structure to result in recursion of the phonological word level. This can occur through morphological movement such as Local Dislocation or through recursion of the M-Word structure, such as in compounds.

3.4.1 Compounds in Spanish

One example of M-Word recursion occurs in compounding. In compounds in Spanish, ω-Level processes seem to "overapply" in that they apply in places that are not motivated by the surface phonology. Two such processes are diphthongization of mid vowels under stress (38a) and epenthesis of *e-* to initial *sC* clusters (38b). In (38a), we see that if stress does not fall on the mid vowel in question, diphthongization does not apply. In (38b), we see that if a (stem-level) prefix is attached, there is no need for epenthesis, so it does not apply. In the compounds in (38c), however, the mid vowel of the first member of the compound is diphthongized despite not bearing surface stress. Likewise, in (38d), the second member of the compound gains an epenthetic *e-* despite the presence of the preceding vowel from the first member.
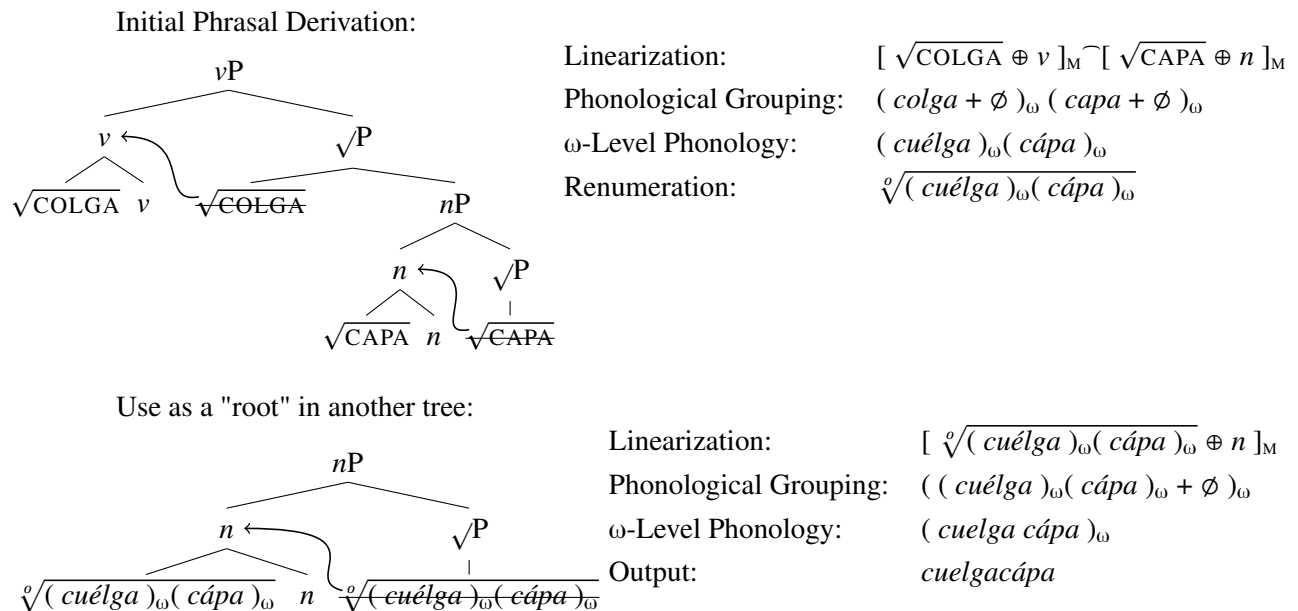
(38) a. Spanish diphthongization under stress   (Harris 1989)
- *c*[ué]*lga* "he/she hangs" (cf. *c*[o]*lgámos* "we hang")
- *c*[ié]*n* "100" (cf. *c*[e]*nténa* "group of 100")

   b. Spanish *e-* epenthesis to initial *sC* clusters   (Lema 1978; Harris 1987; Eddington 2001)
- <u>*e*</u>*scribir* "write" (cf. *inscribir* "inscribe")
- <u>*e*</u>*sfera* "sphere" (cf. *hemisferio* "hemisphere")
- <u>*e*</u>*smóquin* "smoking jacket" (loan word from Eng. *smoking*)

    c. Overapplication of diphthongization in compounds   (Harris 1989)

- *c*[ue]*lgacápas* "coatrack" (*c[o]*lgacápas*)
- *c*[ie]*mpiés* "centipede" (*c[e]*mpiés*)

    d. Overapplication of epenthesis in compounds

- *guardae̱spaldas* "bodyguard" (*guardaspaldas)
- *quitae̱smalte* "nail-polish remover" (*quitasmalte)

It appears that both members of the compound have undergone ω-Level phonology separately before being joined together into the compound. In addition, the compound as a whole seems to have undergone a pass of ω-Level phonology as evidenced by the presence of a single stress.

These compounds are exocentric, meaning the category (and semantics) of the compound is not a subset of one of the members. In addition, the order of the elements in the compound is the same as they would be if they were a phrase. Given these observations, we propose that these compounds are built as a phrase in one syntactic workspace and then treated as a root in a separate workspace where the compound is being used (suggested by Harley 2009 based on the concept of renumeration from Johnson 2004).

(39)   Derivation of *cuelgacápas* (ignoring the final /s/, see discussion below)

Initial Phrasal Derivation:

Linearization: $[\sqrt{\text{COLGA}} \oplus v \text{ }]_\text{M}\frown[\sqrt{\text{CAPA}} \oplus n \text{ }]_\text{M}$

Phonological Grouping: $(\text{ } colga + \emptyset \text{ })_\omega (\text{ } capa + \emptyset \text{ })_\omega$

ω-Level Phonology: $(\text{ } cuélga \text{ })_\omega(\text{ } cápa \text{ })_\omega$

Renumeration: $\sqrt[o]{(\text{ } cuélga \text{ })_\omega(\text{ } cápa \text{ })_\omega}$

Use as a "root" in another tree:

Linearization: $[\text{ } \sqrt[o]{(\text{ } cuélga \text{ })_\omega(\text{ } cápa \text{ })_\omega} \oplus n \text{ }]_\text{M}$

Phonological Grouping: $(\text{ } (\text{ } cuélga \text{ })_\omega(\text{ } cápa \text{ })_\omega + \emptyset \text{ })_\omega$

ω-Level Phonology: $(\text{ } cuelga \text{ } cápa \text{ })_\omega$

Output: *cuelgacápa*

For the sample derivation in (39), the structure of the phrase *cuelga capas* "hang capes" is built in one workspace. The contents of this workspace are linearized and the phonological groupings are calculated. Using the M-Word ⇒ ω-Word correspondence here, the two elements of the compound will be treated as separate words (as they would in the phrase). This phonological unit is then "renumerated", or treated as a root[14] (represented as $\sqrt[o]{}$ below), and the unit is inserted into a different workspace where it combines with another functional head (here a little *n*). When the syntax of this workspace is linearized and the phonological

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[14]Exactly what it means to be treated as a root needs to be investigated further. Here, I am not suggesting that the phrase gets stored in the lexicon but rather that the phrase behaves morphosyntactically like a root in the second workspace.

groupings are calculated, the compound and the *n* head are structurally an M-Word, and thus are grouped as a ω-Word by the phonology.

The compound shows recursion of the ω-Word structure because the elements are treated as separate ω-Words in one workspace, renumerated, and then treated as a single ω-Word in the compound workspace.

The presence of the /s/ at the end of these compounds needs to be investigated further. An initial hypothesis is that it is a plural (or generic) marker in the initial phrasal derivation but that renumeration causes the plural feature to be lost. Thus the compound carries the /s/ of the plural but not the plural feature. This explanation could also explain the seemingly spurious /i/ in another type of Spanish compound, for example, *verdiazul* "greenish-blue" or *veintidós* "twenty-two" (perhaps renumeration of the phrases *verde y azul* "green and blue" and *veinte y dos* "twenty and two", respectively).

3.4.2   Local Dislocation

Another example of nested M-Words occurs under the morphological movement operation Local Dislocation.

Embick and Noyer (2001) propose a morphological movement operation called Local Dislocation, in which, under the relevant conditions, linearly adjacent elements from the syntactic output are moved during Linearization in a way that reflects morphophonological (rather than syntactic) boundaries (see also Embick 2007a,b). Local Dislocation takes elements that are adjacent at the M-Word level and concatenates them at the Subword level (in either order), as schematized in (40).

(40)   Schematic of Local Dislocation

$[\text{X}]_\text{M} ^\frown [\text{Y}]_\text{M} \rightarrow [(\text{X} \oplus \text{Y})_\text{Sub}]_\text{M}$ *or* $[(\text{Y} \oplus \text{X})_\text{Sub}]_\text{M}$

Local Dislocation is noteworthy for the relationship between morphosyntax and phonology proposed here because it allows an element that is outside an M-Word to move inside an M-Word, and thus become part of the ω-Word.

This result is precisely what happens in both Maltese and Makassarese clitics; Clitic elements that are outside the M-Word of their hosts behave outside the ω-Word of their hosts in some instances, but in other instances they undergo Local Dislocation and behave as inside the same ω-Word as their hosts. In addition, because of the nature of cyclic spell-out, if an M-Word has already undergone spell-out before Local Dislocation applies, it appears that a second pass of the ω-Level phonology applies.

For the case studies below, the critical aspects of the framework are as follows:

(41)   Critical Aspects of Framework

a. Cyclic heads cause Spell-Out of their complements ($\mathbb{C}_1$-LIN from Embick 2010)

b. Spell-Out of the M-Word structure of a category-defining head causes a pass of the M-Word Phonology

c. Local Dislocation of an element into an Spelled-Out M-Word (via Local Dislocation) causes the M-Word phonology to run again.

This case studies in Makassarese and Maltese is excerpted with minor modifications from Shwayder (forthcoming in PWPL 20.1).

Makassarese Adjectives and Clitics

Data   In Makassarese, when a suffix or clitic attaches to an adjective there are three different patterns of stress, as shown in (42). By default, the stress falls on the penultimate syllable, as seen in the adjective stem (42a).[15] When a suffix is added, such as the comparative suffix /-aŋ/, stress shifts to the new penultimate syllable, as in (42b). Some clitics, such as the absolute clitic, have no effect on the stress and appear simply to lean onto the stem without any modification, as shown in (42c). With the determiner clitic, however, there is an assymetry in stress placement between consonant-final (C-final) and vowel final (V-final) stems, with stress shifting in V-final stems but not in C-final stems, as shown in (42d).

(42)   Makassarese adjectives, comparatives, absolutives and determiners (Basri et al. 2000)

	C-final /gassiŋ/	V-final /lompo/	
a. Adjective stem	gássiŋ "strong"	lómpo "big"	
b. Comparative Suffix /-aŋ/	gassíŋ-aŋ "stronger"	lompó-aŋ "bigger"	← stress shift
c. Absolutive Clitic /-aʔ/	gássiŋ-aʔ "I am strong"	lómpo-aʔ "I am big"	← no stress shift
d. Determiner Clitic /-a/	gássiŋ-a "the strong ..."	lompó-a "the big ..."	← asymmetrical

Analysis   The comparative suffix is part of the initial M-Word structure,[16] as schematized in (43a), and thus is part of the domain of stress for the assignment of penultimate stress at the M-Word level phonology. The absolutive clitic, on the other hand, seems to lean onto its host, but does not participate in the M-Word phonology of the host (i.e., is not part of the domain of stress). This is to be expected of a morphosyntactic node that is not part of the same M-Word (43b).

The key problem in this data, however, is that the determiner clitic behaves asymmetrically. When it attaches to C-final stems it behaves like the absolutive clitic (causing no change in stress), but when it attaches to V-final stems it behaves like the comparative suffix (causing a change in stress).

I propose that this is a variable application of Local Dislocation and reapplication of the M-Word phonology in the cases where Local Dislocation applies. That is, Linearization of the syntax outputs a structure identical to that with the absolutive clitic (43c), and, in cases with C-final stems, the derivation is identical. When attaching to V-final stems, however, the Makassarese determiner Local Dislocation Rule (44) applies, causing the determiner to move into the M-Word structure and the M-Word phonology to run again.

(43)   Morphological Structures of Makassarese suffix and clitics

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[15]The basic stress pattern in Makassarese is obscured somewhat by stems that end in consonants other than /ŋ/ or /ʔ/, which undergo epenthesis of /Vk/. This epenthetic material is not part of the domain of stress, however, allowing for main stress to actually fall as far back as four syllables from the right edge, such as in *rántasakaʔ* "I am dirty" from stem /rantas/. Besides the fact that there is this epenthetic material, these stems behave just like stems ending in licit final consonants and do not have stress shift with the determiner clitic. See Basri et al. (2000) for more detail on the data.

[16]Assuming that in the comparative in Makassarese, unlike English, the root and *a* heads undergo syntactic movement to the Deg head, and thus the comparative suffix is part of the morphosyntactic M-Word.

a. Comparative: [($\sqrt{\text{ROOT}}$ ⊕ a) ⊕ Deg[CMPR]]$_M$

b. Absolute: [$\sqrt{\text{ROOT}}$ ⊕ a]$_M$⌐[ABS]$_M$

c. Determiner: [$\sqrt{\text{ROOT}}$ ⊕ a]$_M$⌐[D]$_M$
 - Subject to Makassarese determiner Local Dislocation Rule (44)

(44) Makassarese determiner Local Dislocation Rule
 [$\sqrt{\text{ROOT}}$ ⊕ a]$_M$⌐[D]$_M$ →[($\sqrt{\text{ROOT}}$ ⊕ a) ⊕ D]$_M$
 where the phonological form of [$\sqrt{\text{ROOT}}$ ⊕ a]$_M$ ends in a vowel

The proposed structure of the Makassarese DP is given in (45). Under the $\mathbb{C}_1$-LIN hypothesis, the NP (and AP) will undergo Spell-Out and Vocabulary Insertion when the cyclic D head is merged, but the D does not (until the next cyclic head is merged). Thus, the phonology of the adjective is available for reference during the linearization phase of the morphology and can be used as a condition for application of Local Dislocation.

(45) Proposed structure for DP with NP(+AP) complement in Makassarese

```
              DP
             /  \
          NP      D
         /  \
       ...   AP
            /  \
          a   √ROOT
```
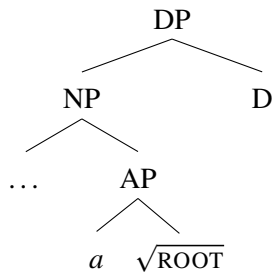
Using only a basic footing and stress rule (46) along with Local Dislocation, the Makassarese facts can be explained.

(46) Makassarese Stress and Footing: "Build trochees right to left."

The derivation of *lompóa* "the big …" is shown in (47). When D is merged, the NP is spelled out and undergoes a pass of M-Word phonology. When a higher cyclic head is merged and D is spelled out, it undergoes Local Dislocation to concatenate at the Subword level to the previously spelled out NP. This triggers a second pass of the M-Word phonology which causes the stress to shift to the new penultimate syllable.

(47) Derivation of Makassarese *lompóa* "the big …"
   1. Merger of D triggers Spell-Out of NP
      (a) Linearization: … [a ⊕ $\sqrt{\text{BIG}}$]$_M$,
      (b) Vocabulary Insertion: … [[a, ∅] ⊕ [$\sqrt{\text{BIG}}$, /lompo/]]$_M$
      (c) Input to M-Word Phonology: lompo
          (M-Word) Stress and Footing   (lómpo)
   2. Merger of higher cyclic head causes Spell-Out of D

(a) Linearization: [/(lómpo)/]$_M$⌢ [D]$_M$

(b) Local Dislocation: [/(lómpo)/ ⊕ [D]]$_M$

(c) Vocabulary Insertion: [/(lómpo)/ ⊕ [D, /-a/]]$_M$

(d) Input to M-Word Phonology: lompo-a   ← second pass of M-Word phonology

   (M-Word) Stress and Footing   lom(póa)

(e) Output: *lompóa*

In the derivation of *gássiŋa* "the strong . . ." (48), however, Local Dislocation does not apply because it is conditioned on the final segment of the host being a vowel. Because Local Dislocation does not apply, there is no second pass of the M-Word phonology and the stress remains on the initial syllable as was assigned during the first pass of the M-Word Phonology.

(48)   Derivation of Makassarese *gássiŋa* "the strong . . ."

  1.   Merger of D triggers Spell-Out of NP

    (a)   Linearization: . . . [a ⊕ $\sqrt{\text{STRONG}}$]$_M$,

    (b)   Vocabulary Insertion: . . . [[a, ∅] ⊕ [$\sqrt{\text{STRONG}}$, /gassiŋ/]]$_M$

    (c)   Input to M-Word Phonology: gassiŋ

      (M-Word) Stress and Footing   (gássiŋ)

  2.   Merger of higher cyclic head causes Spell-Out of D

    (a)   Linearization: [/(gássiŋ)/]$_M$⌢[D]$_M$

    (b)   No Local Dislocation: condition "final vowel" not met

    (c)   Vocabulary Insertion: [/(gássiŋ)/]$_M$⌢[D, /-a/]$_M$

    (d)   Output: *(gássiŋ)=a*

The second pass of M-Word phonology triggered by Local Dislocation can account for the asymmetric behavior of stress assignment in Makassarese. Where Local Dislocation applies, the determiner clitic moves into the host's M-Word and is subject to the M-Word phonology with the host. Where Local Dislocaiton does not apply, the determiner clitic is outside the M-Word of the host and is outside the domain of stress.

Maltese Verbs and Object Clitics

Data   Maltese shows an asymmetry in the application of syncope when object clitics are attached to verbal stems. While all stems show show syncope of the first vowel when the first-person plural subject agreement suffix is added, the first-person plural object clitic only causes syncope in glide-final hosts, not other hosts, as shown in (49):

(49)   Maltese first-person plural subject suffix and object clitic (Brame 1974; Odden 1993)

	non-glide-final /ħataf/	glide-final /ʔaraj/	
a. 3.M.sg Subj. Agr. -∅	ħátaf "he snatched"	ʔára "he read"	← no syncope
b. 1.pl Subj. Agr. /-na/	ħtáf-na "we snatched"	ʔráj-na "we read"	← syncope
c. 1.pl Obj. Clitic /-na/	hatáf-na "he snatched us"	ʔráː-na "he read us"	← asymmetrical

Although one can account for the difference between the subject agreement and object clitic behaviors with a stratal system (that is, between 49b and 49c; see Kiparsky 2011), there is no stratal difference between the glide-final and non-glide-final hosts in (49c) that can account for the difference in syncope between them when the object clitic is attached.

Analysis I will assume here that the object clitic originates as part of the object DP[17], as shown in (50), but any syntactic structure which has the clitic moving in from outside the $\sqrt{\text{ROOT}}$-v-ASP-AGR complex will be consistent with the morphophonological analysis.

(50) Syntactic Structure of Maltese verb and object clitic[18]
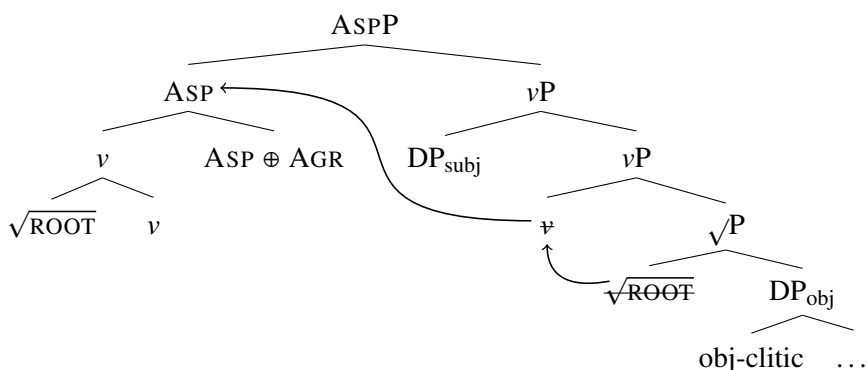
Under the assumptions of the $\mathbb{C}_1$-LIN theory, the object clitic and the rest of the object DP will undergo spell-out once the cyclic head v is merged. However, there is nothing for the object clitic to attach onto until the next cyclic head is attached and spells out the $\sqrt{\text{ROOT}}$-v-ASP-AGR complex, allowing the object clitic to move up and linearize onto it. The exact mechanics of this movement will be left unspecified at the moment.[19] The resulting structure will be one in which both the object clitic and the $\sqrt{\text{ROOT}}$-v-ASP-AGR complex will have undergone one pass of phonology each, and are syntactically linearly adjacent, but not phonologically combined. The linearized morphosyntactic structure before combining the clitic is shown in (51):

(51) Morphological structure of Maltese verbal complex and object clitic before linearization

[($\sqrt{\text{ROOT}} \oplus v \oplus$ ASP $\oplus$ AGR)]$_M$⌢[obj-clitic]$_M$

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[17]Maltese can have an object clitic and a full object phrase in the same clause (Borg and Azzopardi-Alexander 1997), so the object clitic cannot be the entire object DP.

[18]Maltese is described as having an aspect rather than a tense system by Borg and Azzopardi-Alexander (1997) so an ASP node is used in this tree. Whether this node is aspect or tense or both does not affect the relevant morphophonology. Similar to the cases above, the AGR node is shown attached to the ASP head, although any analysis which puts AGR in the same M-Word/ω-Word would work.

[19]The mechanics of the clitic movement is actually a question that needs to be examined. That is, we would like to assume that the object clitic undergoes syntactic movement up to the verbal complex head. However, if this is the case, we might expect the clitic to be part of the M-Word and thus the default behavior phonological behavior of the clitic would be to be inside the ω-Word. Here, we must assume that there is some difference in the nature or the timing of the clitic movement that excludes it from the structural M-Word by default. One possibility has to do with the spell-out status of the objects. That is, if the object clitic has already been spelled-out, perhaps it cannot join the head complex in the same way as the other nodes can.

I propose that Local Dislocation applies during the Linearization of the object clitic and the √ROOT-*v*-ASP-AGR complex in Maltese, but that it is sensitive to the final segment of the √ROOT-*v*-ASP-AGR complex. That is, Local Dislocation will apply when the final segment of the √ROOT-*v*-ASP-AGR complex is a vowel but not when the final segment is a consonant. This results in a second pass of the M-Word phonology being run for V-final hosts, but not for C-final hosts.

(52)   Maltese object clitic Local Dislocation Rule
   [(√ROOT ⊕ *v* ⊕ ASP ⊕ AGR)]$_M$⌢[obj-clitic]$_M$ →[(√ROOT ⊕ *v* ⊕ ASP ⊕ AGR) ⊕ obj-clitic]$_M$
   where the phonological form of [(√ROOT ⊕ *v* ⊕ ASP ⊕ AGR)]$_M$ ends in a vowel

Using the proposed architecture and Local Dislocation rule, a simple formulation of syncope (53) and a few other simple rules (54), or equivalent constraints, will predict the correct outcome for syncope for Maltese object clitics.

(53)   Syncope (M-Word level): V̆ → ∅ / _ CV
   "Delete unstressed non-final vowel in a light syllable"

(54)   Other relevant rules in Maltese

   a.   Stress Assignment and Footing (M-Word and Phrasal): "Build trochees right to left"

   b.   /j/-deletion (M-Word level): j → ∅ / _]$_M$
      "Delete /j/ at the end of an M-Word"

   c.   Boundary Lengthening (M-Word level): /V/ → [Vː] / _]$_M$
      "Lengthen a vowel at the end of an M-Word"

   d.   Final long vowel shortening (Phrasal Level): Vː → V / _]$_M$
      "Shorten a M-Word final long vowel"

The derivation of *ʔraːna* "he read us" is shown in (55). At the merge of *v*, the root and object clitic are Spelled-Out. After higher cyclic node causes the Spell-Out of the rest of the √ROOT-*v*-ASP-AGR complex, the object clitic moves up to adjoin it. At this point, the √ROOT-*v*-ASP-AGR complex has already undergone one pass of M-Word phonology, resulting in the form /ʔáraː/. However, the Local Dislocation of the clitic into the M-Word of the √ROOT-*v*-ASP-AGR complex causes a second cycle to run, resulting in the syncope of the first vowel.

(55)   Derivation of Maltese *ʔraːna* "he read us"

   1.   Merge of *v* triggers Spell-Out of √P:
      (a)   Vocabulary Insertion: [√READ, /ʔaraj/], [obj-clitic[1.pl.], /-na/]
   2.   Merge of higher cyclic head causes Spell-Out of *v*, ASP, and AGR, movement of nodes up to AGR:
      (a)   Linearization: [[√READ, /ʔaraj/] ⊕ *v* ⊕ ASP[Perf.] ⊕ AGR[3.M.sg])]$_M$
      (b)   Vocabulary Insertion:
         [[√READ, /ʔaraj/] ⊕ [*v*, ∅] ⊕ [ASP[Perf.], ∅] ⊕ [AGR[3.M.sg], ∅]]$_M$

    (c)   Input to M-Word Phonology: ʔaraj

       (M-Word) Stress and Footing   (ʔáraj)

       (M-Word) Syncope   —

       (M-Word) /j/-deletion   (ʔára)

       (M-Word) Boundary Lengthening   (ʔáraː)

3.   Movement of object clitic up to $\sqrt{\text{ROOT}}$-*v*-ASP-AGR complex

    (a)   Linearization: [$\sqrt{\text{ROOT}}$-*v*-ASP-AGR, /(ʔáraː)/]$_M$⌢ [[obj-clitic[1.pl.], /-na/]]$_M$

    (b)   Local Dislocation: [$\sqrt{\text{ROOT}}$-*v*-ASP-AGR, /(ʔáraː)/ ⊕ [obj-clitic[1.pl.], /-na/]]$_M$

    (c)   Input to M-Word Phonology (second pass): ʔáraː-na

       (M-Word) Stress and Footing   ʔa(ráːna)

       (M-Word) Syncope   (ʔráːna)

       (M-Word) /j/-deletion   —

       (M-Word) Boundary Lengthening   (ʔráːnaː)

4.   Output, Input to Phrasal Phonology: (ʔráːnaː)

   (Phrase Level) Vː] Shortening   ʔráːna

The derivation of *ħatáfna* "he snatched us" is shown in (56). Local Dislocation does not apply in step (56-3b), thus there is no second pass of M-Word phonology. The result is no additional change in the phonology of the $\sqrt{\text{ROOT}}$-*v*-ASP-AGR complex other than the leaning-on of the clitic and Phrasal phonology. This accounts for the lack of syncope in this form.

(56)   Derivation of Maltese *ħatáfna* "he snatched us"

   1.   Merge of *v* triggers Spell-Out of $\sqrt{}$P:

     (a)   Vocabulary Insertion at $\sqrt{}$P: [$\sqrt{\text{SNATCH}}$, /ħataf/], [obj-clitic[1.pl.], /-na/]

   2.   Merge of higher cyclic head causes Spell-Out of *v*, ASP, and AGR, movement of nodes up to AGR:

     (a)   Linearization: [[$\sqrt{\text{SNATCH}}$, /ħataf/] ⊕ *v* ⊕ ASP[Perf.] ⊕ AGR[3.M.sg])]$_M$

     (b)   Vocabulary Insertion:

         [[$\sqrt{\text{SNATCH}}$, /ħataf/] ⊕ [*v*, ∅] ⊕ [ASP[Perf.], ∅] ⊕ [AGR[3.M.sg], ∅]]$_M$

     (c)   Input to M-Word Phonology: ħataf

        (M-Word) Stress and Footing   (ħátaf)

        (M-Word) Syncope   —

        (M-Word) /j/-deletion   —

        (M-Word) Boundary Lengthening   —

   3.   Movement of object clitic up to $\sqrt{\text{ROOT}}$-*v*-ASP-AGR complex

     (a)   Linearization: [$\sqrt{\text{ROOT}}$-*v*-ASP-AGR, /(ħátaf)/]$_M$⌢[[obj-clitic[1.pl.], /-na/]]$_M$

     (b)   No Local Dislocation: fails "final vowel" condition

   4.   Output, to Phrasal Phonology: (ħátaf)=na

     (Phrasal) Stress and Footing   ħa(táfna)

This architecture also predicts the correct outcome for the forms without object clitics, as shown in (57). In these cases, the subject agreement *-na* starts out in the same M-Word as the root due to the syntactic movement of the $\sqrt{\text{ROOT}}$, *v*, and Asp nodes up to Agr, thus only one pass of M-Word phonology applies.

(57)   Derivations for Maltese forms without object clitics

	ħtáfna "We snatched"	*ʔrájna* "We read"
Linearization	[ħataf ⊕ na]$_M$	[ʔaraj ⊕ na]$_M$
Input to M-Word Phonology	ħataf-na	ʔaraj-na
(M-Word) Stress and Footing	ħa(táf-na)	ʔa(ráj-na)
(M-Word) Syncope	(ħtáf-na)	(ʔráj-na)
(M-Word) /j/-deletion	—	—
(M-Word) Boundary lengthening	(ħtáf-naː)	(ʔráj-naː)
Input to Phrase Level Phonology	(ħtáfnaː)	(ʔrájnaː)
(Phrasal) Vː]$_M$-shortening	(ħtáfna)	(ʔrájna)
Output	(ħtáfna)	(ʔrájna)

As predicted by the output of the M-Word phonology with a final long vowel, these forms do show up lengthened in forms with an object clitic, such as "we read you" *ʔrajnɪːkom* and "we snatched you" *ħtafɪːkom* (where [ɪː] is a normal outcome of underlying long /aː/).

3.4.3 Evidence for Two Passes of Phonology

In Maltese, the effects of both runs of the M-Word phonology can be seen in (58) with the application of the /j/-deletion and syncope at different passes of the phonology.

(58)   Selected Maltese forms comparing /j/-deletion and syncope

	UR		Surface	
a. 3.M.sg Subj. Agr. -∅	/ʔaraj + ∅/	→	<u>ʔára</u> "he read"	← no /j/
b. 1.pl Subj. Agr. /-na/	/ʔaraj + na/	→	<u>ʔráj-na</u> "we read"	← /j/
c. 1.pl Obj. Clitic /-na/	/ʔaraj + ∅ # na/	→	<u>ʔráː-na</u> "he read us"	← no /j/

The form *ʔára* has a final /j/ which is deleted when the M-Word phonology is run. In the form *ʔrájna*, the /j/ is never M-Word-final so /j/-deletion does not apply. The first vowel of underlying /ʔaraj-na/, however, is subject to syncope, resulting in *ʔrájna*. In the derivation of *ʔráːna*, however, the /j/ must be M-Word final during a pass of the M-Word phonology in order to be deleted. The initial vowel must also be in the right configuration for syncope. These two environments, however, do not happen at the same time, but rather sequentially, as shown in (59):

(59) Derivation of *ʔráːna* compared with *ʔára* and *ʔrájna*

	ʔára "he read"	ʔráj-na "we read"	ʔráː-na "he read us"
UR + Subj. Agr.	ʔaraj + ∅	ʔaraj + na	ʔaraj + ∅
1. Stress and Footing	(ʔáraj)	ʔa(rájna)	(ʔáraj)
2. Syncope	—	(ʔrájna)	—
3. /j/-deletion	(ʔára)	—	(ʔára)
4. Boundary Lengthening	(ʔáraː)	(ʔrájnaː)	(ʔáraː)
Second pass *of same rules*			# na
Input (+ Obj.Cl.)			(ʔáraː)+na
1. Stress and Footing			ʔa(ráːna)
2. Syncope			(ʔráːna)
3. /j/-deletion			—
4. Boundary Lengthening			(ʔráːnaː)
(Phrase) Vː] shortening	(ʔára)	(ʔrájna)	(ʔráːna)
Output	ʔára	ʔrájna	ʔráːna

As demonstrated, the second pass of M-Word phonology accounts for the syncope in *ʔráːna*, but the first pass leaves a trace with the deletion of the underlying /j/.

Case Study Conclusion   The case studies in Maltese and Makassarese show asymmetries in phonological form were dependent on both phonological (phonological shape of the host) and morphosyntactic (presence of a particular clitic) information.

I proposed an explanation based on the framework in which the trigger for applying the M-Word block of phonological processes was the Spell-Out of the morphosyntactic M-Word structure. The M-Word level phonology was proposed to be re-triggered when late movement caused by Local Dislocation moved new material into a previously constructed M-Word. The Local Dislocation process was able to be conditioned by the phonology of the M-Words it was manipulating because those M-Words had already been spelled out, following the $\mathbb{C}_1$-LIN theory of cyclic Spell-Out.

4   Summary of Proposal and Questions to be Examined

To recapitulate, the overarching question for this dissertation is:

- What is the relationship between the domains of morphologically sensitive phonological processes and morphosyntactic structures?

Using the framework of Distributed Morphology, I propose that a stem-level of phonology is triggered by diacritics on certain exponents while the word level phonology is calculated on the basis of a morphosyntactic structure, the M-Word, with some possible modifications.

For the stem-level, some of the questions to be examined are:

- Are there any universal or language-specific generalizations to be made about what items have [+]

diacritics? That is, some languages may have item-by-item triggers, as in English, while others may have all exponents triggering spell out?

- Could a language choose to have all $^+$ affixes (or all non-$^+$) by default? What does this tell us about the nature of the diacritic?

- Could a language place this diacritic by morphological features or exponents (e.g., on all n nodes) rather than on vocabulary items?

- Are all instances of "well-behaved" level orderings results of syntactic structure rather than phonological levels?

For the word level, some of the questions to be examined are:

- Are the different grouping mechanisms (head-merging, phonological leaning, Local Dislocation) visible with respect to their effect on the phonology? What is the relationship between these mechanisms and the notion of "phonological word"?

- Are there default or automatic phonological groupings of associated with these mechanisms?

- Is there a principled way to determine what terminals will be included into a neighboring ω-Word (or what ω-Words serve as hosts) or is this behavior idiosyncratic?

- Are all cases of the inclusion of a neighboring terminal into a ω-Word reducible to Local Dislocation?

- What are the conditioning factors relevant to Stray Terminal Grouping? How is this operation optional or variable in some cases?

In this dissertation, I hope to improve the (often vague) discussion of the morphosyntax-phonology interface by positing an explicit pathway between morphosyntactic structure and phonological domains.

5   Timeline

A proposed list of topics and a timeline for completion.
- Jan.–Mar. 2014
    - Recursive M-Words in other types of Compounds
    - Continue work on English Stress
- Apr.–June 2014
    - Prosodically triggered morphemes: Greek Preterite/Perfective e- and German ge- prefixes
    - Phonological interaction in Bulgarian & Polish clitics
- July–Sep. 2014
    - Stem Level Defaults: Comparative Stem Level of Slavic
    - Ablaut/Umlaut: Icelandic/German
- Oct.–Dec. 2014
    - Templates/Non-linear morphophonology: Hebrew
    - Complex morphophonology: Kashaya, Huave
- Jan.–Mar. 2015
    - Finish Writing
- Aim to defend by April 2015

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